First International Conference on Advance Modern Computing Trends and Technology ICAMCTT 2021 (July 30 & 31, 2021)

S. Binny,
Roji Thomas,
Susheel George Joseph

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MESSAGE

Rev Fr Joshy Cheeramkuzhy CMI
Principal

It is my pleasure to extend a warm welcome to all delegates and participants for the First International Conference on Advance Modern Computing Trends and Technology on behalf Kristu Jyoti College of Management and Technology

I hope that this conference will serve as a forum for all of us here to think things through.
On the most recent trends in the prestigious fields of Engineering and Management Furthermore, it brings various ideologies together under one roof and provides opportunities for exchange. Ideas, establish research relationships, and identify global partners for future collaboration. I have closely observed all of the organisers' dedicated efforts.

I am confident that the participants will be empowered because of this conference.

Rev Fr Joshy Cheeramkuzhy CMI

MESSAGE

Conference Director
Mr Roji Thomas
HOD, Department of Computer Application

It gives me great pleasure to cordially invite you to the First International Conference on Advance Modern Computing Trends and Technology, which will be held on the 30th and 31st of July 2021. As the Director of this wonderful institution, I can assure you that these two days are designed to deliver and share the most recent research and developments in emerging technologies in all fields of Engineering and Management to all researchers and academicians. In the scope of this conference, I hope to highlight numerous scientific discoveries and major milestones. I am confident that you will enjoy participating in the exchange of professional knowledge, insights, and collaboration.

Mr Roji Thomas

MESSAGE

Conference Secretary
Mr Susheel George Joseph
Associate Professor & IQAC coordinator
Department of computer Application

As Secretary and Correspondent for this prestigious institution, I want to take this opportunity to welcome all delegates from worldwide to this First International Conference on Advance Modern Computing Trends and Technology (ICAMCTT-2021).

The conference's goal is to keep researchers up to date on the latest trends in the diverse fields of engineering and management. Furthermore, it provides a common platform for academicians, industrialists, and research scholars to deliberate and discuss.

The conference has received an overwhelming response from all parts of the country and from around the world. I congratulate the organizing committee, supporting staff and delegates for their initiative and wish a grand success for the conference.

Mr Susheel George Joseph

MESSAGE

Conference Convenor
Ms Binny.S
Associate professor & Research Hub Coordinator
Department of computer Application

I am overjoyed that the Kristu Jyoti College of Management and Technology of Research Hub is hosting the First International Conference on Advance Modern Computing Trends and Technology (ICAMCTT-2021) on July 30th and 31st, 2021.

The conference's theme highlights current trends in engineering and management, and it provides a shared platform for academicians, industrialists, and research researchers from across the world to share and exchange their knowledge and expertise.

I am confident that this conference will enable scholars to connect and integrate many areas of research to produce findings that address societal issues.

I convey my heartfelt greetings.

Ms Binny.S

Keynote Address

Digitalization and New technologies

Mobile Internet, IoT, Cloud, Big Data Analytics, 3D printing, Blockchain, Drones, and Driverless Cars are spawning new industry titans at the expense of old ones. The use of machine learning and AI in decision making is becoming the new norm in both government and industry.

The covid-19 pandemic has wreaked havoc on several industries, including tourism, travel, retail, colleges, and others. It has had an impact on globalisation, urbanisation, and working in offices, schools, colleges, and universities.

Many of today's business leaders grew up owning and controlling assets. Management is becoming more complex in all businesses today. Automation technologies such as robotics, driverless vehicles, cloud computing, IoT, and mobile internet are rising to prominence. Big data, data analytics, AI, ML, and APIs will be used for algorithmic decision making, such as demand forecasting, inventory optimization based on weather forecast data, cognitive customs clearance, intelligent robotic sorting, anomaly detection in logistics documents, predictive maintenance of factory floor equipment and transport vehicles, and many other applications. Covid-19 has compelled working from home, online classes, Zoom meetings, and several others.

We can see how flourishing companies like Amazon, Zoom, and Microsoft teams follow open platform-based business models while collaborating with ecosystem partners.

In this lecture, we will introduce new technologies that are affecting both industry and society, as well as demonstrate their application in manufacturing and management. Finally, we can say that "AI is every where in productivity."

Mr Harikrishnan .P
Syndicate Member
Mahatma Gandhi University

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A Comparison of Data Encryption Algorithm's Performance in Cloud

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Abstract—Cloud services are being used by businesses of all sizes, regions, and industries. This is because it has seen the fastest adoption into the mainstream than any other technology in the domain. Cyber-attacks are increasingly common, especially in education, finance, healthcare, and the public sector. The shift from on-premises data storage to cloud storage, which is connected by wired and wireless technologies, is the reason for the growth. While cloud platforms make it easier to store large databases of customer, employee, financial, and sales information, hackers can exploit loopholes in cloud computing to gain unauthorized access by spoofing it. This article will cover various encryption methods. The main objective is to analyse and compare the performance of different cryptographic algorithms to improve data security in cloud computing.

Index Terms—Cloud Computing, Cryptographic algorithms, Encryption, Performance

I. INTRODUCTION

Data security has become increasingly important in today's world. Every company has large amounts of data in its database that must be safeguarded. If this information is hacked in any way, the company will be severely harmed. Data is perhaps an organization's most important asset. Regardless of legal or regulatory constraints, it is in a company's best interests to keep its data secure. In their personal lives, everyone requires data security. Personal information is stored online and stored on servers with an uninterrupted connection to the cloud or the web. Cryptography plays a key role in data protection. In our daily lives, the use of cryptography is ubiquitous. Cryptography is the science and art of changing messages so that they are secure and resistant to unauthorized access[4][5]. It is a crucial component in the development of information systems. It is concerned with the study of mathematical techniques about issues of data security such as confidentiality, data integrity, and data authentication[1][2]. Various mathematical processes are used to secure cryptographic methods in a wide range of applications[3].

In cryptographic terminology, plain text is data that can be read and understood without too much action. Encryption is a method of hiding plain text to hide its essence. Plain text creates an unreadable pad called an encryption cipher. The process of getting plaintext from a cipher is called decryption. Figure 1 shows the encryption and decryption process. The system or product that provides encryption and decryption is called a cryptosystem [1][6]. In the field of information security, many encryption methods are widely available and used. The asymmetry and symmetry encryption algorithms are of two types. Only one key must encrypt and decrypt data using symmetric-key cryptography, also known as secret-key cryptography. Asymmetric keys use two keys: one private and one public. Encryption is done using the public key, and decryption is done using the private key. Cryptography plays an important role in solving these problems. Strong and well-established

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data encryption has benefited from online and incredibly valuable assets or properties.

II. RELATED WORK

In general, there are three sorts of cryptographic techniques Symmetric Encryption, Asymmetric Encryption, and Hashing function. Figure 2 shows the classification of cryptography. With symmetric encryption, a key is used by both the sender and the recipient. The sender encrypts the plaintext and sends the ciphertext to the recipient using this key. On the other hand, the recipient uses the same key to decrypt the message and receive the plaintext. Different types of symmetric key encryption: AES, DES RC2, IDEA, Blowfish, Stream cipher. In asymmetric cryptography, there are two associated keys (public and private). The public key can be transferred freely, but the private key must be kept secret. The public key is used for encryption, and the private key is used for decryption. Some of the types of asymmetric key cryptography are RSA, DSA, PKC, Elliptic curve techniques. Keys are not used in the Hash function. Plain text is hashed using a fixed-length hash value, which prevents the contents of plain text from being retrieved. Many operating systems also use hashing algorithms to protect passwords.

A. Advanced Encryption Standard(AES)

Joan Daemen and Vincent Reiman created the AES algorithm, a block cipher of symmetric keys, in 1998 [9]. AES is a symmetric-key algorithm that encrypts and decrypts, indicating that the sender and recipient use the same key. The length of the AES data block is 128 bits. The key size is 128, 192 or 256 bits [7]. This is an iterative algorithm, and each move is called an iteration. When the key length is 128, 192, or 256 bits, the total number of turns is NR, 10,12 or 14 [8]. AES uses several transformations to ensure security. Each AES cycle, except the last one, uses all four modifications for permutation , substitutions, mixing, and key addition [7]. Each cycle is a set of four basic changes that use encryption. The decryption engine uses the reverse order of the steps specified in the encryption method. The basic structure of encryption and decryption in the AES method is shown in Figure 3. Subbyte, shift row, mix column and add round key are the four basic transformations performed at each pass [10].

1. SubByte: A non-linear replacement byte that uses a replacement table to work with each status byte individually.
2. ShiftRow: Numbers are shifted cyclically from individual bytes.
3. MixColumn: column with multiple columns
4. AddRoundKey: Using the basic XOR method, add a round key to the report.

B. Data Encryption Standard(DES)

DES is a block cipher with a key size of 56 bits and a block size of 64 bits. IBM developed DES in 1972 as a data encryption method. The US government adopted it as the standard encryption algorithm. It started with a 64bit key, but the NSA has limited its use to 56-bit keys, so DES removes 8 bits from the 64-bit key and then uses the 56-bit compressed key derived from the 64-bit key cryptography. 64-bit block data [9] DES is a 16-pivot substitution and exchange algorithm. The data and key bits are moved, exchanged, XORed, and sent through 8 s-boxes, the set of lookup tables required by the DES algorithm, at each cycle. Decryption is essentially the same procedure as encryption, but the reverse is true [7].

As shown in Figure 4, DES is a block cipher. DES creates a 64-bit ciphertext from a 64-bit plaintext; At a decryption site, DES creates a 64-bit plaintext block from a 64-bit ciphertext. The same 56-bit encryption key is used for encryption and decryption.

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The encryption procedure consists of sixteen Feistel turns and two permutations (P-boxes), which we call beginning and end permutations. Each move uses a separate 48-bit key derived from the encryption key using a predefined technique. Parts of the DES encryption are shown in Figure 5 at the encryption site [11].

C. Triple Data Encryption (3DES)

3DES is a block cipher. 3DES was first released in 1998 and gets its name because it encrypts, decrypts, and encrypts each data block three times using DES encryption[9]. Figure 6 shows 3DES showing encryption and decryption. Encrypt the data. Three times with three 56bit keys. This is a less risky version of DES. Start with DES and create a block cipher technique using the combined block method. 3DES is more secure than the original DES algorithm[12].

Here is the procedure for encryption-decryption:

Use a DES with the K1 key to encrypt blocks of text. Decrypt the result of step 1 with K2 using a single DES. Finally, encrypt the result of step 2 with K3 using a DES. The ciphertext is the result of step 3. The reverse process of decrypting the ciphertext is called decryption. K3 is used for decryption, then K2 is used for encryption, and finally, K1 is used for decryption.

D. Base64

Base64 encoding converts binary data into a text format that can be safely passed in contexts that only support text. The original binary data is split into 3-byte Base64-encoded tokens. Since the byte is eight bits long, Base64 only needs 24 bits. The ASCII standard is then used to convert these three bytes into four printable characters. The first step is to divide the three bytes of binary data (24 bits) into four six-bit values. Since ASCII requires seven bits, Base64 uses only six bits (26 = 64 equivalent characters) to ensure that the encoded data is readable and that none of the special ASCII characters are used. Base64 is the name of the algorithm, which derives from the use of these 64 ASCII characters. The numbers 09, alphabets, 26 lowercase, and 26 uppercase character, rs, and two additional characters ”+” and ”/” make up the ASCII characters used for Base64.

III. RESULTS AND DISCUSSION:

This section discusses the results of the scoring parameters. The algorithms are implemented in Java using the Eclipse IDE. Java encryption and security implemented. Encryption, decryption, key generation, key management infrastructure, authentication, and authorization are some of the security features provided by the java encryption and security packages. Table 1 and Table 2 shows the time it takes to encrypt and decrypt the same text with different encryption algorithms. Table 3 shows the comparison among AES, DES,3DES, and base64 algorithms. Figure 7 shows that AES took as little time as possible to encrypt three different encryption methods with input sizes of 5KB, 10KB, 20KB, and 50KB, respectively. The base64 algorithm, on the other hand, took longer, followed by DES and 3DES. For 5KB, 10KB, 20KB, and 50KB input data encryption, this method requires 39ms, 46ms, 61ms, and 114ms, respectively. Figure 8 compares the average time it takes to decrypt data of different sizes for four encryption methods (KB). It shows that DES takes the shortest possible time to decrypt data with input sizes of 5KB, 10KB, 20KB, and 50KB. Base64, on the other hand, took longer to decode the data with average decryption times of 13ms, 13ms, 14ms, and 26ms, sorted by input sizes of 5KB, 10KB, 20KB,

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and 50 KB. Also, 3DES consumes most of the time after the Base64 algorithm.

IV. CONCLUSION

Using encryption to protect data by regulating access to such data is a technique that has been around for a long time, and, with the increasing use of information technology in every element of our human activity, it is becoming increasingly important. The experimental results of encryption methods are displayed, demonstrating that all techniques employ the same text files for testing. During the analysis, it was found that the time it takes to encrypt and decrypt is longer in base64. Compared to other algorithms, AES takes less time to encrypt and decrypt. AES is the best algorithm for use if cryptographic strength is a critical consideration in the application.

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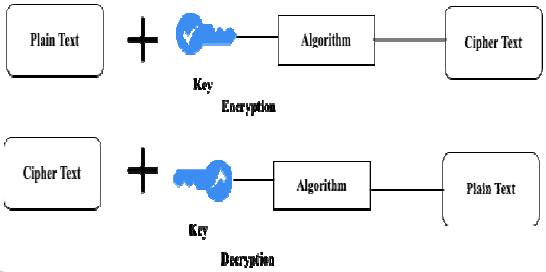
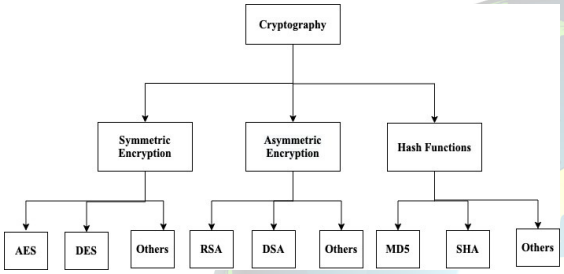
Fig. 1. Encryption and Decryption.





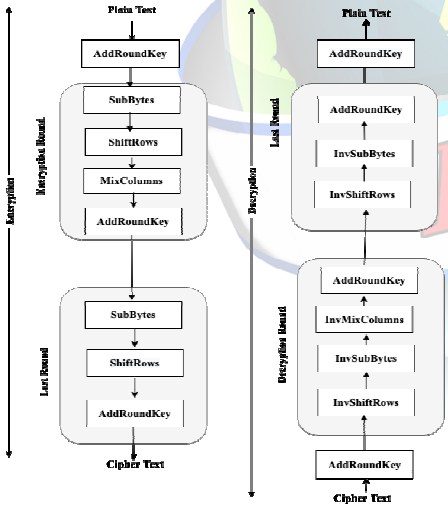


Fig. 2. Classification of Cryptography[6].

Fig. 3. AES Encryption and Decryption.

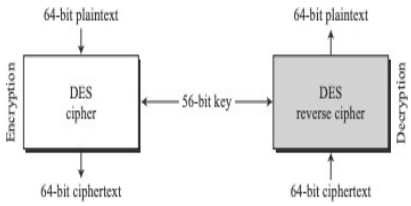


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Fig. 4. Encryption and decryption with DES.

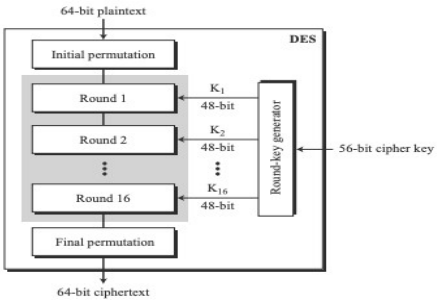

Fig. 5. General Structure of DES.

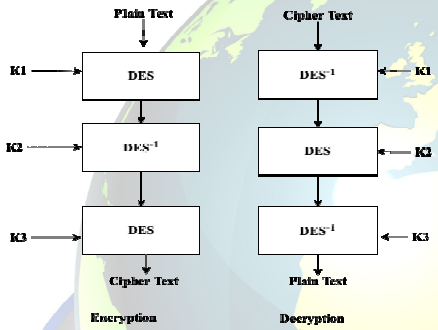

Fig. 6. 3DES encryption and decryption.

TABLE I
ENCRYPTION TIME FOR DIFFERENT FILE SIZE

Algorithms	5KB	10KB	20KB	50KB
AES	4milliseconds	7milliseconds	11milliseconds	18milliseconds
BASE64	39milliseconds	46milliseconds	61milliseconds	114milliseconds
DES	5milliseconds	9milliseconds	12milliseconds	17milliseconds
3DES	7milliseconds	16milliseconds	22milliseconds	31milliseconds

TABLE II
DECRYPTION TIME FOR DIFFERENT FILE SIZE

Algorithms	5KB	10KB	20KB	50KB
AES	1milliseconds	2milliseconds	6milliseconds	12milliseconds

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BASE64	13milliseconds	13milliseconds	14milliseconds	26milliseconds
DES	1milliseconds	2milliseconds	3milliseconds	6milliseconds
3DES	1milliseconds	4milliseconds	7milliseconds	16milliseconds

TABLE III
COMPARISON OF EXECUTION TIME AMONG AES,BASE64,DES,3DES

Encryption Algorithm	Plain text	Cipher Text	Encryption time	Decryption time	Memory used in bytes
AES	hi, to welcome my git area!	acd7fddda5793cef7ba666c21ebc38b82919baeabbcabb4b7c2a7c004a817926	3 milli seconds	0 milli seconds	1224096
base64	hi, to welcome my git area!	aGksIHdlbGNvbWUgdG8gbXkgZ2l0IGFyZWEh	35 milli seconds	5 milli seconds	605200
3DES	hi, to welcome my git area!	8f54f86cf8f3fa2fc6942c7466ea39e6b6e9e3ad118bbf64d8a1910def2ebcbe	3 milli seconds	0 milli seconds	1179216
DES	hi, to welcome my git area!	f9c2e3f6443d2ebb4cea492b0df87e105901ab75885f158d5cfad57f6a5c5fd9	3 milli seconds	0 milli seconds	1215488

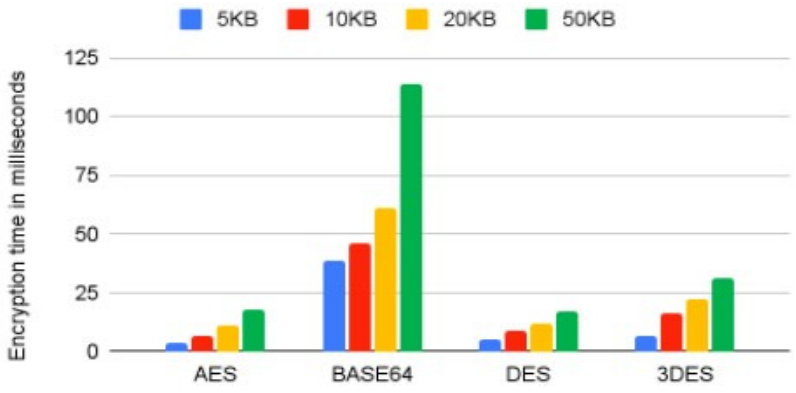

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Fig. 7. Average Encryption Time.

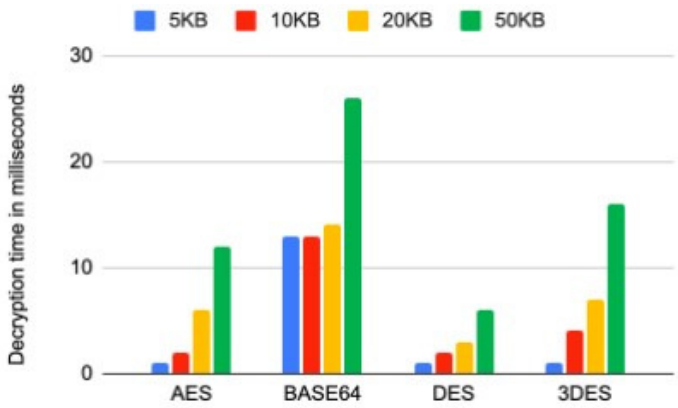

Fig.8. Average Decryption Time

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A Comparison of Machine Learning Algorithms for Diabetes Prediction using Pima Indian Dataset

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***Abstract*—Diabetes is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period. Symptoms of high blood sugar include frequent urination, increased thirst, and increased hunger. It is a very common and serious disease in many American Indian tribes, Indians, and many other populations in the world. Several well- known risk factors such as parental diabetes, genetic markers, obesity, and diet are considered as the main risk factors for diabetes mellitus, while the precise nature of the gene or genes remains unknown.**

***Index Terms*—Machine learning, Diabetes patients, Pima Indian Diabetes, Classification algorithms**

I. INTRODUCTION

Diabetes Mellitus also called as "Sugar diabetes "is a condition that occurs when the body cannot use glucose normally. The main source of energy in the body's cells is glucose and its level is controlled by a hormone called insulin. Type1 diabetes is a condition in which our immune system destroys insulin making cells in our pancreas called beta cells. This condition is usually diagnosed in children and young people, so it's also called as juvenile diabetes. Type1 diabetes symptoms are extreme thirst, increased hunger, dry mouth, frequent urination, fatigue, upset stomach and vomiting etc. Type2 diabetes mellitus is a chronic disease. It is usually called as adult onset diabetes because it used to start always in middle and late-adulthood. It is characterized by high levels of sugar in the blood and type2 diabetes is much more common than type 1 diabetes. Its symptoms are excessive urination, hunger and thirst, increased susceptibility to infections especially yeast or fungal infections, weight loss, dizziness etc. Diabetes is a common medical complication during pregnancy would be an understatement; it is a major medical problem for both over and under – fed pregnant populations. It is a major cause of prenatal morbidity & mortality and a significant contributor to bad obstetric history (BOH).50% of GDM patients develop type 2 Diabetes in next 20 years, so the long term complications too cannot be ignored1 Incidence is 1% - 14%2 and varies according to ethnicity, selection criteria and diagnostic test Asians data suggests a local incidence of 5-8%. 90% of them are of Gestational onset and Type 1 diabetes occurs in 7.5%. To study the reason that leading to diabetes, a cluster of dataset about Pima Indian Diabetes was collected. It is consisted of 8 predict variables and 1 response variable. The variables are

PRG, PLASMA, BP, THICK, INSULIN, BODY, PEDIGREE and AGE. After randomly selecting 700 observations from 768 patients, 9 variables were taken to fit a generalized linear model to predict the probability that individual females have diabetes. Then, using stepwise selection provided subgroups of characteristics with higher risk of diabetes. Diabetes Prediction deals with the problem statement that correctly classifies and predicts whether a female has diabetes or not. The research people are Pima Indian females.

II. LITARATURE REVIEW

The PID database availed from UCI Machine Learning Repository, consists of two categories namely tested positive and tested negative. It has 8 features as : number of times pregnant, plasma glucose concentration at 2-hours in an oral glucose tolerance test, diastolic blood pressure (mmHg), triceps skin fold thickness (mm), 2-Hourserum insulin (mu U/ml), body mass index(weight in kg/(height in m)2), diabetes pedigree function and Age (years). A Research Paper given by Sudajai Lowanichchai, SaisuneeJabjone, Tidanut Puthasimma, Informatics Program Faculty of Science and Technology Nakhon Ratchsima Rajabhat University it proposed the application Information technology of knowledge-based DSS for analysis diabetes of elder using decision tree.

The result showed that the Random Tree model has the highest accuracy in the classification is 99.60 percent when compared with the medical diagnosis that the error MAE is 0.004 And RMSE is 0.0447. The NBTree model has lowest accuracy in the classification is 70.60 percent when compared with the medical diagnosis that the error MAE is 0.3327 and RMSE is 0.454 [1]. In another Research paper presented by Yang Guo, GuohuaBai, Yan Hu School of computing Blekinge Institute of Technology Karlskrona, Sweden, The discovery of knowledge from medical databases is important in order to make effective medical diagnosis. The dataset used was the Pima Indian diabetes dataset. Preprocessing was used to

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improve the quality of data. Classifier was applied to the modified dataset to construct the Naïve Bayes model. Finally weka was used to do simulation, and the accuracy of the resulting model was 72.3%. [2]. In a Research paper presented by Ashwinkumar U.M and Dr. Anandakumar K.R. Reva Institute of Technology and Management, Bangalore S J B Institute of Technology, Bangalore. This Paper has proposed a novel learning algorithm i+ Learning as well as i+ LRA, which apparently achieves the highest classification accuracy overID3 algorithm. Literature Review on Diabetes, by National Public health: Women tend to be hardest hit by diabetes with 9.6million women having diabetes. This represents 8.8% of the adult population of women 18 years of age and older in 2003 and a two fold increase from 1995 (4.7%). By 2050, the projected numbers of all persons with diabetes will have increased from 17 million to 29 million.

III. METHODOLOGY

A. About Dataset

This dataset is originally from the National Institute of Diabetes and Digestive and Kidney Diseases. The objective is to predict based on diagnostic measurements whether a patient has diabetes. Several constraints were placed on the selection of these instances from a larger database. In particular, all patients here are females at least 21 years old of Pima Indian heritage.

- Pregnancies: Number of times pregnant
- Glucose: Plasma glucose concentration a 2 hours in an oral glucose tolerance test
- Blood Pressure: Diastolic blood pressure (mm Hg)
- Skin Thickness: Triceps skin fold thickness (mm)
- Insulin: 2-Hour serum insulin (mu U/ml)
- BMI: Body mass index (weight in kg/(height in m)^2)
- Diabetes Pedigree Function: Diabetes pedigree function
- Age: Age (years)
- Outcome: Class variable (0 or 1)

TABLE I
PATIENT DETAILS (FEMALE) AGED AT LEAST 21 AND ABOVE

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35	0	33.6	0.627	50	1
1	1	85	66	29	0	26.6	0.351	31	0
2	8	183	64	0	0	23.3	0.672	32	1
3	1	89	66	23	94	28.1	0.167	21	0
4	0	137	40	35	168	43.1	2.288	33	1

B. Data Acquisition

When encountered with a data set, first we should analyze and "get to know" the data set. This step is necessary to familiarize with the data, to gain some understanding about the potential features and to see if data cleaning is needed. First we will import the necessary libraries and import our data set to the Jupyter notebook. We can observe the mentioned columns in the data set. Visualization of data is an imperative aspect of data science. It helps to understand data and also to explain the data to another person. Python has several interesting visualization libraries such as Matplotlib, etc. We can observe that the data set contain 768 rows and 9 columns. 'Outcome' is the column which we are going to predict, which says if the patient is diabetic or not. 1 means the person is diabetic and 0 means person is not. We can identify that out of the 768 persons, 500 are labeled as (non-diabetic) and 268 as 1 (diabetic).

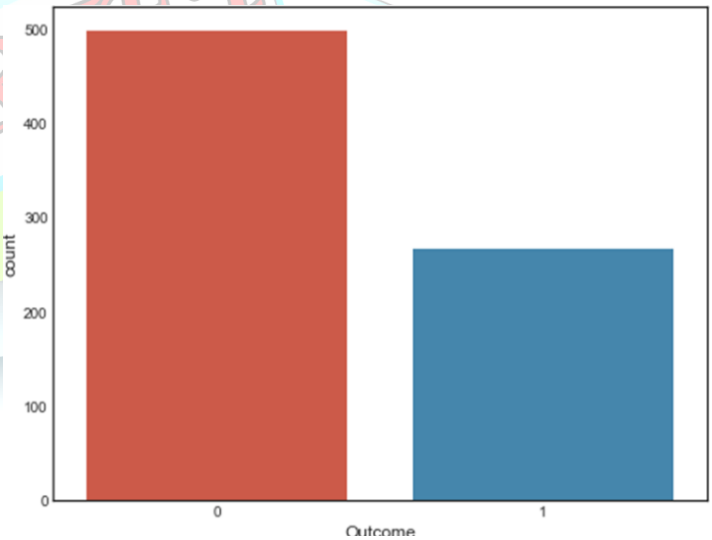

Fig.2 Predicted outcome of diabetes

C. Pre-Processing

1) *Missing Values:* One relevant problem in data quality is the presence of missing data. Missing data may have

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different sources such as death of patients, equipment malfunctions, and refusal of respondents to answer certain questions, and so on.

2) *Data Cleaning:* Next phase of the machine learning work flow is the data cleaning Considered to be one of the crucial steps of the work flow, because it can make or break the model. There is a saying in machine learning "Better data beats fancier algorithms", which suggests better data gives you better resulting models.

3) *Outlier Detection and Treatment:* Presence of outlier has considerable effect on the accuracy of prediction model. Outliers can be detected in the PID dataset using box plot. The attribute serum insulin has the large number of outliers therefore the corresponding data 36 cases are eliminated from data set leaving with 498 cases for the modeling. In this data set 700 cases have label tested negative, while 157 cases have label tested positive.

4) *Model Selection:* Model selection or algorithm selection phase is the most exciting and the heart of machine learning. It is the phase where we select the model which performs best for the data set at hand .First we will be calculating the "Classification Accuracy (Testing Accuracy)" of a given set of classification models with their default parameters to determine which model performs better with the diabetes data set. We imported the necessary libraries to the notebook. We import 7 classifiers namely K-Nearest Neighbors, Support Vector Classifier, Logistic Regression, Gaussian Naive Bayes, Random Forest and Gradient Boost to be contenders for the best classifier. Train/Test Split, This method split the data set into two portions: a training set and a testing set. The training set is used to train the model. And the testing set is used to test the model, and evaluate the accuracy. K-Fold Cross Validation, This method splits the data set into K equal partitions ("folds"), then use 1 fold as the testing set and the union of the other folds as the training set. Then the model is tested for accuracy. The process will follow the above steps K times, using different fold as the testing set each time. The average testing accuracy of the process is the testing accuracy.

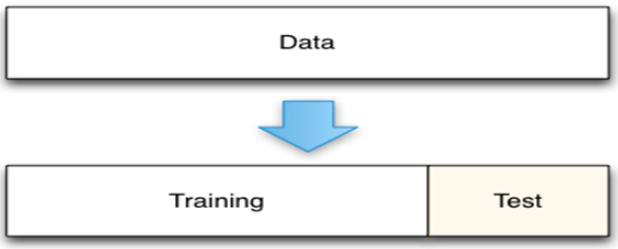

Fig.2. Steps in Random Forest and Gradient Boost classifier

D. Visualization

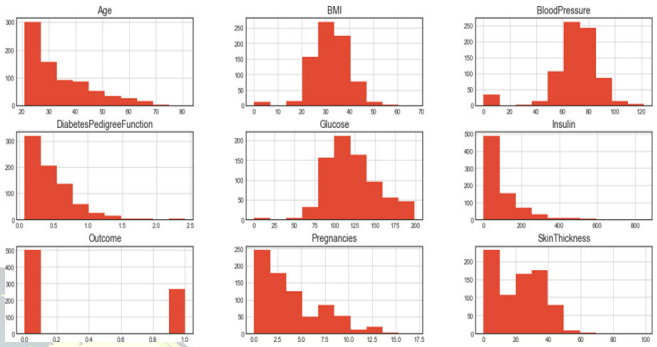

Fig.3 Histogram for the attributes which indicates the distribution

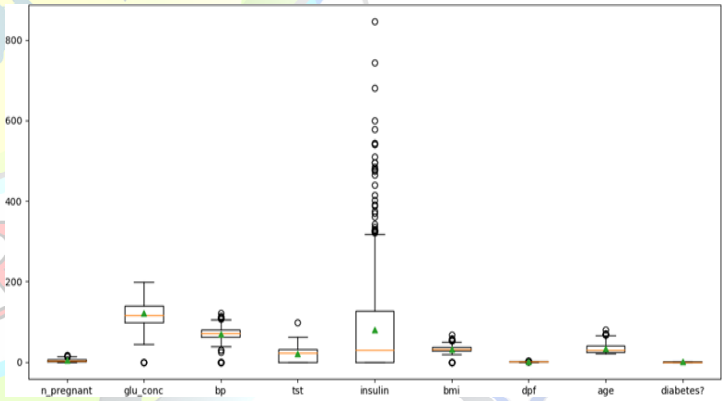

Fig.4 Box plot without normalization

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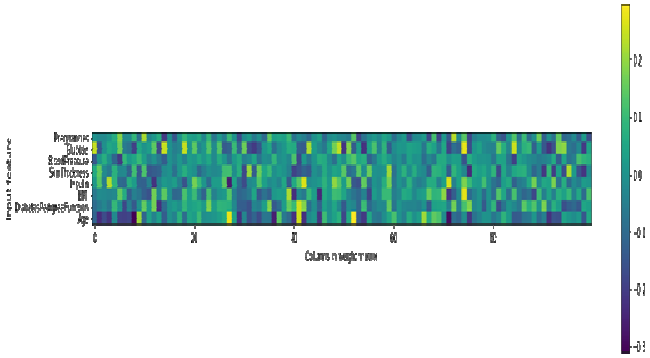

Fig.6 Attributes columns in weight matrix

Properties	Value
Number of Samples	768
Number of attributes	8
Number of classes	2
Type of attributes	Numeric
Type of Class attributes	Binomial

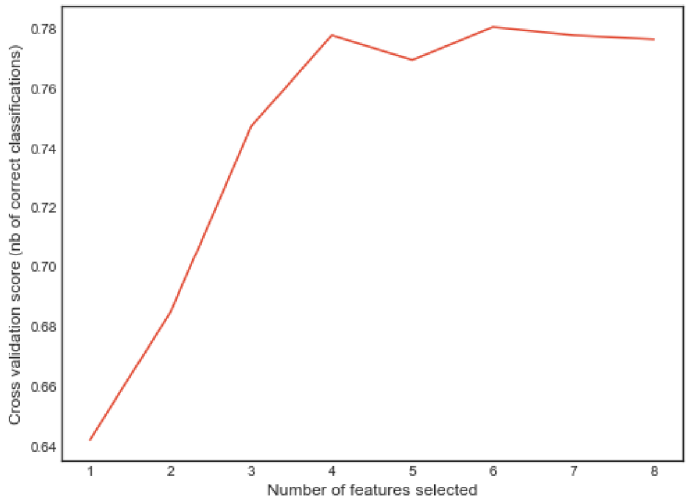

Fig.5 Gradient Boost CV v/s No of features

IV. RESULTS AND DISCUSSIONS

A. *Dataset Description*

The dataset chosen for this work is Pima Indian Diabetes dataset because it has been widely studied and also because it is considered a difficult set. The source of the database is National Institute of Diabetes and Digestive and Kidney Diseases. Several constraints were placed on the selection of these instances from a larger database. In particular, all patients in this dataset are females of at least 21 years old of Pima Indian heritage. In the Pima Indian Diabetes data set, an instance represents one report of diabetes test. Each instance is characterized by 8 attributes, and each instance is classified as either positive or negative. There are 768 instances in the data set in total. The class is distributed as follows: Class value 1 is interpreted as "tested positive for diabetes" and class value 2 is interpreted as “tested negative for diabetes”. In other words, the class label represents if the person has not diabetes (tested negative) or the person has diabetes (tested positive).

TABLE II
REPRESENTS THE DESCRIPTION OF DATASET USED

There are 268 (34.9%) cases in class ‘1’ and 500 (65.1%) cases in class ‘0’. There are eight clinical findings which are listed as number of times pregnant, plasma glucose concentration a 2 hours in an oral glucose tolerance test, diastolic blood pressure (mmHg),triceps skin fold thickness (mm), two hour serum insulin (mu U/ml), body mass index, diabetes pedigree function, and age (years).

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B. Applying Classification Algorithm Without Feature Selection

Applying various classification algorithms such as Support Vector Machine, logistic Regression, Gradient Boosting and Random Forest classifier tree on the original Pima Indian Diabetes Patient Datasets

- K-NN Classifier
  Accuracy of K-NN classifier on training set: 0.79
  Accuracy of K-NN classifier on test set: 0.78

- Logistic Regression
  Training set score: 0.781
  Test set score: 0.771

- Decision Tree Classifier
  Accuracy on training set: 1.000
  Accuracy on test set: 0.714

- Random Forest Classifier
  Accuracy on training set: 1.000
  Accuracy on test set: 0.786

- Gradient Boosting Classifier
  Accuracy on training set: 0.917
  Accuracy on test set: 0.792

- Support Vector Machine Classifier
  Accuracy on training set: 1.00
  Accuracy on test set: 0.65

C. Applying Feature Selection & Classification Algorithm After Feature Selection

Attribute or feature selection is done with the help of greedy stepwise approach. The whole datasets of diabetes patients is comprised of all relevant or irrelevant attributes. By the use of feature selection, a subset (data) of diabetes patient from whole diabetes patient datasets will be obtained which comprises only significant attributes. Applying feature selection or attribute selection using Greedy Stepwise Technique on 9 attributes.

- K-NN Classifier
  Accuracy of K-NN classifier on training set: 0.79
  Accuracy of K-NN classifier on test set: 0.78

- Logistic Regression
  Training set accuracy: 0.785
  Test set accuracy: 0.766

- Decision Tree Classifier
  Accuracy on training set: 1.000
  Accuracy on test set: 0.714

- Random Forest Classifier
  Accuracy on training set: 0.800
  Accuracy on test set: 0.755

- Gradient Boosting Classifier
  Accuracy on training set: 0.804
  Accuracy on test set: 0.781

- Support Vector Machine Classifier
  Accuracy on training set: 0.790
  Accuracy on test set: 0.797

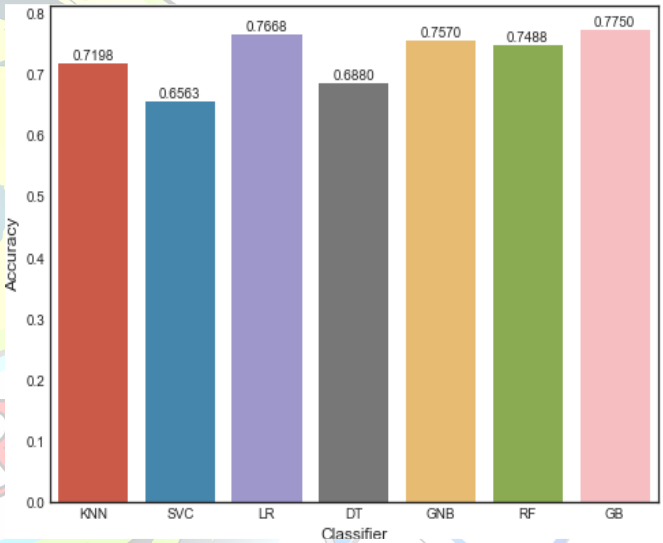

Fig.7 Comparison of classifiers

We can see the Logistic Regression, Gaussian Naive Bayes, Random Forest and Gradient Boosting have performed better than the rest. From the base level we can observe that the Logistic Regression performs better than the other algorithms.

V. CONCLUSION

The classification performance depends on the quality of the data. A data pre- processing is done properly then accuracy of the classifier may get increased. Data is to be used for classification is selected by clustering algorithm where cases which are correctly grouped are only considered for classification. In this report, initially, the dataset, 700 total observations, was randomly selected. Then, according to the picked dataset, the probability that individual females have diabetes was predicted. We finally

find a score of 77 % using Gradient Boosting Classifier and parameters optimization. Based on the feature importance, Glucose is the most important factor in determining the onset of diabetes followed by BMI, Age and Other factors such as Diabetic Pedigree Function, Pregnancies, Blood Pressure, Skin Thickness and Insulin also contributes to the prediction.

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We would also like to show our gratitude to Dr. B Kannan, Cochin University of Science and Technology for sharing their pearls of wisdom with us during the course of this research, and we thank "anonymous" reviewers for their so-called insights. We are also immensely grateful to Ms. Keerthy A.S, Cochin University of Science and Technology for their comments on an earlier version of the manuscript, although any errors are our own and should not tarnish the reputations of these esteemed persons. We thank Dr. Bindu N, Associate Professor Sree Narayana College Cherthala for valuable comments that greatly improved the manuscript. We thank our colleagues from Sree Narayana College Cherthala who provided insight and expertise that greatly assisted the research, although they may not agree with all of the interpretations/conclusions of this paper.

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A COMPARITIVE STUDY OF AUGMENTED REALITY WITH AND WITHOUT UX

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Abstract: ***"What most excites me about augmented reality's future is its role in the arts. It has heaps of potential in this way, to scale cultural experience and make it accessible to broader audiences at lower costs. Imagine, for instance, a live AR performance of Hamlet, that is simultaneously beamed into people's living rooms across the world."*** [1] **These are the famous words of Catherine Allen.**[2] **Augmented reality (AR) refers to technology that incorporates real-time inputs from the existing world to create an output that combines both real-world data and some programmed, interactive elements which operate on those real-world inputs. Even though the UI is an extremely important part of our design, it is very important that we properly differentiate the total user experience from the user interface (UI). Over the past several decades, augmented reality (AR) has established a definite zone in fields like entertainment, marketing, education, and many and many more. The use of AR apps in the enterprise have grown to $2.4 billion in 2019. So here is a comparative study of Augmented Reality with and without UX along with some case studies.**

Keywords: Augmented Reality (AR), User Experience (UX), Virtual Reality (VR), Future scope, Technology, Trends, Case Study.

INTRODUCTION

With the existing social distancing norms and worldwide lock downs and travel ban, our world has confined into four walls and especially to various sized digital screens. They range from home theatres, PCs, Laptops, tablets and our small mobile screens. From elder to younger everybody is longing for better experiences from these screens. There has been a huge technological boom in past two years. Developers and investors are working towards enhancing the digital experience. There is a huge demand in the field of education, medicine, gaming and entertainment. Distant education was never thought to come so near to us. Gaming sites is running a race to give their players the best

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experiences. AR (Augmented Reality) and VR (Virtual Reality) is a general topic for discussion like never before. Surveys shows that AR and VR based studies increased in the past five years and sufficiently even more in the past two years.

[3] According to Growth Enabler's estimates, there are close to 1,500 start-ups in the AR/VR segment worldwide, with the US accounting for nearly 45 per cent, followed by the UK, Israel and Canada. Globally, from 2013 to 2017, the AR segment has received $2.5 billion in funding, and VR $2.7 billion.

The average usage of smartphones by Indians is estimated to have gone up 25 percent to almost 7 hours a day as people depend on these gadgets for work or study from home and entertainment amid the pandemic, a report said. The study, commissioned by handset maker Vivo and conducted by CMR, said the average time spent on smartphones in a day has been on the rise with average usage growing 11 percent to 5.5 hours in March 2020 (pre-COVID) from about 4.9 hours on average in 2019. This has grown by another 25 percent to 6.9 hours April onwards (post-COVID), the report titled "Smartphones and their impact on human relationships 2020", said [3].

DIFFERENCE BETWEEN AR AND VR

[4] Augmented reality (AR) is an enhanced version of the real physical world that is achieved through the use of digital visual elements, sound, or other sensory stimuli delivered via technology. [4] It holds the promise of creating direct, automatic and actionable links between the physical world and the electronic information. It gives us a simple and immediate user environment to a technologically enhanced physical world. AR goes beyond mobile computing and it act as a connecting link between virtual world and real world. An AR system must have the following three characteristics:

- Combines real and virtual
- Interactive in the real time
- Registered in 3D

Fig 1

Where as in a Virtual Reality, a user is placed inside a completely computer-generated environment. [5] Virtual Reality (VR) is the use of computer technology to create a simulated environment. Unlike traditional user interfaces, VR places the user inside an experience, where, instead of viewing a screen in front of them, users are immersed and are able to interact with 3D worlds. By simulating as many senses as possible, such as vision, hearing, touch, even smell, the computer is transformed into a gatekeeper to this artificial world. The only limits to near-real VR experiences are the availability of content and cheap computing power.

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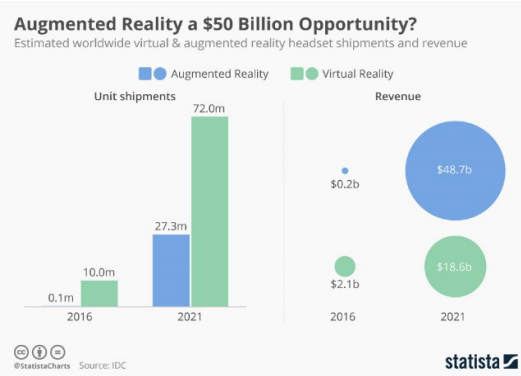
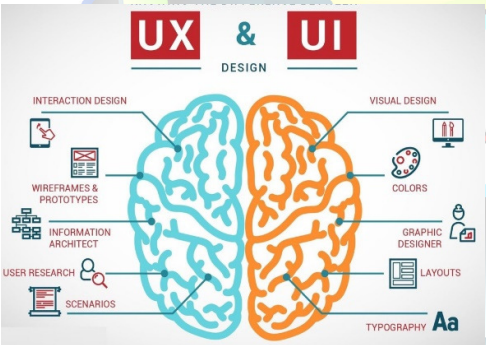


[6] Fig 2

Here we are discussing more about augmented reality and the importance of UX in it. Before that we need an introduction about the difference between UIUX.

DIFFERENCE BETWEEN UI AND UX



[7] Fig 3

UI design and UX design are two among the most misunderstood terms in web and app design.[8] The "UI" in UI design stands for "user interface." The user interface is the graphical layout of an application. It consists of the button, users click on, the text they read, the images, text entry fields, and all the rest of the items the user interacts with. This includes screen layout, transitions, interface animations and every single micro-interaction. Any sort of visual element, interaction, or animation are to be designed.

[8]"UX" stands for "User Experience." A user's experience of the app is determined by how they interact with it. Is the experience smooth and intuitive or clunky and confusing? Does navigating the app feel logical or does it feel arbitrary? Does interacting with the app give people the sense that they're efficiently accomplishing the tasks they set out to achieve or does it feel like a struggle? User experience is determined by how easy or difficult it is to interact with the user interface elements that the UI designers have created.

[8]A UX designer decides how the user interface works while the UI designer decides how the user interface looks. This is a very collaborative process, and the two design teams tend to work closely together. As the UX team is working out the flow of the app, how all of the buttons navigate you through your tasks, and how the interface efficiently serves up the information the user need, the UI team is working on how all of these interface elements will appear on screen.

INCREASING USERS IN AR

[9] *"Be fast, have no regrets... If you need to be right before you move, you will never win"*, said Mike Ryan, epidemiologist at WHO, in March. Yes! it's been 2 years since the pandemic had raised to its peak. But without much regrets we can say that apart from person-to-person connection, we have maintained all other activities perfectly via online. The internet has a great role in it. Here comes the important role of augmented reality

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in these days. As we have discussed above, about augmented reality and the vast growth in it, now we can go for its relevance.[10] The growing adoption of augmented reality is a reason behind its steady entrance in the education and e-learning industry. According to the findings of Statista, the augmented reality global market size will reach $198 billion by 2025. The most important thing to clear out here is, AR is not the same as virtual reality. Augmented reality plays with reality but does not add anything. Like, when you use the IKEA app, you can check how a sofa will look at your place.

Interactive learning, 3D model, group interaction etc, all has adopted this idea pretty well. Chromville - a colouring app where as soon as the child colours a figure, it comes to life.

[11] The earliest functional AR systems that provided immersive mixed reality experiences for users were invented in the early 1990s, starting with the Virtual Fixtures system developed at the US Air Force's Armstrong Laboratory in 1992. In 1998 augmented reality was first used for navigation in NASA's X- 38 spacecraft. Later in 2000 AR Quake launched which was the first AR game, as well as had head-mounted display, players had to wear a bag that contains a computer and gyroscopes. So, coming back the statistics of last decade, it shows a drastic increase in the use of AR. The convergence of 5G, artificial intelligence (AI), and edge cloud processing will soon make it easier to deliver more seamless, enjoyable, and cost-effective AR experiences across a variety of connected devices.

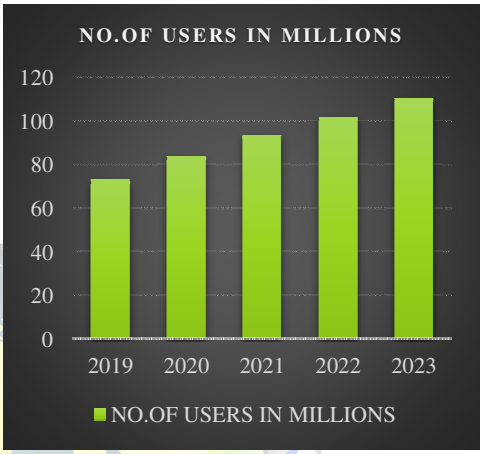

Fig . 4

The above graph (Fig. 4) shows us the number of users using the augmented reality in their daily life. The last finding is a prediction that in coming years the usage of augmented reality will increase approximately to 110.1 million [12].

Now arises the question that whether user experience have any important role in this increasing usage of augmented reality. A good AR experience imbues users into new interactions. This is only possible when people are ready to believe that what they see on the monitor is real. It is important to use the maximum screen space to display the physical world and our app's virtual objects. To help users believe that the AR world is real, UX has a vital role. Many users may have never experienced an AR environment before. When

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they come across the first AR experiences, they require proper guidance on how to interact with the system. Onboarding plays a key role in creating a great UX.

Let us give the user a quick tutorial on how to use the AR application. Provide them necessary instructions or tips on how to use specific tools with respect to actual interactions. By doing that, you won't overload users with information, instead they'll be able to interact more efficiently. We can use several methods of visual cues, motion, and animation to help the users. Use graphical and in-app experiences as much as possible. By using some case studies, we can come to a conclusion.

CASE STUDY 01 – AUGMENTED REALITY WITHOUT UX.

[13] Augmented Reality (AR) user experience may not be as exciting as a virtual reality roller coaster ride, but the technology is proving itself as a very useful tool in our everyday lives. From social media filters, 3D navigation, interactive guides, to surgical procedures, AR is rapidly growing in popularity because it brings graphical elements into our real world, thus enhancing the things we see, hear, and feel. When compared to other reality technologies, augmented reality lies in the middle of the mixed reality spectrum; between the real world and the virtual world.

So, taking a game without a UX the end user while using it will face many problems. For example, in the case of a game when the user starts playing it without proper manual or guidance on how one can play it. They will fail to go from one level to the other. And also, there will not be any customer care for improving the user needs. This kind of application can be an utter failure only because of UX failure. When done well, UX design is virtually invisible to its users. It is when a UX design feature has been executed poorly that it sticks out like a fox in a chicken coop.

Fig 5

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Fig 6

Fig 5 and 6 are some of the funny ux failures.

Now coming back to AR and UX, whether it is a call or Google search, it is very important to look at the functionality in a new way. We cannot just take the smartphone screen and put it in the AR device.

CASE STUDY 02 - AUGMENTED REALITY WITH UX.

[14] Augmented-reality interfaces are an example of non-command user interfaces in which tasks are accomplished using contextual information collected by the computer system, and not through commands explicitly provided by the user. To be able to interpret the current context and "augment" the reality, an "agent" runs in the background to analyze the many external inputs and act on them, or provide actionable information.

For example, In 'Waverly Labs' earpiece called "The Pilot" actively "listens" for another language in order to translate it in real time to English (or the user's language of choice). The user does not need to tell the earpiece to listen every time a nearby person speaks; instead, the earpiece "agent" constantly interprets the real-world auditory input and starts translating based on the context of the situation. Other apps, such as Ingress, display an associated "portal" as soon as users approach a landmark. Similarly, the parking-assistance system does not require any additional input or commands from the user; it offers actionable information based on the vehicle's current state (reverse gear) and position relative to surrounding obstacles.

[11] As a type of non-command UX, AR interfaces provide excellent opportunities for improving user experience. To see why, consider an airplane mechanic who crawls around inside the guts of an aircraft for an inspection and needs to check for how long a certain part has been in service. With a traditional screen-based user interface, the mechanic would have to somehow "save" the part's number (by remembering it, taking a picture of it on a smartphone, or writing it down on a piece of paper) and then access a phone or computer-based system to determine

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for how long that part has been in operation. But with an AR technology like HoloLens or Google Glass, the service record could be displayed right on top of the item, with a little to no commands from the user.

The information overlaid over the physical world would help the mechanic check the records of any suspected part in situ, without the need of any external device or implement. The operation could be repeated rapidly, with any other part and will allow quick interception and diagnosis of other problems before they worsen or cause an accident.

[14] Note that we assumed a well-designed user interface in our example of aircraft repair: we said that the mechanic would see "useful information" displayed next to each part. It's easy to imagine a poorly designed system that would overwhelm the mechanic with too much information, or with a confusing display, making the necessary information hard to spot. As always, good user experience only comes from close attention to users' needs, and any new UX technology opens up even more opportunities for careless design. We're sure that there will be many lousy AR systems shipped in the coming years — that's why UX professionals have long-term job security, despite changes in technology.

CONCLUSION

Fig 7

There is been a huge success in Augmented Reality in the recent years and this is an opportunity for a uninterrupted, less-effort, yet greater user interaction with the real world. As more technologies use this growing trend, augmented reality application may certainly grow to include much more than what it does now, but by understanding the users' needs and wish, developers and designers will then be able to create a successful and efficient augmented reality.

Make sure and look back on what companies have done in the past, and avoid the mistakes they have made. Prioritize all aspects of the user experience and then you've already taken a step in the right direction.

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A MATHEMATICAL ANALYSIS OF FUEL COMBUSTION RESULTING IN AIR POLLUTANTS

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Abstract

This paper manages the investigation of barometrical contamination to numerically depict the spatial and worldly dissemination of contaminations transmitted into the environment. The numerical scattering displaying of contaminations from power plants is acted in the product bundle FlexPDE. Subsequently, an assessment of seriousness of air contamination can be accomplished, utilizing the poisons focus and air conditions. The checked poisons are SO2, NOx, and PM.

Keywords: air quality, mathematical modeling, numerical simulation, pollutant dispersion.

1. Introduction:

As a general rule, the air dissemination alludes to the conduct of gases and articles in violent stream. In the logical writing, there are two key models for portraying air dissemination. The first is the Eulerian approach, in which the conduct of species is portrayed comparative with a fixed arrange framework. The Eulerian depiction is the normal model of treating heat also, mass exchange marvels. The subsequent model is the Lagrangian approach, in which the focus varieties are portrayed as a component of moving liquid. The two methodologies yield various sorts of numerical connections for the species fixations that can, eventually, be connected. Every one of the two models of articulation is a legitimate depiction of fierce dissemination [1], [2]. There are distinctive programming bundles that can reenact different change measures happening in presence of contamination and in view of test information. The principle trouble with these projects is their adjustment, with the end goal that the showed results will be pretty much as close as conceivable to the genuine natural case [3]. AERMOD is the most utilized programming to numerically model air poisons scattering. This product utilizes an air scattering model dependent on the design of violent environmental layers and on the scaling idea, including the treatment of various point sources at ground level or at tallness. This product utilizes the Gaussian scattering model for the stable environmental conditions and non-Gaussian model for precarious barometrical conditions [4].

2. Environmental scattering models

The environmental scattering describes the reality development of a set of particles (vaporizers, gases, dust) produced into the environment. The environmental scattering marvel is affected by the barometrical conditions, the territory oundaries and outflow esteems. The numerical recreation of contaminations' scattering into the climate

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is utilized for assessing the focus of contaminations transmitted from the mechanical action or auto traffic downwind [5].

The contributions for the air scattering models are:

- the meteorological conditions (wind speed and bearing, air choppiness, air temperature);
- the discharge boundaries (source area and stature, stack width, mass stream rate and speed, and exhaust temperature);
- the geographic information of the source and recipient;
- the area and sizes of blocked articles (structures or different constructions).

The fundamental barometrical scattering models are: Gaussian model, Eulerian model, Lagrangian model, the model of rising smoke cloud, semi-observational model, substance model, receptor model, and stochastic model [6].

2.1. The scattering coefficients

The standard deviation σ values, additionally called scattering coefficients, showing up in the conditions portraying the focus, depend on exploratory information got from the investigation of toxins development. The most utilized scattering coefficients are;

- Pasquill-Gfford coefficients, additionally called country Pasquill coefficients;

- McElroy-Pooler coefficients, likewise called metropolitan Briggs coefficients.

The standard deviations rely upon the landscape design (provincial region with open level ground, or metropolitan region with tall structures) and the air dependability (the inclination of the combination on the upward bearing due the regular flows convection) [7]. Pasquill has separated the environmental security into six classes to address the reformist increment of the air security that impact the parallel and vertical scattering. Table 1 reports the Pasquill solidness classes, as an element of sun oriented radiation impact and season of day when the climatic scattering model is considered [8].

The qualities of the soundness classes are:

- A: very unsteady, the temperature inclination < - 1.5°C/100 m, and the tuft is unequivocally swaying depicting the circles;
- B: decently flimsy, the temperature inclination in the reach - 1.5 – - 1 °C/100 m, the crest is firmly swaying with turbulences;
- C: marginally insecure, the temperature angle in the reach - 1 – - 0.5 °C/100 m, the tuft is somewhat swaying, firmly tapered;
- D: impartial (adiabatic), the angle temperature in the reach - 0.5 – 0.5 °C/100 m, the crest is funnel shaped without convective disturbance;

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- E: isothermal, the temperature angle in the reach 0.5 – 1.5 °C/100 m, the tuft is conelike without convective disturbance;

- F: reversal, the temperature angle > 1.5 °C/100 m, the tuft has the banner structure with bringing down propensity [Error! Bookmark not defined.].

Estimation of Pasquill Stability Classes*

Surface (10m) Windspeed (m/s)	Daytime			Nighttime	
	Incoming solar radiation**			Cloud cover fraction	
	High	Moderate	Low	≥4/8	≤3/8
<2	A	A-B	B	-	-
2-3	A-B	B	C	E	F
3-5	B	B-C	C	D	D
5-6	C	C	D	D	D
>6	D	D	D	D	D

*A-extremely unstable, B-moderately unstable, C-slight unstable, D-neutral, E-slight stable, F-moderately stable. **Solar radiation: high (> 700 W/m^2), moderate (350-700 W/m^2), low (<300 W/m^2).

3. Air pollutants dispersion

3.1. The pollutant concentration

The general Gauss dispersion equation, for a continuous point source of pollutants as a cloud of smoke resulting from the chimney of evacuated pollutants in the atmosphere, is calculated with [9]:

$$C(x,y,z) = \frac{Q}{u\sigma_z\sqrt{2\pi}} e^{-\frac{y^2}{2\sigma_y^2}} \cdot \left[e^{-\frac{(H_r-H_e)}{2\sigma_z^2}} + e^{-\frac{(H_r+H_e)}{2\sigma_z^2}} \right]$$

where, as shown in Fig. 1, C is the emission concentration [g/m3], Q – emission source rate [g/s], u – horizontal wind velocity, y – lateral distance from the plume center, He – the effective plume height above the ground [m], Hr – receiver height [m], σz – standard deviation of the vertical distribution emission [m], σy – standard deviation of the horizontal distribution emission [m].

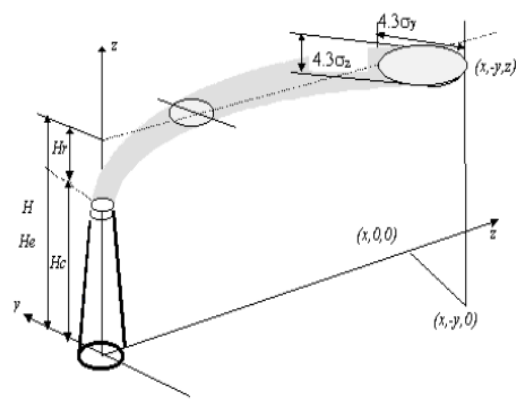

Fig. 1. Gaussian coordinates system for horizontal and vertical dispersion

The two sets of dispersion coefficients are illustrated in Fig. 2 (a), for the horizontal direction, respectively Fig. 2 (b) for the vertical direction.

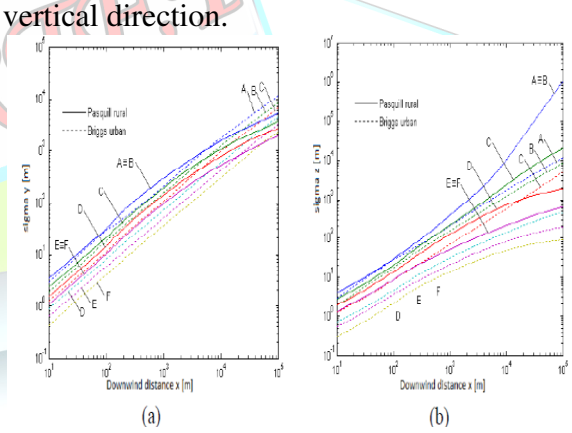

Fig. 2. Dispersion coefficients: (a) horizontal direction, and (b) vertical direction

While the Gaussian conditions have been generally utilized for air dissemination computations, the absence of capacity to remember changes for wind speed with

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stature and nonlinear synthetic responses restricts the circumstances where they might be utilized. The air dissemination condition gives a more broad way to deal with air dissemination computations than do the Gaussian models. The Gaussian models have been demonstrated to be extraordinary instances of that condition when the breeze speed is uniform and the vortex diffusivities are steady. rticulation (2) is the air dissemination condition without compound response [10]:

$$\frac{\partial c}{\partial t}+\bar{u}\frac{\partial c}{\partial x}+\bar{v}\frac{\partial c}{\partial y}+\bar{w}\frac{\partial c}{\partial z} = \frac{\partial}{\partial x}\left(K_{xx}\frac{\partial c}{\partial x}\right)+\frac{\partial}{\partial y}\left(K_{yy}\frac{\partial c}{\partial y}\right)+\frac{\partial}{\partial z}\left(K_{zz}\frac{\partial c}{\partial z}\right) \quad (2)$$

where u, v, w are the functional forms of wind velocity, and Kxx, Kyy, Kzz are the eddy diffusivities.
The expressions available for Kzz are based on the Monin – Obukhov similarity theory, coupled with observational or computationally generated data, [11]. These expressions can be organized according to the type of stability.

3.2. The lifting height of the smoke plume

To compute the contamination fixation, the range from which the scattering is beginning must to be known. On account of the capability of simple calculation, Briggs, [12] is the favored strategy. This strategy represents the ascent of tuft capacity of downwind distance, the crest convey limit, and wind speed [7, 12]. The estimation calculation is:
- Calculating the ascending F

$$F=\frac{g}{4}\pi w_{e,c}D_{i,c}^{2}\frac{T_{e,c}-T_{a}}{T_{e,a}}=gV_{e,c}\frac{T_{e,c}-T_{e,c}}{T_{a}}=\frac{gQ_{e,c}}{c_{p,a}\rho T_{a}} \quad (3)$$

where F is the ascending flow; g = 9.80665 [m/s2], the gravitational acceleration;we,c the exhaust gas velocity from chimney [m/s]; Di,c the inner diameter ofchimney [m]; Te,c the absolute temperature of the gas to exit from chimney [K]; Ta the absolute air temperature on top [K]; Ve,c the volumetric flow of the exhaust gases [m3/s]; Qe,c thermal flow emitted by chimney [kJ/s]; cp,a the air specific heat
at constant pressure [kJ/kgK]; ρa air density [kg/m3]. - Calculating the downwind distance xf where the plume height is maximum

$$x_f=\begin{cases}49\cdot F^{5/8}, for\ F<55\\ 119\cdot F^{2/5}, for\ F\geq 55\end{cases} \quad \text{(for stability classes A, B, C, D)} \quad (4)$$

$$x_f=3.14\frac{u}{s^{0.5}} \quad \text{(for stability classes E, F)} \quad (5)$$

4. Mathematical modeling

4.1. Software description

The product bundle FlexPDE was utilized for the numerical demonstrating of air contamination scattering. This limited component model developer and athematical solver carries out the numerical model and presents the graphical yield of the results. FlexPDE is additionally a critical thinking climate, playing out the whole
scope of capacities important to tackle fractional differential condition framework: an proofreader for planning scripts, a lattice generator for building limited component networks, a limited component solver to discover arrangements, and a designs framework to plot results. The prearranging language permits the client to portray the math of his fractional differential conditions

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framework and the math of his concern space [13].

4.2. 2D air poisons scattering demonstrating

Utilizing the conditions and the coefficients of the air scattering, various portrayals of the poisons fixation capacity of surface and shape can be gotten. For the numerical demonstrating of poisons (SOx, NOx, PM 10) from a point wellspring of contamination, for example the exhaust smokestack of the fuel gasses, the following data sources are required:

- the components of the demonstrating space;

- wind speed (u);

- the toxin stream (Q) ;

- the chimney stack (H);

- soundness class (A-F);

- the landscape type (rustic or metropolitan).

For the numerical demonstrating, the accompanying data sources were utilized μ=6 m/s, Q= 200 g/sC= 20 g/m3, H = 50 m, soundness class A, country landscape, the space measurement 500x200 m.

Two models were executed, for various time-frames like t = 50 s what's more, t = 100 s. Fig. 3 delineates the contamination focus profile in the reenactment space for the double cross time frames. As displayed, the contamination advancement increments with the development of calculation time. To achieve a toxin scattering displaying on a more extensive field, a higher calculation time is suggested, in any case, prompting a more drawn out reaction time.

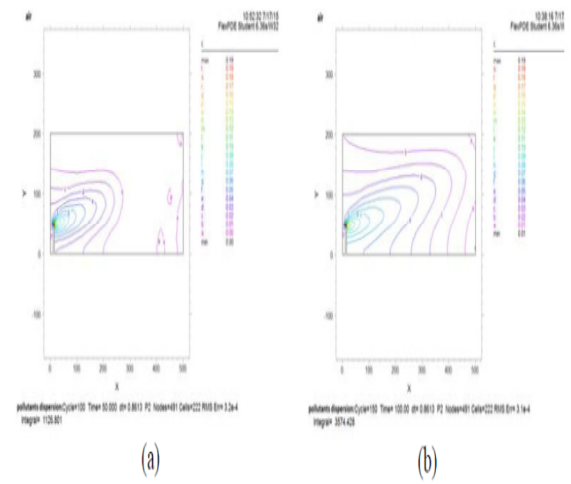

Fig. 3. The pollutant concentration profile in the simulation domain (a) s, (b)

Fig. 4 shows the evolution of pollutant's concentration for the two timeperiods. Fig. 5 shows a zoom image of the results obtained in Fig. 4.

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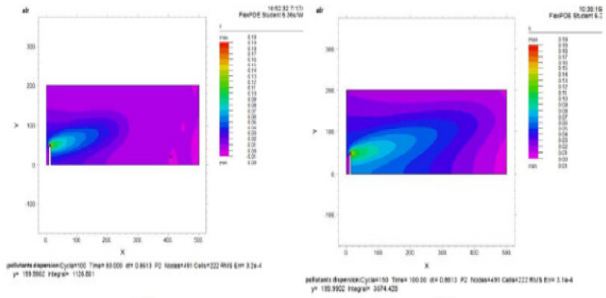
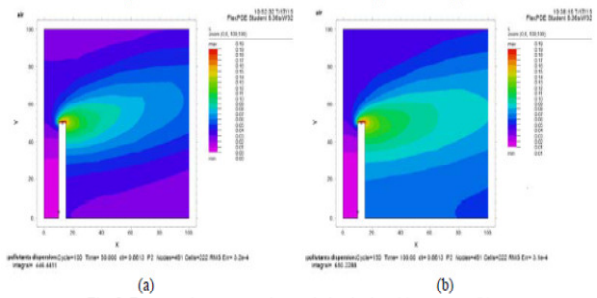


(a) (b)

Fig. 4. The concentration evolution in time (a) s, (b) s



(a) (b)

Fig. 5. Zoom on the concentration evolution in time (a) s, (b) s

The considered pollutant is the mixture composed of SOx, NOx and PM10 with a total concentration □ C = 0.19 g/m3.

5. **Conclusions**

Because of the air scattering measure, the toxin focus may change in each place of the space. In view of the directed examination, the blunders fluctuate opposite relatively with the processing time. The information sources information should go along, as precisely as could really be expected, with the meteorological conditions, geographic area, and the contamination outflows source boundaries. The breeze speed is vital inside the numerical model for depicting the advancement of the crest as near the truth. The outcomes of the mathematical reproduction utilizing the FlexPDE programming shows the scattering of contamination's focus. The outcomes affirm the hypothetical examinations as the variety of discharge's fixation stays consistent with the alteration of stature. Be that as it may, the grouping of emanation (the dirt statement) is adjusting in space with the stature. This numerical model can be a helpful instrument in assessing air contamination from the modern regions.

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A NEW SOFTWARE RELIABILITY GROWTH MODEL::SIZE BIASED INVERSE MAXWELL DISTRIBUTION

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Abstract: In the Recent development of computer technology, the role of software reliability plays a vital role in almost all the fields of industry, military, pharmaceutical and business etc,, In the management of software, the software cannot fail during its use. Therefore, the software must be rigorously tested by experienced testers before use to minimize errors and malfunctions in the software. There are several software reliability enhancement models for assessing the reliability of software systems. Finding a reliability function for time domain data based on a Non-Homogeneous Poisson Process (NHPP) is essential. The main objective of this paper is to present the Size Biased Inverse Maxwell Distribution (SBIMD) as a software reliability enhancement model and to obtain expressions for the reliability function that enables the reliability of the product to be calculated. The parameters are estimated using the maximum likelihood estimation method. Live data set is analyzed and results are displayed.

Keywords: Software reliability, NHPP, Non-Homogeneous Poisson Process, Maximum Likelihood Estimation.

I. Introduction

Software reliability is the probability failure of free operation of software in a specified environment over a specified period of time. Many models have been proposed over the past 4 decades to gain access to the reliability of the software system, for example Goel & Okumoto (1979), Musa (1980), Crow & Basu (1988), Wood (1996), Pham (2005), Kantam & Subbarao (2009), Sethi & Rana (2011), Vara Prasad *et al*. (2013), Subbarao *et al*. (2015), Subbarao *et al*. (2017), Pushpa Latha *et al*. (2019), Geeta Reddy & Prashant (2019), Hui & Liu (2020). The goal of such models is to improve software performance. These models are related to estimating future system performance from the failure data collected during the testing phase of the software product. Most models assume that the time between failures will follow the exponential distribution with the parameter changing with the number of errors remaining in the software system. The software system is likely to have product and defects of human work. The accuracy of software reliability enhancement models varies significantly when verified using the very few data sets available and despite the existence of many models. None of them can be recommended unreservedly for potential users.

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This paper provides an SBIMD to analyze the reliability of the software system. Our goal is to develop a parsimonious model whose parameters have a physical description and can provide quantitative measurements for software performance evaluation. The layout of the paper is as follows: Section II describes the SBIM model and the description of the mean value function for the underlying NHPP. Section III discusses the parametric assessment of SBIMD based on the time between failure data. Section IV describes the methods used for software failure data analysis for live data and contains Section V conclusion.

II Size Biased Inverse Maxwell Distribution Development

Software reliability is best assessed using the model Non-Homogeneous Poisson process. Non-Homogeneous is a computational process that is used to determine the appropriate mean value function m(x), where m(x) represents the expected number of software failures.

The pdf, cdf and mean value function of SBIMD are respectively given by

$$f(t) = \frac{2}{\lambda^2 t^3} e^{\frac{-1}{\lambda^2 t^2}},\ t > 0, \lambda > 0 \tag{2.1}$$

$$F(t) = e^{\frac{-1}{\lambda^2 t^2}}, t > 0, \lambda > 0 \text{ and} \tag{2.2}$$

$$m(t) = a\, e^{\frac{-1}{\lambda^2 t^2}} \tag{2.3}$$

where 'λ' is the scale parameter and m(t)/a is the cdf of SBIMD.

Software reliability models can be classified according to probability estimates. When the Markov process refers to a failure process, the resulting model is called the Markovian model. The second is the fault counting model, which describes the failure phenomenon through a random process such as Homogeneous Poisson Process (HPP), Non Homogeneous Poisson Process (NHPP) and compound poison process. Most failure calculation models are based on the NHPP described in the following lines.

A software system is subject to failures at random times caused by errors present in the system. Let $\{N(t), t > 0\}$ be a counting process representing the cumulative number of failures by time 't'. Since there are no failures at time t = 0 we have N(0)=0. It is assume that the number of software failures during non overlapping time intervals do not affect each other. In other words, for any finite collection of times $t_1 < t_2 < .... < t_n$ the 'n' random variables $N(t_1), \{N(t_2) - N(t_1)\}, ...\{N(t_n) - N(t_{n-1}\}$ are independent. This implies that the counting process $\{N(t), t > 0\}$ has independent increments.

Let m(t) indicate the number of software failures at time 't'. Since the number of errors remaining in the system at any time is finite, m(t) is bounded, non decreasing function of 't' with the following boundary condition.

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$$m(t) = 0, t = 0$$
$$= a, t \to \infty$$

Where 'a' is the expected number of software errors to be eventually detected.

Suppose N(t) is known to have a Poisson probability mass function with parameter m(t) i.e.,

$$P\{N(t) = n\} = \frac{[m(t)]^n . e^{-m(t)}}{n!}, n = 0,1,2....\infty$$

Then N(t) is called NHPP. Thus the random behaviour of the software failure phenomenon can be explained by the N(t) process. Different time domain patterns have appeared in the literature that describes the random failure process by NHPP, which differs in the mean value function m (t).

In this paper we consider m(t) as given by

$$m(t) = a\, e^{\frac{-1}{\lambda^2 t^2}}$$

$$P\{N(t) = n\} = \frac{[m(t)]^n . e^{-m(t)}}{n!}$$

$$Lim_{n \to \infty} P\{N(t) = n\} = \frac{.e^{-a} . a^n}{n!}$$

which is also a poisson model with mean 'a'

Let N(t) be the number of errors remaining the system at time 't'

$$N(t) = N(\infty) - N(t)$$

$$E[N(t)] = E[N(\infty)] - E[N(t)]$$
$$= a - m(t)$$
$$= a - a\, e^{\frac{-1}{\lambda^2 t^2}}$$
$$= a\left[1 - e^{\frac{-1}{\lambda^2 t^2}}\right]$$

Let $s_k$the time between (k-1)th and kth failure of the software product. Let x_k be the time up to kth failure. Let us find out the probability that time between (k-1)th and kth failures, exceeds a real number 's' given that the total time up to the (k-1)th failure is equal to x, is

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$$P\{S_k / X_{k-1}(s/x)\} = e^{-[m(x+s)-m(s)]} \tag{2.4}$$

This expression is called Software Reliability.

III Modified Maximum Likelihood Estimation of SBIMD

The constants found in the mean value function are 'a', 'λ' and are therefore called the parameters of the model in NHPP and other expressions. Software reliability should be estimated from 'a', 'λ' or they should be estimated from software failure data. Suppose we have a 'n' time instant of experiencing the first, second, third .... n failures of the software. In other words, if x_k is the total time for k^{th} failure, then x_k is an observation of the random variable x_k and such failures are recorded as 'n' respectively. The joint probability of such failure time realizations $x_1, x_2, ...x_n$ is

$$L = e^{-m(x_n)} \prod_{k=1}^{n} m^{'}(x_k) \tag{3.1}$$

The function given in equation (3.1) is called the Likelihood function of the given failure data. Values of 'a', 'λ' that would maximise L are called Maximum Likelihood Estimators (MLEs) and the method is called Maximum Likelihood (ML) method of estimation.

$$L = e^{-\left(ae^{\frac{-1}{\lambda^2 x_n^2}}\right)} \prod_{i=1}^{n} \left[\frac{2a}{\lambda^2 x_i^3} e^{\frac{-1}{\lambda^2 x_i^2}} \right] \tag{3.2}$$

Taking logarithms on both sides of L, to get the log-likelihood equation and the unknown values of 'a' and 'λ' are obtained

$$\log L = -ae^{\frac{-1}{\lambda^2 x_n^2}} + n\log 2a - n\log\lambda^2 + \sum_{i=1}^{n} \log\left(\frac{1}{x_i^3}\right) - \sum_{i=1}^{n} \frac{1}{\lambda^2 x_i^2} \tag{3.3}$$

The unknown values of 'a', 'λ' would be solutions of the equations

$$\frac{\partial \log L}{\partial a} = 0, \quad \frac{\partial \log L}{\partial \lambda} = 0$$

$$\frac{\partial \log L}{\partial a} = 0 \Rightarrow \hat{a} = \frac{n}{e^{-1/\lambda^2 x_n^2}} \tag{3.4}$$

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$$\frac{\partial \log L}{\partial \lambda} = 0 \Rightarrow n - \sum_{i=1}^{n} \frac{1}{z_i} + \frac{a}{z_n} e^{\frac{-1}{z_n}} = 0 \tag{3.5}$$

Let us approximate the following expressions in the LHS of equation (3.5) by linear functions in the neighbourhoods of the corresponding variables.

$$\frac{e^{-1/z_n}}{z_n} = \alpha_i + \beta_i zi,\ i = 1,2....n-1 \tag{3.6}$$

Where α_i is the slope, β_i is the intercept, $z_i = \lambda^2 x_i^2$ and $z_n = \lambda^2 x_n^2$

With such values equation (3.6) when used in equation (3.5) would give an approximate MLE for 'λ' as

$$\hat{\lambda}^2 = \frac{(n + a\alpha_n) + \sqrt{(n + a\alpha_n)^2 + 4a\beta_n x_n^2 \left(\sum_{i=1}^{n} \frac{1}{x_i^2} \right)}}{2a\beta_n x_n^2} \tag{3.7}$$

We suggest the following method to get the slope and intercept in the RHS of equation (3.6).

Let $p_i = \frac{i}{n+1}, i = 1,2.....n,\ q_i = 1 - p_i$

Let z_i^*, z_i^{**} be the solutions of

$F(z_i^*) = p_i^*,\ F(z_i^{**}) = p_i^{**}$

Where

$$p_i^* = p_i - \sqrt{\frac{p_i q_i}{n}} \tag{3.8}$$

$$p_i^{**} = p_i + \sqrt{\frac{p_i q_i}{n}} \tag{3.9}$$

Given a natural number 'n' we can get the values of z_i^* and z_i^{**} by inverting the equations (3.8) and (3.9) through the function F(z) the LHS of equation (3.6) we get

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$$\beta_i = \frac{\left(\frac{e^{\frac{-1}{z_i^{**}}}}{z_i^{**}}\right) - \left(\frac{e^{\frac{-1}{z_i^{*}}}}{z_i^{*}}\right)}{z_i^{**} - z_i^{*}} \tag{3.10}$$

$$\alpha_i = \left(\frac{e^{\frac{-1}{z_i^{*}}}}{z_i^{*}}\right) - \beta_i z_i^{*} \tag{3.11}$$

It can be seen that the evaluation of x_n, α_i are based on only a specified natural number 'n' and can be computed free from any data. Given the data observations and sample size using these values along with the sample data in equation (3.11), (3.7) we get an approximate MLE of 'λ'. Equation (3.4) gives approximate MLE of 'a'.

IV. Illustration

In this section, we present an analysis of NTDS software failure data taken from Jelinski and Moranda (1972). The data were first released to the U.S. The Navy Fleet comes from the Computer Programming Center, and in real-time software development is flawed, it is a multi-computer complex that forms the core of Naval Tactical Data Systems (NTDS). NTDS software consists of 38 different modules. Each module has to follow three steps; Production phase, testing phase and consumer phase. The data is based on one of the larger modules referred to as the A-module, the trouble reports or the 'software anomaly reports'. The times (days) between software failures and additional information for this module are summarized in the table below.

Table 1: NTDS Software Failure Data

Error Number n	Time between Errors S_k days	Cumulative Time $x_n = \sum s_k$ days
Production (check out) phase		
1	9	9
2	12	21
3	11	32
4	4	36
5	7	43

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6	2	45
7	5	50
8	8	58
9	5	63
10	7	70
11	1	71
12	6	77
13	1	78
14	9	87
15	4	91
16	1	92
17	3	95
18	3	98
19	6	104
20	1	105
21	11	116
22	33	149
23	7	156
24	91	247
25	2	249
26		250
Test Phase		
27	87	337
28	47	384
29	12	396
30	9	405
31	135	540
User Phase		
32	258	798
Test Phase		
33	16	814
34	35	849

The data set contains 26 failures in 250 days. 26 software errors were found during the production phase and five additional errors during the testing phase. An error has been detected in the user phase and two more errors have been detected in the next test phase, indicating that the module's network occurred after the user error was detected.

Considered a random sample of size 20 and are assumed to follow SBIMD with 'λ' as a parameter. At λ=1 this assumption is confirmed by the method of QQ plot correlation. The ML estimates so obtained for standard SBIMD are

$$\hat{a} = 20.00184$$

$\hat{\lambda} = 0.03401$

The estimator of the reliability function from the equation (2.4) at any time x beyond 105 days is given by

$$R\,S_k / X_{k-1}(s/x) = e^{-[m(x+s)-m(s)]}$$

$$R\,S_{21} / X_{20}(105/50) = e^{-[m(50+105)-m(105)]}$$
$$= 0.44849$$

V. Conclusion

In this paper we have presented the SBIM software reliability enhancement model with a mean value function. It provides an acceptable explanation of the software failure phenomenon. This is a simple method for model validation and is very convenient for software reliability practitioners.

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A Novel Approach to Dynamic Difficulty Adjustment (DDA) in Battle Royale Games (BRG)

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***Abstract* – Dynamic Difficulty Adjustment (DDA) is a customizable solution for game players to adjust the level of difficulty in computer games to the skills of the player by automatically modifying the features, dimensions, and scenarios of the game. This paper explores the different approaches to address DDA to provide a flexible, dynamic and interactive gaming experience for the player of Battle Royale Games (BRG). An automated difficulty selection mechanism is proposed for addressing the challenges faced by the players of PUBG, Call of duty and Garena free fire games.**

Index Terms - Dynamic Difficulty Adjustment (DDA), Computer games, Artificial intelligence, Battle Royale Games (BRG).

I. INTRODUCTION

The boost in playing games was of course due to the global outbreak of Covid-19 pandemic. The growth in consumption of digital devices and penetration of internet made online games a mainstream entertainment option resulting in the growth of gaming industry. The development of technological advances made video games prominent in the gaming genre bringing a new level of entertainment through enhancements, upgrades and optimizations. There are professional players and casual players playing for sport or fun, the ultimate objective is to win. Video games are largely available in the market and are one of the most complex programs in the world which are extremely hard to develop a game and maintain. The enthusiasm, goals and interest of the game players may be different leading to the design of games for entertainment, education, and other purposes. Gameplay is the interaction between the player, rules, and objects in the game. Goals, rules, challenges, and objects are the elements of game design that produces desirable interactions. Action games, role-playing games, puzzle games, strategy games, simulation games, word games and Adventure games are some of them.

Players begin games at different skill levels developing their skill at different rates. Difficulty is a crucial factor in game and increases with progress in game level. The levels will help the players to keep the spirit and continue playing. But at the same time, due to the different levels even the best-designed games may seem to be uninterestingly easy for some players and very frustratingly difficult for others. This is because, as the level increases, there are more exciting activities to be unlocked. Every player wants to be in higher level and unlock all the activities in higher levels. So, if players are not able to achieve that and are facing continuous failures, they will be frustrated. Game will be boring if the game is too easy to unlock the higher level. In both situations, there is a chance that player will stop playing games. The game difficulty increases regularly as the game progresses in a smooth linear fashion or as steps (levels). The scores of the players should exhibit a steady improvement to make the player interested. The beginners, intermediaries and experienced players need to make progress in their scores despite the difficulties faced. The factors that increase the level of difficulty can be modulated at the beginning of the game by choosing a difficulty level. This also can annoy the players. Great gaming experience can be achieved, enjoyed and improved by upgrading the skills and accessories.

The game designers infuse fun with curiosity, fantasy, control and challenge to be kept in balance for the player to be entertained. The game difficulty and player skill must match making the challenge parameter difficult to control. Taking break between challenges will prevent overwhelming the player and create an enthralling and delightful experience.

Even though the game and the difficulty levels are same, players may feel different engaging experience because of the large diversity among the players with different learning speed, skill set, and experiences. Dynamic Difficulty Adjustment (DDA) is one of the solutions for this problem where the game alters itself during the play, in response to player performance. DDA adjusts the game's level of difficulty to easy or hard by analyzing the performance of the player. One of the most common methods to implement DDA is through heuristic prediction and intervention, adjusting game difficulty by

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analyzing the player's skill. It alters the level of challenge based on the real time feedback from the player. The flow of the game also depicts an optimal balance between anxiety and boredom. The flow experience of games is achieved by clearing the goals at different levels. The DDA system guides the player into the flow zone by tracking and adapting to the player's skill. DDA is an Artificial Intelligence (AI) based system that changes the attributes within the game at run time thereby increasing the confidence of the player to beat the game when presented with a hard challenge.

A critical challenge for tailoring the difficulty level in real time (dynamically) is to make the change at times when the player is not aware. There is difficulty in understanding the player's performance at the beginning of the game. The tutorials for playing games (playable tutorials) give a notion of the player performance. Balance with reliable and consistent feedback is critical to gaming systems.

The game designer does not need to pre-determine one specific difficulty curve but can effectively provide a range of possible difficulties which are dynamically selected for each individual player based on their experience of the game. It allows the player to select easy, medium or hard mode of difficulty. Measuring the player performance and adjusting the challenge accordingly is involved in DDA. The main cost factor in the design and maintenance of games is balancing the game and the elements in it to create interest in the player.

Variables to evaluate the player performance correspond to game rules, win or loss conditions and skill of the player. Variables in games also indicate the current state of the player and his learning process. The number of variables chosen depends on the type and complexity of the game. Considering a higher number of variables will give a precise adjustment in difficulty. The DDA system keeps track of the game variables by overwriting the variable value by triggering an event or by permanent tracking. The event triggered parameters change on fulfilling a condition or performing an action. Variables that are always in the game are permanently tracked. In a computer game the variables of life and death constantly change. The score of the game is a variable with the number of points collected. The time spend to play a game is also a variable that depends on the interest and skill of the player.

II. BATTLE ROYALE GAMES

A Battle Royale is a popular online multiplayer video game genre involving dozens to hundreds players where players battle it out until only one player or team remains. Players can start from the basics, then increase their levels and rank according to their game play. Players are given a space to defeat other players and survive to the end. The winner will be the last player who is alive. Players will get points according to their survival time, number of enemies defeated and for some other factors. Points gained from previous games will be deducted from the total points if they cannot survive for a long time in the current game.

The multiplayer Battle Royale Games (BRG) Free fire, PUBG, Call of duty are considered in this paper. These games are getting a very huge hype as players interact with other real time players with frequent new features and updates making them more attractive. These games are with real time players making it hard to predict the game play of players and the difficulty in each game. The difficulty and frustration of players of BRG are discussed in this paper and a proposal that how we can solve these problems by implementing DDA in real time player games.

The Battle Royale genre in gaming was started by PUBG (Player Unknown's Battlegrounds). The accessibility and simplicity made it popular among the battle royales and with other games. PUBG game is compatible and playable with a large number of devices. PUBG, Call of duty and Garena Free Fire are the most popular games with 3 modes solo, duo and squad. Solo means one to one. There will be a maximum of 100 players in a game and each of them is individual player. Duo means a group of 2 player and squad is a small group with 3-5 players. The players are taken to an island or to any maps using planes for survival to the end. The player who is alive by defeating other players is the winner at the end of the game. The weapons, health kits and other things needed for the game are available at the island itself. There are safety zones for the player to stay and survive. Since real time players interact in the game, the strategy or gameplay cannot e predicted. Even if we analyze a player, it is not necessary that next time the same player will be our enemy, so that we cannot predict the difficulty or winner of the game. There are different levels, tiers and ranks. Every player start from the lowest level 1 and the level increases as they play the game and earn points. There are seasons in BRG. In each season there are tiers or ranks. When the player earns points in the season, tier become higher. At the end of each game the player will get either positive or negative points. The player with highest tier or rank will get additional features, frames, points etc. Reward points are gained on reaching the highest tier but reaching the highest tier is very hard and there is a high chance of getting negative points. It is hard to sustain the highest tier because only a particular number of players can get the highest tier and title. A player is degraded if another player has more points than the player in the highest tier or rank. The player will get negative points if he or she cannot survive for a long time in the game or if they could not take much kills.

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BRG has the facility to interact with other players through voice chat, messages and playing emotes while playing the game. Players from different region are united together. The game flow is unpredictable because humans are playing the game. The player gains a unique experience in each game interacting with different players. The rewards, prices, new dresses, weapons, armor, gun skin and other objects from seasons and events create interest in players to get a higher tier and unlock new rewards.

III. LITERATURE STUDY ON BATTLE ROYALE GAMES AND DDA

A number of studies were conducted on automatically tailoring the gaming experience using DDA. One of the challenges of game development is to design a game with the difficulty level that engages the user for a longer period of time. The game with greatest entertainment value has the challenge level that matches the skill of the player. A game with an adaptive Artificial Intelligence (AI) can add interest, create varied gaming experience and increase longevity of the game. Battle Royale Games cater to Maslow's hierarchy of needs. The lack of fulfillment of needs create an obsessive passion for games in players [1]. The concept of DDA to adapt to the players uses neural network trained with evolutionary algorithms and multilayer perceptron architecture [2]. Difficulty is dynamically balanced in MOBA games to improve player's entertainment by creating a computer controlled opponent that adapts dynamically to the player performance [3]. DDA is triggered based on Electro Encephalo Graph (EEG) headset to monitor and increase the excitement of the player [4]. The facial expressions and emotions of the player are captured to dynamically balance the game [5]. The paper [6] presents a systematic review to identify the relation between game types and gaming disorders. The trends in personalization of video game rules and player's preferences are examined in [7]. The results of path analysis based on the online questionnaire survey on Japanese students who play online games showed that Battle Royale Games are associated with aggressive feelings [8]. A meta heuristic Battle Royale optimization algorithm is proposed for the survival of the player in games [9]. The design requirements to balance games dynamically are discussed in [10]. The player's confidence to win can be increased by dynamically adjusting the difficulty in playing [11]. A set of variables to assess the skill of the player can be used to balance the difficulty [12]. The expected value of attributes at different levels of the game can be calculated with probabilistic approach [13]. The findings in [14] suggest that gamification has an impact on sustaining and encouraging game play. Several approaches to dynamically balance the gaming experience were reviewed in diverse gaming genre [15] and one common aspect in all methods is the estimation of the level of difficulty of the player at any given instant using heuristic (challenge) functions. A probabilistic approach using DDA maximized player engagement by modeling the progression of the player [16]. Bayesian optimization techniques were used to design games which maximize the engagement of users allowing the players to attempt a game for a short period [17]. A study on how DDA can be implemented using Partially Observable Markov Decision Process (POMDP) uses influenced diagrams to reduce large problems to smaller and manageable units [18]. The physiological signals of the player were measured and analysed to determine the anxiety level of the player, which was chosen as the target affective state, to automatically adjust the difficulty in real time. Wearable biofeedback sensors and several physiological indices were explored to determine their correlations with anxiety [19]. The three approaches to measure the difficulty of a game genre are using formal model of game play, using features of the game and direct observation of the player [20]. There are embodiments of systems that perform automatic granular difficulty adjustment which is undetectable by user.

In multiplayer video games, Multiplayer Dynamic Difficulty Adjustment (MDDA) features are used to balance the challenge between differently skilled players [21]. It must be clearly understood how MDDA design is perceived by players. Some studies indicate that MDDA optimises challenge and performance but awareness of the presence reduces the effectiveness. The data on expectations of the player regarding the effect of components, features and attributes must be investigated from MDDA. The score difference between players is significantly reduced by DDA, allowing less skilled players to be more competitive against more skilled players [22]. Deep Player Behaviour Modelling (DPBM) uses deep learning techniques to create significant improvements in motivating the players and improving adaptability [23]. The machine learning approach to DDA with Partially Ordered Set Master (POSM) algorithm orders or sorts the difficulty settings from least to most difficult.

The characters and cartooning style in the Battle Royale Games attracted players to be addicted. These games are survival games with around 100 players in a game. To be a winner among higher player counts is a tense affair. Looting is an important part of a Battle Royale making the players scavenge for weapons and gear. The aim of the player is to prolong the game. Some of the challenges faced are:

- Anger or Frustration
- Internet speed
- Unknown players and their skills
- Low end devices

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Frustration is the most common challenge that makes the player angry. The rank and level of players will be increasing gradually as the game progresses along with the level of difficulty. There are chances of getting negative points as levels progress. Continuous negative points disappoint and frustrate players making them to stop playing. Keeping the player challenged with an exotic gaming experience in interactive games is difficult as it is tough to estimate when and how to do game adjustment.

IV. PROPOSED MODEL WITH DDA AND ITS IMPLEMENTATION

The life cycle of a video game or video game development cycle includes concept, design, launch, and post-launch of the game. The ultimate aim of each game is to make players spend their maximum time in playing and retain the player's interest. But if the players get frustrated, they may stop playing. This may affect the ranking of game in the gaming industry. To avoid that, the solution for this frustration is implementing DDA in BRG. The emphasis of the framework with DDA helps game designers to better align the learning goals with game mechanics to produce more deeply effective game experiences. The DDA system includes adjustment actions and adjustment policies with proactive and reactive strategy.

The main thing that makes the players disappoint and frustrated is the negative points in the game. Getting negative points less than 4 for two or three times is negligible but more than that make the player frustrated for sure. A new player or players below a certain level never care about their point or rank. But a player who is going for a rank push will be frustrated with the negative points as he or she enters to a certain level where they start getting more negative points.

DDA is the method that automatically adjusts the difficulty of the game. By using DDA we can calculate the average points earned by a player in his or her each 10 games and if the average negative point of a consecutive 5 games or 5 games in a day is more than half of the average of the 10 games, then it is a big loss for his earned positive points. In such situation the player should be given a lobby with low rank than him or her. Thus, the player can earn positive points this time and thus the player can overcome his or her frustration and have a confidence that he can earn positive points in next game also.

When the game becomes too tough to progress through the challenges imposed by an AI-controlled environment, the proposed adaptive system can assist players by balancing the difficulty behind the scenes. This retains the interest of the player over time by allowing them to progress at a steady pace. The historical data on the player's game activity is used in this method. The following steps implement the proposed Dynamic Difficulty Adjustment in Battle Royale Games:

1. Analyze the performance of each player who reached certain level namely crown in PUBG, pro in Call of Duty and diamond in Free Fire.
2. Find the sum of with positive points in 10 matches.
3. Find the sum of the negative points of 5 matches.
4. Find the average of both positive and negative points. 1) Check whether the average of negative points is larger than half of the average of the positive points 2) Check whether there is a continuous negative point in consecutive 5 matches and whether the sum of that negative points is greater than 10 3) Allocate a lobby with players having less rank than this player if any of these conditions satisfies.
5. Update the sum of positive and negative points in each 24 hrs. Updating is done by adding the point of current match to the existing sum and the point of very first match will be excluded from the sum.
6. Repeat all these steps until the current season ends.
7. Make the sum of positive and negative points at the beginning of next season and perform steps 1 to 6.

CONCLUSION AND FUTURE WORK

Battle Royale genre has a profound impact on the video gaming industry. This paper is an attempt to systematize the scaling of difficulty in playing the Battle Royale Games PUBG, Call of duty and Garena free fire. The proposed scheme of Dynamic Difficulty Adjustment (DDA) provides efficient, promising and competitive results by collecting the player's game data to overcome the challenges and to reach more players. For the Battle Royale genre to flourish and open gates to contribute to the success of gaming industry, the overall game difficulty must be adjusted to the skill and expertise of individual players on the fly.

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A SYSTEMATIC SURVEY ON THE APPLICATION OF DIFFERENT DATA MINING AND MACHINE LEARNING ALGORITHMS IN HEALTH CARE SECTOR FOR DISEASE DIAGNOSIS

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Abstract:

Human healthcare became one of the most important topics in the current society. The accurate, fast , effective and robust disease detection is often a difficult task, because of this it became necessary that medicine field searches support from other fields such as computer science and statistics. These disciplines now a days facing the challenge of exploring new techniques, beyond the traditional ones. As large number of techniques emerges every day, it makes necessary to provide a comprehensive overview which avoids the very particular aspects. On this , I propose a systematic review which deals with the application of different Data Mining and Machine Learning algorithms in the diagnosis of human diseases. This review focuses on various modern techniques which are related to the Machine Learning techniques applied to diagnosis of human diseases in the health care field, in order to discover interesting patterns and to make non-trivial predictions in decision-making. I hope, this work can help researchers to discover and determine the applicability of the Machine Learning techniques in their particular specialties. I provide some examples of the algorithms used, analyzes some trends that are focused on the goal searched, and the different area of applications. The advantages and disadvantages of each technique are given to help choose the most appropriate in each real-life situation.

Keywords: Machine Learning; Data Mining; Decision Tree Algorithm; Support Vector Machine; Neural Network.

I. INTRODUCTION

Nowadays, advances of technologies in biological and medical field have been providing us explosive volumes of physiological and biological data. Learning from these data, facilitates the understanding of human health and disease. Particularly, Machine Learning (ML) helps to perform predictive analysis or pattern recognition on large amount of data. Also, it offers a wide range of alerting, risk management and decision support tools, targeted at improving patient's safety and healthcare quality. Machine learning offers a wide range of tools, techniques, and frameworks to address these challenges. There are many algorithms available in ML for data modeling. Some of the important and extensively used machine learning technique for medical diagnosis are Decision Tree Algorithm since its implementation is simple and easy to interpret [1,8]. Some of the other more popular Machine Learning based Algorithm applied for medical diagnosis are Support Vector Machine as well as Artificial Neural Network based techniques [2,14].

II. BACKGROUND OF THE STUDY

Mining of data is the most important stage of information discovery in a database system contains huge amount of data. Data Mining is the process of extracting unique, implicit and potentially useful information from the huge data. The difference between knowledge discovery and Data mining is that the utilization of different intelligent algorithms to excerpt patterns from the data whereas information discovery is the complete process which is involved in discovering knowledge from data. The primary objective is to abstract high-level information from the low-level data . The key approach in research to utilize large volume of data is applying Machine Learning and Data Mining methods for the extraction of knowledge.

III. METHODS

Based on the methodology of a systematic review, I searched in literature databases such as Scopus, Journal Citation Reports (JCR), Google Scholar, and MedLine from the last decade up to the present.

Data Extraction

A protocol for data extraction was defined and evaluated. The following inclusion criteria were used:
Studies with key words such as Human Disease, Heart Disease, Hepatitis , Lever Disease; Diabetes; Dengue belong to the thematic areas Data Mining, Artificial Intelligence, Machine Learning ,Deep Learning, Big Data .The document types are Indexed Journal Papers, Books, Book Chapters, and Conference Papers.
Moreover, the following exclusion criteria were used:
Not among the years 2010-2020; Not belonging to the sub areas of Data Mining, Machine Learning ,Artificial Intelligence, Deep Learning and Big Data ; Not Indexed Journal Paper, Book, Book Chapter, Conference Paper as source type ; Topics addressed in other studies; Not conclusive; Not fully solved.

IV. DIAGNOSIS OF DISEASES BY USING DIFFERENT MACHINE LEARNING ALGORITHMS

Many researchers have worked on various Machine Learning algorithms for diagnosis of diseases. Researchers have been accepted that ML algorithms

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performed well in the diagnosis of different diseases. Figurative approach of diseases diagnosed by various Machine Learning Techniques are shown in this paper. This survey paper includes disease diagnosis by ML for Diabetes, Liver disease , Heart disease, Dengue and Hepatitis.

A. HEART DISEASE

Otoom et al . [4] has proposed a system for monitoring and analysis of Coronary artery diseases. Cleveland heart data set is taken from UCI, which consists of 303 cases and 76 attributes/features. Out of 76 features ,13 were used. The algorithm used were Bayes Net, Support Vector Machine (SVM), and Functional Trees (FT) . For detection ,WEKA tool is used. 88.3% accuracy is attained after experimenting Holdout test, by using SVM technique. In Cross Validation test, Both SVM and Bayes Net showed the accuracy of 83.8%. After using FT, 81.5% accuracy was attained . Seven best features are picked up by using Best First selection algorithm. Cross Validation test were used for validation. By applying the test on Seven best selected features, Bayes Net has attained 84.5% of correctness. Support Vector Machine showed 85.1% accuracy and FT classified 84.5% correctly.

Vembandasamy et al . [5] proposed a system, to diagnose heart disease by using Naive Bayes. Naïve Bayes have powerful independence assumption. The data-set used have obtained from one of the leading diabetic research institute in Chennai, which consists of 500 patient's data . WEKA tool was used and executed classification by using 70% of Percentage Split. Naive Bayes offers 86.419% of accuracy.

Chaurasia and Pal [6] proposed a system for heart disease detection. WEKA tool is used. Naive Bayes, J48 and bagging were used . Heart disease data set from UCI machine learning laboratory is used which consists of 76 attributes. Only 11 attributes were employed for prediction purpose. Naive bayes provides 82.31% accuracy. J48 gave 84.35% of correctness and 85.03% of accuracy has achieved by Bagging. On this data set, Bagging offered a better classification rate.

Parthiban and Srivatsa [7] have put their effort in the diagnosis of heart disease in diabetic patients by using the ML Algorithms. Algorithms of Naïve Bayes and SVM are applied by using WEKA tool. Data set consists of 500 patients was used which are collected from Research Institute , Chennai. Out of 500, 142 patients had the disease and 358 did not have the disease. By using Naive Bayes Algorithm 74% of accuracy is attained. In the existing literature Support Vector Machine attained the highest accuracy of 94.60 %. The following Table I shows level of accuracy of different Machine Learning algorithms in the prediction of Heart disease

Table I. ML Algorithms and its accuracy level in the prediction of Heart disease

Algorithm	Accuracy in %
Bayes Net	84.5
SVM	94.6
FT	81.5
Naive Bayes	86.41
J48	84.3
Bagging	85.03

B. DIABETES DISEASE

Iyer et al . [9] has performed a work to predict diabetes disease by using DT(Decision Tree) and Naive Bayes. Pima Indian diabetes data set are the data set used in this work WEKA tool is used to perform tests. In this data-set percentage split of (70:30) predicted better than cross validation. J48 showed 74.8698% and 76.9565% accuracy level by using Cross Validation and Percentage Split Respectively. Naive Bayes attained correctness of 79.5652% using PS.

Sen and Dash [10] proposed a model for the diagnosis of Diabetes disease. Pima Indians diabetes data set which is received from UCI Machine Learning laboratory is used. WEKA tool is used for analysis. CART, Adaboost, Logiboost and grading learning algorithms were also used for the prediction of diabetes . Experimental results were compared based on the correct or incorrect classification. CART offered 78.646% accuracy. The Adaboost offered 77.864% accuracy. Logiboost offered 77.479% accuracy. Grading has the classification rate of 66.406%. CART offered highest accuracy of 78.646% and misclassification Rate of 21.354%, which is lesser as compared to the other techniques.

Kumari and Chitra [11] has also done an experimental work to predict diabetes disease .In their experiment, they used SVM. For classification purpose, RBF kernel is used in SVM. Data set used was Pima Indian diabetes data set provided by Machine Learning laboratory at University of California, Irvine. MATLAB 2010a were used to conduct experiments. SVM offered 78% accuracy level.

Sarwar and Sharma [12] have suggested Naive Bayes for the prediction of Type-2 diabetes .The employed data set consisted of 415 cases and data are gathered from dissimilar sectors of various societies in India. MATLAB with SQL server is used for the development of model. 95% correct prediction has achieved by Naive Bayes.

Ephzibah [13] has also constructed a model for the diagnosis of diabetes. Their proposed model combined GA and fuzzy logic. It is used for the selection of best subset of features and also to enhance accuracy of classification . The employed dataset has picked up from UCI Machine Learning laboratory that has 8 attributes and 769 cases. For the implementation , MATLAB is used. Only three best features/attributes were selected by using Genetic Algorithm. These attributes were used by fuzzy logic classifier which has attained the accuracy level of 87% .It is found that Naive Bayes based systems are helpful for diagnosis of Diabetes disease. It offered a highest accuracy of 95% .The results showed that this system can do good prediction with minimum error to diagnose diabetes

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disease. The following Table II shows level of accuracy of different Machine Learning algorithms in the prediction of Diabetes disease

Table II. ML Algorithms and its accuracy level in the prediction of Diabetes disease

Algorithm	Accuracy in %
CART	78.6
Adaboost	94.6
Naive Bayes	95
J48	76.95
Logiboost	77.47

C. LIVER DISEASE

Vijayarani and Dhayanand [15] proposed system to predict the liver disease by using Support vector machine and Naive bayes Classification algorithms. ILPD data set is used which is obtained from UCI. The above mentioned data set comprises of 560 instances and 10 attributes. Comparisons has made on the basis of accuracy level and time of execution. Naive bayes showed 61.28% correctness in 1670.00 ms. SVM attained 79.66% accuracy in 3210.00 ms . MATLAB is used for implementation. SVM showed better accuracy as compared to the Naive bayes .But in the terms of time of execution, Naive Bayes took less time as compared to SVM.

Gulia et al . [16] performed a study on intelligent techniques to classify the liver patients. The data set had chosen from UCI. WEKA tool and five techniques J48, Random Forest, MLP, Bayesian Network and SVM were also used in this experiment. At first step, all algorithms are applied on the original data set and obtained the percentage of correctness. In the second step, Feature Selection method is applied on whole data-set to get the significant subset of liver patients and all the above mentioned algorithms were used to test the subset of the whole data-set. In the third step they took the comparison of outcomes before and after Feature Selection. After FS, algorithms provided accuracy level as J48 had 70.669% accuracy, 70.8405% accuracy has achieved by the MLP algorithm, SVM showed 71.3551% accuracy, 71.8696% accuracy has offered by Random forest and Bayes Net showed 69.1252% accuracy.

Rajeswari and Reena [17] used the algorithms Naive Bayes, K star and FT tree to analyze the liver disease. Data set is taken from UCI which consists of 345 instances and 7 attributes. 10 cross validation test have done by using WEKA tool. Here Naive Bayes provided 96.52% Correctness in 0 sec. 97.10% accuracy has achieved by using FT tree in 0.2 sec. K star algorithm classified the instances with 83.47% accuracy in 0 sec. On the basis of results, highest classification accuracy has offered by FT tree on the liver disease dataset as compared to other algorithms used. Time taken for getting result when algorithm is applied on the dataset of liver disease is low as compared to other algorithms. Which showed the improved performance of FT tree. The following Table III shows level of accuracy of different Machine Learning algorithms in the prediction of Liver disease

Table III. ML Algorithms and its accuracy level in the prediction of Liver disease

Algorithm	Accuracy in %
SVM	79.6
FT	97.1
Naive Bayes	96.5
J48	70.6
Bayes Net	69.12

D. DENGUE DISEASE

Tarmizi et al . [22] have performed a work on the detection on Malaysia Dengue outbreak .The highly contagious disease like Dengue creates trouble mostly in the countries like Thailand, Indonesia and Malaysia. Decision Tree (DT), Rough Set Theory (RS) and Artificial Neural Network(ANN) were the classification algorithms used in their study . Data set are taken from Public Health Department of Selangor State. WEKA data mining tool has used. 10Cross-fold Validation and Percentage split test has done. In 10-Cross fold validation , Decision Tree offered the accuracy of 99.95% , Artificial Neural Network attained 99.98% of accuracy and RS showed 100% of accuracy level. After using PS, Both Decision tree (DT) and Artificial Neural Network (ANN) provided 99.92% of correctness. And RS achieved 99.72% accuracy level.

Fathima and Manimeglai [18] also performed a work on the prediction of Arbovirus-Dengue disease. The algorithm used by these researchers in this work was Support Vector Machine(SVM). Data set has obtained from King Institute of Preventive Medicine and from various hospitals and laboratories of Chennai and Tirunelveli from India. It consists of 29 attributes and 5000 samples. Data has examined by R project version 2.12.2. The obtained accuracy level by SVM was 90.42 %. The following Table 4 shows level of accuracy of different Machine Learning algorithms in the prediction of Dengue disease

Table IV. ML Algorithms and its accuracy level in the prediction of Dengue disease

Algorithm	Accuracy in %
SVM	90.4
DT	99.9
RS	100

E. HEPATITIS DISEASE

Ba-Alwi and Hintaya [19] has done a comparative analysis on various data mining algorithms like Naive Bayes, K Star, FT Tree, LMT, J48, and NN for the diagnosis of Hepatitis Disease. The data set was taken

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from UCI Machine Learning repository. Results are measured and classified in terms of accuracy and time. Comparative Analysis is taken by using WEKA and neural connections tool. In this Analysis they used a second technique Rough Set theory, by using WEKA. Performance of RS was higher than NN .The accuracy level of various algorithsm are Naive Bayes gave 96.52% in 0sec. 84% was attained by the Naive Bayes Updateable algorithm in 0 sec. FT Tree attained 87.10%. in 0.2 sec and K star offered 83.47% of correctness in 0 sec. 83% has achieved by J48 in 0.03 sec. LMT provides 83.6% in 0.6 sec. Neural network showed 70.41% .

Karlik [20] gave a comparative analysis of Naive Bayes and back propagation for the diagnosis of hepatitis disease. The different types of hepatitis "A, B, C, D and E" are generated by different viruses . the have used RapidMiner open source software in their analysis. The Hepatitis data set has taken from UCI ,which include 20 features and 155 instances. In this experiment, 15 attributes were used. Naive Bayes classifier gave 97% accuracy. Three-layered feed forward Neural Network were used and which was trained with Back propagation algorithm .For training purpose, 155 instances were used . Feed forward Neural Network with back propagation showed highest accuracy of 98%. The following Table 5 shows level of accuracy of different Machine Learning algorithms in the prediction of Hepatitis disease

Table V. ML Algorithms and its accuracy level in the prediction of Hepatitis disease

Algorithm	Accuracy in %
Naïve Bayes	96.5
FT	87.1
LMT	83.6
NN	70.4
FFNN	98

V. DISCUSSIONS AND ANALYSIS OF MACHINE LEARNING TECHNIQUES

For diagnosis of Heart disease, Diabetes, Liver disease, Dengue and Hepatitis , various ML algorithms performed well. From existing literature, it is observed that Naive Bayes and SVM algorithms were widely used in the detection of various diseases. Both algorithms offered better accuracy level as compared to other algorithms. Artificial Neural network (ANN) is also very useful for the prediction of diseases. ANN showed good outcome but it took more time as compared to other algorithms. FT Tree algorithm were also used but they did not attain wide acceptance due to its complexity. It is also found RS theory is not widely used but it presents maximum output. The following Figure 1 shows a comprehensive graph of highest accuracy level attained by different Machine Learning algorithms for the prediction of Heart disease, Diabetes , Liver Disease ,Dengue and Hepatitis

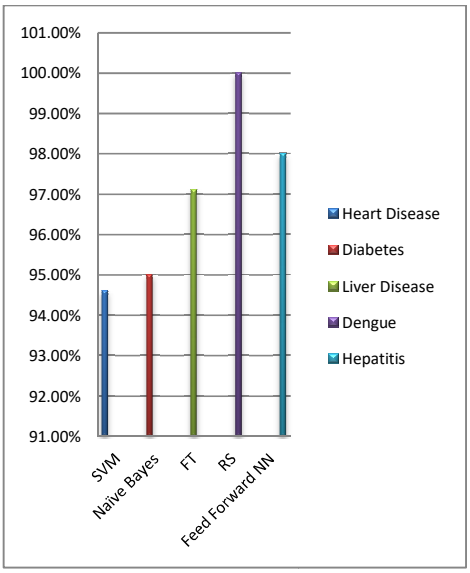

Fig 1. Accuracy level attained by different ML algorithms for the prediction of different diseases

VI. CONCLUSION

Machine Learning plays a vital role in various applications like Image detection, Data mining, Natural Language Processing, and Disease Diagnostics. Machine Learning offers possible solutions in these different domains. This paper provides a survey on different Machine Learning techniques for the diagnosis of different Diseases like Diabetes ,Heart disease, Liver disease, Hepatitis and Dengue .Many algorithms have shown good performance and results since they identify the attribute accurately. From the previous study, it is observed that for the detection of Heart disease, SVM provides accuracy level of 94.60%. For the detection of Diabetes , by Naive Bayes offered the highest classification accuracy of 95%. For the diagnosis of Liver disease ,FT provides 97.10% of correctness . 100% accuracy is achieved by RS theory in dengue disease detection. The Feed Forward Neural Network correctly classifies hepatitis disease with 98% of accuracy level. Figure 1 shows comprehensive graph of highest accuracy level attained by different Machine Learning algorithms for the prediction of the above mentioned diseases . From analysis, it is clearly observed that these algorithms provide enhanced accuracy on the prediction of different diseases. This paper provides a set of tools which are developed in the community of AI. These tools are really useful for the analysis of problems and also provide opportunity for the improved decision making process.

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An in-Depth Analysis of Services of Cloud Computing with Reference to the Business Contrivance

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Ⅰ.Abstract

Cloud computing is the most prodigious trend in the neoteric period of time in Information and Communication Technology.(ICT) This unprecedented probing get a bead on the contemporaneous state of affairs on the subject of CC deployment in Latvia. This superlative framework scrutinize the insertion of empirical interrogation for instance, how CC services can ameliorate the business production of Latvia small and Medium Enterprise (SME) in respective industries.

Methodically speaking, innumerable teensy business keepers are flabbergasted to become proficient in the certitude of practising several forms of Cloud Computing for years at the minimum on a individual degree.It encompasses your Hotmail, Gmail, Flickr, or skype accounts. Succinctly, Cloud Computing is authentically any configuration of web-based allocated Computing Service. In pragmatic, your entire computing prerequisite from website hosting and consumer correlation administration over to storage and backup. Without any further ado, it can be uprooted to the cloud. This implies your applications, files and document which will reposes in an off-site data centre rather than your computer's hard drives. In such a way, one and the other(You and your employees) can ingress these facets through any appliance/device that concatenate to the Internet(desktops, laptops, tablets, smartphones and other mobile devices.The termination of this intricate appraisal proffered an all-inclusive erudition concerning SME, ICT vendors, service providers, government organization, investigator and students.

Keywords: Cloud Computing,Positive impact, Benefits

Ⅱ. Introduction

In conformity with the modish proclamation Cloud Computing is the sublime voguish in pristine technology whither companies decided to contrivance the burgeoning of market in the contemplation of getting accomplished in modernist business in it's apex. To a great degree, it is plausible to comprehend this newfangled technology as a thriving renovation. In accordance with the statistics delineation, the aggregate number of cloud-based end-users proceed towards 3.4 billion which is in the region of the entire populace of Cosmos in 2018.

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This statistical anatomization demonstrably line up the certainty of Cloud Computing as a technology which is ballooned enormously and in two shakes it will subjugate the Information Technology Market. Owing to the fact of stupendous magnification of this technology, every single bracket of business should be cognizant about the stream which is thoroughly trembling the whole industry. As I already promulgated Could Computing invariably clutched great impression upon the appropriate companies. This technology also heeded the influence of global presentations, internal corporations and IT sectors. In spite of the fact that, this high-yielding technology is amplifying the accustomed modus operandi of backing-up the data.

Simultaneously, Cloud Computing is proposing up-to-date techniques and apparatus for the accredited companies in a systematic manner. The paramount of this contemporary investigation is to map out the high-water mark of optimistic quotient with respect to the subject-matter Cloud Computing catenated business crafting. The overriding stumbling block came up with the hindrance and security quandary in the course of migration. For this objective reasoning, it is obligatory to pinpoint the radical obscurity in a panorama of getting greater forethought and strategy to vanquish the mishaps.

If you are glancing forward to commence a well-refined business system, at this point you can confiscate Cloud Computing as the bear fruit of modern pursuit of businesses. Here, in lieu of dispatching the applications on a PC or a LAN, they put on to shared multi-tenant. As we heard, it is patently a self-service induction. We can use any application that runs in the mark of cloud. In such a way you can go around with this effortless stairway including logon and customization. Many businesses are persuaded by the outright catalogues of applications in cloud such as, CRM, accounting, HR, and custom-built applications. The cloud-based applications doesn't make you feel ponderous until or unless it is not in a placement of remunerative resounding. Consequently, cloud computing is a bargain-basement. In addition to the asseveration, the customer's don't require to pay wages to all hardware and software.

The commitment of cloud computing is to overture more advanced ascendance and copper-bottomed locked services. Thusly, Cloud dispenses new characteristics, revamped security, and performance enticements spontaneously. In the long run, cloud applications and transformation in to cloud technology doesn't swallow-up the appraised IT resources in any means. The assimilation of cloud computing permits the customer to concentrate upon the deploying more applications, fresh projects, and renovation.

At this juncture I can disseminate that Cloud Computing is the exceedingly fashionable trend in contemporary World. Apart from this assertion, small and medium sized endeavor's are implementing cloud services to save paper money and to accumulate their business calculations. At hand, cloud services also clasped assets and liabilities to scrutinize. This pamphlet elucidate the well-being, deliberation and variety of cloud computing in the matter of business. At this moment of time, CC illustrated noteworthy technology trends and draw a bead at comprehensive shifts in Information Technology which proceeds the value of IT market.

A coherent service contributor oversees the technology and trades. Subsequently, they shares the outlay of infrastructure in an explicit manner.

On the account of the proliferated growth of computing accumulation, Cloud computing has tackle as a protuberant exploration of technology materialized as a new fangled counter measure in the IT sphere. Many commerce's in conjunction with small and medium enterprises are relocating to this technology for the

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multitudinous grounds of computing resources, truncated out-and-out prize of proprietorship and the mushroomed revenue and so on. The cardinal provocation of companies for arrogating cloud computing are interoperability, portability and other authoritative ingredients. The heuristic consequences of the study accentuated the embracing Cloud technology in business organization's such as micro, small and Medium Businesses (SMBS).

Furthermore, this inspection concerted upon the dynamism of utter business procedures and the mammoth of copious nature. Previously mentioned phases are the ruling idiosyncrasy of today's business scenario. In proportion to the disputation, the utility of Information Technology as a medium of structural and imperative conception is an indispensable segment for the management blueprint of corresponding corporation. The rudimentary angle of contemporary is together with the substitute stratagem to business management which is the utilization of services hinged on cloud computing. It does have the designs of the potency to polish off noteworthy commercial prosperity without investments in contriving their own IT substructure. The aspiration of this slipstream is to bestow nature and precedence of various sorts of cloud services. The voguish trends in cloud computing in respect to business is also divulged transparently.

Cloud Technologies clapped eyes on the new business model rather than a voguish technology. It
propound entrancing possibilities for accretion and management of computing resources and software manifesto.

In the cessation of this evaluation I'm affirming Cloud Computing as the pinnacle of business strategies.

Ⅲ.Impact study of adopting Cloud Technology in Business Organization

The investigation of the impact of cloud in company organizations has several important implications for the adoption of cloud technology in enterprises: ease of use and convenience, cost savings, reliability, security,privacy,sharing and collaboration. The literary support for these influences is summarized below.

Ease of Use and Convenience-Small business employees usually work outside of their physical office, so they can easily access their data. The need for employees to access from remote locations and the ever-increasing number of online transactions require cloud computing solutions.

Accounting Financial work has been outsourced to the cloud, giving small business executives more time to focus on strategic work and planning. Accountants use cloud computing for their SMB customers and charge a convenient monthly fee. In any geographic area, from any device, from any organization. Less powerful devices (smartphones) can make full use of the company's internal IT system through a simple web interface (such as the AWS management console).

Reduce costs: The small business subscription model can save a lot of costs. For small businesses that use business intelligence and analytics that require a lot of computing power, access costs have been reduced. Saved 70% of the cost. Since the introduction of AWS (Amazon Web Services) as a cloud service provider. Despite its lack of competitiveness, AWS has also cut prices several times in the past three years. American SMEs appreciate the low cost of core IT resources and the low maintenance cost of IT assets, thereby lowering the barriers to entry. With the sales per user model, small businesses can afford business applications such as CRM (Customer Relationship

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Management) or SCM (Supply Chain Management). Provide it at an affordable price. Small businesses and startups can now afford applications such as ERP (Enterprise Resource Planning), CRM (Customer Relationship Management), SFA (Sales Automation), and SCM (Enterprise Resource Planning, Supply chain) through low monthly fees. Instant access to equipment and No upfront investment is required to obtain software resources, thereby shortening time to market and making IT an operating (rather than capital) expense.

Implementing IaaS can reduce capital and IT costs. Cloud capacity when not needed is very cheap. In a risky business model, the scalability (operational excellence) of the resources provided by the cloud provider becomes a huge competitive advantage when the demand increases sharply at one time. 24 hours a day is more reliable. Employees can even call the cloud center (if necessary) without relying on their own IT staff. Data redundancy is built into the cloud storage solution, so files are always available even in the event of a network interruption, power outage, etc. Despite the AWS outage in 2011, built-in redundancy helped Netflix remain optimistic about the network. Even in 2010, the availability of Gmail reached 99.984%, which is 32 times more reliable than traditional email systems. For SMEs, the reliability of cloud services is important, but not as important as large companies but it is important to migrate end-user data to another cloud provider (in the event of a failure of the main provider).

Poor interoperability is a common problem in cloud computing. In addition, reliability is affected by various cloud business solutions (such as Salesforce.com, Amazon, Gmail and Google Docs make cloud settings easy. Although the cost of cloud services is relatively low, the required reliability must be maintained. It also believes that under the SLA, commercial companies that provide automated disaster recovery need timely telephone support. The FTC (Federal Trade Commission) and the Cloud Security Alliance are working to improve the reliability of these cloud providers.

Security and privacy: companies talking about cloud security are actually biggerBusy with own control (such as private cloud), rather than any other major issues. Cloud security is a good thing because authentication and encryption minimize risks.

Ⅳ.The characteristics of cloud technology

The characteristics of cloud technology are:

On-demand self-service: Customers can use any contractually agreed computing resources, such as computing power, storage space, or applications from service providers, without manual intervention. It can be accessed anytime and anywhere from any standard device that can access the network resource pool: the provider's computing resources are pooled to provide limited services. The pooled resources can be geographically distributed in several data center. The provider's computer resources are shared by multiple clients. Resources are dynamically allocated to customers as needed.

Fast elasticity: The client can use computing resources flexibly. The client can request more resources. Release them when needed, and release them when not needed. From the customer's point of view, resources are unlimited. Customers only pay for the total amount of resources used.

Measurable service: Cloud computing is an adaptive system. They automatically balance the load and optimize the use of resources. Users can track and control resource usage to ensure transparency of invoices.

The cloud has multiple functions:

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• Everything from infrastructure such as servers to applications such as communications and collaboration, to utilities such as accounting, word processing, and customer relationship management (CRM).Provided via the Internet as a service.

• Regardless of the system used, the service speed is constant.

• You can access applications, services, and data through various connected devices (such as smartphones, laptops, and other mobile Internet devices).

• Provide services on demand, users can configure, monitor, and manage computer resources as needed, without internal IT support.

• The provider uses a multi-tenant model to pool resources and provide services to multiple customers. If the client does not need so many specific resources (electronic storage, processing, memory, network bandwidth or virtual machines) or other clients at any given time, the cloud can switch and reallocate resources to save costs.

• Fast flexibility and strong ability Scale up or down to meet customer needs.

• Track the usage of IT resources for each application and each billing customer. Services provided by the cloud, rather than building your own infrastructure. The following are the benefits of cloud computing technology to keep the enterprise active. Organizations that migrate on-premises infrastructure to the cloud.

V .Cloud service model.

The cloud service models used are mainly divided into three categories.

Software as a Service (SaaS): Instead of installing software on the customer's computer and regularly updating patches, frequent version updates, etc., it uses word processing, CRM (customer relationship management), ERP (enterprise resource management), etc. The Application Planning is available (hosted) on the Internet for end users. Applications or programs (such as e-mail and document authoring) accessed over the Internet from various devices, including computers and mobile phones. It does not manage or control any cloud infrastructure or application functions.

You can choose to host these services internally, externally through a cloud provider, or using a hybrid approach.It can be owned and operated by the company or a third party, and can exist internally and externally. In any case, the company controls the infrastructure and data. Mainly used by large companies. Hybrid cloud. combination. Two or more clouds (private or public) remain unique, butThe company provides and manages some internal resources and other resources. Suitable for companies that want to store data at home but want to scale instantly. It is also suitable for companies whose applications cannot be easily migrated to cloud computing. Which one is best for your business depends on your specific needs (e.g.Control what you want) and your budget, and most likely need advice from IT professionals. Service models

Platform as a Service (PaaS): These platforms and software development do not need to obtain software licenses for platforms such as operating systems, databases, and middleware The kit (SDK) and tools (such as Java, .NET, Python, Ruby on Rails) are available on the Internet. It enables you to provide applications developed by your company in a cloud infrastructure. Most organizations use virtualized servers and related services to run existing applications or develop and test new applications.

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Infrastructure as a Service (IaaS): Refers to tangible physical devices (raw computing), such as virtual computers, servers, storage devices, and networks. The broadcast is physically located in the central location (data center), but can be accessed via the Internet and use the login authentication system and password from any dumb terminal or device Choose according to your business and technical needs. External storage or processing resources (such as data storage, disaster recovery, and servers) that you access from the Internet. Or manage infrastructure, but you can control your operating system, applications, and programming environment

VI.Cloud deployment model

Cloud services can be provided in one of the following public clouds: It can be obtained through the Internet through a third-party provider, which is very cost-effective for small and medium-sized enterprises using IT solutions such as Google Apps.

Private cloud**:** internal management, suitable for large Company (managed within the company). cloud infrastructure For use by organizations or private groups. It is not shared with other users and can only be accessed through a private network controlled and used by the organization. Private clouds provide a higher level of security than public clouds. Most organizations choose this deployment model because it is more reliable and secure.Hybrid cloud. Cloud infrastructure is a combination of different cloud infrastructures. The hybrid model enables key business information and applications to be used in private clouds, while applications with lower security requirements and higher accessibility can be used in public clouds. The mentioned supply model can also be used in Community Cloud & combiningClouds

Community cloud: used and controlled by a group of companies with common interests. And private cloud.Deployment models There are a variety of cloud computing deployment models that can be implemented

Public cloud**:** Cloud infrastructure can be used by a large number of users (general public). The Internet is usually done through a Web browser.

VII.Benefits of Cloud Computing

The benefits of cloud computing for small businesses There are several reasons why small businesses should consider using cloud services:

• Cost savings. One of the biggest advantages is that there is no need to purchase expensive IT infrastructure, such as expensive servers. Cloud computing services use it to manage and maintain IT systems

• Scalability. You can increase or decrease the required storage space. This is especially beneficial for startups that want to avoid buying servers that may be underutilized at first, and then overwhelmed as their business grows. Not only can you save money by paying for what you use, but you can also avoid possible downtime while waiting for equipmentSystem upgrades, access to superior technology, powerful applications and modern computer infrastructure are unaffordable for small businesses (customer relationship management and e-marketing packages,Open up new markets and transform ideas into new products and services faster.

• increase productivity. The use of cloud computing eliminates the hassle of introducing and maintaining certain IT services, and ensures that you and your employees can focus on more efficient tasks. Because applications (including legacy applications) tend to run more efficiently in the cloud, your employees

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can work faster and more efficiently.Don't experience excessive downtime.

• Cooperate with employees. Cloud computing provides access to data through an Internet connection, making employees' lives easier, especially if you have mobile employees or multiple offices. Internal meetings or presentations with customers.It can also easily use mobile devices such as smartphones and tablets to make the most of them.

• Selective subcontracting. With all available cloud options, SMBs do not have to outsource all IT needs at once, but can choose the services they want to outsource. This is not a business decision at all.

• Improve safety.Many small business owners put security as their primary consideration when considering migrating to cloud computing, but the irony is that good cloud providers have better privacy and privacy practices than most domestic small businesses. Suppliers have technicians who monitor their services 24 hours a day, 7 days a week.

• Disaster recovery.Damaged by fire or theft. Cloud computing enables you and your employees to stay away from the office or work from home in the event of a disaster, making it easier to recover from disasters when your facilities are unavailable. Five reasons why small businesses choose cloud computing to solve data loss Prevent cloud computing from loading data during internal computing interruptions or failures, even if you are not using other cloud computing services.Access the latest software. Renting software through cloud services instead of buying software allows companies to access the latest version. Economic benefits for companies operating on the Internet. Hosting the website in the cloud can save you the cost of purchasing and upgrading hardware. In addition, cloud services can be scaled to meet growing demand immediately. This is especially beneficial for start-ups that cannot reliably predict space requirements.

Human Resource Management There are many tools that can be used to monitor employee performance, no matter where they are. In addition, many small businesses use cloud computing for payroll and bookkeeping. Collaboration Employees, partners, and suppliers can often meet online as effectively as internally. You can exchange files over the network and update them in real time.Web conferencing technology also enables employees to provide complex presentations to prospects and customers without incurring travel expenses or personal time. The billing is required only when in use, because the billing model is based on use and does not require advance payment. Infrastructure is not purchased, so it is reduced.Acquisition costs and maintenance costs.

VII.The future of cloud computing

This relatively new technology opens up many possibilities. Be aware of these trends:

• Increasing use of mobile devices will increase the demand for cloud services. New technologies will emerge that will make it easier for mobile users to access the cloud, and mobile, cloud and social media will converge.

• Web conferences are becoming more and more complex,With the integration of audiovisual, oral and instant messaging, it becomes more accessible. This reduces the need for face-to-face meetings and makes employees more flexible.

• When making business decisions about migrating to the cloud, pay more attention to greater flexibility, faster deployment time, and higher efficiency.

• Cloud service agents are becoming more and more popular,Help companies adopt cloud technology, manage services and reduce costs.

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Niche cloud service providers will proliferate and grow, as will cloud consulting companies and professional services companies.

• Costs decrease as cloud usage increases.

• As businesses (especially small businesses) realize that data in the cloud is more secure than data in their offices, concerns about cloud security will decrease.

IX.Conclusion

Cloud computing is an important part of the company because it has the potential to be flexible, fast, and efficient in all business processes and activities. Migrating the company to the cloud allows the company to realize significant financial benefits without having to invest in its own IT infrastructure.Cloud computing should not only be seen as a means to achieve greater hardware and software cost savings, but also a prerequisite for building business strategies that change the company's overall operations and increase efficiency and flexibility over time.

Cloud service providers provide customers with safer, more reliable and more scalable services.To provide customers with better services to meet their business needs. Cloud computing is a simple way to reduce business costs and increase sales. Cloud-based companies have the advantage of being able to access information anytime, anywhere. As a result, decision-making capabilities have been improved, and the company's performance has become faster and better.By using different encryption methods, regular backups, choosing the right cloud provider, etc., various problems related to the implementation of this technology can be alleviated. Cost/benefit cloud providers charge customers per user or per use.

For those who absolutely need it in business to save money. The choice to use makes senseIf you only need cloud services on a regular basis (such as seasonal business) instead of daily. Note that setup costs are high and will wipe out any savings in the cloud. Possible options to increase productivity and save money, it's time to set goals and targets:

• Decide what you want to use cloud computing for (for example, for all or part of your business processes).

• Choose the cloud service that best meets these needs.

• Create a budget. You may find that the cost of deploying existing or legacy systems to the virtual world is low, and you may not be able to migrate to the cloud as you wish.

• Create a schedule (some companies preferPhased cloud).

• Make sure you include performance metrics so that you can continuously evaluate your needs for cloud service products.

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Analysing the Impact of Online Classes on Student's Health using Machine Learning Techniques

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Abstract—The onset of Covid 19 had an adverse effect in all areas of one's life and thereby made us adapt to new and unfamiliar ways to carry on with our daily life. Utilization of online mode of interaction became a necessity for most of us. One such shift was the transition from regular class to online class. The educational sector was one of the quickest to adapt to online mode of operation, using apps like google meet, zoom, microsoft teams,etc to conduct online interactive classes. In this paper we try to analyse the health concerning problems associated with this new mode of education. For this purpose we use machine learning to categorize the data collected and use it to analyse the student's health and check whether their health is more negatively affected on online classes when compared to offline classes. Machine learning classification techniques such as Naive Bayes, J48, Random Forest, Decision Table etc to conduct the analysis.

Keywords—COVID-19, Google Meet, Zoom, Microsoft Teams, Machine Learning, Naive Bayes, J48, Random Forest, Decision Table

I. INTRODUCTION

Education is one of the most prominent as well as an important sector of a country. It impacts the future of the youth as well as the future of the whole country itself. In 2020 marked the arrival of a world-wide pandemic due to a deadly virus known as COVID-19 and most of the organizations and institutions had to be shut to suppress the spread of the virus. This pandemic has disrupted the traditional way of learning and studying and forced the education sector to adopt a new means of teaching so that the students can stay home and study [6]. This method of Online Learning was a remarkable measure to continue the education of the students, and the whole

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sector did not come to a halt due to the pandemic.

The pandemic forced a sudden shift to online mode of teaching and learning which was new to the majority of students and teachers alike and had a great deal of starting trouble. But among all this the health related side effects of this was shortsighted and often ignored by many due to many reasons. Using devices like computers and smartphones for attending classes can cause strain to students who attend classes for a long period of time. Temporary as it may be, the harmful after effects can be carried on by the students for the rest of their life and can cause severe problems in the future. Therefore through this paper we try to identify these problems which students face in comparison to the offline class.

A student's academic performance could be affected by differences between economic, racial, availability of resources, stress and also anxiety caused due to the pandemic situation. These can all affect negatively and can impair the learner's ability to concentrate and study through online classes. Apart from that, not all teachers are used to teaching through these online services, rather be ready to do it swiftly[5]. These acts as physical barriers to efficient learning through online services

Online classes are attended through tools commonly called Learning Management Systems. Some of them are Next, Canvas, Moodle etc. YouTube acts as an efficient platform for tutorials and guides. Real-time online lectures are held by using the previously mentioned softwares like Microsoft Teams, Google Meet, Zoom, Cisco Webex etc[4]. Online assignments are required to be submitted by students, these are done using pdfs, created by PDF Scanners like Adobe Scan, CamScanner, Tiny Scanner, etc. The government in some states like Tamil Nadu have provided students with laptops and internet for free to promote and support the online learning system.

Therefore we use data mining to collect data and categorize data and use a variety of machine learning algorithms to find one with highest precision to drive an outcome . Machine learning is used in such cases because it becomes easier to process large data collection by teaching the computer and automating the task [8]. This is achieved by feeding the machine learning algorithm tokenized data during training sessions . The algorithm uses pattern recognition to learn and apply complex mathematical calculations to learn [7] . After this the algorithm can be used to operate on the actual data to predict any outcomes. Through machine learning we can predict data using models,patterns and algorithms and therefore has before an important feature in the field of data analytics [7].

We use the weka tool for testing different machine learning algorithms. Weka

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is a software used for implementing data mining using Java. It has a different collection of tools and has a roster of different algorithms used to analyse data, model prediction, etc. It has a GUI(Graphical User Interface) which helps in easier navigation and usability of the software. It has a workbench that includes different methods to solve Data Mining problems such as clustering, classification, regression, etc. A single relational table is used as the input for all the algorithms and methods. This single relational table is created using the file or generated by a database query[1].

II. LITERATURE REVIEW

Machine learning algorithms use little to no human interventions to analyse the data and build a new data model. It can find complex patterns and irregularities and most of all learn from the data. Therefore we use different machine learning algorithms to analyse our real time data.

A. Random Forest

Random forest is a machine learning algorithm which is used to achieve accurate results most of the time. The random forest algorithm is a kind of supervised learning algorithm. The algorithm creates a bunch of decision trees which are trained with bagging method. In other words, the Random Forest algorithm builds two or more decision trees from the data and groups or merges them together to get an accurate prediction.

Leo Breiman proposed this scheme in the 2000's to build a predictor that operates on a set of decision trees that grow randomly in some selected subspaces of data. Using Breiman's approach, trees are formed in the collection by selecting a random node, and a small group of input coordinates to split, then calculating the best split based on these features(input coordinates) in the training set. This newly created tree is grown using CART methodology as maximum as possible without pruning. Bagging is blended across this subspace to resample and replace the tree with training data sets that grow a new individual tree[2].

For classification and regression problems, the random forest approach is commonly used. This algorithm is used in banking sectors to determine if a customer is eligible for a loan based on his account balance, payment status, etc. It is also used in healthcare sectors to identify the diseases suffered by a patient, or if they are at risk of cancer or other diseases, etc.

B. J48

J48 comes as an extension of the ID3 algorithm which was developed by the WEKA project team. Since It uses a

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predictive machine learning model it used to to predict the target variable of a new dataset record. The J48 algorithm creates a decision tree based on attributes data set.The nodes on the decision tree are used to represent different instances of classification and the branches are used to show the results, and finally the leafs show the class label

C. Naive Bayes

Naive Bayes algorithm is an algorithm that uses Bayes' Theorem, which is a theorem that is used for calculating a probability by counting frequency and combinations of values in a data set that is previously taken. Naive Bayes algorithm uses conditional probabilities of each attribute of each class and uses this data for prediction from the data set[9]. Real world situations are more often predicted by using Naive Bayes because it performs much better in those conditions. One of the parameter estimations of Naive Bayes model is Maximum Likelihood and it is used very often. Also this algorithm only requires a small training data and then it can start estimating the parameters.

D. Decision table

Decision tables are one of the most simple machine learning algorithms which is also used for prediction based on data where decision is taken on each instance of data depending on a set of variables that are provided [10]. A decision table is divided into two fractions ,the first part contains all the attributes and their values that are possible and the second part of the decision table includes all the conclusions [11]. After that the attributes are cross checked according to the conclusions drawn from the decision table. But decision tables are rarely used because they cannot be used if the attributes have more outcomes and it also cannot be used for complex data.

III. METHODOLOGY USED

A. Data Collection

The primary means of data collection was done through google form which included a questionnaire which contained questions about health problems associated with online classes and whether the participants are facing more problems when compared to offline classes. The data collected were real time data and were collected from indian states of Kerala and Madhya Pradesh and a total of 207 responses were received.

The following attributes were included in the form for data collection

Refer [Table 1]

From Table 1, the 13th entry is used as the class label response for prediction.

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B. Results and Discussion

This survey and classification is done by using Weka software tool which is open source machine language. It is a graphical user interface based tool . It includes tools such as preprocessing, clustering, regression etc. From the collected dataset 120 samples were taken through Google forms and stored in MS Excel and converted as .arff files.

Weka software tool was used in classification of the data set from Google Forms. 207 responses were taken into account and were processed using this tool. The result is shown in Table 2.

Refer [Table 2]

Chart 1 shows some of the measures of the four algorithms

Refer [Chart 1]

Chart 2 shows the comparison of accuracy between the four algorithms

Refer [Chart 2]

Accuracy is used to machine learning algorithms to find which algorithm is best suited for the purpose depending on the relationships and patterns it can identify from the data. Accuracy is not one of the most appropriate performance metric in some unusual situations like in cases where target variable classes in the data set from or input are unbalanced[3].

$$\square\square\square\square\square\square\square = \frac{\square\square}{(\square\square + \square\square)}$$

Recall shows the amount of positive predictions made by the algorithm from all the possible predictions on the data. In other words, it specifies what number of relevant data items are selected[3].It's calculated by dividing the total number of true positives by the total number of true positives and false negatives in the data set.

$$\square\square\square\square\square\square\square\square\square\square\square = \frac{\square\square}{(\square\square + \square\square)}$$

Precision is the ratio between the positively predicted data and all the possible positive predictions. It means the number of selected data items from the data set that are relevant. Or it means the number of observations that the algorithm predicted to be positive, is actually positive in the data set[3]. The precision of an algorithm is therefore the no. of true positives divided by the sum of the true positives and false positives in the dataset founded by the algorithm.

$$\square - \square\square\square\square\square\square\square\square = \frac{\square\square}{\square\square + \square.\square(\square\square + \square\square)}$$

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F-measure is used to test the accuracy of the algorithm, it combines precision and recall into a single entity. It is also known as F1-Score or F-Score. Its formula is the harmonic mean of precision and recall.

IV. CONCLUSION

Through this paper we try to analyse the effects of online classes on student's health with the help of real-time data-set. Online classes place a huge amount of strain and stress on students, and long and constant viewing of screens of devices leads to headaches. Using Weka tool and different machine learning algorithms were used to process the data collected from the google forms. Through testing of the data, the random forest was found to be the most accurate algorithm when compared to other algorithms and had an accuracy rate over 96 percent. The recall precision and the f-measure of random forest and all the other algorithms are shown in the graph. The data used was real time data and a total of 207 responses were recorded, this data had a small sample size and hence could not represent the entire student body. From the paper we can see that random forest is the best technique which can be used to analyse the students overall health during online classes.

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Tables and Charts

Attributes	Possible Values
Regular attendee	{Yes, No}
Feel better attending online class	{Yes, No}
Headaches after online class	{Yes, No}
Uses headset	{Yes, No}
Fatigue after online class	{Yes, No}
Nourishment during online class	{Yes, No}
Body pain due to sitting postures	{Yes, No}
Regular Exercises	{Yes, No}
Attends in well air-circulating room	{Yes, No}

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Uses laptop/desktop for class	{Yes, No}
Uses mobile for class	{Yes, No}
Network issues	{Yes, No}
Online class has affected negatively	{Yes, No}

[Table 1] - Questionnaire used for data collection

Algorithms	**Accuracy**	**Precision**	**Recall**	**F-Measure**
Random Forest	96.618%	96.6%	96.6%	96.6%
J48 Pruned Tree	87.439%	89.1%	87.4%	85.0%
Naive Bayes	83.091%	82.4%	83.1%	82.7%
Decision Table	83.574%	86.4%	83.6%	78.5%

[Table 2] - Measures of each algorithm

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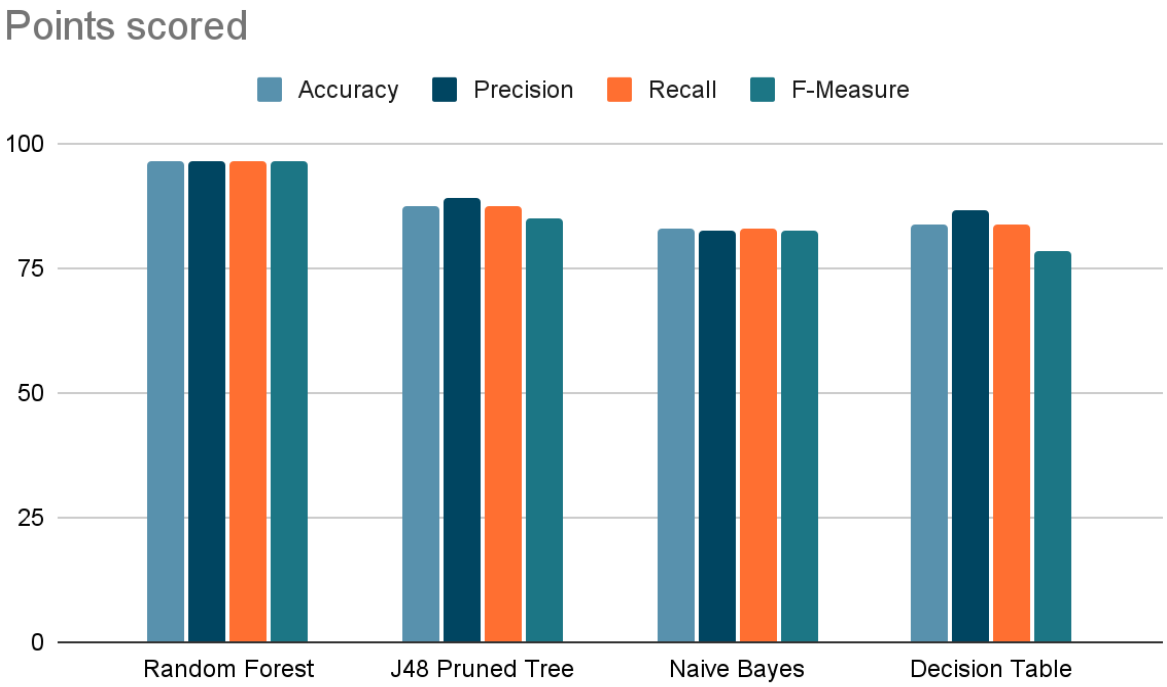

[Chart 1] - Comparison of measures of four algorithms

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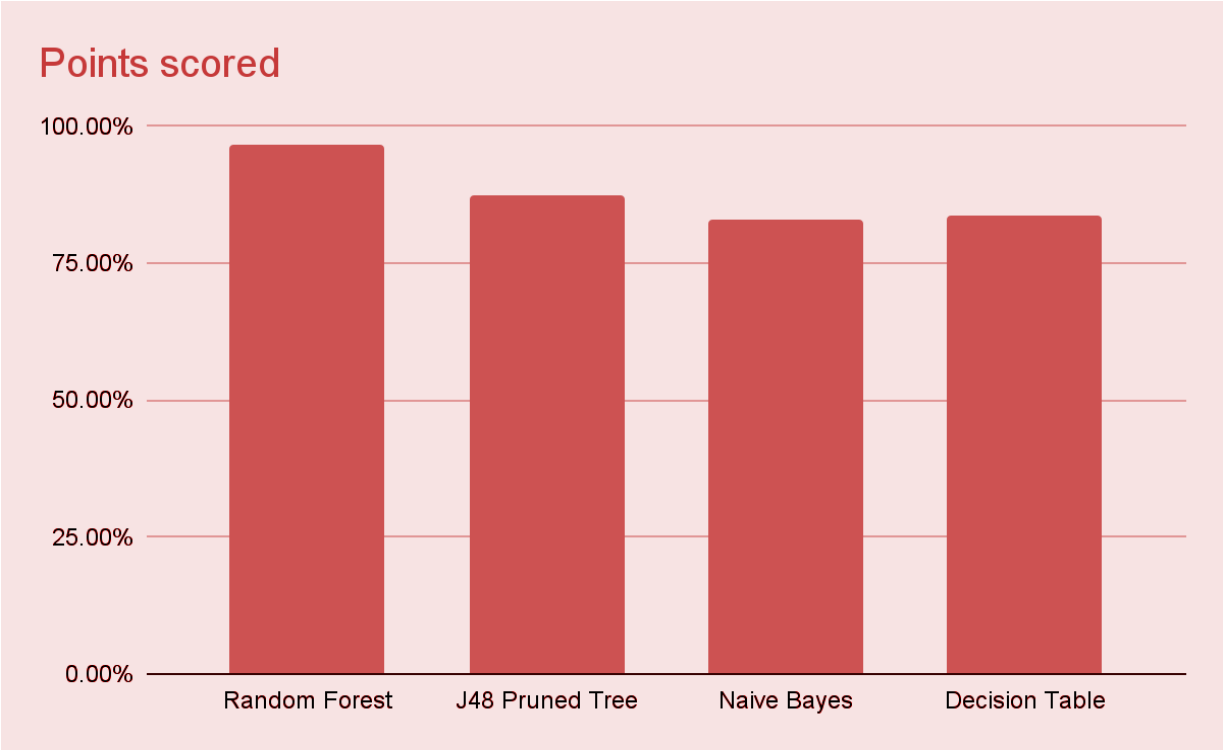

[Chart 2] - Comparison of accuracy between four algorithms

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Analysis of Supervised Machine Learning Models on Heart Disease Prediction

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Abstract— **Different types of heart diseases are the major cause of reduction of human being on earth.Health sector around the globe find out many obstacles inorder to predict the disease.The number of death increases just because the patient who has heart disease can not be diagnosed very fastly.For this different types of tests like blood glucose,ecg,cholesterol etc have to be done .For the past couple of decades ,health care people collect various details of patients undergone heart problems.These data are stored on online databases.By using this data , the status of a patient's heart health can be predicted. These stand-in data can be collected from different repositories.For this various machine learning techniques are available.The main objective of this paper is to compare different ML algorithms like Logistic Regression, K Nearest Neighbour (KNN), Random Forest, Support Vector Machine (SVM) and XGBoost etc which have been applied in state of the art research for heart disease prediction. .**

***Keywords*— Machine Learning,Random Forest,Support Vector machine**

I. INTRODUCTION

Nowadays technology is getting involved more and more in our day to day life. Just like in another field, technological innovations affect very deeply in the medical sector. New devices have been developed and disease diagnosis has been very much easier. New technologies like Big data implementation in healthcare sector[12] is one of the promising field in recent years.Heart is the most important organ of human body whose function is to pumb blood to different parts of the body. It has been working continuously since our birth without much problem.But due to lack of exercise and some unhealthy food habit ,the heart sometimes shows some abnormalities. These assymetrical problems of heart will affect the whole body and sometimes it cause the death of a person. The major symptoms of heart failure includes sweating, fatigue, chest pain etc[1].According to World Health Organization[14] around 17 million people die of CVDs, particularly heart attacks. In United States one person dies in every 37 seconds due to CVDs. The rate of deaths can be controlled to a great extent if heart failures can be detected at an early stage.In order to make sure whether a patient has heart disease or not, several body inavasive tests like BP,ECG,blood sugar,cholesterol etc have to be done. With the help of technology like machine learning, the time taken for heart disease diagnosis can be reduced to a large scale. Researchers have brought forward different machine learning models with improved accuracy for the heart disease prediction.The work suggested in this paper mainly focuses on different machine learning methods that can be applied in heart disease prediction. According to WHO ,CVDs are a group of disorders of the heart and blood vessels and it includes coronary heart disease – a disease of the blood vessels supplying the heart muscle;cerebrovascular disease –a disease of the blood vessels supplying the brain; peripheral

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arterial disease – a disease of blood vessels supplying the arms and legs; rheumatic heart disease – damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria; congenital heart disease – malformations of heart structure existing at birth; deep vein thrombosis and pulmonary embolism – blood clots in the leg veins, which can dislodge and move to the heart and lungs.

Heart disease diagnosis with the help of machine learning has been a fast-growing area in the field of research. Likewise Internet of Things has been using in HD prediction[15]. In IoMT also ML techniques can be applied for proper diagonisis. In this paper some machine learning algorithms like Support Vector Machine(SVM), K Nearest Neighbour(KNN), Logistic Regression, Decision Tree,Random Forest and Naïve Bayes, etc. have been used by various authors to predict the heart disease. This paper is divided into different sections. Section 1 gives an introduction. Section 2 provides various studies related to heart disease prediction, section 3 contains materials and methods, then discuss the results and finally provides the conclusion.

II. LITERATURE REVIEW

Dr.S.V.Kogilvani[2] et.al predicted heart disease by using Clevland dataset.Since the online dataset contains small number of references, they create some synthetic dataset.After proper data preprocessing , performance of both Clevland and synthetic data are compared on the basis of accuracy,recall and precision and synthetic data found to be performed well.

In [3] Rishabet.al also took data from Clevland and developed a web based application form which will be helpful for the patients to know whether their heart has some problem by entering their health data in the form.The interactive web application was developed using HTML,CSS Django framework along with ML techniques.They have compared Logistic Regression,SVM,DT and NB and Logistic Regression got highest accuracy of 82.89.The advantage of the research is the end user can use this web application for preliminary prediction about the condition of their heart.

G.Dinesh Kumar[4] analyzed patient's heart health by taking data from Clevland,Hungarian,Switzerland and Longbeach databases.After proper data preprocessing different algorithms like LR,NB,RF,SVM and GB are used for modeling and R programming language is used for statistical computation and visualization.

B.fredrik[5] has used several number of experiments using cross validation and percentage split on UCI statlog dataset.Here NB,DT and RF are compared to analyse heart data.Three algorithms are evaluated a number of ties by using different evauation strategies and Random Forest performed well.In this research only precision ,recall,f-measure,ROC are measured but no accuracy.

R.Indrakumari[6] et.al suggested a research work in which the main risk features that affect heart is considered and K-means algorithm is used for analysis along with talaeu tool for isualization.By using this unsupervised algorithm the research predicts four types of chest pain.

Divya Krishnani[7] et.al proposed a model that use various ML algorithms RF,DT,KNN on Framing ham Heart Study dataset. The dataset contains 4240 record of which only 15.2% has heart problems and the other 84.8% has no heart disease.Missing values are replaced by mean.In order to balance the class, random sampling is applied.Different ML algorithms RF,DT and KNN are used for analysis and RF got highest accuracy.10 fold cross validation is also applied in the model for better accuracy.

A.Gonsalves[8]et.al built a prediction model by using South African Heart disease dataset from KEEL.For pre-processing and other data

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analysis,they used WEKA tool.DT,SVM and NB are used for analysis with10 fold cross validation.Since the data set is unbalanced,the researchers measure other metrics such as specificity and sensitivity apart from accuracy.But sensitivity and specificity rates are very low.

Terrada[9] et.al has suggested supervised ML based medical diagnosis system that uses three different databases(Clevland,Hungarian,Z-alisadeh) to predict atherosclerosis that causes heart disease.Three ML techniques ANN,adaboost,DT are used in three datasets for comparison.For ANN,they tried different number of simulations for best parameters.ANN outperformed well with 94% accuracy when used with Z-alisadeh dataset. than others.Haq et al. [10] suggested a hybrid method for HD prediction by using LR,KNN, ANN, SVM, DT and NB on Clevland dataset.The researchers first used these classifiers on full dataset.Then they applied feature selection methods Relief,mRMR and Lasso with K-fold cross-validation.Then both results are compared and various performance measures are used for evaluation. Relief FS performed well than other two feature selection methods.

In[11]M.Thyagragen brought forward PSO and RS with TSVM,that uses data from UCI database.Z-score is used for data normalization along with PSO and RS based attribute selection methods.The proposed PSO RBF TSVM method is compared with existing IT2FLS and MFA and RBF-SVM based methods and the proposed method performed.

III. MATERIALS AND METHODS

Since medical data are freely available on internet researchers make use of it for the easy diagnosis.Using these dataset it is possible to analyze and reveal various diseases. Machine learning methods can be applied to the heart disease dataset which is available on the internet for predicting heart failure. These dataset may contain some missing values, or some redundancies. So instead of just applying the Machine Learning technique, some type of feature engineering can be done on these datasets so that the efficiency of these models will improve.[11].

A.Datasets

Various heart disease datasets are available on internet of which the "Cleveland heart disease dataset"[12] has been used by most of the researchers in this review. This dataset has a total of 303 records of heart patients with 76 attributes. There are so many missing values, errors and some redundancies in the records. So some rows are removed and selected. 297 records with 13 important features and one target variable. The target variable shows whether a patient has heart disease or not. The UCI Clevland dataset is shown in Table 1.Most of the heart datasets contain these types of parameters.

TABLE1. DESCRIPTION OF UCI CLEVLAND HEART DISEASE DATASET

Sl No	Attributes	Explanation
0	Age	Age of the patient
1	sex	Gender of the patient
2	Cp	Value of Chest pain - 1: typical angina - 2: atypical angina - 3: non-anginal pain - 4: asymptomatic
3	Trestbps	Resting hyper tension
4	Chol	Cholesterol
5	Fbs	Blood Sugar Level in Fasting
6	Restecg	Resting ECG
7	Thalach	Peak heart rate attained
8	Exang	exercise induced angina (1 =yes; 0 = no)
9	Oldpeak	ST depression due to exercise corresponding to rest
10	Slope	Maximum exercise ST segment slope - 1: up sloping - 2: flat -3: down sloping
11	Ca	Count of main vessels (0-3) colored by fluoroscopy
12	Thal	3 = normal; 6 = fixed defect; 7 = reversible defect
13	Target	Whether the patient has Heart

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failure or not

B. Methodology

Machine Learning is a type of Artificial Intelligence that helps to identify patterns from data. Nowadays data is the new oil. By using this precious data, Machine Learning can do different analysis and operations then finally takes decision. There are different types of Machine Learning tools to predict heart disease.ML is a set of techniques to make computers better at doing things than human beings can do.ML involves makimg machines learn things like human do.ML uses a set of techniques to extract knowledge from existing data and with the help of these data decisions are made.The main steps in ML process are

Exploratory data analysis-Understand and analyse data.

Feature Engineering-Handling missing values, handling outliers, normalization and standardization.

Feature selection-Removing those features which are not contributing the output thus by including only strong features.

Model Selection-Selecting the right algorithm from the available ML models. Some models may be suitable for numerical processing; others may be suitable for image processing etc. To select the appropriate model for our problem is one of the major tasks.

Model Training-The aim of this step is to make predictions correctly. Training means learning good values for all the weights and bias.

Model Evaluation-Once the model training is complete, the model's quality should be evaluated. Hereby using some metrics, measure the performance of model. Test the model against some new data.

Parameter Tuning-After evaluation, it is possible to see if it is possible to improve the training by tuning. Tuning of model parameters for improved performance is done in this step.

Make Prediction-Using further test set which has been withheld from the model are used to test the model.

IV. RESULTS AND DISCUSSION

There are different metrics used to evaluate Machine Learning models. They are confusion matrix, accuracy, precision, recall, ROC curve, etc. Using the correct kind of metric to find out how good our model is one of the important factors. This is used to get an idea of our model's performance. Various Machine Learning models used in the above papers are listed in Table 2.

There are different classification matix in Machine learning models .They are confusion matrix, Accuracy, precision, recall,f1 score,ROC curve,AUC score.Selection of right metric is important in describing the model.If the wrong metric is selected, then the performance of the model will be very poor.The most important metric is confusion matrix ,which is shown below(Fig 1).Here FP is known as Type 1 Error and FN is called Type 2 error.TP and TN are the most accurate results and in any classification problem the aim should be to reduce type1 and type2 errors.From the confusion matrix ,accuracy can be measured as

Accuracy=(TP+TN) / (TP+FP+FN+TN).

But if the dataset is imbalanced,then accuracy will not be a good metric.In that case,other metrics like Recall,Precision,F score,MCC,AUC score etc will be helpful. In this paper, researchers have taken different metrics for different datasets.

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Fig 1 Confusion Matrix

Comparisons of different research works is shown in Table 2.Four researchers have taken Clevland dataset only and three of them have taken Clevland along with other datasets.Three authors have taken different datasets.Out of the ten papers , seven authors used Decision tree,four authors used Logistic Regression,five authors used Support Vector Machine,five of them used Naïve Bayes, four used Random Forest,three papers applied K nearest neighbours and adaboost one and only one author used unsupervised algorithm

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References	Dataset	Data preprocessing	Algorithms compared	Evaluation	Prediction performance and remarks
Dr.S.Kogilvani	Clevland and synthetic data	missing value treatment,standard scalar,minmax scalar	DT,KNN,RF,SVM,LR	Not mentioned	Accuracy,precision,recall,f1score.-synthetic dataset performs well
Rishabh Magar	Clevland	Null value treatment,feature scaling	LR,SVM,DT,NB	Not mentioned	Only accuracy is calculated.LR has highest accuracy of 82.89
G.Dinesh Kumar	Clevland,Hungarian, Switzerland,Longbeach	Data cleaning,data integration,missing value treatment	LR,SVM,NB,RF,GB	Not mentioned	Only accuracy is calculated.LR has highest accuracy of 91.61
B.Fredrick David	UCI Statlog	not mentioned	RF,DT,NB	K-fold cross validation& percentage split	TP rate,FP rate,precision,recall,f1 score,ROC,MCC,PRC.RF performs well but accuracy is not defined
R.Indrakumari	Clevland	missing value treatment,Tableau for data visualization	Unsupervised algorithm-K means clustering	Not mentioned	Four types of chest pain are predicted.
Krishnani	Framing ham Heart Study	missing value treatment,random sampling for dataset balancing	RF,DT,KNN	10-fold coross validation	confusion matrix, accuracy, precision,recall,f1score,,ROC RF performs well with 96.8% accuracy
H Amanda	South African HD dataset from KEEL	WEKA tool used	DT,NB,SVM	10-fold coross validation	accuracy,sensitivity and specificity.NB performed well with 71.5.Dataset is imbalanced.
Terrada	Clevland,Hungarian, Z-Alisadeh	missing value treatment,changed categorical values to binary values	ANN,Adaboost,DT	10-fold coross validation	Accuracy,precision,recall,f1score,MCC.ANN performed well with 94% in Z-Alisadeh dataset.
A.Haq	Clevland	missing value treatment,standard scalar,minmax.FS methods .Relief,mRMR and Lasso	LR,KNN,ANN,SVM,NB,DT	10-fold coross validation	Accuracy,sensitivity,specificity, error rate,MCC,AUC and ROC.Relief FS method performed well.
M.Thyagaragen	UCI	Z-score for data normalization and PSO and RS for FS	RBF TSVM, IT2FLS and MFA and RBF-SVM	Not mentioned	Accuracy,sensitivity,specificity. RBF TSVM performed well.

K means clustering.In many papers data processing as well as validation methods are not used. Accuracy is very important in measuring ML models, but some papers fail to predict the accuracy. By considering these disadvantages, to design machine learning model with proper feature engineering and validation methods is the main aim of the future work.

V. CONCLUSIONS.

Many industries are successfully using Machine Learning. Healthcare sector is the most important beneficiaries of Machine Learning that help them in identifying different diseases in advance. Since datasets about various diseases are freely available on internet, disease prediction becomes much easier without doing any invasive tests on human body. In the case of heart disease prediction, Machine Learning methods can be applied to heart disease dataset available on internet, we can easily predict whether a patient has heart disease or not. The state-of-the-heart of the research related to heart disease prediction using Machine Learning has been discussed and compared in this paper. The next priority is to improve the accuracy of the models by using neural networks with proper feature engineering methods.

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Natural Impacts and Effects of Artificial Intelligence in Human Life

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Abstract - Artificial intelligence (AI) could dramatically improve our lives, positively impacting everything from healthcare to security, governance and the economy. But almost all technologies can be used for ill as well as for good. It is clear that this scientific field is one of key elements for shaping better future for us. But there are also some anxieties regarding possible ethical and safety related issues that may arise because of intense use of powerful Artificial Intelligence oriented systems. Most researchers agree that a super intelligent AI is unlikely to exhibit human emotions like love or hate, and that there is no reason to expect AI to become intentionally benevolent or malevolent. In the wrong hands, AI could be exploited by rogue states, terrorists and criminals. In this paper we will discuss natural Impacts and effects of artificial intelligence in human life.

Keywords

Artificial Intelligence, Super intelligent AI, Natural Impacts, Ethical AI, Safety of AI

1. Introduction

Artificial Intelligence (AI) is one of the rising innovations which attempt to reproduce human thinking in AI systems. John McCarthy created the term Artificial Intelligence in the year 1950.AI has an important and effective role on transforming the current and the future state of our life. But almost all technologies can be used for good as well as for bad. It is clear that this scientific field is one of key component for shaping better future for us. When we think about the positive impact of AI, it can dramatically improve our life by increasing efficiencies of our work place and can augment the work humans can do. AI can take most dangerous task and it relive human from doing such jobs. AI also becomes helpful in sectors like health care, security, traffic, etc. So, AI improves Job productivity and freed up human from stressful jobs.

When we come to Negative impact of AI, we must think about it safety and other outcomes in future. Generally most AI is developed for human enrichment as

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well as safety. But sometimes at a wrong hand AI becomes most dangerous. The objective of keeping AI's effect on society beneficial motivates research in numerous areas, from financial matters and law to specialized points, for example, check, legitimacy, security and control. Whereas it might be minimal in excess of a minor disturbance if your PC crashes or gets hacked, it turns into even more significant that an AI

framework does what you need it to do in the event that it controls your vehicle, your plane, your pacemaker, your robotized trading system or your power grid. Another short-term challenge is preventing a devastating arms race in deadly self-governing weapons.

2. Material and Methods

At present there are many papers that have been published recently as a proposals or reviews on impact and effect of artificial intelligence in our day to day life. So, here choose a literature search for finding information about various keywords; artificial intelligence, super intelligent AI, Benefit and Risk of using AI, artificial intelligence safety; machine ethics.

Here in this section it is proposed that certain question and topic about various challenges to be faced during the usage of AI,

- Will machines become super-intelligent and will humans eventually lose control?
- AI will destroy jobs?
- Individuals are experiencing loss of control over their lives
- Data abuse
- Reduction of individual's cognitive ,social and survival skills
- Should we allow autonomous weapons and strong AI to get into the wrong hand?
- AI doesn't become so proficient at doing the job it was designed to do that it crosses over ethical or legal boundaries
- Machines Created by Machines

2.1 Will machines become super-intelligent and will humans eventually lose control?

Computer based intelligence assume control over the world or its loss of control from human is a theoretical situation where AI turns into the predominant type of knowledge on Earth, with a computer projects or robots adequately assuming the responsibility for the planet away from the human species. Possible situations incorporate substitution of the whole human labor force, takeover by an incredibly smart AI, and the mainstream idea of a robot uprising. Some people of note, for example, Stephen Hawking and Elon Musk, have upheld investigation into careful steps to guarantee future hyper-savvy machines stay under human control. The AI control problem is the issue of how to build a super intelligent agent that will aid its creators, and avoid inadvertently building a super intelligence that will harm its creators. Some scholars argue that solutions to the control problem might also find applications in existing non-super intelligent AI.

2.2 AI will destroy jobs?

It is general question arises when we think about job opportunities.Each person has their own opinions about the pluses and minuses of the technology. As per PwC survey, 7 million existing jobs will be replaced by AI in the UK from 2017-2037, but 7.2 million jobs could be created. However, if we think about it in a positive way, AI is actually encouraging evolution in the job market, as candidates come to realize they must develop new types of skills and must study advanced technologies in order to secure fulfilling work. Here there real challenge is for humans to find their passion with new responsibilities that require their uniquely human abilities.

The true fact is that people will still work, but they will work better with the assistance of AI. AI can take most dangerous task and it relive human from doing such jobs. AI also becomes helpful in sectors like health care, security, traffic, etc. So, AI improves Job productivity and freed up human from stressful jobs. Now we have many routine white-collar tasks such as answering emails, data entry and related responsibilities that can be handled by "intelligent" assistants if businesses are prepared to recognize the potential.

When we think about in a negative way as AI is replacing the majority of the repetitive tasks and other

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works with robots, human interference is becoming less which will cause a significant issue in the employment standards. In this economy every organization is looking to replace the less qualified individuals with AI which can do similar work with more efficiency.

2.3 Individuals are experiencing loss of control over their lives

Artificial intelligence algorithms work with the help of huge data. At each moment there are many information collected about each and every person in a single day. Due to these facts our privacy gets compromised. Using AI China made a social credit system; the system will use big data to build a high-trust society where individuals and organizations follow the law. It will do so by assigning social credit scores to each entity based on their behavior, which are translated into a variety of rewards and punishments. This system can also implement in business and government sector for taking decisions about a person.

2.4 Should we allow autonomous weapons and strong AI to get into the wrong hand?

Co-author Miles Brundage a researcher at Oxford University's Future of Humanity Institute states that "Personally, I am particularly worried about autonomous drones being used for terror and automated cyberattacks by both criminals and state groups".

Artificial intelligence made a transformative impact of on our society will have far-reaching economic, legal, political and regulatory implications that we need to be discussing and preparing for. It is difficult to determine who is at fault if an autonomous vehicle hurts a pedestrian or how to manage a global autonomous arms race is just a couple of examples of the challenges to be faced. Also, there may be new AI-enabled form of terrorism to deal with: From the expansion of autonomous drones and the introduction of robotic swarms to remote attacks or the delivery of disease through Nano-robots also a challenge to our lives.

2.5 Machines Created by Machines

That's a rising issue because if it should be allowed one intelligent machine to create or develop other ones autonomously. It is still unclear how after-learned, intelligently done behaviors can result to differences in new type of machines developed as benefiting from experiences – after-learned data of previous, ancestor machines. Here we can't predict that for what purpose it developing the new machine and how much it takes a change in our lives. Also we can't know that new machines behavior, its knowledge and other features. The newly created machines may be benevolent or malevolent.

3. Results and Discussion

In addition to the mentioned ones in the past section, there are numerous other ethical and safety oriented issues caused by Artificial Intelligence. More up to date advancements and upgrades appeared in the context of Artificial Intelligence day-by-day cause us to derive and think about new issues that should be replied. At this point, there is always hope to think about also alternative solutions and at least such efforts are necessary to improve the associated literature covering such solution oriented works. Here, also have some suggestions for eliminating or controlling the mentioned issues:

- It is important to design laws and rules for controlling working mechanism of intelligent, autonomous machines.
- Design complex algorithmic structures limiting abilities and behavior of machines
- Ensuring a monetary future where people actually have occupations
- For a superior, controllable Artificial Intelligence, it is important to frame a few callings and occupations.
- Teaching machines about human practices and characteristics, and make them take on a similar mindset as a human

Based on reviews and search of different article it is observed that the result is, AI is too good as well as bad in some cases. Most of the researchers said the AI is good for human by getting help in various sectors such as health care, traffic, job sector and enrich their life with the help of AI. And they also tell that AI remains under human control.

But some of them worries about super intelligent AI will harm human by their wrong usage. So, we get result that some of them are myths. Every new invention will lead a new opening but we as humans need to take care of that and use the positive sides of the invention to create a smart world. The key us is to ensure the "rise of the robots" doesn't get out of our hand. Some of them also said that AI can destroy human civilization if it goes into the wrong hands. But still, there is no AI applications that can destroy or enslave humanity.

4. Conclusion

This paper has provided a general discussion and overview of natural impact and effect Artificial Intelligence. When we consider a particular issue or situation, some of them are just imaginations and scenarios, which have not realized yet but they are all possible in future. Here also provide some solution to the emerging situations.

There were some researchers, who think that intelligent systems of the future are potential threats for our future. The discussed topic in this paper are just some remarkable examples regarding Artificial Intelligence in the future and it is clear that we are still desiring a future, which has lots of unclear, misty problems waiting to be discovered and solved.

5. Acknowledgement

I would like to express my sincere gratitude to my supervisor Mrs. Soumya Koshy (Assistant professor of Kristu Jyoti College of Management and Technology), for providing her valuable guidance, comments and suggestions throughout the article. I would specially thank Mr. Shusheel George Joseph (Associate Professor of Kristu Jyoti), for constantly motivating me to work harder. At last but not least my sincere gratitude goes to all my friends who directly or indirectly helped me to complete this Article.

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Assessment and Effective Performance Evaluation Among Scholars Using Artificial Neural Network(ANN)

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Abstract- Computer has revolutionized the field of education and there are some areas where there is a need of use of computers. We know the current system of paper evaluation it involves evaluation of answers written by the students in their exam sheets which is manually evaluated by the evaluator. The students are generally classified on the basics of their performances in the examination. Many mistakes can occur from the checking side. Therefore, the assessment of examination should be carried out in a most efficient way. One of the major issues of the existing evaluation is biasness of the evaluator. Also many mistakes can occur while calculating the total marks of the student and so on. Likewise, a lot of cash and time is squandered. The practice of current evaluation system is used widely across the world and students across all the areas have been facing the drawbacks of this current evaluation system. The advance of separation training has likewise been hampered by the non-accessibility of an automated assessment framework. This paper tends to how these striking insufficiencies in the instructive framework can be evacuated.

Keywords- Artificial Neural Network, Computerized evaluation, Neural network

1.Introduction

As we know computers have revolutionized the field of education. The internet has made computers a real knowledge bank providing distant education, corporate access etc. The proposition clarified above can be effortlessly coordinated into a working model. This difference in assessment framework results does a great deal of useful for understudies, too is required to change the instructive framework. An exploration on this proposition would additionally make the framework substantially more productive. The real assessment of students lies in the proper evaluation of their papers. In conventional paper evaluation leaves the student at the mercy of the teachers. Luck plays a major role in this current system of evaluation. Sometimes the students don't get sufficient opportunities to express their knowledge. Instead they are made to regurgitate the stuff they had learnt in their respective text books. This hinders their creativity to a great extent. Also a great deal of money and time is wasted. The progress of distance education has also been hampered by the non-availability of a computerized evaluation system. In conventional the evaluation system at present involves the students writing their answers for the questions asked, in sheets of paper. The answer sheets are sent for correction to the corresponding staff. The evaluation can be done by an internal or external faculty depending on the significance of the exam. Paper evaluation is done using answer keys and depending upon it marks are granted.

1.1. Evaluator's biasness:

Evaluator's biasness is a major issue for the students. When the faculty the is internal, there is always a chance for him to be biased towards few of his pupils. In some cases it is natural and we cannot blame the staff.

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1.2. Improper evaluation:

Evaluator's will try to evaluate the papers given to him as soon as possible. In order to complete their work on time they do so. But it is a rare case. Evaluator's correct the paper by just having an outlook of the answer sheets. This induces the students to write essays so that marks can be given for pages and not for contents. So students with real knowledge are not really rewarded.

1.3. Appearance of the paper:

In conventional method of evaluation appearance of the paper has a great influence. The student's handwriting plays a major role in it.

1.4. Time delay:

Manual correction takes days for completion and, the students get their results only after months of writing exams. This introduces unnecessary delays in transition to the higher classes.

2.Material and methods

Having rattled off the negative marks of the current assessment framework, the requirement for another one turns into the need of great importance. This proposition is tied in with automating the assessment framework by applying the idea of Artificial Neural Networks. The software is built on top of the neural net layers below. This software features all the requirements of a regular answer sheet, like the special shortcuts for use in Chemistry like subjects where subscripts to equation are used frequently and, anything else required by the student.

2.1. Artificial Neural Network

An Artificial Neural Network (ANN) is a data preparing worldview that is enlivened by the way natural sensory systems, for example, the mind, measure data. The critical component of this worldview is the novel structure of the data preparing framework. It is made out of countless exceptionally interconnected handling components (neurons) working as one to tackle explicit issues. ANNs, similar to individuals, learn by model. An ANN is arranged for a particular application, for example, design acknowledgment or information order, through a learning cycle.

2.2. Basic Structure

The examination system can be divided basically into three groups for each of the following class groups:

a. Primary education
b. Secondary education
c. Higher secondary education

The assessment framework must be completely extraordinary for every one of the above gatherings in view of their distinctive learning destinations. In this paper the essential instruction isn't managed as a result of its straightforwardness.

2.3. Role of artificial neural network

a. Dissect the sentence composed by the understudy.
b. Concentrate the significant parts of each sentence.
c. Quest the reference for the concerned data.
d. Analyse the focuses and, distribute marks as indicated by the weightage of that point.
e. Keep up a document with respect to the positives and, negatives of the understudy
f. Pose further inquiries to the understudy in a subject he is all the more tidy up.
g. In the event that it feels of vagueness in sentences, at that point set that answer apart and proceed .

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2.3.1. Model

A suitable algorithm like the back propagation can be used for this purpose. The use of a new neural network model designed specifically for this purpose is suggested. The neural network should be integrated with a grammatical parser which analyses the grammar.

2.3.2. Analysis of Language by Neural Network: (Substantiations that the language can be recognized effectively)

1.Perceptron learning was utilized for learning past tenses of English action words in Rumelhart and McClelland ,, 1986a. This was the principal paper that professed to have shown that a solitary instrument can be utilized to infer past tense types of action words from their foundations for both ordinary and irregular words.

2. Prediction of Words (Elman 1991):

Elman's paper demonstrated how to predict the next word in a sentence using the back propagation algorithm. The input layer receives words in sentences sequentially, one word at a time. Words are represented by assigning different nodes in the input layer for different words. The task for the network is to predict the next input word. Given an input word and the context layer activity, the network has to activate a set of nodes in the output layer (which has the same representation as in the input) that possibly is the next word in the sentence. The average error was found to be 0.177.

3. Non-supervised learning algorithm:

Self-organizing feature map (SOFM, Kohonen, 1982) is an unsupervised learning algorithm that forms a topographic map of input data. After learning, each node becomes a prototype of input data, and , similar prototypes tend to be close to each other in the topological arrangement of the output layer. SOFM has ability to form a map of input items that differ from each other in a multi-faceted ways. It would be intriguing to see what kind of map is formed for lexical items, which differs from each other in various lexical-semantic and syntactic dimensions. Ritter and Kohonen presented a result of such trial, although in a very small scale (Ritter and , Kohonen, 1990). The hardest part of the model design was to determine the input representation for each word. Their solution was to represent each word by the context in which it appeared in the sentences. The input representation consisted of two parts: one that serves as an identifier of individual word, and another that represented context in which the word appear.

4. Adaptive Resonance Theory:

The fundamental thought of Adaptive Resonance Theory (ART) (Grossberg, 1980) is that to accomplish a steady learning, top-down desire associations are coordinated to just a single course, from the input towards the output. In ART, notwithstanding the association from the input to the output , there is an association from the output to the input that is utilized to extend desires onto the input. The specific design portrayed here is called ART1, which learns varieties of parallel information (estimations of every factor is either 1 or 0)(Carpenter and , Grossberg, 1987). Unique ART calculation is characterized as far as differential condition and along these lines the organization.

2.3.3. Training

The training of the neural network is the vital part of success of this proposal. The training involves a team of experienced

a. Subject Masters
b. Language Masters
c. Psychology cum Evaluation Masters

The subject masters train the net to have a general idea of paper evaluation. The language masters give specific training to the net to expect for various kinds of sentences. The psychology masters train the net for various levels of

error acceptance in semantics. They also train the net about the common mistakes the student is expected to make in sentences. The neural network is put into a phase of supervised training for a specific time until its error margin is less than what is allowed. This beta version can be checked for common defects and , improvised further according to the requirements of the students.

2.4. Merits

4.1. Effective distant education programmes

As we know the distant education programme at present has no effective examination system. If we implement such a model, the distant education methodology will lead to a greater success.

.4.2. Evaluator's biasness, Handwriting – not really an issue

Majority of the students have trouble in negotiating the above factors in any examination. This system is really a relief to all such grievances.

4.3. Freedom of ideas

The student has the liberty to write any point provided they are valid and , relevant. This really was a hurdle to students as they are made to write things known to their staff or given in their text book.

3.Result and Discussion

The proposition clarified above can be effortlessly coordinated into a working model. This difference in assessment framework results does a great deal of useful for understudies, too is required to change the instructive framework. An exploration on this proposition would additionally make the framework substantially more productive.

4.Conlusion

This paper helps us to overcome the bad effects of conventional paper evaluation techniques. The task of paper evaluation becomes easier. Here students know the fundamentals of English grammar. This provides the student the liberty to write any point provided they are valid and relevant. The proposed system is very useful.

5.Acknowledgement

I would like to express my sincere gratitude to my supervisor Mrs. Soumya Koshy for providing her valuable guidance , comments and suggestions throughout the article. I would specially thank Mr. Susheel Joseph for constantly motivating me to work hard.

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Detecting Noise Pollution Using Green Technology

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Abstract

As per the Worldometer elaborations of the latest United Nations data, the current population of India is 1,394,346,143 as of Saturday, July 24, 2021. This decadal growth of urban population has been leading to many public health challenges especially environmental pollution. Actions that cause pollution are necessary to meet the growing population and its development, hence they are inevitable. Therefore preventive measures to minimize pollutants are more practical than their total elimination. It is here Green Technology plays a significant role.. Green Technology is the application of science and technology in generating energy to non-toxic cleaning products which are environment friendly. This technology intends to reduce the impact on humans on the environment. Green Technology has been around for the past two decades but recently started gaining more popularity due to increased alarming ecosystem issues. In this paper we will introduce how to apply green technology in detecting noise pollution.

Keywords: Green Technology

Introduction

Noise can be defined as an unwanted sound or a loud sound which is both harmful and annoying to ear. It can be the source of stress, and exposure to loud sound may result in negative effects on health.The cause of noise pollution are attributable to population density, urbanisation and the increasing use of more powerful and varied noise sources, including means of transport which is considered as one of the main sources of environmental noise. The problem of noise pollution is constantly expanding, producing negative effects from different point of view, affecting social, economic and work aspects, thus entailing a wide range of extra-auditory disturbances. A normal human ear could hear sound levels from 0dB

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to 140dB in which sound levels from 120dB to 140dB are considered to be noise. In this context, it is necessary to have a precise data on noise exposure levels. Once the noise sources have been ranked in order of importance in terms of their contribution to the overall noise problem, it is then useful to rank them in terms of which are easiest to do something about and which affect most people and hence, we could take this into account to decide which source has to be treated the first. Here we will introduce two main equipments used to detect noises around –Arduino Sound Level Meter and MK: 427 Noise Sensor.

1. Analysis of Noise Level in dB with Microphone and Arduino

Loudness or sound levels are commonly measured in Decibel (dB). Here we will use a normal Electret Condenser microphone with Arduino and try measuring the sound or noise pollution level in Db. We will use a normal amplifier circuit to amplify the sound signals and feed it to Arduino in which we will use regression method to calculate the sound signals in dB. To check if the values obtained are correct we use the "Sound Meter "android application else use better meter for calibration.

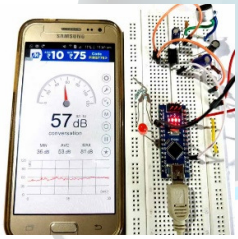

Figure: 1

Materials Required

1. Arduino UNO
2. Microphone
3. LM386
4.10K variable POT
5. Resistors and Capacitors

The use of 10k POT: A potentiometer is a simple knob that provides a variable resistance, which we can read into the Arduino board as an analog value.
The use of LM386: It is an integrated circuit containing a low voltage audio-power amplifier and suitable for battery powered devices.
The use of resistors: we use resistors to limit the amount of current going to certain components in the circuit, such as LEDs and integrated circuits.

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The use of capacitors: A decoupling capacitor's job is to supress high-frequency noise in power supply signals. If the power supply temporarily drops, a decoupling capacitor can supply power at the correct voltage. Decoupling capacitors connect between the power source and ground.
A Capacitor is used to filter the DC noise from Microphone.

Basically when the microphone senses sound the sound waves will be converted to AC signals. This AC signal might have some DC noise coupled with it which will be filtered by this capacitor. Similarly, even after amplification a capacitor C3 is used to filter any DC noise that might have been added during amplification. We have used the popular LM358 amplifier to amplify the signals from microphone. Along with amplifier we have also used two filters, the high-pass filter is formed by R5, C2 and the low-pass filter is used by the C1 and R2. These filters are designed to allow frequency only from 8Hz to 10 KHz, since the low pass-filter will filter anything below 8Hz and the High Pass filter will filter anything above 15 KHz. This frequency range is select is because the condenser microphone taken works only from 10Hz to 15KHZ.

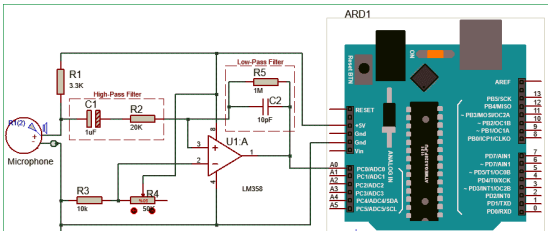

Figure: 2

Result

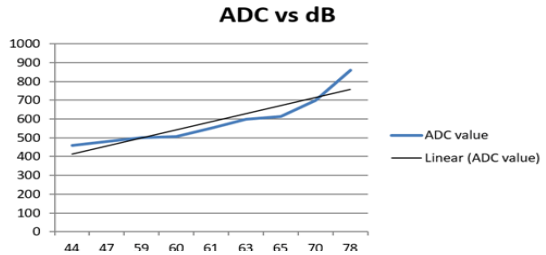

Figure: 3

As we can see the value of dB is not related linearly with ADC, meaning you cannot have a common multiplier for all ADC values to obtain its equivalent dB values. In such case we can utilize the “linear regression” method. Basically, it will convert this irregular blue line to the closest possible straight line (black line) and give us the equation of that straight line. This equation can be used to find the equivalent value of dB for every value of ADC that the Arduino measures.

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2. MK: 427 Noise Sensor

The MK: 427 Noise Sensor is an outdoor noise measurement instrument that has been specifically designed for integration with other data logging and monitoring systems. Unlike a conventional Sound Level Meter, the MK:427 Noise Sensor converts the noise level in decibels into an industry standard 4-20mA output which can be connected to standard DCS/SCADA based systems to add a noise measurement capability. The analogue electronics are highly reliable and operate without any user intervention. No specialist acoustic knowledge is required – simply power-up the Noise Sensor and the measured noise level is continuously fed to the output. The MK:427 Noise Sensor has proved to be a robust, reliable sensor over many years and has been used across a wide range of industries including power generation, construction, demolition, large scale manufacturing sites and public utilities.

Figure: 4

Noise Sensors are:

- Self-contained noise sensor for integration with external data loggers & monitoring systems
- Purpose designed for long term environmental noise monitoring
- Designed for integration into existing environmental conditioning systems like SCADA or DCS Systems
- Industry standard 4-20mA output
- Automatic calibration with electrostatic actuation
- Weatherproof and suitable for most outdoor applications with a range of mounting solutions and an IP65 rating
- Designed & manufactured by Cirrus Research plc.

Some Key features of MK: 427 Noise Sensor

- Robust, fully weather protected Class 1 outdoor microphone
- Eliminates the need for third party software
- Proven long term reliability in harsh outdoor environments
- Outdoor Windshield and bird spikes to protect the microphone

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- Entire length of the MK:427 Noise Sensor is 1m
- Simple mounting and installation for quick deployment
- IP65 rating for long-term outdoor noise measurements

General Guidance for Positioning MK: 427 Noise Sensor

- It is usually worth conducting a noise survey, or referring to measurement data from a recent noise survey to understand the noise profiles for the area.
- Install the sensor at a location nearby to where the environmental noise is most likely to cause annoyance to neighbouring residential areas or other sites.
- Try to mount the unit away from obstacles and building walls.
- The microphone should always be a minimum of 1.2 – 1.5m above the ground level.
- Avoid, where possible, overexposed areas where high wind speeds will affect the noise level reading.

Advantages of MK: 427 Noise Sensor over Arduino Sound Level Meter

- MK:427 Noise Sensor converts the noise level in decibels into an industry standard 4-20mA output which can be connected to standard DCS/SCADA based systems to add a noise measurement capability.
- Long term reliability in harsh environments
- It eliminates the need for third party software
- Fully weather protected class 1 microphone
- Weatherproof and suitable for most outdoor applications

Conclusion

In the recently published guideline by the World Health Organization for the burden of disease from environmental noise, it is concluded that future epidemiological noise research will need to focus on vulnerable groups such as children, older people, and lower socioeconomic groups. From this research paper, out of the two equipments Arduino Sound Level Meter and MK: 427 Noise Sensor, which are commonly used to detect environmental noise, we come to know that the latter has far more advantages and long term use. Since MK: 427 Noise Sensor is eco-friendly as well as a remedy for noise pollution out of the two, we can expect to control noise pollution to some extent with its increased use.

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E-waste Management: An Approach to Green Computing

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Abstract — *This paper intends to portrait how E-waste management and Green Computing helps to make the environment carbon-free and energy-efficient. Anything that runs on electricity that you have decided to get rid of constitutes E-waste. Eco-friendly and environmentally responsible usage of computers and their resources are said to be Green Computing. Here we discuss various sources of e-wastes, problems caused by them, their effects, different steps for proper handling of these toxic and harmful wastes to make the development process sustainable and green. The goal is to reduce the hazardous impact of electronic waste and preserve the environment through the proper disposal of e-waste. Thus, green computing attains the aim of going green set by the IT industries in terms of public relations and reduced cost. The objective of Green IT is to find and promote new ways of reducing pollution, discovering alternative technologies, and creating more recyclable products; E-waste utilization an approach to green computing is a way to achieve this.*

Index words — **E-waste, Green IT, Sustainable development, Going green, Green Technology, Energy efficiency, Green use, Energy star.**

I. INTRODUCTION

The tremendous technological development in the 21st century brought many advantages. However, the growth of the technologies demands high energy accompanied by intention e-waste and hazardous emissions. As technology is increasing exponentially, contributes more towards global warming and climate change. For these reasons, the world focuses on going green by taking initiatives for green computing through e-waste management. E-waste is one among the fastest-growing waste streams on the earth. Already, we produced something like quartile million tons of e-waste annually. Electronic waste is composed of electrical equipment that is outdated, unwanted, or broken. Anything that runs on electricity that you have decided to get rid of results in e-waste. Globally, we only recycle 10% of our e-waste, a variety that is as shocking because it is depressing. As for the 90% we do not recycle, it finishes up getting landfilled, incinerated, or illegally traded.

Green computing is a well-balanced and sustainable approach towards the achievement of a greener, healthier, and safer environment without compromising the technological needs of the current and future generations. The main goal of green computing is to maximize energy efficiency during the product's lifetime. It involves activities that emphases on the tactical deployment of IT to vigorously and ethically align organizations' aims and objectives with environmental protection in mind during the complete industrial operations.

The outline of this paper is structured as Section II describing the e-waste and e-waste management concepts. In section III the green computing and various aspects of green

computing are described. Finally, a conclusion is made followed by references.

II. E-WASTE AND E-WASTE MANAGEMENT

E-waste acronym for electronic waste may be referred to as the hardware products nearing the end of products useful phase. A well-known "Bathtub curve" helps in the reliability study of a hardware product. The life of hardware products consists of three phases: - Burn-in phase, Useful life phase, and wear-out phase.

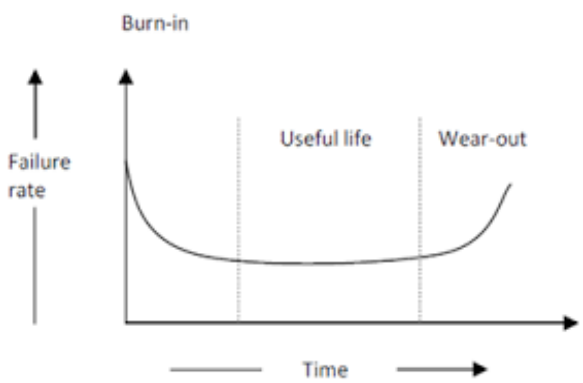

Fig. 1. Bathtub curve

The initial phase is said to be the burn-in phase, where the failure intensity is high. After completing testing and fault fixing, the intensity rate gradually comes down initially and stabilizes after some time. The second phase is the useful life phase, where the failure intensity is approximately constant. The third phase is called the wearing out phase because in this phase the failure intensity will increase due to the wearing out of the hardware components.

E-waste contains a laundry list of chemicals that are harmful to human beings and the environment. Disposal of e-waste possesses extra care because mishandling during disposal will end up with the chemicals that should be decomposed with air, water, and soil. All the electronic goods become obsolete, within two or three years of purchase. This global mountain of waste is expected to continue growing at 8% per year. Rapid changes in technology, changes in media, falling prices, and planned obsolescence have resulted in a fast-growing surplus of electronic waste around the globe. Computers and several other devices are associated with our day-to-day living. All these devices are consuming quite an amount of energy. On the other hand, technological advancements and short innovation cycles have increased the obsolesce rate of these devices, contributing to the e-waste streams [**3**].

Fig. 2. Examples of e-wastes

E-waste management refers to the process of managing e-wastes through a proper disposal way. E-waste is not just a waste. It contains highly toxic substances, such as mercury, lead, BFRs, etc. so the handling of e-waste should be given prior importance than anything.

The life cycle of e-waste can be divided into four phases [**1**]:

1. Phase I – Production of EEE (Electrical and Electronic Equipment).
2. Phase II – Generation of UEEE (Used Electronic and Electrical Equipment).
3. Phase III – Decision for fate.
4. Phase IV – E-waste Processing

A. Categories of e-waste

- Large Household Appliances:
  Washing machines, Dryers, Refrigerators, Air conditioners, etc.

- Small Household Appliances:
  Vacuum cleaners, Coffee Machines, Irons, Toasters, etc.
- Office, Information & Communication Equipment:
  PCs, Laptops, Mobiles, Telephones, Fax Machines, Copiers, Printers etc.
- Entertainment & Consumer Electronics:
  Televisions, VCR/DVD/CD players, Hi-Fi sets, Radios, etc.

- Lighting Equipment:
  Fluorescent tubes, sodium lamps etc. (Except: Bulbs, Halogen Bulbs)
- Electric and Electronic Tools:
  Drills, Electric saws, Sewing Machines, Lawn Mowers etc. (Except: large stationary tools/machines)
- Medical Instruments and Equipment
- Automatic Issuing Machines

B. Impacts of e-waste

The impacts of improper disposal of electronic wastes on the environment are little known, these impacts nonetheless possess very real threats and dangers to the global environment at large [**6**]. Uncontrolled burning and disposal are causing environmental and health problems due to processing electronic waste. Electronic waste is of concern largely due to the presence of toxic substances. The production of semiconductors, printed circuit boards, disk drives and monitors used in computers uses many hazardous chemicals. Printer toners and inks contain toxic materials such as cadmium. Computer Central Processing Unit (CPU) contains massive metals such as cadmium, lead, and mercury. Printed Circuit Boards (PCB) contain heavy metals such as antimony, silver, chromium, zinc, lead, tin, and copper [**4**].

Lead found on printed circuit boards and in computer monitor glass cause damage to the central and peripheral nervous systems, blood systems, and kidneys in humans. Mercury found in printed circuit boards and LCD screen backlights would affect a baby's growing brain and nervous system. Adults also suffer from organ damage, mental impairment, and a variety of other symptoms. Cadmium found in chip resistors and semiconductors causes various types of cancer and accumulates in the kidney. BFRs acronym for Brominated Flame Retardants found in the printed circuit board and some plastics may also increase the risk of cancer.

When electronics containing heavy metals such as lead, barium, mercury, lithium, etc., are improperly disposed of, these heavy metals leach through the soil to reach the groundwater channel which eventually causes water pollution. These types of chemicals are not biodegradable – they persist in the environment for the distant future, increasing the risk of exposure.

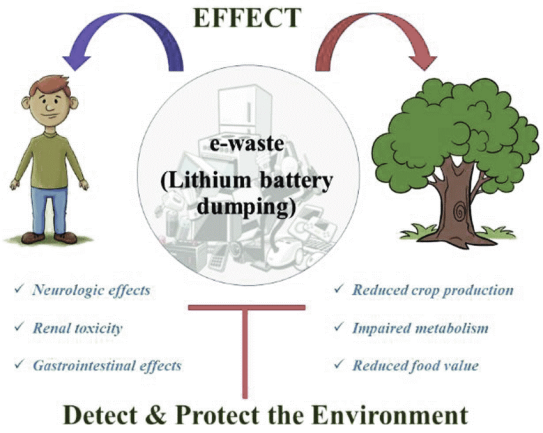

Fig. 3. Impact of e-waste in human beings and environment.

C. Disposal of e-waste

In developing countries like India, China, Nigeria the formal recycling is getting a boost from the government and local NGOs. Even though a lion's share of the e-waste generated in these countries is recycled, refurbished, and reused by the informal sector and the semi-informal sector. This on one hand ensures recyclability and reusability thereby enhancing the life cycle of the electronic product.

The various methods for e-waste disposal are Reuse, Incineration, Recycling, and Landfilling. Reuse refers to the usage of equipment that has been upgraded. Inkjet cartridges and laser tones are used after refilling. Incineration is a complete

and combustion process in which the waste is burned in specially designed incinerators at a high temperature in the range of 900 to 1000 degrees Celsius. Recycling is the process of developing new products from a product that has originally served its purpose. All the computer hardware components can be recycled. Landfilling is one of the widely used but not recommended methods for the disposal of e-waste. Electronic waste often contains heavy metals and other toxic substances which can contaminate ground and water resources.

Some organizations take care of this e-waste in an efficient and eco-friendly way. Services of these organizations include disposals, asset tracking, portfolio planning, certified DoD data erasure, and comprehensive electronic waste recycling. E-waste, Recycle force, A&S Metal Recycling, Inc., Hope services, and Ben Lomond Transfer stations are some of the organizations that aim to the proper disposal of electronic wastes. Realizing the growing concern over e-waste, the Central Pollution Control Board (CPCB) of the Government of India has formulated 'The e-waste rules,2011' and are effective from 01-05-2012. The implementation and monitoring of these guidelines shall be done by the State Pollution Control Board concerned.

D. Proposed solutions

It is high time that everyone's responsibility to take care of the beauty of nature. We should set apart electronic waste from regular trash to preserve the earth's resources for future generations. The proposed solutions for e-waste are:

- Every individual should be made aware of how to classify and cast out e-waste separately.
- Energy-saving monitors should be used, and they should be turned off when not in use.
- Give prior importance to paperless work. Take printouts only in unavoidable situations.
- Virtualization should be implemented wherever possible.
- Give more importance to recycling and reusing products.
  Handover e-waste to the organizations that take care of these waste materials in an organized manner.

E. E-waste management in India

Electronic waste typically refers to the hardware products that came to the end of the product's useful life. Examples of e-wastes are computer monitors, motherboards, air conditioners, etc. According to the Global e-waste monitor conducted in 2017, India generates about 2 million tons of e-waste annually and is ranked fifth among the e-waste producing countries.

Only 20 percent of worldwide e-waste is recycled. The UN report indicates that thanks to poor extraction techniques, the entire recovery rate of cobalt from e-waste is merely 30 percent.

As per the report of the Union Environment Ministry, some organizations are storing e-wastes in hazardous conditions and others cannot even handle such wastes. India now has 178 registered e-waste recyclers, accredited by the state governments to process e-waste expeditiously.

III. GREEN COMPUTING

Green computing is the environmentally responsible and eco-friendly use of computers and their resources. In broader terms, it is also defined as the study of designing, engineering, manufacturing, using, and disposing of computing devices in a way that reduces their environmental impact.

Many items manufacturers and vendors are continuously investing in designing energy-efficient computing devices, reducing the use of dangerous materials, and encouraging the recyclability of digital devices. Green computing practices a government-initiated labeling program named Energy Star created by the United States Environmental Protection Agency (EPA) in the early 1990s to recognize and

promote energy-efficient products. The program has also been put forward by Australia, New Zealand, Canada, Japan, and Europe. Electronic devices that carry the Energy Star logo generally take up 20 to 30 percent less energy than required by federal standards. The Energy Star logo is a world standard symbol for energy efficiency.

Fig. 4. Energy star logo

Green Computing is also known as green information technology (green IT). Green Computing aims to attain economic viability and improve the way computing devices are used. Green IT practices include the development of environmentally sustainable production practices, energy-efficient computers, and improved disposal and recycling procedures.

A. How to achieve green computing?

To advocate green computing at all possible levels, the four complementary approaches mentioned below are employed:

- **Green Design** – Designing objects and services that comply with the environment such as energy-efficient computers, printers, green data centers, etc.
- **Green Manufacturing** – The discovery and development of new products that reduce or eliminates the use or generation of hazardous substances in manufacturing.
- **Green Use** – Using resources in an eco-friendly manner that reduces the usage of hazardous materials.
- **Green Disposal** – Re-making an existing resource or recycling e-waste with little to no impact on the environment. As computing becomes increasingly relevant, finite natural resources are rapidly being diminished, and energy costs are rising. This makes "Green Computing" an important and timely issue.

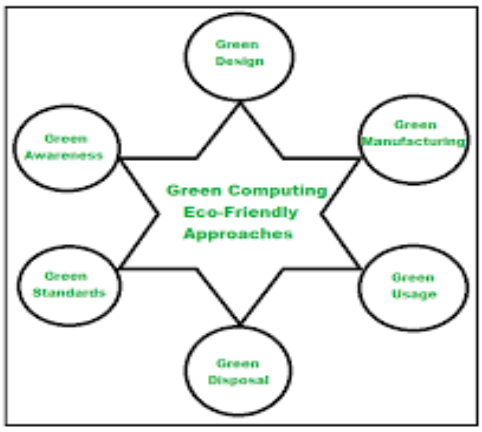

Fig. 5. Green computing approaches

B. Environmentally sound practices for green computing

Government regulatory authorities are actively working to promote green computing concepts by introducing several voluntary programs and regulations for their enforcement. The work habits of computer users and businesses are often modified to attenuate the adverse impacts on the worldwide environment. Here are some steps which will be taken [**7**]:

- Power down the CPU and every peripheral during extended periods of inactivity.
- Increase the usage of liquid-crystal-display (LCD) monitors rather than cathode-ray-tube (CRT) monitors.
- Power-up and power-down energy-intensive devices like laser printers to their need.
- Buy energy-efficient notebook computers rather than desktop computers.
- Use the power-management features to show off hard drives and displays after several minutes of inactivity.
- Minimize the utilization of paper and properly recycle paper.
- Dispose of e-waste consistent with federal, state, and native regulations.
- Employ energy sources for computing workstations, servers, networks, and data centers.
- Instead of buying a new computer, try refurbishing an existing device.

C. Advantages of Green IT

- Green computing can save energy.
- Green computing can economize at the end of the day.
- More sophisticated recycling processes
- Waste reduction
- Reduction of the resource depletion problem
- Less pollution
- Less greenhouse gas emissions
- More efficient hardware use
- Sustainable IT practice
- Increases pressure to travel green within the IT industry.
- Reduction of health risks for customers
- Better working conditions
- Teleworking may improve flexibility.

D. Disadvantages of Green IT

- Significant upfront costs
- Plenty of knowledge may be required.
- Green IT may conflict with profit optimization goals.
- May slow down computer networks.
- Technological change may make older IT systems outmoded.
- Acceptance inside companies may be rather low.
- Lacking awareness of the public
- Green IT is going to be susceptible to questions of safety.
- It may not be manageable for little businesses.
- Maintenance may be difficult.
- Many technologies are not that green as they seem.

E. How companies can implement Green computing

E-waste recycling - Non-biodegradable materials cause some of the most drastic effects on the environment. Recycling such products ensures you mitigate the consequences of their disposal on the environment. E-waste in our offices comprises all digital devices that are no longer useful to the organization. These products are often as little as a mouse or as large as industrial printers. Whenever the devices get damaged beyond repair or obsolete, they are often thrown away. Digital devices are often made from plastics and metals that are non-biodegradable. But for the record, most of these materials can be recycled [**5**]. As a result, you help reduce emissions produced from plastic production and can save our natural resources. Both SMBs and enormous enterprises should search for an e-waste recycler to require care of all their digital waste.

Only using products with the energy star label - Companies are always looking for ways to cut costs and opting for cheaper products is often a solution.

No one pays much attention to environmental protection or energy-saving during the purchase. However, energy-saving devices are more durable as well as sustainable in the environment. Before purchasing office or remote working devices, look for the Energy Star Rating used to show the level of energy efficiency. Any IT infrastructure you want to set up for your workplace should ensure this rating.

Working remotely - 2020 has seen such a huge shift in the workplace. Previously, there was a 115% hike in the remote workforce between 2005 and 2017 but nothing like we have seen in 2020. Based on Global Analytics Report 2017, working remotely takes about 600,000 cars off the road annually. As a result, the amount of greenhouse gas emissions because of daily commutes decreased in a significant manner. The study shows that there will be a reduction of 54 million tons of emissions in the U.S if all telecommuters worked from home for at least 3 days. Remote working is currently becoming a trend as most companies have realized how important it is for business sustainability. Also, home offices consume less space and resources minimizing energy consumption.

Using cloud computing - One of the advantages of green computing is ensuring that companies can do the most important chunks of labor using the smallest amount of possible energy. And this is often where green cloud

computing comes in. Green cloud computing is taking advantage of cloud technologies to try to do more work but with less amount of energy. To get a far better grasp of the concept, we've to first check out how work was done before the cloud.

People had to travel to an office to access their computers with specific RAMs, processing speed, and storage for them to figure, whether you utilized all the resources. Additionally, all computers need to be hooked to an on-site data center with bulky computer systems that might consume such a lot of power to run. While using cloud computing, businesses have access to technologies like remote desktop and remote access. An employee can access all company data and systems using their personal computer, phones, and tablets. There is no need for a physical data center as company data is stored on a server within the cloud. There is more work through with minimal resource utilization.

F. Green computing in India

In response to the world revolution in the field of green IT, India is also moving towards embracing it with open arms. Adopting green IT and sustainability solutions are emerging as key concerns for businesses, investors, and technologists across industries and policymakers in India. The operational cost of creating energy-efficient resources available is pressuring CIOs in Indian companies to develop strategies to optimize ICT utilization, including companywide energy management, while not compromising on the growth or deployment of newer technologies. Amongst government policy initiatives also plans such as the National Action Plan on Climate Change (NAPCC) which outlines the nation's strategy to manage greenhouse gas (GHG) emissions and Indian Economic Survey and India's 12th Five Year Plan which websites Inclusion of Green IT shows the importance given thereto by the Indian Diaspora. Given below are several rules which are set for IT and therefore the telecom industry in India to follow for a greener future. As per the advocacy put forward by the Task Force formed for growth of IT, ITES and manufacturing in India are as follows [**2**]:

- Standardization – There is a need for interoperable open standards for all the devices including networking equipment which is a prerogative of BEE and DIT. Need to standardize IT equipment and benchmarks for data centers for a cleaner and greener environment is required.
- Government Procurement – Government agencies should include the standards for energy consumption as the technical standards in government purchases, and with the establishment of mutually agreeable standards for a greener computing environment between BEE and the IT industry, it should be made mandatory in all government purchases.
- Setting up a center of excellence – The government of India should set up COE (Centre of Excellence) in the top technical institutions and universities. The centers can become the testing grounds and prototypes/pilot evaluation stages for clean green technologies.
- Tax Incentives – Investing in clean technology is a costly affair when the organization is an early mover/adopter. Tax incentives on the production of cleaner technologies and for the user of the same are needed for better adoption.
- The impetus of green computing has been envisioned for the telecom center too, with government initiatives especially DoT's Recommendation on the adoption of Green Technologies in the Telecom Sector.
- At least 50% of all rural towers and 20% of the urban towers are to be powered by hybrid power (Renewable Energy Technologies (RET) + Grid power) by 2015; Further 75% of rural towers and 33% of urban towers are to be powered by hybrid power by 2020.
- Every telecom product, equipment, and service that corresponds to the telecom network should be certified "Green Passport" by the year 2015 Telecommunication Engineering Centre shall certify telecom products, equipment, and services based on their ECR ratings.

- All service providers should declare to TRAI, the carbon footprint of their network operations and therefore the declaration of for an equivalent should be done twice a year.
- Service providers should embrace a Voluntary Code of Practice encompassing energy efficient Network Planning, infra-sharing, deployment of energy-efficient technologies, and adoption of Renewable Energy Technology (RET) to scale back carbon emissions.
- Service providers should evolve a "Carbon Credit Policy" in line with carbon credit norms with the last word the objective of achieving a maximum of fifty over the carbon footprint levels of the bottom Year (2011) in rural areas and achieving a maximum of 66% over the carbon footprint levels of the bottom Year in urban areas by the year 2020.

Fig. 6. Graph showing growth of e-waste in India.

IV.CONCLUSION

It is our duty today to seem upon environment-friendly approaches for our sustainable future. Invention, Innovation, and Adaptation of green technologies are that the need of the hour. The risk related to handling this e-waste involves green technologies for end-of-life disposal. e-Waste management practices comprise varied means of ultimate disposal of end-of-life equipment which have different impacts on human health and therefore the environment.

By going "green" in technology we help promote an eco-friendly and cleaner environment, alongside our own benefits by reducing costs, conserving energy, lowering waste. Green computing has come a long way, but with so many innovations coming along regarding preserving the environment, it is safe to say that green computing is a great development. Green computing aims to reduce the garbage and harmful effect of e-waste from our environment. The main goal of e-waste management is to keep the society and environment as a worthy place for living. As there are hindrances and challenges that we face while working with green computing and e-waste together. But the ever-increasing technology has made it easier to work in the field of green computing and e-waste management. All organizations, companies must take e-waste management as compulsory for making green computing an initiative. Otherwise, the world will have to face several problems. It is hoped that there will be a lot of progress that must have done in this field.

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FEDERATED LEARNING FOR PRIVACY PRESERVATION

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Abstract: One of the significant challenges of Artificial Intelligence (AI) and Machine learning models is to preserve data privacy and to ensure data security. Addressing this problem lead to the application of Federated Learning (FL) mechanism towards preserving data privacy. Smart healthcare is another domain which we expect will greatly benefit from the rising of federated learning techniques. Medical datas are very sensitive and private, yet medical data are difficult to collect and they exist in isolated medical centers and hospitals. The insufficiency of data sources and the lack of labels have led to an unsatisfactory performance of machine learning models, which becomes the bottleneck of current smart healthcare. We envisage that if all medical institutions are united and share their data to form a large medical dataset, then the performance of machine learning models trained on that large medical dataset would be significantly improved. Federated learning combining with transfer learning is the main way to achieve this vision. Transfer learning could be applied to fill the missing labels thereby expanding the scale of the available data and further improving the performance of a trained model. Therefore, federated transfer learning would play a pivotal role in the development of smart healthcare and it may be able to take human health care to a whole new level. In this paper, we present in detail understanding of Federated Machine Learning, various federated architectures along with different privacy-preserving mechanisms. Finally, we also depict how Federated Learning is an emerging area of future research that would bring a new era in AI and Machine learning.

Keywords- Federated Learning, Artificial Intelligence, Machine Learning, Privacy, Security, Distributed Learning.

I. INTRODUCTION

Due to the emergence of AI and Machine learning over the past few decades, Preserving the data privacy is of utmost importance in these days. Data leaks on publicly available data and the private data of the companies lead to alarming increase towards data privacy. Utilizing the data which is isolated as data islands by maintaining specific privacy standards is very crucial for better data security. Misusing the personal data of the user may cause overhead to the user forcing him not to enclose his personal details. Even in the companies and industries, it is essential to protect data from data leaks as it would lead to grave consequences for the company. The data leaks, in turn, would affect the financial and commercial aspects of the company on a large scale leading to huge losses.

Many machine learning and AI models need sufficient data for training and to produce high- quality models. Although the models need to use user data if they need to build good prediction models for the user, there should be a way to ensure user privacy. In edge devices where users interact with different applications like in mobile phones, there is an ample amount of private data related to the user which is being exposed every day. To solve the problem of using data to train models, ensuring data privacy, we have a new approach known as Federated Learning (FL) [1]. Federated Learning is a collaborative Machine learning technique where the machine learning models are trained on edge devices instead of a central server to ensure data privacy. The data is not exchanged between the devices. However, only the model updates (gradient updates) are sent to the server to build a global model using the aggregated gradients from all the computing edge devices. Thus, the server has no information about the raw data that the edge devices have been trained on, maximizing the data privacy of the users. Federated Learning has been evolving over the past few years due to the increasing demand for data privacy and security.

The rest of the survey work is organized as follows: Section 2 details various related works in the area of Federated Learning. Section 3 details about Federated Learning, its working principle, training process, categorization of Federated Learning architectures along with various implementation frameworks, and Section 4

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elaborates more about the privacy- preserving mechanisms in FL. Section 7 concludes the survey work and suggests a few possible directions for the future area of research.

II. RELATED LITERATURE

Because data is dispersed across numerous devices, machine learning and AI models need to be able to access it reliably in order to construct efficient models. Federated Learning is a recent trend for training machine learning models in a decentralised manner without access to raw data other than the updated gradients from client models. The focus of Federated Learning is on the edge and mobile computing [2, 3] devices and then extended its application to large scale production systems.

For AI models to be helpful, data scattered everywhere as data islands must be combined on a broad scale. Integrating data from these islands is difficult because it incurs a cost. Federated Learning has shown to be a lifesaver when it comes to lowering the cost of data integration by executing AI models on data stored on edge computing devices.

Due of the privacy-preserving characteristic of Federated Learning, much of the academic work is currently focused in FL. For vertically partitioned data, Clifton and Vaidya provided safe k-means [4], secure association mining algorithms [5], and a naive Bayes classifier [6]. The authors of [7] developed a privacy-preserving linear regression methodology based on homomorphic encryption. For vertically partitioned data, the authors of [8,9] developed a linear regression technique. The linear regression problem was handled immediately using FL. The authors of [10] used Stochastic Gradient Descent (SGD) to solve the problem and also proposed privacy-preserving methods for neural networks and logistic regression. The authors of [11] presented a new algorithm for association rules on the horizonally partitioned data. For horizontally partitioned data [12] and vertically partitioned data [13], secure Support Vector Machines (SVM) methods have been implemented. [14] developed a number of secure multi-party linear regression and classification techniques. The authors of [15] suggested multi-party gradient descent methods that are both efficient and secure. Secure Multiparty Computation (SMC) was used in all of these studies [16]. The authors of [17] suggested a homomorphic encryption-based secure logistic regression methodology. Shokri and Shmatikov [18] proposed that neural networks be trained on horizontally partitioned data with parameter updates exchanged. The authors of [19] used homomorphic encryption to improve the overall security of the system while maintaining gradient privacy.

III. FEDERATED MACHINE LEARNING

Federated Learning is a decentralised machine learning environment in which all participating clients train a shared global model without disclosing data to a central server. The server receives only the model updates from each participating device. To generate an efficient global model, the model updates are pooled using the Federated Averaging technique [3]. As a result, it is collaborative machine learning, in which all clients contribute model updates in order to reach a common learning goal. FL enables smarter models, lower latency, and reduced battery usage while maintaining privacy.

a) DEFINITIONS

To understand the term Federated Learning, it is essential to know the terms distributed learning [20,21], centralized and decentralized Federated Learning [3].

- ✓ **Distributed Machine Learning:** We train a model on a huge dataset via distributed machine learning. Clients are computational nodes in a single cluster or datacenter in this case. Any part of the dataset is accessible to all clients. In a datacenter, the data is dispersed among several computing nodes. The goal of distributed learning is to parallelize computer capacity by distributing data or models.
- ✓ **Centralized Federated Learning:** It has a central server that orchestrates the entire training process and coordinates all of the learning nodes. The central server is in charge of initial node selection before training begins, as well as the aggregation of model updates received. The server may become a bottleneck here as all the selected nodes have to send updates to a single entity.
- ✓ **Decentralized Federated Learning:** The computing nodes in this Federated Learning scenario can work together to compute the global model. This configuration prevents single-point failures by exchanging model updates only across networked nodes without the orchestration of the central server.

b) FEDERATED LEARNING LIFE CYCLE

The life cycle of a Federated Learning (FL) model consists of six stages, as shown in Figure 1.

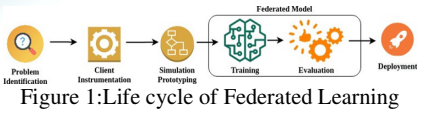

Figure 1:Life cycle of Federated Learning

Initially, in the FL process, a model engineer develops a model for a particular application. In natural language processing, a domain expert may develop a prediction model for next word prediction to use in a virtual keyboard application. Figure 1 depicts the primary components and actors involved in the FL process. A typical workflow of the FL model can be realized, as shown in Figure 1. The life cycle of a Federated Learning (FL) model consists of six stages, as shown in Figure.

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- Problem identification: Here, the model engineer finds a problem that needs to be solved with Federated Learning at this point.
- Client instrumentation: The essential training data is stored locally by the clients. Additional data or metadata may be required in a few circumstances, such as the labels for a supervised learning task.
- Simulation prototyping: The model engineer prototypes the model architectures and then uses a proxy dataset to test the learning hyperparameters in a Federated Learning simulation.
- Federated model training: Typically, all federated training processes are started to train multiple model versions. For additional training, we might employ other optimization hyperparameters.
- Federated model evaluation: The models are then assessed, and the top candidates are chosen when the Federated Learning tasks have been suitably trained. Various metrics computed on standard datasets in the datacenter are used in the analysis. The models are pushed to held-out clients after federated evaluation is completed on local client data.
- Deployment: Following the selection of a good model, it proceeds through the usual model launch procedure, which includes live A/B testing, manual quality assurance, and a staged deployment. The model's launch process is determined by the application owner, who is unaffected by how the model is trained.

IV. FEDERATED LEARNING TRAINING PROCESS

Federated Learning (FL) training process consists of five steps and a central server orchestrates the training process in FL setting, by iterative execution of the steps.

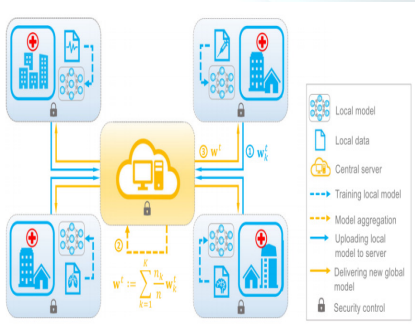

Figure 2:Federated learning

1. Train global model in the server.
2. Deploy global model to edge devices.
3. Optimize model from each edge device.
4. Upload locally trained model update.
5. Average the update values and apply the average to the global model.
6. Repeat step 2 to step 5.

a. FEDERATED LEARNING CATEGORIZATION

Horizontal Federated Learning (HFL): Because the data is spread across different devices, the data utilised to train the Federated Learning (FL) is non-identical. We divide Federated Learning (FL) into three categories based on how data is dispersed among numerous participating devices in the process: Horizontal FL, Vertical FL, and Federated Transfer Learning.

In FL, the central authority is responsible for executing the final global update of the model based on model updates from clients. We'll go into FL categorization based on data splitting in depth. Horizontal Federated Learning (HFL), also known as sample-based Federated Learning (FL), is used in the scenarios in which datasets share the same feature space but different space in samples, as shown in Figure 3.

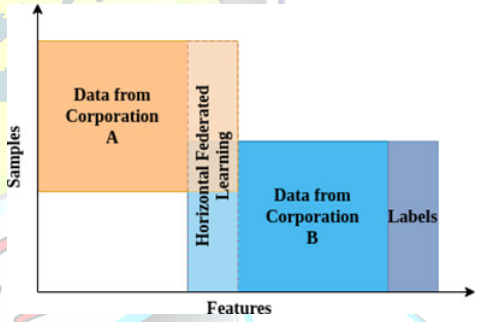

Figure 3 Horizontal Federated Learning (HFL) data partitioning.

Figure 3 depicts an example architecture for a horizontal Federated Learning (FL) system. Using a parameter or cloud server, k participants with the same data structure collaborate to develop a machine-learning model. It is assumed that no information is leaked to the server from any of the participants [25]. Sample architecture for a horizontal Federated Learning (FL) system is shown in Figure 4. The training process of the HFL system usually contains the following four steps.

- **Step 1:** Initially, all participants compute training gradients locally, and then use differential privacy [26], encryption [25], or secret sharing [24] approaches to conceal selected gradients. These masked results are then forwarded to the server.
- **Step 2:** The server then performs secure aggregation without learning any information about any participating client.
- **Step 3:** The server sends the aggregated results to all the participants.
- **Step 4:** The decrypted gradients are used to update each participant's model.

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All of the steps are repeated until the loss function.

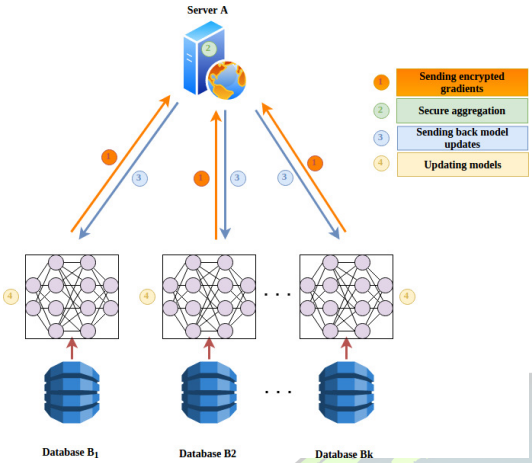

Figure 4 Horizontal Federated Learning (HFL) architecture.

Vertical Federated Learning (VFL):

When two datasets share the same sample ID space but differ in feature space, vertical federated learning (VFL) or feature-based federated learning (FL) is used. Vertically Federated Learning (VFL) combines these different features and computes gradients and training loss while maintaining privacy. Finally, it cooperatively constructs a model using data from both sides. After the learning phase, each party only has the model parameters that correspond to its features. Finally, when it comes to inference, the two sides must work together to obtain results.

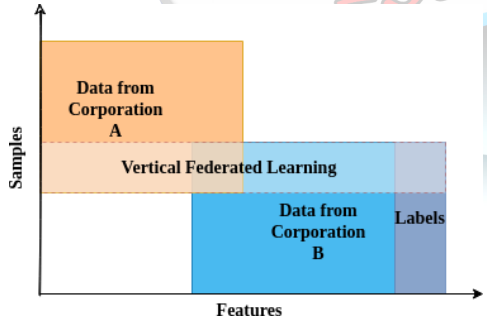

Figure 5. Vertical Federated Learning (VFL) data partitioning.

The training process of VFL can be divided into the following four steps, as shown in Figure 6.

- **Step 1:** Initially, Collaborator C creates encryption pairs and sends a public key to A and B.
- **Step 2:** Both A and B encrypt and exchange the intermediate results for gradient and loss calculations.
- **Step 3:** Companies A and B compute the encrypted gradients and add a mask, respectively. Company B also computes an encrypted loss. Both A and B send encrypted values to C.
- **Step 4:** C decrypts and send the decrypted gradients and loss back to A and B. Then A and B unmask the gradients and update the model parameters accordingly.

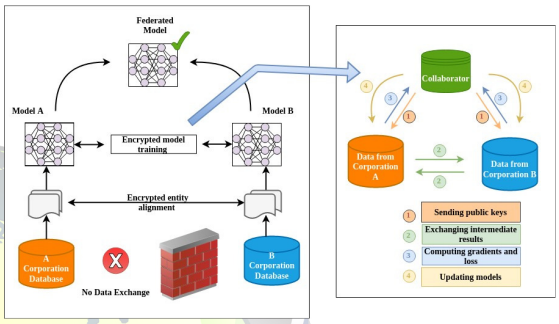

Figure 6. Vertical Federated Learning (VFL) architecture.

Federated Transfer Learning (FTL): In instances when two datasets differ in both sample and feature space, federated transfer learning is utilised. FTL is an important addition to existing Federated Learning (FL) systems since it addresses issues that aren't covered by existing FL algorithms. Learning a common representation between the features of parties A and B is known as transfer learning. It reduces the number of mistakes made while predicting labels for the target domain. Both parties must still compute the prediction results at inference time. Thus, in a federated context, transfer-learning approaches can be used to offer solutions for the full sample and feature space. In general, a common representation is learned between the two feature spaces using limited common sample sets, and then applied to only one-side feature samples to obtain predictions.

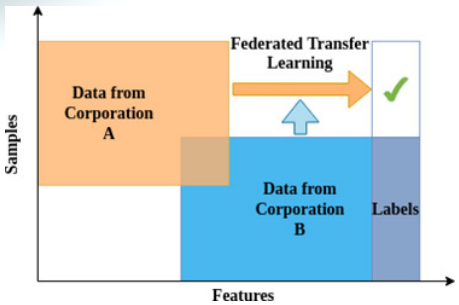

Figure 7. Federated Transfer Learning (FTL) data partitioning

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V. FEDERATED LEARNING IMPLEMENTATION FRAMEWORKS

Due to the variety of edge computing devices, federated learning is challenging to create and deploy in the real world. Different programming languages, frameworks, and hardware configurations may be used on these devices. There are numerous federated frameworks for simulating FL algorithms. TensorFlow Federated [27], PySyft [28], Federated AI Technology Enabler [29], PaddleFL [30], Leaf [31], and Clara Training Framework [64] are a few of the available tools and frameworks. TensorFlow Federated (TFF) created by Google is an extendable, powerful framework for executing Federated Learning (FL) research by simulating Federated Learning (FL) computations on realistic proxy datasets.

The Federated Core (FC) API is for expressing novel algorithms, while the Federated Learning (FL) API is for federated models that have been implemented. PySyft is a new open-source library for Federated Learning (FL) and privacy protection. It was created by the OpenMined community, and it integrates these several technologies for creating safe and private machine learning models.

We can start building privacy-preserving applications right away using these popular deep learning frameworks without needing to learn a new Deep Learning framework. As a result, Federated Learning (FL) and other privacy-preserving methods could be simply implemented in any application domain.

As a result, several frameworks are created to mimic FL in a server context. They do not, however, allow for large-scale client experimentation in a distributed mobile scenario. Another framework Leaf includes a set of open-source federated datasets, an evaluation framework, and a set of reference implementations using for practical federated environments.

VI. PRIVACY MECHANISMS IN FEDERATED LEARNING

Privacy is one of the crucial properties of Federated Learning (FL). Therefore, it requires analysis and security models to provide privacy guarantees. In this section, we briefly review various privacy techniques for Federated Learning (FL).

Secure Multiparty Computation (SMC): Multiple parties are involved in SMC security models, which give security evidence in a well-defined simulation framework to ensure that each party only knows its input and output. The parties have no information about the other parties in this situation. Zero-knowledge is very desirable, but it usually necessitates extremely sophisticated computation methods that are difficult to execute efficiently. . In some unusual circumstances, partial information disclosure may be permissible if security guarantees are provided. As a result, a security model using SMC can be built with fewer security criteria in exchange for efficiency.

Differential Privacy: Differential Privacy is introducing noise to the data or employing generalisation methods to obscure certain important attributes until a third party is unable to differentiate the individual, rendering the data unrecoverable and therefore protecting user privacy. The DP method is lossy as machine learning models are built after noise is injected, which can reduce much performance in prediction accuracy.

- **Local Differential Privacy:** Differential privacy can be achieved without requiring trust in a centralised server by having each client apply a differentially private transformation to their data before sharing it with the server.
- **Distributed Differential Privacy:** Here, the clients first compute and encode a minimal, focused report, and then send the encoded reports to a secure computation function, whose output is available to the central server. The output already satisfies differential privacy requirements by the time the central server can inspect it. The encoding is done to help maintain privacy on the clients. This privacy-preserving technique can be implemented via secure aggregations and secure shuffling.
- **Hybrid Differential Privacy:** This combines multiple trust models by partitioning users by their trust model preferences. There are two options before the advent of HDP like most-trusting and the least trusting model.

Homomorphic Encryption (HE): Through an exchange of parameters within the encryption method, homomorphic encryption is used to preserve user data privacy. The data and the model are not sent, and they cannot be guessed by the other party's data, unlike differential privacy protection. Certain mathematical operations can be done directly on ciphertexts without any prior decryption using homomorphic encryption (HE) techniques. Homomorphic encryption is a useful technique for Multiparty Computation (MPC) since it allows a participant to compute functions on values while keeping the data concealed.

Secure Aggregations: Secure aggregation is server-side functionality for a large number of clients. It allows each client to submit a tensor value, with the server learning just the aggregate function of the clients' values, which is usually the sum. Only an unordered collection of messages from all clients is learned by the server. Aside from the metadata in the message itself, the server is unable to link any communication to its sender Secure aggregation is server-side functionality for a large number of clients. It allows each client to submit a tensor value, with the server learning just the aggregate function of the clients' values, which is usually the sum. Only an unordered collection of messages from all clients is learned by the server. Aside from the metadata in the message itself, the server is unable to link any communication to its sender.

SecureBoost: In the context of Federated Learning, SecureBoost is a unique gradient-tree boosting technique (FL). There are two key steps to it. The data is first aligned under the privacy constraint. Second, it learns a shared gradient-tree boosting model collaboratively while securing all training data across different private parties.

SecureBoost is advantageous because it achieves the same degree of accuracy as a non-privacy-preserving technique while revealing zero information about each private data provider. The SecureBoost framework is theoretically demonstrated to be as accurate as other non-federated gradient tree-boosting techniques that bring data into one place.

VII. CONCLUSIONS AND FUTURE SCOPE

The emphasis on data privacy and security with the isolation of data has become the next challenges for AI, but Federated Learning (FL) has emerged with the solution. It could establish a united model for multiple enterprises and institutions while local data is protected so that enterprises could work together on data security. Thus, Federated Learning (FL) provides a platform to build a cross-enterprise, cross-data, and cross-domain ecosphere for AI, Machine learning and big data. This paper generally introduces the basic working of Federated Learning (FL), various architectures, privacy-preserving techniques of Federated Learning (FL), and discusses its potential in industrial applications. In the near future, Federated Learning (FL) would break the barriers between industries and establish a new community, wherein the data and knowledge could be shared. It ensures the safety and the benefits would be equally distributed based on the contribution of each participant. Finally, the essence and need of AI would be brought to every corner of our lives through Federated Learning (FL).

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HUMANOID ROBOTS IN FUTURE HEALTH SECTOR

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Abstract

Robots are nowadays common in every sector. From December 31st 2019 onwards an unknown virus was detected in Wuhan city, China that has been spread over the world and took lakhs of lives. As it is still prevailing as a contagious disease and is affecting all sectors especially medical field. During this situation the use of Robotics has been increased. As the threat of being affected by coronavirus; doctors, nurses and other health care workers started using robots to interact in real time with patients. Even though robots are efficient in many ways, they cannot mimic empathy which includes a core of compassion, listening to those in need, expressing genuine concern etc. But these robots can also be the sole companions of healthcare workers in future. So, we are discussing about the necessity of humanoid robots in the medical field.

Keywords: Robots,Health sector, Pandemic situation,Covid-19,AI,Future.

I. INTRODUCTION

The first Robot "Unimate" was invented by George.C.Devol & Louisville,Kentucky in 1950.The word 'Robot' originated through the play i.e,Czech playright Karel Capek .

It developed from the word 'Robota' which means 'forced labour'. The very first non-laparoscopic robot was the Puma 560, that performed neurosurgical biopsies with high accuracy in 1985.Nowadays the usage of robots are essential in the medical sector.There are simple as well as highly complex robots,i.e. used for surgery.Robots have an extremely important role in assisting healthcare workers during pandemic**[1]**. A study which was conducted in the Science Robotics says "Robots have the capability to be used for disinfecting, transferring medicines and food, count important signs. As the epidemics shoot up, the roles of robotics are becoming more clearer". A vast

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digit of hospitals are currently using robots to sustain healthcare workers & patients **[9]**.

IIApplying Robotics in Pandemic(Covid19)

There are various types of robots which operate in hospitals, for the patients it is like talking to a doctor face to face.In India this pandemic has been the turning point for the services of the robot industry.We turned to robots on a scale never seen before to help with the global war against the coronavirus in a crisis where people themselves are hazardous,Robots become more useful and valuable today than ever before.

Robots often get a bad rap in public consciousness with movies like Terminator,in the opinion of respected figures ,*Elon Musk* and the late *Stephen Hawking* who have warned against the dangers of AI. There's also the more immediate threat of AI and robots replacing jobs in the coming decades.Time and time again society has turned to robots and unmanned vehicles to perform functions that have become dangerous for humans to perform controlled robots.

TABLE I
[8]ROBOTS USED IN MEDICAL FIELD DURING PANDEMIC

SL.N0	NAME	FUNCTION
1	UVD Robots	Keeping services disinfected,and is directed to clean rooms by hospital staff/mobile App
2	Cylindrical Robots	Rolls into treatment room to allow health care workers to remotely take temperature & measure blood pressure & oxygen saturation from patients hooked up to a ventilator.
3	Xenex X5 Lightstrike	It is a disinfecting robot.
4	Starship delivery Robot	It is a self-driving robot which safely transports needed items such as food & medicine without human interaction.
5	Moxie	It's a hospital robot assistant designed to aid nurses by performing supporting task such as gathering medical supplies & delivering them to patient's rooms,collecting fresh linens & removing old ones & transporting patient lab samples.
6	Ninja	Designed for recovering stroke patients but have been repurposed to measure patient's fever & allows doctors & nurses to communicate with patients via video chat.
7	Tommy	Helping by being placed in patient's room to monitor health conditions & relay patient's messages to nurses via touchscreen.

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III.Requisite For Robots

Expenditure

As robots are required on a large scale in the health sector they need to be cost efficient for extensive availability and usage. Adaptability of these system may not be practicable in most parts of the world.Surgical robots are very expensive, as they are providing cutting edge technologies with unified high definition video systems for tool guidance and direction for the surgeon**[4].**

Over the last 10-15 years we have seen the arrival of an increasing role of technology in all aspects of medicine and surgery .One of the exciting new modalities that came along is that of robotic-assisted Laparoscopic surgery.So there is keyhole surgery employing a robotic slave to improve both vision and dexterity of the surgeon.The robot that has dominated the field is the Da Vinci Robot made by intuitive medical .
It's now available in numerous hospitals across the UK and is employed across a breadth of specialities,particularly in urology.Operations where this device is used include radical prostatectomy for prostate cancer,radical cystectomy for bladder cancer and in robotic-assisted partial nephrectomy for renal cancers.

Power requirements

To set off medical robots AC or DC power have to be required without interruption,so these reproving systems can perform tasks frequently.As medical facilities differ from wide ranging city hospitals to small hospitals,various sustainable energy sources are also employed for well grounded power solutions[**2**].

Semiconductors specialises in energy efficient innovations and solutions.This is highly relevant in the area of power management in industrial robotics where on semiconductor advancements are enabling more efficient machine.On semiconductor solutions are helping the next generation of robots manage power as they become more robust .Advancement in voltage regulators are enabling to operate more efficiently and generate less heat.All power management requires mosfets and superjunction mosfets are ideal for high voltage industrial power application.This technology is tailored to minimize conduction loss provides superior switching performance dvdt rate and higher avalanche energy. Point of load power supply places the individual power supply regulators close to their point of use.This solves key design issues such as emi radiation and conduction losses for high performance industrial robotics with high peak current demands and low noise margins.

Today's robots process more high resolution images to identify ,classify,manipulate & avoid objects.Idos are key components to provide a clean voltage input which results in higher image quality from cmos image sensors. This allows both collaborative & autonomous robots to navigate their environment more accurately synchronous switching regulators are an ideal solution for battery powered robots, extending battery life with increased efficiency. Linear regulators block the noise from switching dc dc power supplies ,like point of load regulators .The compact is more simplistic design of ldos fits easily into design with limited space yet still offers high performance capabilities whether you need to switch electronic signals ,amplify signals or convert power in your robotic design on semiconductor products are highly efficient solutions that fit in compact circuit designs .Then robots can move and see more accurately .They help protect the people they assist and they accelerate production workflows.

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IV.AI & Humanoid Robots Improving Health Sector

Face Mask Detector Robot:A new robot called 'whiz' which can detect humans without a mask.A face mask detection app has been installed in this robot which is working with an artificial intelligence algorithm to detect if you were wearing a mask or not.It will generate a voice reminding people to wear a mask or to wash their hands often.

Robots enhancing accuracy in the surgical field: Many robots has been used in top hospitals all around the world.As they don't have feelings ,never get tired and also doesn't loss concentration,hence they are considered as perfect surgeons.They are called waldo surgeons,these surgeons aqueduct gap between humans & machines and perform task with great accuracy.As long as the software is set to function correctly, the human surgeons have only supervising role by controlling it.[**11**]

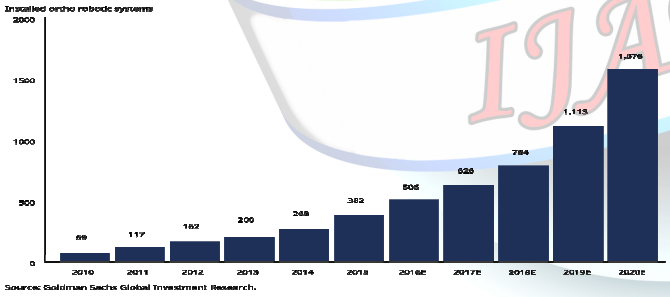

Figure 1-**Growth of surgical robots**

Precision in Diagnosing: Computer algorithms are performing incredible task with high accuracy at massive scale using human like intelligence that is often referred as Artificial intelligence.AI is poised to make an incredible impact on human lives in future.Even now we still face massive challenges in diagnosing several-life threatening illnesses such as infectious diseases and cancer.Thousands of people lose their lives due to liver and oral cancer.The best way to help these patients is to perform early detection and diagnosis of diseases.**[10]**

Instead of using 10,000 very expensive medical images,we can now train the AI algorithms in an unorthodox way, using only 50 of these high-resolution, but standard photographs, acquired from DSLR cameras and mobile phones & provide diagnosis.

Remote Robot Interventions: It is mainly used for emergent medical events, such as heart attack and stroke.This advancement has the potential to help millions of stroke patients around the world who lack access to the medical care they need.In stroke ,they say time is brain for every hour and a half delay in care a patient losses one year of disability free life.Even transport hospital can result in losing upto 2 years of independent life.As a result two-third of the patients may not survive or will have permanent disabilities from their stroke event.

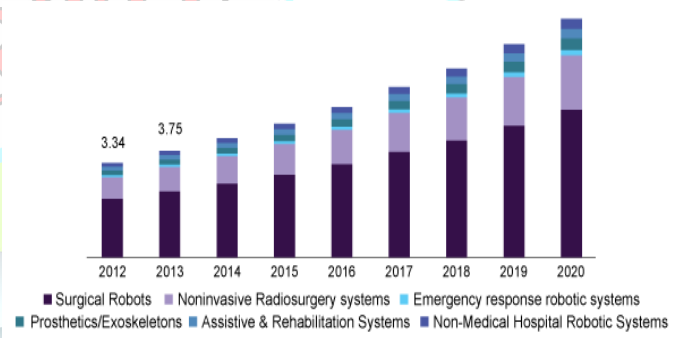

Figure 2-**Graph of robotics growth in whole world**

The Goal is to disrupt the status quo by bringing the physicians to the patients with remote robotics.That will enable them to reach patients ,treat them faster and that will bring great outcomes in future. There is a robotic assisted remote PCI interventions on patients who are more than 30kilometers away from a physician.Its proven that it is applicable to

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perform first in human projects of remote robotics[**3**].

Micro Robots : It is a tiny robot i.e, used inside the body.Used for carrying cancer killing drugs to treat difficult-to-reach tumors which are deep inside the body.The approach of drug delivery would minimize the exposure of normal ,healthy cells to toxic chemotherapy drugs , thus avoiding the side effects**[7]**.The team developed call these bots 'microrollers' because they navigate blood vessels by rolling along their walls.By sticking to the walls where blood flow is slower with the help of a magnetic field, the microrollers can roll against the bloodstream which has been a challenge for bots of this size.It has two faces , each with a specific job, one side is needed for navigation & it's made of magnetic gold & nickel layers, which allows the researchers to control the microbot's movement by flipping on a weak external magnetic field.

V.Grace : The Robot Nurse

Grace is a humanoid robot developed by the Hong Kong team which launched the celebrity humanoid robot Sophia.Grace uses artificial intelligence for diagnosing patients. She is targeted to assist in the health sector and designed to interact with the elderly and those isolated by the covid-19 pandemic.She is dressed in blue & has asian features with collar length brown hair and a thermal camera in her chest to take your temperature and measure responsiveness of patients.She can speak english mandarine and cantonese.She can do all things for elderly people,can visit people and brighten their day with social stimulation,entertain and help guide exercise and also can do talk therapy,take bio readings and help health care providers assess their health and deliver treatment.

Grace's resemblance to a health care professional and capacity for social interaction is aimed at relieving the burden of front line hospital staff overwhelmed during the pandemic.For simulating 48 major muscles on the face Grace has 36 motors in the face they are reversible which means that each motor can simulate two muscles because human muscles require two for the actions.As the covid has accelerated ,the deployment of humanoid robots in different settings will have a positive effect in the health sector. For socially isolated individuals during covid with a lot of negative thoughts, if they can get help through deployment of these social robots in their intimate settings, certainly it will have a positive impact in the society.

VI.Will AI & Robotics Replace Doctors ?

People have different opinions when comes to this topic.Its true that AI has already been a part of our lives, we may not have realized it.If you have a modern generation smartphone which already got neural chips inside it, the apps we use every day like twitter, facebook etc .They all are optimized through AI to give a personalized feed.

All sectors are investing heavily in the AI space And so as you can imagine that healthcare is the next big place for AI.There is so much money invested in this, that the dialogue has gone from *'let's build tools to help doctors to AI might replace doctors*'.It says there exist major problems with having human medical providers for example, human error.Now matter how accurate humans are, it is a part of being humans to make mistakes which creates ambiguity when you consider how powerful the human brain actually is, In 2016 study from Johns Hopkins University found that medical error can be the third leading cause of death.It's estimated that quarter million patients are dying annually from medical error.In medical AI big changes are occuring every every week.We now know that deep learning or machine learning algorithms really are changing the way we interpret images whether it's

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MRIs, CTs ,X-rays, Ultrasounds which is equal to or above radiology performance.It can diagnose skin cancer just as accurately as a panel of dermatologist and another machine learning algorithm can predict who's at risk for heart disease much better than doctors can. Using machine doctors is also much cheaper with the upcoming doctor shortage and a collapsing healthcare financial system .Training a doctor takes thousands of dollars and years of work.Whereas as the robots can learn diagnose much faster.And can calculate all the drug interactions and possible treatments much faster than a mere human doctor can.With medical knowledge doubling every three years , it may be hard for humans to keep up also they don't get tired after looking thousands of X-rays & doesn't need sleep at night.If take an area like breast cancer diagnosis even amongst highly trained pathologist agreement on some forms of breast cancer can be as low as 48% that's because each pathologist is reviewing the equivalent of thousand 10 megapixels images for every case.This is a large data problem but one in which machine learning is uniquely equipped.

From a survey conducted says that AI is better at picking objects than humans.In speech recognition AI is almost equal to humans but only for single speakers i.e once you put two speakers in a room, AI gets confused.It also says that they are *brilliant idiots* for example as we said that AI is fantastic at detecting objects , so they can tell what is what.But can't tell why they are arranged .

Today's AI is fantastic at solving single simple tasks,imagine if it's a radiology AI might be brilliant at detecting TB in lung, it's not a radiologist, It does that one job very well.There are still challenges in this health care sector that AI can't deal with & it also says that ,they can't take over doctors job.For example robots can't **mimic emotion & empathy[6]**.Let's consider an example scenario; A lady actually flown across the country driven 50 km from the airport through the pouring rain and finally made it to the hospital where her mother has been admitted with serious health issues.She saw her mother through hospital room window & all she wanted to tell her mother how sorry she was for not being there for the past few years & wanted to tell her that she is there now and everything is going to be okay.But in this particular hospital there was a robot who took care of the facilities & it's set to lock the door at 9.00 p.m .When the lady arrived the hospital it was almost 9.01 p.m .And the robot said 'no visitors are allowed'.She pleased the robot to let her see her mother just once.But for robots rules are rules , here robots are build on binary logic.They unfailingly do what they were programmed to do , what they believe is right without any exceptions.It's actually a cruel combination ie, brilliance, calculating logic & lack of compassion which is one of those reasons that make sure AI won't replace doctors.

Trust can also be a reason , we know that robotics in healthcare has increased from year to year. Back then mostly used were surgical robots and were only available in multispeciality hospitals.Different robots assisting healthcare workers has been rapidly increased only during covid19 pandemic.In a research also, found out that it's difficult for patients to believe robots. Because they think that programmed robots can't meet their needs in hospitals.The medical support provided by robots are kind of insufficient. Their way of assisting is more systematic which creates trust issues in the patient's mind. And the comforting words of a machine made of algorithms can't actually make us feel secure.The warmth & the concern from health workers which comfort & heal patients are lacking in many ways.[**5**]

Robots are not **flexible** like doctors i.e,there will be situations where immediate changes are required for

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different cases, a pre-programmed robot definitely can't deal with this situation alone ,they need guidance from doctors to perform the corresponding task.We know that patients need physical as well as mental support in health care. For example in gynaecology, some patients are mentally and emotionally weak & they need counseling before operation.But for robots they can't understand the gestures and pain of humans which is deep inside ,because it's a human thing. And they cannot perform counseling sessions with the programmed messages.We know for different people problems are also different ,So the advice and help they provide should vary from patient to patient.It will be difficult for robots to give professional advices like doctors.

Even though robots doesn't get tired and neither required sleep like doctors and can work for whole day, there should be adequate **power** needed for them to perform tasks and if some power failure problem occur during surgery or disfunction occur, it will cause the life of patients.Robots can't handle situations like this, all by themselves.So these are some important reasons that is going to keep doctors in future health sector without any threat of being replaced.

VII.Conclusion

The covid 19 pandemic had made us use more robots in different countries.As it was contagious , doctors had no option but to treat patients while keeping a safer distance from them. During this time robots were used as a medium by the health care workers to interact with isolated patients.To be honest we don't know what the future holds for us.What if something like this happens again?So we have to be prepared.Using robots in health care was one of the best choice. It will be way more efficient if we use **Humanoid Robots** instead of other robots ,as it is convenient for patients to interact with.

We can say that when compared to other robots humanoid robots don't have much difference.But when it comes to the health sector, humanoid robots have a plus point.Their human like appearance, actions , gestures and the way of mimicking human emotions will be more appealing for patients.It will become a little bit easier for patients to trust them because of their human like behaviour & facial expression.

We have AI which is pretty good at lots of things & we have humans who are good at different things, each having weaknesses and strengths that complement each other. If we summarize it ,AI really is tremendously important in partnership with humans, i.e, it's going to make a big difference and we are going to be better at diagnosis and treatment. Also we are going to have a smarter, more agile and safer healthcare system.It will be absolutely possible only if doctors are going to keep their hands on the wheel of future healthcare along with robots.This idea of losing medical job isn't real in the future , in fact it will be the cooperation of both Robots & Healthcare workers.

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HYPER PARAMETER OPTIMIZATION IN STACKED DEEP NEURAL NETWORK FOR MEDICAL DIAGNOSIS

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Abstract— Diabetes is a metabolic disease where the blood sugar rate of an individual is consistently above normal. Due to the modern lifestyle and work culture, diabetics is widespread and affects the productivity and quality of life for an individual. A diabetics patient is at a very high risk of various health issues like organ failure and even it can even result in loss of life. An early prediction of this chronic disease can avoid health issues and save many lives. The aim of this article is to develop a better predictive model for diabetics using an automated hyper parameter optimization (HPO) approach in Multilayer Perceptron (MLP). This article provides an efficient way to increase the accuracy of Neural Network to a substantial level through the HPO process using Grid Search Optimization (GSO) through the stacking ensemble model. In order to run the ensemble model at an optimal level and to minimize errors, appropriate hyperparameters must be calculated. Three GSO methods are utilized to tune the hyper parameters. To build the stacking ensemble model, the PIMA data set was used.

Keywords: HPO, MLP, GSO: Hyper Parameter Optimization, Multilayer Perceptron, Grid Search Optimization.

INTRODUCTION

A study carried out by the WHO recently revealed that in 2016, diabetics was one of the leading causes of death worldwide. Diabetes has resulted in 1.6 million fatalities in 2016 and this statistic replaces HIV / AIDS with diabetes as one of the most frequent cause of death [4]. The burden of diabetes disease grew from 108 million in 1980 to 422 million [5] in 2014, and the percentage of diabetic patients amongst adults over 18 years of age rose from 4.7% in 1980 to 8.5% in 2014[5]. 642 million people i.e. (1 in 10 people) are expected to contract diabetes by 2040. 46.5% of people with diabetes have not been diagnosed officially [6]. This makes it necessary to develop techniques and procedures to assist in the early detection of diabetes in order to reduce the number of deaths related to diabetes, as late diagnosis is responsible for a majority of deaths linked to diabetes [7].

There is a need to implement sophisticated information processing to develop cutting-edge strategies for the early detection of diabetes. Data mining tools can also be effectively applied. The ability to remove and uncover previously unseen, secret, yet important patterns from a large database repository is given by data mining [7]. These tools can assist medical evaluation and decision making.

LITERATURE SURVEY

Roshan Birjais [1] conducted a research in many classification algorithms for diabetes prediction and his team found out that the Gradient Boosting algorithm outperform other classifiers and

obtained 86% accuracy. They have analysed various prime factors for the cause of diabetes disease.

Md. Maniruzzaman [2] wrote an article in which he used LR for identifying the prime features for the diagnosis of diabetes disease. Accuracy and Area Under curve are used as the performance measures for the classifiers. It revealed that LR along with the Random forest generates the maximum accuracy.

Atik Mahabub[3] used an ensemble voting classifier for forecasting diabetes disease. The Out of eleven classifiers, the best performing three will be used for the ensemble classifier. Accuracy, Precision, F-Measure and Recall [3] are used as the parameters for evaluating the classifiers. The outcome clearly shows that the ensemble method outperform the base classifiers.

BACKGROUND STUDY

Neural network is used for the prediction. Parameter tuning mechanism in neural network is applied for improving the accuracy.

ARTIFICIAL NEURAL NETWORK

Artificial Neural Network [17] is built by multiple nodes that reproduce the human brain's biochemical neurons. The neurons are linked and are communicating with each other. The nodes are capable of taking input data and executing the operations. The outcome of these operations is transferred to other neurons. The output is referred to as its activation or node value for a node. A technique known as Gradient Descent in the Artificial Neural Network, which takes places in the backpropagation period whereby it intends to regularly resample the gradient of the model parameter in the reverse direction based on the weight 'W', periodically updating till the global minimum of G(W) function is reached.

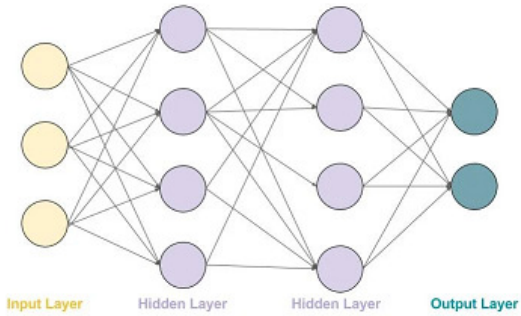

Figure 1: Hidden Layers in Artificial Neural Network

A loss represents the prediction error found in the Artificial Neural Network. In deep learning, this is estimated as a loss function. The Loss Function describes the model's operating efficiency. For the estimation of the loss function, stochastic gradient descent was used. For each iteration, weights are updated, and the model is trying to reach the global minimum point.

LOGISTIC REGRESSION

Logistic Regression is a well-known classification algorithm used to estimate the probability of a target variable. The design of the goal or dependent variable is binary, indicating that only two possible groups are available. Mathematically, f(Xi), a LR model predicts P(Yi=1).

b=wt0+wt1 x1+wt2x2+…+wtnxn.

A sigmoid function can be used to map the predicted values to the probabilities.

S(y)=1/(1+e(-y))

S(y) is the estimated output; y is the value inputted to the function and e is the base of natural log.

NAVIE BAYES

The Navie Bayes algorithm follows the Bayasian principle which belongs to a category of conditional probabilities (CP). The CP is the probability that an event B will happen, provided A has already occurred. Though Bayes Theorem provides a principled way for calculating conditional probability, in practice its computationally expensive and thus using some assumptions, bayes theorem is simplified by making some assumptions and turning it into an effective classification model referred to as Naive Bayes. Conditional probability can yield the probability of an event using prior information.

P(H/E) = (P(E/H) * P(H))/(P(E))

PROPOSED MODEL

Stacking Ensembles

To obtain better performance, ensemble methods allow for combining the results of many methods. More the models, better will be the performance of the ensemble strategies. An ensemble method where the no. of models is stacked in a way that their observations act as input to a new model is called Stacking.

Hyper Parameters in Neural Network

The variables that determines how the network is trained are called the Hyperparameters. Hyper Parameters also determine network structure. These variables are set before the training phase, i.e. before the weight and bias is optimized.

Network Weight Initialization

Based on different activation functions applied to each layer, it is preferred to use separate weight initialization schemes.

Activation function

It is used to apply nonlinearity to frameworks that will permit nonlinear prediction restrictions to be learned by deep learning models. The most popular among the activation functions is the rectifier activation function. While making predictions, for binary, Sigmoid is used while for multi-class predictions, softmax is deployed in the output layer.

Gradient Descent

The learning rate determines how fast its parameters are modified by a network. The learning process is slowed down by a low learning rate, but converges efficiently. The higher learning rate accelerates learning, but does not converge. A decreasing learning rate is usually prioritised.

Momentum

Momentum is used to eliminate oscillations and to know the course of the next step with knowledge of the previous phase. For momentum, usually, a value between 0.5 and 0.9 is used.

Number of epochs

The number of epochs measures the number of times the entire training data is given to the model during the training process. The number of epochs is raised until the accuracy begins to decline, while the accuracy of the training is improved due to overfitting.

Batch size

Refers to the no. of sub samples provided to network before the parameter is updated.

METHODOLOGY

Diabetes prediction using MLP Model is described in the following steps. In this model these steps are used to predict diabetes more accurately.

Data Collection

PIMA Indian Data set [17], from the UCI repository is used for the analysis. The data set consists of features including age, number of pregnancies, Body Mass index, Diabetes Pedigree Function, Glucose Level [17] etc…

HYPER PARAMETER TUNING USING GRID SEARCH.

It is one of the traditional hyper parameter tuning method [13]. Before the learning process starts, the value of the hyper parameter needs to be calculated. Grid Search is also known as a comprehensive search [13], with each mixture of hyper parameters explored by Grid Search. This means that each variation of the hyper parameter values listed would be tried. There can be several parameters for models, and it can be viewed as a search problem to find the right combination values to the parameters. The purpose of algorithm tuning is to find the best values of the parameter corresponding to the particular problem. Grid Search can be expanded to provide the highest results by using automatic approaches for finding optimum values to the parameters.

HYPER PARAMETER TUNING USING GRID SEARCH.

Also known as a comprehensive search, it's a traditional hyper parameter tuning method. The value of the hyper parameter needs to be measured before the start of the learning process. Here, each variation of the hyper parameter values is explored which means that each variation of the hyper parameter values that are listed is tested. On further expanding, grid search can provide the highest results using automatic approaches that would optimum values for the parameters.

Implementation

Input values are converted to vectorised format using Logistic regression. The output of Logistic Regression is saved as a collection in Python and this will be given as the input for the MLP. Grid Search is used for doing the parameter optimization. The model optimizes the following hyper parameters

- Epoch
- Batch Optimization.
- Gradient descent

By using Keras Classifier Grid parameters such as Batch size and Epochs are optimized. In this model stochastic Gradient is introduced for training the Artificial Neural Network. The internal parameters such as epoch and Batch values are optimized and the model is automized so the best values for Epoch and Batch optimization is find out and it is assigned. This leads to an increase in accuracy and reduced the loss and MSR (Mean Square Error). The Vanishing Gradient Problem is overcome by using ReLU (Rectified Linear unit) activation function. The formulae for ReLU is

R= {0, z}

{1 for z > 0}

{0 for z < 0}

The input of each neuron is passed to the activation function and there it is processed. ReLU overcoming the problem of vanishing gradient by keeping the derivative value as positive. So always there is a difference between Wold and Wnew in ReLU. Feedback connections were introducing LSTM and the best score for grid search is found out. By using standard Grid Search Value of Epoch and Batch size is automated and it is found out that for this dataset the best result was obtained for Batch size =20 and Epoch=20. Forward propagation is improved by adding the features of LSTM [12]. So a new memory part was introduced to store [12] the activation details of the hidden layers. Various steps involved in this model are described below:

- Choose the data set
- Convert all the input values to Vectorised format for standardization Find out the training values
- Initialise the model using Keras Classifier
- Three sub models are introduced, and, in each model, Optimal parameters are finding out using hyper parameter tuning in Grid Search Model.
- In model1 the best values for Epoch and Batch size was find out using Grid search in Keras Classifier. The model is tested with three batch sizes (10,20 and 30) and three epochs (10,20 and 30). All combinations were tested and the best accuracy will be find out for the combinations of batch size 20 and epoch 20.
- In Model2 Forward propagation is improved by introducing LSTM and Adam Optimizer. By automating the model best values for epoch and batch size was predicted. Learning rate and dropout rate is find out and best classifying accuracy is calculated.
- In Model3 ReLU activation function is introduced along with Softmax function. Best predicted result was observed.
- Stacked the three Models using tensor flow method and the accuracy matrix was printed. Logistic Regression is used for stacking the Models.

FINDING OPTIMAL PARAMETERS USING HYPER PARAMETER TUNING IN GRID SEARCH MODEL.

- In model1 the best values for Epoch and Batch size was find out using Grid search in Keras Classifier. The model is tested with three batch sizes (10,20 and 30) and three epochs (10,20 and 30). All combinations were tested and the best accuracy will be findout for the combinations of batch size 20 and epoch 20.
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- In Model3 ReLU activation function is introduced along with Softmax function. Best predicted result was observed.
- Stacked the three Models using tensor flow method and the accuracy matrix was printed. Logistic Regression is used for stacking the Models.

RESULT AND DISCUSSION

From the observations it is found out that the accuracy is incremented in the new model comparing with the base classifiers. Here three base classifiers are used for the accuracy comparison. Naive Bayes, Logistic Regression, Multilayer Perceptron. From the observations it is found out that the automated hyperparameter optimization with stacked ensembled model increases the accuracy level.

Algorithm	Accuracy	Precision	Recall
Navie Bayes	76.3	75.9	76.3
Logistic	77.2	76.7	77.2

Regression			
MLP	78.3	75.0	74.0
Stacked Model	90.7	94.0	82.0

Table 1: Performance Comparison of Classifiers

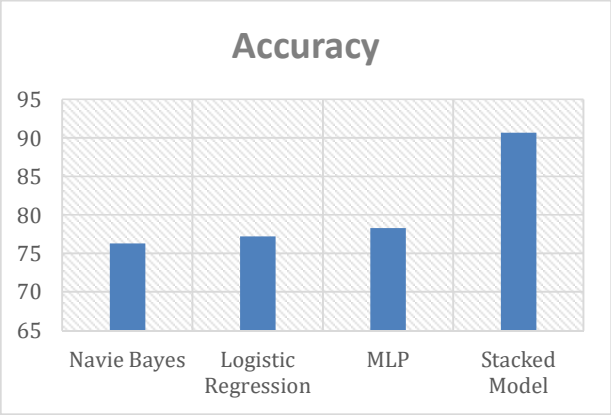

Figure 2: Classifier Performance based on Accuracy

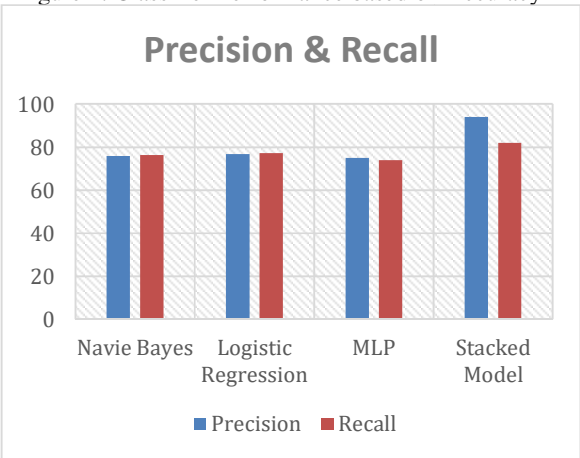

Figure 3: Classifier Performance based on Precision and Recall.

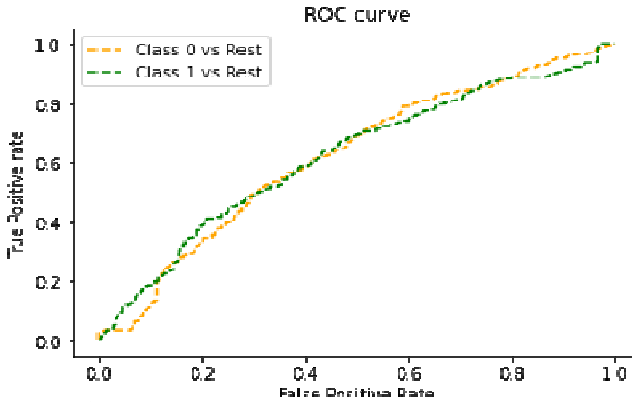

Figure 4: ROC Curve

ROC curve is a graphical plot that shows the system's diagnostic potential as its discriminating threshold is varied. The ROC curve is generated by plotting the true positive rate at different threshold settings against the false positive rate.

CONCLUSION

In this article we are introducing an ensembled hyper parameter tuning mechanism to tackle the deficiencies and improving the accuracy. For this purpose, we have used an automated stacked ensemble method which combines various hyper parameters. Grid Search Optimisation method is used, and three different models were created as base learners using Neural Network by combining various activation functions. The optimum value for each parameter is calculated and stored into an external file by each model. Three output files are created, and these output files are inputted to a logistic regression model which is a learning model. We have used LR Model as the learning model. It is found out that this model improves the accuracy to good extend.

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VISUAL SALIENCY OBJECT DETECTION USING DEEP LEARNING TECHNIQUE

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Abstract—Computer vision is a discipline of computer science that tries to mimic human vision systems. Visual attention is the subset of computer vision and it follows a systematic approach for the selection or concentration of specific information by neglecting the other perceivable information. This same aspect is deployed in salient object detection, through which a person's eye points to some visual scenes which in turn find some characteristics of the image. It drives to saliency, which measures how likely human eyes will fixate a certain part of the image and the part in which the eye focusing is the salient region of an image. The computer vision and image processing algorithms can be used to locate the most salient regions of an image and can create a saliency map. Saliency object detection aims to explore the salient part, by detecting and segmenting the object more clearly, it projects the outline of the salient object. This works aims to create a saliency object detection model based on fixation and segmentation. The saliency map that we proposed here can generate better results than existing models. This is achieved here by developing a model consists of three modules, generation of a mask of an image, segmentation of salient object .The mask and segments generated will be taken to find the mean of the feature vectors to create the saliency map. The performance of the system is done by the evaluation nss, auc, cc metrics and obtained 1.9,0.88,0.80 which is better than the existing salient object detection models.

Index Terms—Saliency map, R-CNN mask, VGG, Saliency Object Detection.

I. Introduction

The capacity to orient and maintain focus on a stimulus, such as a person, inanimate object, or task, is the aim of visual attention. The combination of bottom-up sensory input and top-down attentional cues forms an integrated saliency map according to the recent accumulating research.

The idea of visual attention is derived from one of the most fundamental capacities of the human visual system, the capacity to direct processing resources to important areas of sensory information. Human attention is guided by two systems, bottom-up and top-down mechanism. The bottom-up system directs attention to "salient" things, which appear to "pop out" of a picture due to some feature that distinguishes them from the rest of the picture such as color, orientation, or motion. Saliency detection is an important attentional skill that helps humans to direct their limited perceptual and cognitive resources onto the most relevant subset of available sensory input, enabling learning and survival. Top-down attention, on the other hand, directs attention to behaviorally important areas.

Fig. 1. Orginal Image

Fig. 2. Salient parts

II. Related Works

The [1] Saliency Using Natural statistics (SUN) model combines top-down and bottom-up information to predict eye movements during real world image search tasks. SUN implements target features as the top-down component. SUN outperformed a salience driven model in predicting human fixation positions during real-world image search. It uses natural

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The [2] bottom-up visual saliency model, Graph-Based Visual Saliency (GBVS), is proposed. It consists of two steps, first forming activation maps on certain feature channels, and then normalizing them in a way which highlights complicity and admits combination with another map

The [3] The Spectral Residual Approach is intent to provide features, categories, or other forms of prior knowledge of the objects. By analyzing the log-spectrum of an input image extract the spectral residual of an image in spectral domain, and propose a fast method to construct the corresponding saliency map in spatial domain.

SalNet [4] approach uses a completely data-driven ap-proach, with a large amount of annotated data for saliency prediction. The model uses a CNN that consists of five layers with learned weights, three convolutional layers and two fully connected layers. Each of these three convolutional layers is followed by a rectified linear unit non-linearity (ReLU) and a max pooling layers. The deconvolution layer follows the final convolution to produce a saliency map that reflects the input width and height.

SalGAN [5] consists of two networks, one predicts saliency maps from a raw pixels of an input image where as the other one takes the output of the first one to discriminate whether a saliency map is a predicted one or ground truth. It contains a generator and a discriminator networks. The filter weights in SalGAN have been trained over a some loss resulting from combination of a content and adversarial loss. The content loss is calculated in a perpixel basis, where each value of the predicted saliency map is compared with its corresponding peer from the ground truth map.

DeepFix [6] a fully convolutional neural network for ac-curate saliency prediction. The input image is followed by 5 convolutional blocks. It is similar to the VGG-16net. These are the followed by an inception block and consists of a set of convolution layers with different kernel sizes operating in parallel. The weights of VGG-16 network have been learnt by training on 1.3 million images of the ImageNet database. These are followed by a Location Biased Convolutional (LBC) layers.

EML-NET [7] is a Expandable multi-layer network Multiple powerful deep CNN models to better extract visual features for saliency prediction. The DenseNet-161 mode list pre-trained on the PLACE365 dataset and the NasNet-Large model is pretrained on ImageNet. The input image applied to the CNN model to extract the feature map. The encoder and decoder are separately trained.

III. METHODOLOGY

Visual attention is the process that helps the human visual system to select the most relevant information from a visual scene. Deep neural networks have provided great success in image saliency prediction. The capacity to locate items or regions reflecting a distinct scene is referred to as saliency detection, simulating scenarios in which observers are see-ing their surroundings without a defined aim. A variety of computational models are being built, and the technique is being improved. Initially, models are created with the goal of forecasting human visual attention. The visual process of a person in an image or in a scene by a free moving condition is used to measure performance.

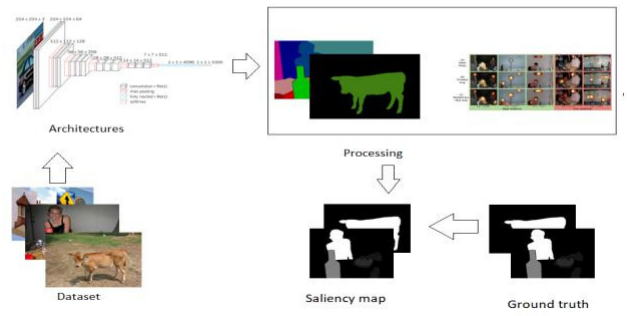

Fig. 3. Basic Structure

The figure 3 shows the structure of the saliency object detection process, there are several datasets available for this process. Each image is obtained from an eye tracker device, with the most often used datasets being MIT300, SALICON, PASCAL-S, MIT1003, and so on. Each image may have a fixation point, which is the place on which our eyes fixate for a few seconds over the image, as well as the associated ground truth, which is utilized to determine the calculation's loss. Each dataset contains images for training, testing, and validation. Following the validation of the datasets, the next stage is to construct a convolutional neural network model through which a featuremap is generated. There are serval types of CNN networks like AlexNet, VGG, ResNet. The pooling layers, which resize the images, are one of the key drawbacks of neural network architectures. Because the focus might be anywhere on the image, shrinking the image size may results in inaccuracies. As a result, the pooling layers after the blocks will be removed. After processing the images through the network, the very next phase is to discover the techniques 18 for generating the saliency map of the images, such as minimal barrier techniques, fine grained approaches, and mean of the feature vectors, segmentation and fixation etc. Finally evaluate the model with evaluation matrixes

Initially load a set of images as the dataset, and subdivides them into training, testing and validation sets. In addition, the dataset also carries videos and convert them into frames. Using any one of the architectures of CNN we extract the features of the images and created a feature map of the image. Since its aim is to detect the salient object, we use an faster R-CNN approach and segments and grab cut the masked images. Calculate the fixation point using the python library scades . The saliency map is the combination of fixation point and the segmentation and also taking the threshold of the images. Calculating the loss , evaluation metrics, F-measure with the help of ground truth images.

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A. CNN

Convolutional neural network is composed of multiple building blocks, such as convolution layers, pooling layers, and fully connected layers, and is designed to automatically and adaptively learn spatial hierarchies of features through a backpropagation algorithm. They are used mainly for image processing, classification, segmentation and also for other auto correlated data. There are different types of network in CNN like RESNET, VGG16, IMGNET,ALEXNET etc. are a special kind of multilayer neural networks, designed to recognize visual patterns directly from pixel images.We build our architecture on the popular 16 layers model from VGG, which known for its elegance and simplicity, and at the same time yields nearly state of the art results in image classification and good generalization properties. We build our architecture

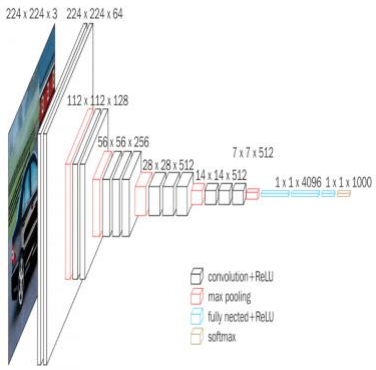

Fig. 4. Vgg Architecture

on the popular 16 layers model from VGG, which known for its elegance and simplicity, and at the same time yields nearly state of the art results in image classification and good generalization properties.

B. SEGMENTATION

Image segmentation is the technique of dividing a digital image into several parts in digital image processing and computer vision. The purpose of segmentation is to simplify and/or transform the representation of a picture into something more relevant and easier to examine. We focus largely on object identification and segmentation for object recognition using computer vision algorithms.

Pass the image through selective search and generate region proposal. R-CNN detection system consists of three modules. The first generates category-independent region proposals. These proposals identify the set of candidate detections present in an image. The second module is a deep convolutional neural network that extracts a feature vector from each region. Each image is segmented 25 and partial form masks are created. These masks contain information on the entire objects in the supplied image. The end outcome of this approach is accomplished as masks of detected objects that are compared to the ground truth with the use of a pixel-wise log loss function. The produced shape encodes the spatial arrangement of the input image full-connected layers translate class labels and bounding boxes into a feature vector from which the spatial structure of produced shapes may be derived

C. SALIENCY MAPS

Saliency Map is a picture in which the brightness of a pixel shows how salient the pixel is. The brightness of a pixel is directly proportional to its saliency. It is mostly a greyscale picture. Saliency maps are also called as a heat map where hotness refers to those regions of the image which have a big impact on predicting the class which the object belongs to.

The retrieved characteristics, such as color, orientation, and intensity, are transformed to feature maps in the form of vectors using the VGG-16. A proper representation for salient object segmentation, as well as computational concepts of feature saliency, such as area contrast, are two components of salient object algorithms. Here saliency is the combination fixation point and the segmentation of the image. and finding the mean vector and taking the binary threshold of the image we get the saliency map.

IV. RESULT

A. DATASET

In this work we are using pascal S dataset contains 850 images natural images from both indoor and outdoor scenarios. Collected on 8 subjects, 3s viewing time, Eyelink II eye tracker. The performance of most algorithms suggest that PASCAL-S is less biased than most of the saliency datasets

B. RESULT AND DISCUSSION

Let us Consider a CNN with a one convolutional layer which is followed by a fully connected layer trained to predict fixations. This model generalizes the classic model and that in turn learn to combine feature maps. The learned features in the CNN can be combined linearly by the fully connected layer. In order to handle the scale dependency of saliency computation, the classic models often recruit multiple image resolutions. But the deep saliency models concatenate maps from several convolutional layers, or feed input from different encoder layers to the decoder to get the det preserve fine details. The most evident difference of classic models compares to deep architectures is the lack of ability to extract higher level features, objects, or parts of objects. The deep structure of CNNs allows capturing complex features that attract gaze automatically. This is the main reason behind the big performance gap between the two types of models.

C. Evaluation Metrics

The main purpose of evaluation metrics is to compare the ground truth map with saliency map generated from the model.There are many different types of evaluation metrics available to test a model.y.Saliency prediction results are usually evaluated with a large variety of metric Commonly used Evaluation metrics, including Earth Movers Distance (EMD), Normalized Scan path Saliency (NSS), Similarity Metric (SIM), Linear Correlation Coefficient (CC), AUC-Judd,

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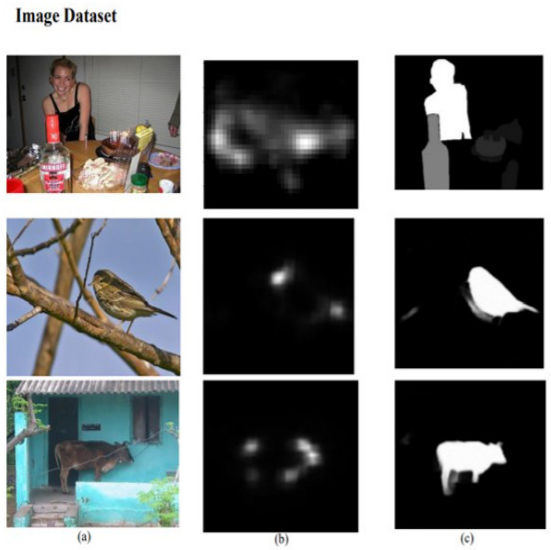

Fig. 5. (a) original image (b) previous model saliency map (c) new model saliency map

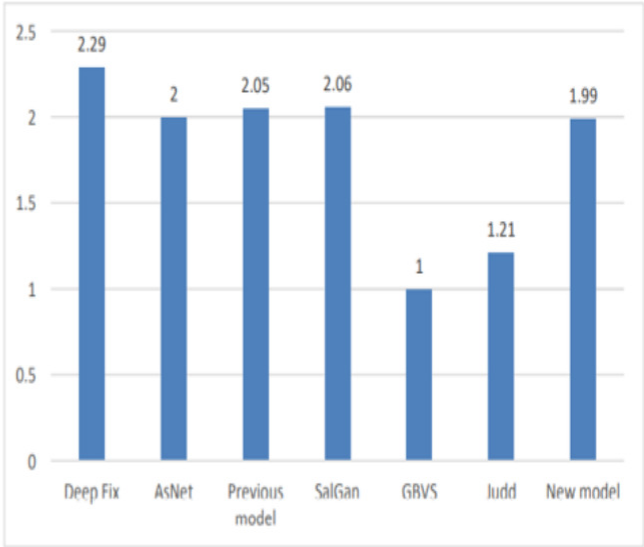

Fig. 6. Normalized Scanpath Saliency graph over different model

AUC-Borji, and shuffled AUC. In our experiments we use AUC Judd, AUC Borji and shuffled AUC. The AUC Judd and the AUC Borji choose non-fixation points with a uniform distribution, otherwise shuffled AUC uses human fixations of other images in the dataset as non-fixation distribution.

1) Earth Movers Distance: EMD is a measure of the distance between the two 2D maps. It is the minimal cost of transforming the probability distribution of the estimated saliency map to that of the ground truth map .

2) Normalized Scanpath Saliency (NSS): This metric is calculated by taking the mean of scores assigned by the unit normalized saliency map . When NSS value is 1 the saliency map shows significantly higher saliency values at human fixated locations compared to other locations. When NSS 0 indicates that the model performs no better than picking a random position, and hence is at chance in predicting human gaze.

3) Area Under Curve (AUC): In AUC, there are two image locations that are used actual human fixations as the positive set (fixation distribution) and some points randomly sampled from the image as the negative set. Depending on the choice of the non-fixation distribution the AUC are classified into 2 types. AUC with uniform distribution of non-fixation points (AUC-Judd and AUC-Borji) and the shuffled-AUC. The saliency map S is then treated as a binary classifier to separate the positive samples upon the negatives. Thresholding over the saliency map and plotting true positive rate on the false positive rate an ROC curve is achieved and its underneath area is calculated.

4) Linear Correlation Coefficient (CC): It measures how correlated or dependent two variables are and CC can be used to interpret saliency and fixation maps, G and S as random variables to measure the linear relationship between

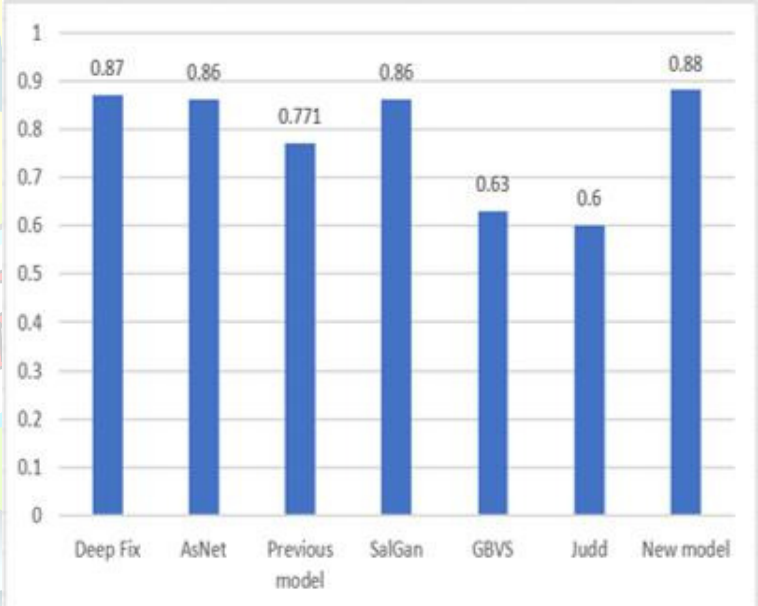

Fig. 7. Area Under Curve graph over different models

them,cov(S, G) finds the covariance of S and G and ranges between -1 and +1, and a score close to -1 or +1 indicates a perfect alignment between the two maps. The most evident difference of classic models compares to deep architectures is the lack of ability to extract higher level features, objects, or parts of objects. The deep structure of CNNs allows capturing complex features that attract gaze automatically. This is the main reason behind the big performance gap between the two types of models.

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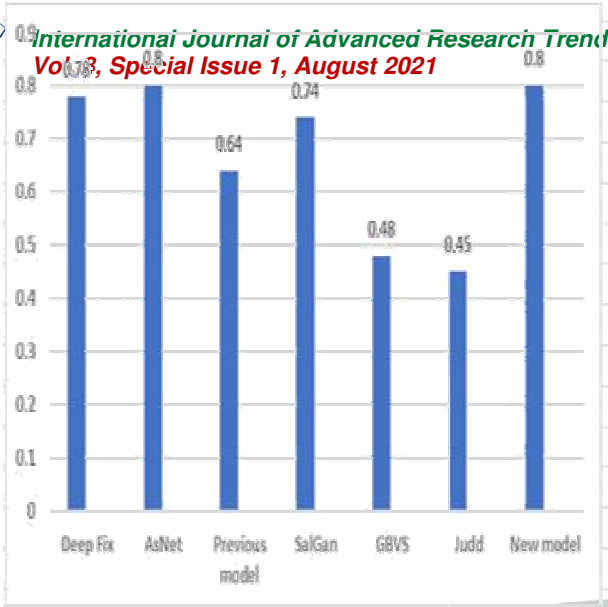

Fig. 8. Linear Correlation Coefficient graph over different models

V. Conclusion

Vision in general and images in particular have played an important role in human life. Visual saliency has been an increasingly active research area over the last few years. Several models are developed to find the visual gaze in an image. These are commonly represented by saliency map. This work presented a novel deep learning architecture for-saliency prediction. Our model uses segmentation and fixation approaches to generate the saliency map. The map generated point out the salient object more clearly than other model. And calculate the AUC, CC and NSS and get a value about 0.88,0.80 and 1.9.

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Virtual Reality in Education Sector during Covid-19 Pandemic

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***Abstract*— this paper highlights the technological advantages of virtual reality, primarily focusing on the possible applications of this technology in the educational sector and the necessity of utilizing it during times like covid-19 pandemic when regular remote learning is hindered. Covid-19 pandemic created many issues and its influence on the educational system is particularly concerning. The conventional methods of education have come to a standstill and students are suddenly pushed into a world of computerized learning, which is inadequate for providing a wholesome and effective learning experience. At a time like this, we should maximize the resources available and implementing virtual reality in education will enable students to learn by getting a perception of the real-world objects rather than what is presented on a computer screen. After reviewing over twenty-two research papers and articles we identified that the implementation of virtual reality in education not only gives essential knowledge to the students but also allows them to "experience" what is being taught on their own. This will make the learning process interesting and easy. Virtual Reality can erase the challenges confronted by the educational sector and can provide students a safe environment with socially distanced and low-risk health situations.**

Keywords—Virtual reality, Education, Oculus Rift, Wired Glove, Augmented reality

I. INTRODUCTION

The COVID-19 pandemic has created the necessity for transformations of remote learning to not only survive a deadly pandemic, but to be potentially acceptable to a new environment. Students have to take classes online. In this situation a trend among governments across the world has been emerging to emphasize the potential for new technologies such as artificial intelligence, virtual reality and augmented reality to mitigate the problems of remote learning. This paper will provide an introduction to the technology of VR and its possibilities in the educational sector bringing two worlds into a unique perspective. On one side, virtual reality with its technological peculiarities and on the other side, the education sector during covid-19 pandemic. Virtual reality is the logic of immediacy and control that creates an atmosphere of being there in the real-world. VR alters the mode of interaction of learners with subjects. VR requires interaction. It helps students in active participation and to discover the unknown extents of knowledge. VR also makes it conceivable for disabled students to learn and do science experiments. Thus it provides an atmosphere where students can study by experiencing each

and every matter in their peculiar way. In virtual reality new models are made possible for creating a virtual world for studying things that are not realized before.

II. VIRTUAL REALITY

Virtual reality is an environment that consents the physical presence of the real world to each user. The definition of virtual reality is that it is an environment generated by a computer which mimics reality by means of interactive devices that send and receive information and are used as goggles, headsets, gloves, or bodysuits. The delusion of being in the shaped environment is acquired by motion sensors that pick up the user's movements and alter his or her vision accordingly. Using different methods of VR and artificial experiences a replication of the real-world environment can be reached. Not only vision but other senses like touch, smell, and hearing will be made possible. Head Mounted Display devices allow vision of 360-degree in a virtual environment. VR came into being from the 1950s. The Sword of Damocles [6] is known as the first virtual head mounted display system invented in 1968 by Ivan Sutherland a computer scientist and one of his students Bob Sproull.

III. VIRTUAL REALITY IN EDUCATION

Virtual reality creates a virtual atmosphere for learners where they can develop their skills without any real-world consequences of failing. They can change from a two-dimensional view of objects to three dimensional experiences where learning becomes easier. Primary education, anatomy teaching, military, astronaut training, flight simulators, miner training, architectural design, driver training and even bridge inspection has been applicable by virtual reality. VR enables engineers to see prototypes in a virtual manner. Expanding remote training methods with virtual training systems is becoming useful in military, engineering and healthcare training.

In Japan, some students at a new online high school appeared in their opening ceremony by putting up headsets created using virtual reality. The N High School, operated by publishing and Media Company Kadokawa Dwango Corp., stated that out of its 1,482 freshmen 73 of them participated in the ceremony using the headset-figure 1. These headsets and School campus were connected so that the wards would have a 360-degree vision of the surroundings inside the campus. The students need not have to visit the campus regularly because they promote every activity to be held online.

A. Covid-19 Pandemic

In the on-going COVID-19 pandemic situation, virtual reality features and theories can be employed in teaching as well as learning areas so that it can be effectively implemented to solve or confront many of the issues regarding online classes arising nowadays. Implementation of VR technology increases recently due to the prevailing epidemic of the SARS-CoV-2 virus. People are restricted for gatherings, the number of people in quarantines is increasing and recommendations related to maintaining social distance and avoiding face-to-face meetings have led to this rapid evolution of the existing educational process focused on remote book learning. This crisis has made limitations on tools available in the process of remote education. These limitations were significantly related to practical training areas, access to advanced equipment, apparatus and whole stands and technological lines. So, understanding this situation, it is clear that VR technology makes up an alternative form for practical education. [18] Unexpected situations like a calamity or pandemic in this rapidly increasing world of technology can create a new education revolution using virtual reality. Application of experimental and situational learning makes VR technology more consistent and efficient to use. [22]

Research conducted on Virtual Reality in Education Sector Market Research Report by Component, by Application, by Region - Global Forecast to 2026 - Cumulative Impact of COVID-19 depicts that COVID-19 is an incomparable global public health threat which is creating a negative impact on every industry. The study is centered on the forecasts of the effect of COVID-19 on the markets. The figure 2 shows that Global Virtual Reality in Education Sector Market size was estimated at USD 1,393.04 Million in 2020

and expected to reach USD 1,775.93 Million in 2021, at a Compound Annual Growth Rate (CAGR) 27.82% from 2020 to 2026 to reach USD 6,076.50 Million by 2026.

B. *Efficiency and Benefits*

The COVID-19 pandemic created a state where students and educators are led into a world of computerized learning. Although it is a sudden drastic change it helps to implement many technologies into the education system for students. But the students are experiencing more difficulties focusing on one screen. Implementing VR technology implemented in classes creates the advantage of concentrating on things in front of the eyes with much attention and also provides interaction with live study materials and excludes any potential side stimuli. This technology can make books, lectures and exercises more interactive and immersive thus becoming an ultimate solution for seizing the attention of students. Benefits seen using virtual reality learning techniques are:

1) Learning using Virtual reality

Virtual Reality apps are available for students which makes it easier to have hands on all study materials in real world experience. Apps like IMAG-N-O-TRON make the pages of a book come alive. EON Experience [7] provides many virtual reality courses that include vast studies on countless subjects.

2) VR and distant education

Virtual reality applications in school education allow students to take part in any classes from anywhere on Earth. Different technologies like rumii, Engage, AltSpace allows students enroll in different courses or to join different groups acquiring knowledge and practical skills.

3) Virtual College Tours

Virtual college tour is an interesting thing at a time like this. Columbia University offers students virtual college tours. VR technology for professionally playing football which gives a real experience of playing in a full stadium has been adopted by Michigan University.

4) Training and Vocational Education

Technological applications like zSpace provide a virtual environment which allows technical training for students in specialized manner.

5) Determine Future Careers via VR

Creating virtual environment in education benefits students to determine their future careers with “Google Expeditions”. It drives through an individual expert's workday, duties or career paths.

6) Education for specials

VR in school education provides aids for special students. Technology called Near Sighted VR Augmented Aid helps students with vision problems. SignAloudGloves allows such students to communicate within a virtual environment using sign language.

IV. VIRTUAL REALITY DEVICES

Development in technologies has brought different specific devices for enhancing the use and working of Virtual Reality (VR). Here we mention some basic descriptions about the highly advanced and most frequently used technology devices with VR, these devices are popular devices in the market.

A. Head Mounted Display

While talking about VR, an image comes to our mind of someone with a device on his head, covering his eyes. Many Head-Mounted Displays (HMDs) are used and purchased from our market. Some devices have solid displays and tracking systems that enables its user to visualize 3D images/videos through a virtual medium and consists of a virtual camera which moves according to the user’s head movements. [10][2] Commonly used HMDs are:

1) Oculus Rift

The Oculus Rift (figure 3) is a headset device which is used repeatedly and is focused on gaming and learning purposes. It comes up with an extended view, in-depth vision, and fast head movement detections. It works by processing data which is observed through a 3-axis gyroscope, accelerometer and magnetometer, which gives the user a fast and clear image, without any delays. It is having innovative maintenance and improving technology day-by-day. [2] Four years after

introducing oculus rift to the market, the first market introduction was launched in early 2016 and sold initially from the official Oculus VR website which gradually made its path in the market between retailers and users from different parts of the world.

2) Cave

Cave Automatic Virtual Environment also known as CAVE (figure 4) is a room used for visualization, mainly to set up a virtual reality environment and creates much experience virtually. Many projectors cover the walls of a room with stereoscopic images and the user has to use head mounted devices or glasses which coexist to various alternating images through projectors and speakers that are placed on all corners of the room to deliver a better high-quality sound [3]. The device named ImmersaDesk was developed and created for the CAVE. It shows a screen which corresponds to one wall of the CAVE and furnish with stereoscopic vision of desirable images with a head movement tracking device, which uses a particular screen and is denoted as semi-immersive VR. [2]

B. Input Devices

The usual perspective to input data in VR systems includes movement recognition. Having a device which reads senses and processes natural movements would change the human-computer interaction to a more instinctive way. The most commonly used data input devices associated to virtual reality is:

1) Wired Gloves

A wired glove is a device which comes up with various sensing detectors and data input using human-computer interaction (figure 5). A motion tracker is a magnetic tracking device which is connected to attain the position and movement of the glove. The movements get collected and analyzed by certain software, so that these can be structured and developed into useful information to recognize signs or other symbolic languages. It senses the movement of hands and fingers to give instructions based on its movement.

2) Wands

In wands (figure 6), the console has the ability to acquire the IR light by a sensor which is placed at the top/bottom of the television and has five emitters of infra-red in each of its sides. The console calculates the area between the console and screen so that the movement of the controller is measured by triangulation which denotes the distance between a certain point and the place where the controller reads the infrared to get information regarding the user movements.

C. Computer Vision

The Microsoft Kinect is one of the most famous device technologies for computer vision. It is used by many industries, universities and hobbyists as it gives a perfect visualization technique through reverse engineering and particular motion sensors. [2] [19]

V. VIRTUAL REALITY APPLICATIONS

As you know virtual reality is a leading technology now-a-days and has many applications. From our detailed studies we found certain main applications that are given below:

A. In Laboratories

We know that virtual reality is a modern technology for experiencing the Real World (RW) virtually by computer-generated content on a particular range of a system or presentation. In the last few years, the applications of VR have changed the marketing levels and have got many users. It is portable and widely accepted and is now available on mobile and other technological devices. They can create a wide impact in laboratory purposes and for students who use these technologies for learning in an exciting manner. It can immerse the user into a virtual computer world, where you get a chance to visualize things much better and clearer.

In laboratories, this can be implemented in various forms of simulations and learning. VR helps in providing professionals use laboratories as an opportunity to experiment, evaluate studies and improve their skills and ideas in a safe and well-mannered environment. Also, the traditional scheme of education for engineering students is through lectures or seminars which are usually held in classrooms or halls. The verbal explanation along with use of educational tools like a white board, projectors and desktop or laptop lets the teacher to avail the digital materials

such as slideshow presentation or multimedia projecting through a digital projector onto the white board will create a learning approach which is active from the instructor side but passive from the student side as described by Sampaio, et al. [14] So definitely use of such small methods can bring changes in students perspective to traditional education and VR can issue them much advanced and innovative method of learning.

Following points shows the importance of implementation of VR Labs in your Institutions:

- Ease of Learning
- Useful and futuristic design
- Continuous improvement and update
- Reduces installation costs
- Varied range of experiments
- Environmentally harmless

Based on our team research, we found that last year Samsung India inaugurated their Samsung AR-VR Innovation Lab at IIT-Jodhpur, to train students on augmented and virtual reality and make them job-ready. This initiative has inspired in choosing VR over any other technology as it stays so close to the minds of learners and will benefit in the growing digital technology market and develop their talent.

They create an advantage for the universities, promote distance learning, and help students who need special attention or have disabilities. Utilizing this VR application, the basic need for laboratory works is shifted from being location-to device-oriented. If distance learners have the means to buy their own VR devices, they can absorb by experiencing the same level of education as full-time students on campus as detailed by M. Soliman. [15] VR Laboratories avoids any possible physical, chemical or biological waste that is produced as a final result of various experiments.

B. In School Education

For education purposes, virtual platforms usually simulate the children in classrooms as we find that human beings learn different things by their experiences, interactions with their surroundings and by using senses to gather information from all around the world. Virtual reality gives an experience the same as in the real world by the sensory input created by computer simulations. It provides an interactive atmosphere by responding to the human acts and movement by the natural behaviors of humans in the real physical world. So, it verifies that VR is a powerful and useful resource that helps in teaching by visualizing things through a virtual environment that allows students to learn to experience various situations, which is better than creating imagination of various topics. The nature of VR systems derives from three sources: immersion, interactivity and multi-sensory feedback as explained by Chris. [4]

Now the virtual environment is more reliable than the real environment and it undoubtedly develops a better education system for students in primary, intermediate or higher secondary levels of schooling. Virtual reality allows the user to build their ideas and critical thinking. In this covid-19 pandemic situation, the traditional mode of teaching cannot be applied effectively to an extent and introducing certain modern techniques and devices such as VR can improve the mode of education for each student. Virtual reality is attempted in classrooms by following ways:

1) Augmented Reality

Augmented reality (AR) is a technology which imposes virtually created images onto the physical real world. The visualization of the virtual objects in this real environment have encouraged and motivated students in experimentation and developments of things that are not applicable in this world. [13]A study done by Antonietti et al. (2000) found that by analyzing some children through an in-depth virtual tour of a painting and allowed them to examine every characteristic of the painting made them understand by their description and interpretation of the paintings, compared to another group that studied the painting without using of VR. [1] This study conveys how learning by virtual visualization is better than any modes of education induced. Another experiment was carried out on 91 primary students in sixth-grade where they used an AR application "WallaMe" which educated them on instructive methods in education of arts. After analyzing the end result of studies, they found a great significant improvement in academic performance, gathering of information, collaborations and motivations. [13] According to Wikipedia use of virtual and augmented reality in

primary education, augmented reality has developments for more mainstream academics. 3D customized and printed textbooks for students provide a more collective way of educating and evoking. The Institute for the Promotion of Teaching Science and Technology has launched a geology textbook which gives students a chance to learn traditional information of virtual interaction with the various layers of the earth's core.

2) Virtual Field Trips

Exploring field trips virtually, students can study and visit places as part of their education which is much reliable in this COVID-19 scenario. Virtual field trips help in developing learning simulations in students while experiencing the lessons. They could visit museums, historical monuments and to different regions through a complete virtual enhancement. Virtual field trips can also allow primary school students in rural areas to have an improved career exploration opportunity that's hardly available for them. These experiences develop a growth in their interest and encourage them to pursue better careers and create a whole new world of intellectual learning and growth. Close visualization of objects which are difficult to find in this physical world improves their educational values.

The main focus of the Virtual Field Trip at present is not to substitute the traditional field trip but to introduce students to the fundamental and basic skills needed to recognize the environment before going for the 'real' field trip. [16] This mode of field trips encourages the participation of the students and engages them in the virtual environment with their instructors or tutors.

3) Historical Studies

With the capability to create immersive simulated experiences, virtual reality is evaluated as an enhancing teaching method for history classes. A study on findings from the history of the Roman Empire with a virtual reconstructing mechanism of a Roman city showed remarkable improvement in the learning and academics of the students. [11] Researchers who studied this research suggested that the increase in incentive for learning boosts interactivity and its vivid experiences are keys to the accomplishment of this experiment, it also developed interests in conducting larger-scaled studies on teaching history for students using virtual reality. [11] A VR museum can help in visualizing finest and best museums from all around the world, as it exhibits visuals without any protective glasses, crowds by tourists, and security procedures. The advanced technology to see everything by its excellent graphics gives the users much realistic and enthusiastic moment in watching the world's most historical and finest collections in the museum. VR museums have been developed and are still in practice over different countries. It will support them during this COVID-19 pandemic to develop learning and explore things without travelling across each place.

C. Astronomical Research

A virtual world or virtual representation is used for many purposes, mentioning one among the many applications is for space representation and for studies regarding astronomy. Creating a virtually visualizable world where researchers and scientists can inspect and study about various astronomical objects and notice various studies. NASA has been using VR technologies from past decades and primarily used for training astronauts before flight and visualizing the take-off. Apart from scientists, for students it creates a development in imagination and aids in sighting the space from our world. The most notable feature of VR is the immersion. The immersive characteristics of Virtual Reality Learning Environment (VRLE) shown over figure 7 utilizes role playing and learning by much interactive experience on learning main science and astrophysics. To enhance immersion through VR, we can wear stereo glasses to see the 3-Dimensional visuals or we can use a 3D head mounted display (HMD). [9]

This empowers students to study and get further concepts about each planet, celestial bodies, comets, galaxies and several other astronomical objects.

According to a research conducted by, Heebok Lee, Sang-Tae Park, Hee-Soo Kim and Heeman Lee, for twenty-two undergraduate students doing majoring in science education in Kongju national university of Korea to survey their opinions of their IVRS (Immersive Virtual Reality System) for the intellectual effectiveness which is shown over figure 8. The idea for the study was for their

Virtual Solar System programs. The scholars were supposed to learn about our planet Earth and its Moon system and the characteristics of the orbits. Then after presenting the virtual solar system visualization and many other class activities, they tested the students' knowledge developments and noted the students' suggestions and reviews on the virtual solar system program and IVRS. [9]

D. Medical Informatics and Technology

The medical need for virtual reality is developing frequently, and the ideology has changed from a basic research level to a complete clinical area for health informatics and for various other developments. [12][5]

Researches and studies are well encapsulated by the yearly "Medicine Meets Virtual Reality" meetings. [20][21] The conjunction of physical and informational technologies: options for a new era in healthcare, technology and informatics and the commercial impact on this technology are already at an advanced stage. [5] The practice of virtual reality in training for different medical groups embraces diverse aspects. In some cases, virtual reality is effective. VR can help with the study of gynecology and obstetrics which could show much on the growth of infant and maternal health. Image guided surgery is another application where virtual and actual objects are fused into a single plot, calling for virtual and AR techniques. [17]

VI. FUTURE OF VIRTUAL REALITY

So, looking more towards the future developments of VR, we can see that it's still advancing technology which is capable of transforming the educational, business, and medical system. By looking onto current COVID-19 Pandemic, and this situation by taking safety measures by social distancing and having remote online-learning, jobs, events, researches we can approximately say that the invention of VR is an additional tool for which is likely to become more trending in the upcoming years, rather than technology and educational unfamiliarity. By enhancing the use of these technologies, we could later bring an outstanding education system to schools and universities. We have to be heavily dependent on the use of technologies like virtual and augmented reality; therefore the educational institutions, universities and several other education systems can apply it and will have a certain mode of use and provide high educational growth as well as standard method of education system from their institutions to students. [15]

There are a number of proven advantages of using VR expertise in education. Firstly, VR enables an outstanding visualization, which might not be possible to obtain in normal traditional classrooms. This reflects the world of thoughts and minds of our future young generations and finds it comfier. It's making everybody be anywhere they want to discover, despite their status, financial backgrounds and inability to be a part of various educational methods. It allows virtually accessing unlimited resources, information, books or articles. These modern technologies should be accessible and implemented in classrooms and based on our current scenario where students struggle in traditional methods of learning practice and find it hard to understand various lessons and practical skills. Throughout this pandemic and remote learning situation, introducing these technologies to curriculum could easily help students in effective learning and also increase engagement, cooperation and their involvement in studies. It will help undergraduates in using this mode for highly efficient technique of learning, which encourages self-study and individual pursuit of knowledge. [8]

CONCLUSION

Everyday technology is bringing drastic deviations to our world and virtual reality is one among them. It can rise to the next footstep towards development in future. VR technologies should be increased to higher levels as it helps to level up the social, economic and educational status in our lives. The method of bringing virtual worlds or objects to the actual world just in front of us and visualizing them through machines from anywhere is mysterious. Virtual reality makes it possible for us. So far, this technology has brought many innovations and will develop amazing inventions that can be executed over

time. During situations like COVID-19 pandemic where lockdown and social distancing is maintained, VR can remain as a leading technology to bring up the loss of reality. Moreover, virtual reality in our education will erase the burden and competitiveness that classrooms often bring and can create an atmosphere for students to feel more encouraged and empowered while learning and practicing through VR devices. As a conclusion, we can attain ideas and end results from our paper about virtual reality and how its expansion in the market leads to a promising fast-growing technology for future generations throughout their life.

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Figure 1-Virtual ceremony held by N High School in Tokyo

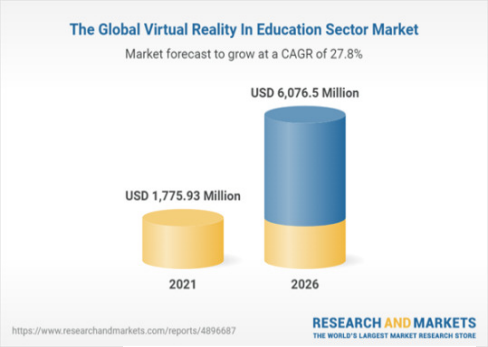

Figure 2- Estimation of Global Virtual Reality in Education Sector Market size

Figure 3- Oculus Rift

Figure 4- Cave Automatic Virtual Environment Model (CAVE)

Figure 5- Wired glove

Figure 6- Wands for VR and gaming console

Figure 7- Virtual Reality Learning Environment (VRLE)

Figure 8-Example of Immersive Virtual Reality System

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IMAGE COMPRESSION USING CNN

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ABSTRACT

Artifical intelligence is an area of computer science that emphasize the creation of Intelligence machines that work and react like human . ie, machine can learn and think .The team machine learning , deep learning, AI and Convultional neural network are interconnected with each other. Deep Learning is a subset of machine learning and machine learning is a subset of AI, which is an umbrella term for any computer program that does something smart. Machine learning is set of algorithms that parse data, learn have learning to make intelligent decision. Convolutional Neural Network is a type of artificial neural network used for image recognition and processing specifically designed by processing pixel values.

Keywords :CNN,ANN,NLP

CONVULATIONAL NEURAL NETWORK

CNNs are powerful image processing, artificial neural network (ANN) that is used for Image recognition and processing by processing pixel values. Instead of the other traditional method, CNN uses the multilayer *perceptron* model. The layers of CNN are arranged in such a way as to cover the entire visual field. So we can overcome the piecemeal image processing problem of traditional neural networks.

A CNN uses a system much like a multilayer perceptron that has been designed for reduced processing requirements. The layers of a CNN consist of an input layer, an output layer and a set of hidden layer that includes convolutional layers, re-lu layers, pooling layers, fully connected layers and

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normalization layers. The removal of limitations and increase efficiency for image processing results in a system that is far more effective and can be used along with natural language processing(NLP).

$$z(t) =$$

Fig.1

How it works..?

We have to discuss about how a digital image is compressed using CNN and the role of each layer. Nowadays we have several CNN models there like ALEXNET, ZF NET, GOOGLENET, VGG 16,RESNET etc.

If we take an example of a 28 * 28 image . Basically we know that a digital image is a matrix of pixels ranging from 0-255. So in the input layer, we have 784 individual cells to store each pixel values. Then it is passed to the next CNN layers.

CONVOLUTIONAL LAYER

Here we used some filter matrix(kernel) to the classify each and every object in the input image. We stride the kernel over the image and got a resultant output matrix. There is an *activation function* which takes the cross product of both input image and the filter matrix.

The output will be a grey scale image with negative values which helps to identify each object and their boundaries.

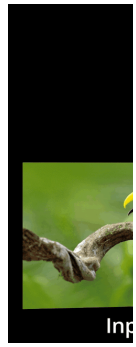
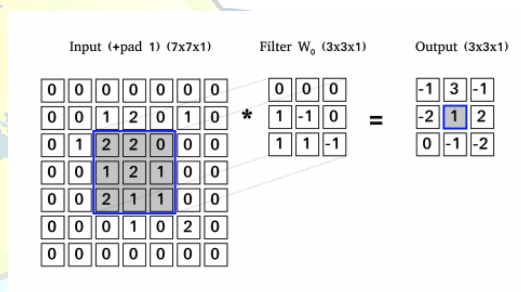


Fig.2

Fig.3



RE-LU LAYER

The output of convolutional layer is the input of the re-lu (rectified linear unit) layer. Here we remove the negative values in the matrix. So that we can focus on each single object in that image. We use re-lu function and sigmoid function to perform this.

Re-lu function

$$R(x) = max(0,x)$$

Sigmoid function

$$f(x) = \frac{1}{1 + e^{-x}}$$

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Then we got an output like:

15	20	-
18	-110	2
20	-15	2
101	75	1

Fig.4

POOLING LAYER

The image compression takes place in this pooling layer. We take the maximum value in each window and stride over the matrix. In this layer , we need to add some empty rows or columns to make it square matrix called padding.

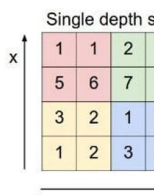

Fig.5

In this figure, we take the maximum value in each striding window. So that we can compress the image without any data loss. Then the next layer is fully connected layer.

FULLYCONNECTED LAYER

Here all the layers are combined together. So that we can get a specific output. If we take an image as input, then the compressed size is determined by

$$[W - K + 2P / S] + 1$$

Where W: Input matrix pixel size

K: Kernal matrix size

P: Padding size

S: Striding size

Here we can see the difference between the compressed image using CNN and the current method. It is clear that the output of CNN method is more clear and specific than the other.

CONCLUSION

So we can conclude the topic that by using Convolutional Neural Network, we can overcome all the current drawbacks in image processing. Gives more accurate output. It will be more faster and efficient. The multifocus concept can be possible. We can compress image without any dataloss. So it will be a beginning in image processing, when we use CNN.

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[II] *Multifocus Image Fusion Using Wavelet-Domain-Based Deep CNN Jinjiang Li ,1,2 Genji Yuan ,1,2 and Hui Fan1,2*

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IMAGE SPLICING DETECTION - COMPARISON OF DMAC AND DMVN NETWORKS

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Abstract---Constrained image splicing detection and localization (CISDL) is a difficult task for image forensics that examines two input suspicious pictures and determines whether one contains suspected portions copied from the other. Here a unique adverse learning approach for training the deep matching network for CISDL is presented. The goal of the deep matching network based on atrous convolution (DMAC) is to create two high-quality candidate masks that show the suspicious regions of the two input pictures. The correlation layer based on the skip architecture is proposed to capture hierarchical features in DMAC, and Atrous spatial pyramid pooling is used to extract features with rich spatial information.Another model called DMVN uses the same process as DMAC but it is not use atrous convolution. Atlast a comparative study of both models was done ,in which the DMAC model is better because it gives high resolution fined grained mask.

Keywords:Atrousconvultion,DMAC,DMVN,CISDL

I. INTRODUCTION

Malicious image forgery is becoming a global epidemic in recent years, due to the rapidly declining cost of digital cameras and quick development of sophisticated image editing tools. Forgers may use forged images to produce fake news, spread rumors or give false testimony, which result in negative social impacts. Image forensics, which seeks to distinguish forged images and prevent forgers from using forged images for unscrupulous business or political purposes, has attracted great attention in research and industrial communities. A variety of image forensics methods investigate an individual image and detect its high-level or low-level inconsistencies caused by image manipulation. However, it is still a challenging task to accurately distinguish forged images, due to advanced image manipulation techniques and limited information provided by a single image. Moreover, these image forensics methods identify forged images or regions without providing the source of forged regions or specific tampering process, but these auxiliary evidences can provide more clues and make results more convincing in real applications. Constrained image splicing detection and localization (CISDL) is newly formulated in the Media Forensics Challenge. Different from "conventional" splicing detection, "constrained" means that the inputs are two images: one is a probe image and the other is a potential donor image. In CISDL given a probe image P and a potential donor image D, CISDL aims to detect if a region of D has been spliced into P, and consequently provide mask images Pm and Dm indicating the regions of P were spliced from D. DMVN generates correlation maps by comparing high-level low-resolution feature maps of VGG, and constructs an inception-based mask convolution module to locate suspected regions. However, low-resolution feature maps restrict DMVN's ability to detect accurate boundaries and small suspected regions. Here proposed a deep matching

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network based on atrous convolution (DMAC) to generate high-quality candidate masks from high-resolution feature maps.

The basic DMAC architecture achieves significant improvements over DMVN.

This work, proposes a DMAC network which takes two images as inputs.These input images are fed into a atrous convolution network for feature map extraction.The extracted feature maps fed into the correlation layer and atrous spatial pyramid pooling for feature maps comparisons.

Fig 1.a)Donor Image b)Donor Mask c)Probe Image d)Probe mask

II. LITERATURE SURVEY

In [1] Proposes a new convolutional layer that suppresses image content and learns forgery detection.In [1] they proposed a CNN to learn manipulation detection features directly from data and it is used in image forensicsIn [2] DMAC is combined with adversarial learning for effective image forgery detection.In [3] propose an optimized 3D lighting estimation method by incorporating a more general surface reflection model.In [4] propose a framework to improve the performance of forgery localization via integrating tampering possibility maps. In [5] proposed algorithm automatically computes a likelihood map indicating the probability for each 8 × 8 discrete cosine transform block of being doubly compressed.

III. PROPOSED METHODOLOGY

In this section, explains the proposed framework, as shown in fig 2. In the DMAC model there are three modules namely feature extraction module, correlation module and ASPP (Atrous Spatial Pyramid Pooling) . In the feature extraction module atrous convolution is adopted to enrich the spatial information of convolutional features.

In the correlation module ,the skip architecture is designed for hierarchical features comparisons and in the ASPP module is used to capture the information of different scales, Atrous Spatial Pyramid Pooling is constructed to generate the final mask. ASPP contains multiple parallel atrous convolutional layers with different sampling rates.

In DMAC Model,two images as inputs probe and donor.In which donor is the is the original image which is captured by camera also called as authentic image and probe image is the image containing spliced portion of donor image also called as tampered image.This two image is given as input to the model and it produce high resolution fine grained mask as output.The DMAC model is using atrous convolution which is used to give high resolution mask.Atlast creating another model called DMVN , in this which is not using atrous convolution and compare with DMAC model for accuracy.

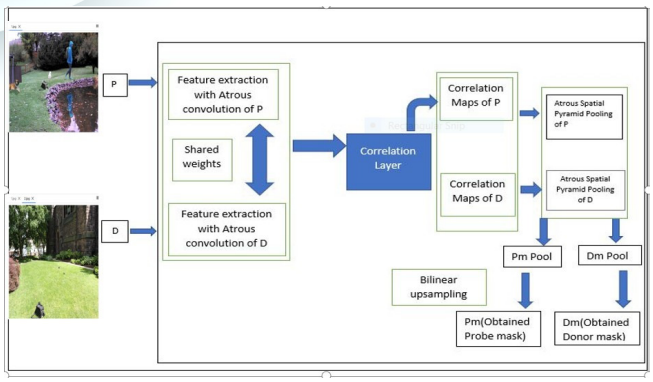

Fig 2.Proposed System Architecture

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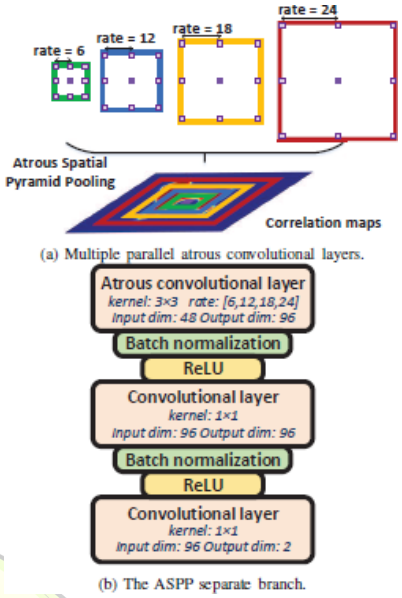
The DMAC network is an unique adversarial network in which feature extraction modules employing atrous convolution, the correlation layer with skip architecture, and ASPP are designed to enrich geographical information.In DMAC atrous convolution, the correlation layer and ASPP are used to capture hierarchical properties and localise impacted regions at many scales, respectively. The detection network and discriminative network, which act as losses with supplementary parameters, monitor DMAC's adversarial training.



(a) Multiple parallel atrous convolutional layers.

(b) The ASPP separate branch.

A. *Feature Extraction with Atrous Convolution*

CNNs' pooling or downsampling techniques necessarily degrade the spatial resolution of the output feature maps. As a result, in this research, atrous convolution is employed to create high-resolution feature maps. Atrous convolution allows us to vary the field-of-view of filters by adjusting the rate value without adding any more parameters.This module alters the image by adjusting the colour, contrast, and light intensity, which aids in the creation of a high-resolution mask.

Assume the input feature maps are scaled down by a factor of two before being convolved with standard convolution filters. The created feature maps are just a fourth the size of the original feature maps, and traditional filters only acquire answers from a quarter of the image locations. If we eliminate the downsampling layer and directly convolve the input feature maps, the filters will have a smaller field of vision. Fortunately, we may keep the original field-of-view by employing atrous convolution with rate r = 2. Using atrous convolution techniques, we can create high-resolution feature maps, get all answers from the input feature maps, and don't need any additional parameters or calculation.Despite the fact that the effective filter size increases, we only need to examine non-zero filter values, resulting in a constant number of filter parameters and operations per site.

B. *Correlation Computation Module*

To build dense high-resolution feature maps, atrous convolution is used as the basic process.One of the most difficult difficulties in deep matching tasks is deep feature comparison. For other tasks, only the neighbouring fields are compared, allowing for the creation of complex correlation layers. They usually compute the scalar product of a pair of individual descriptors at each place for long-range correlation computing tasks.We can denote correlation computation procedure as a function. The skip architecture is proposed to effectively organize the atrous convolution and hierarchical convolution features.It makes full use of the feature extraction module's wealth of information. Three sets of feature maps are produced by the atrous convolution layer: f3, f4, and f5. As a result, three sets of correlation feature maps can be created using the feature maps f3, f4, and f5, with no upsampling or mapping functions required.The computation procedure of the proposed correlation layer based on the skip architecture can be summarized as Algorithm: The skip architecture is used to compute the correlation layer.

C. *Atrous Spatial Pyramid Pooling*

The fact that the tampered portions are on different scales is a problem in the image splicing detection technique. The final masks are generated using Atrous Spatial Pyramid Pooling (ASPP), which captures the information

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on multiple scales provided by the correlation maps.Simply ASPP is a discriminative network that drives the DMAC network to produce masks that are hard to distinguish from ground truth ones. Multiple atrous convolutional layers with varying sampling rates are present in ASPP. As a result, those obscene convolution filters have varying field-of-views and can focus on altered parts of various scales. A separate branch of convolutional layers, batch normalisation, and ReLU layers follow each atrous convolutional layer with one sample rate.The individual branches are then merged to create the finished masks. During mask formation, there is no upsampling operation with learnable parameters, thus we just use bilinear upsampling during test time.

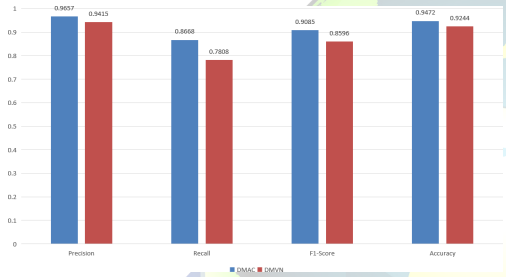

Fig 3: Atrous Spatial Pyramid Pooling [6]

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IV. RESULT AND DISCUSSION

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Precision: 0.8541114489666498
Recall: 0.9286295170072838
F1 Score: 0.8898130659054911
Accuracy: 0.9384002685546875
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Fig 4- Result of DMAC Model

Fig 5- Comparison Between DMAC and DMVN

V. CONCLUSION

This work provides a simple but effective framework for detecting image splices. A unique adversarial learning framework is proposed to deal with the CISDL task. To improve the DMAC network's ability to detect small matching regions and multi-scale regions, atrous convolution, the skip architecture, and ASPP are used.A lot of experiments are conducted on all generated datasets and also all publicly available datasets.The experimental results demonstrate the appealing performance of the proposed adversarial learning framework and the DMAC network.The use of atrous convolution and ASPP has clearly increased the effectiveness of the algorithm compared to the existing ones.Although the techniques to detect small tampered regions and regions under huge changes still need further research.

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Impact Of Covid19 On Online Shopping And Review on Some Machine Learning Algorithms

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Abstract— *The covid-19 crisis has brought with it several changes in our society of which the changes in shopping patterns is prominent. To be more precise, the pandemic created an era of online shopping. Traditional purchasing is now replaced with E-commerce .The wide variety of products offered , low expense ,time saving ,ease of transportation are all reasons contributing to this. At the same time there are many challenges and difficulties too, like the need to sustain customer satisfaction. Consumer opinions and transactions are monitored using machine learning techniques to get more information regarding customer satisfaction, interests, shopping behaviours and threats by E-commerce Businesses. But also, there are increasing reports of unfair, confusing, falsified business habits taking place online and many scams also take advantage of the crisis. So the information regarding the users and their interests need be secured and protected in order to avoid fraud and public crisis. The changes in online shopping patterns though situational, can have long lasting effects on entire industry. We have conducted a survey on 150-200 people over the state to analyze the changes in shopping behavior throughout the epidemic .In this paper we give our reviews on papers focusing on the influence of 2019 Novel corona virus (COVID-19) on E-commerce and the changes in the demand and buying behavior of customers. Also, the paper analysis the machine algorithms like J48, Random Forest and Random Tree to find the accurate one.*

Keywords— E-commerce, Novel Corona Virus, Data Privacy, j48 algorithm ,Random forest algorithm, Random tree algorithm.

I. INTRODUCTION

Corona virus Disease or COVID-19 is a rapidly spreading infectious disease, first originated in bats or pangolins. Its first human transmission was reported to be in WUHAN, CHINA and later spread across different parts of the world. Corona viruses are a group of viruses which has the ability to infect both humans and animals and cause sickness. Covid-19 was declared as a pandemic by the World Health Organization (WHO) on March 11th, 2020. The disease is most likely to spread through close contact of within around 6 feet with one having the infection. Fever, breathlessness, cough, sore throat, headache, muscle pains, chills, loss of taste and smell, etc are all the symptoms of this disease. Older adults and people with chronic health conditions are more severe to the illness.

The covid-19 crisis caused many losses to human life worldwide, bought many changes in life pattern and even put forward many challenges to public health, food systems and world of work. Covid crisis turned people's life upside down. Social distancing and lockdowns were introduced, educational as well as business institutions were closed, people shifted their meetups to online platforms, people started working and learning from home, worshipping also turned virtual, people started purchasing online more often, health was taken into serious consideration by many, and so many other changes did also come up. Different sectors were also affected differently. Expert volumes of various sectors including agriculture and fisheries were lessened and a lot more social and economic impacts were formed. Poverty was probably increased in many regions, unemployment rate rose up, tourism and hotel industry also got affected and moreover many people even lost their dear ones during the severe pandemic. This way the changes that followed the disease end up in a very long list. Among all the other effects of covid-19, the change in shopping patterns is very notable.

Covid-19 changed consumption trends globally and in many cases for the long-term. Months of lockdown and social distancing made consumers to think differently on shopping and spending as well. People were restricted to leaving the house only for necessary items and preferred shopping online more often. Face masks, hand-sanitizers and toilet papers were of high demand and so retailers were

forced to limit its number of purchases. Customers began to place a greater emphasis on cleanliness and health, and as a result, hand sanitizers, soaps, cleaning gels, and disinfectant products were among the most popular things purchased during the epidemic. Vitamins and supplements, Detol, Lysol are also in top positions. The pandemic pushed more shoppers online and so a huge rise was experienced in e-commerce. It was found through surveys that India saw greater changes in shopping habits than other countries. Consumption of fruits, vegetables, dairy products increased over junk foods. This way, now people could buy anything just with a click of a mouse. Consumer sentiments changed and so did the myths of shopping online. Consumers who earlier refused to buy online because of their fear in connectivity, inclusion and trust now started to believe in online shopping.

The biggest challenge ever faced by any entrepreneur is of winning and keeping customers. They adopt various steps to meet this and of which knowing their customers are one of the main steps they put forward. They do this through gaining an understanding of their clients' desires, wishes, and purchasing habits. They always try to know their customers even more. The most successful entrepreneurs know about the name, age, income, hobbies, taste, dislikes, and so much about their customers. They collect such information by tracking their customers using the technologies of artificial intelligence (AI) and machine learning (ML). The gathered big data allows retailers to have a better understanding of client shopping behavior and how to attract new customers. Big data analytics is also utilized to generate customer suggestions based on their purchasing history, resulting in more personalized shopping experiences and better customer care. But while people may enjoy shopping online for making cheap deals in the comfort of their home, their financial transactions and shopping accounts could be compromised by countless prying eyes. Many online scams and fraud are found taking advantage of the Covid crisis too. The location data, bank data, personal data are all misused by many. Still, legal regulations hardly protect people privacy against this misusing. Therefore ,this raises the need for a true secure environment for consumers to share their information or data without fear of scams. In this paper, we present the data we collected through the survey that we conducted to study the changes in shopping patterns and to show the frequency of scams. We also put forward our conclusion on three machine learning algorithms to find the better of the three that can be used to ensure data privacy.

II. LITERATURE REVIEW

Privacy is a term which is hard to define. The concept of privacy has a pivotal role in this modern era. It can be found on the works of Aristotle and John Locke too. But the time-honoured definitions of privacy will not be able to handle the challenges made by the technologies, since it is formulated before the arrival of internet. Now everything is going by online, including the job, shopping etc. In which the online shopping is the current growing trend that is found to have high existence in this pandemic period. And there is a rapid growth in the number of online shopping websites which have high market potential. The important thing which is taken to consideration is that the data and . Since it is online, chances are high for the loss of data protection and privacy. According to studies the privacy can have four dimensions and they are the collection of personal information, unauthorized secondary use of personal information, errors in personal information, and the improper access to personal information. It matters when these four things are not taken well. People used to highly bother about the privacy and security and reluctant to use and share personal information in past times, but when the trends had changed and the arrival of millions of online platforms enhanced the people began to be more likely towards online. And thus it became accepted as the part of life. Trust works here. And now during this pandemic it became the only way of communication, purchasing, working, etc. So more than acceptance the needs of people worked here. A numbers of issues are going on this topic even now. It is impossible to complete even a transaction without sharing your personal data. And that is why the data privacy plays significant role in e-commerce. So it is important to gain the trust of people while coming with a new online marketing platform.

Earlier the use of online shopping was comparatively very low. People were reluctant to purchase from online since they cannot choose it by seeing or touching the product. So the trust in online products were less according to recent studies. But now everything have been changed from top to bottom. As a result, the total concepts of people were changed. Number of online shopping customers increased rapidly. During the pandemic and all, online shopping has became the only way of purchasing for people. Studies shows people will continue to stick on to online shopping even after the epidemic since it provides vast options and facilities for the consumers.

Histories shows that the efficiency of machine learning algorithms were reasonably low earlier when compared to nowadays. The hardware devices used were not much developed and advanced in the past times. However the capability of hardware devices had a great role in deciding the efficiency of algorithms. Also the basic vision on the j48 algorithm, random forest algorithm, random tree algorithm was not much advanced. The collection of data sets, analysing the algorithms, etc were merely basic. As a result efficient results were relatively small.

III. METHODOLOGY AND MATERIALS

To know more about the pattern of shopping online during covid19, we conducted a survey on 150 to 200 people of which 51.9% were male and 48.1% were females. People of the age group 20-30 were found to be more to the use of online method for shopping than any other .97.4% people uses online platform for shopping purpose and 82.5% will still prefer shopping online even after the end of covid crises. The survey also shows an increase in online purchase by 74.7% during the pandemic. Also, fashion is the category

that is shopped the most. We could also find that 12.3% had experienced some kind of scam while purchasing online. 12.3% scam being reported from a survey of 200 people is not too small. There are a huge lot of cases of scam being reported all over the world during the covid19 pandemic era as almost everything changed to online mode. Scams related to purchasing of covid vaccines, online foods that cure covid, masks that can prevent covid were noted. Also financial theft and personal data loss was located many. In the last two years of the pandemic 37% of consumers have been victims of application fraud and 38% experienced account takeovers (Survey results conducted in December 2020 of 8653 US consumers of age 18 and above).
Online scammers pretend to be legitimate and use a fake website or a fake ad on a genuine retailer site. Many of these websites offer luxury items at low prices and scam over the consumer either in method of payment or privacy and protection of information they collected. So, we need to ensure the protection of our information and money.

Different algorithms where used to solve this issue. Algorithms like Logistic regression , Naïve bayse, random forest, j48, random tree ,and so were all applied under different conditions to bring up a solution, Here we review the solutions found using j48, Random forest and random tree algorithms to find the best of the three.

A. J48 Algorithm

J48 algorithm is an open source java implementation of the C4.5 decision tree algorithm. J48 algorithm recursively splits a data set to get all the possible predictions. This algorithm uses the greedy method approach to enhance decision trees for classification. J48 algorithm generates decision trees, and it is based on certain rules to classify. Its nodes analyze the existence and the significance of every unique feature. It also has some disadvantages like over fitting, insignificant or empty branches etc. It includes the following steps:

- Step1: First the leaf is labeled with a similar class if the instances belong to similar class.
- Step2: Then, the potential data is figured and its gain is taken from the test on attribute for all attributes.
- Step3: Finally, the best attribute will be selected based on the present selection parameter.

B. Random Forest Algorithm

Random forest algorithm is a supervised machine learning algorithm which is very flexible and also easy to use. It is one of the most popular algorithm. It can be used for classification as well as regression problems in machine learning. And ensemble of multiple decision trees is what makes it a forest. When there is an increase in the number of trees, there will be an increase in the accuracy too and so prevent over fitting. Random Forest algorithm is used in different sectors like banking, medicine, marketing, land use, etc. This algorithm too has many advantages and disadvantages. It enhances accuracy of the model, it can handle large data sets with great dimensionality, it is flexible and easy to use, it is simple and diverse and reduces risk of over fitting. But this algorithm is time consuming, more complex and may require more resources too. It includes the following steps:

- Step 1: Samples are selected at random from a given data set.
- Step 2: A decision tree is constructed for each selected sample which will then be used to give the predicted result.
- Step 3: Voting for every predicted result will be done.
- Step 4 :The result with more number of votes will be selected as the final prediction result.

C. Decision tree or random tree algorithm

Decision tree and Random forest algorithms are two major widely used decision algorithms. Decision tree algorithm is also a supervised machine learning algorithm which can be operated on both classification and regression algorithms. It is like a tree with nodes in it in which the number of criteria decides the branches. Data is split into branches in them and this tree also has root nodes, leaf nodes, children nodes and so on like any other. It has many advantages like it is easy, it is fast, it can handle large data and even numerical and categorical one. But it may over fit, or show more deflections too. Thus, adding to its disadvantages. Its working includes splitting, pruning, selection of trees, entropy, and knowledge gain.

IV. DATA COLLECTION

The data set collected through the survey of 150-200 people gave us different results from which we could predict the shopping patterns of the customers during the pandemic. Here we classify the data set into different attributes like gender, age, use of online platforms, first purchase , application, category, payment, scam experience, reason, post covid shopping, satisfied mode and frequency of purchase and we could also give a description to them(table 1).

TABLE I. ATTRIBUTES AND DESCRIPTION

Attribute	Description
Gender	Specifies the gender of the customer
Age	Specifies the age of the customer
Use of online platforms	Describes if the customer has used any online platforms for shopping
First purchase	Specifies if the customer made his first purchase during covid time
Application	Specifies the most frequent application used for shopping online
Category	Specifies the mostly preferred category for online shopping
Payment	Specifies the mode of payment
Scam experience	Specifies if the customer had any scam experiences
Reason	Specifies the reason for shopping online
Post covid shopping	Specifies if the customer will continue shopping online after covid crisis
Satisfied mode	Specifies the satisfied mode of shopping
Frequency	Specifies the frequency of purchase

V. OBSERVATION

The data that was collected through the survey was analysed as above. Our reviews on papers on the efficiency of the three different algorithms namely j48, random forest and random tree gave us the results as given in the tables.

TABLEII. ACCURACY OF ALORITHMS

Algorithm	Accuracy
J48	75.84%
Random forest	76.81%
Random tree	68.59%

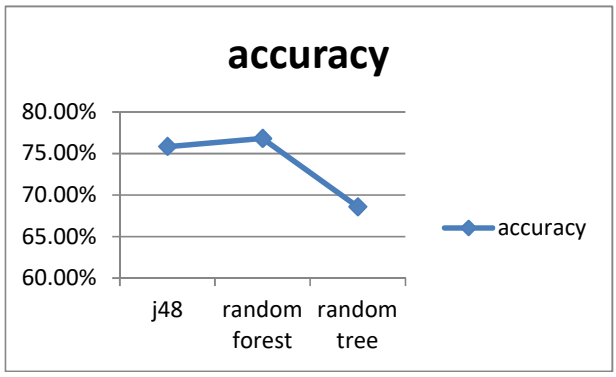

Fig.1 Figure showing accuracy of algorithms

From the papers we reviewed we could give an average accuracy value to the algorithms j48, random forest and random tree as given in the table. We ended up concluding that random forest algorithm was most efficient than others as it showed more accuracy value than other two algorithms. Therefore this algorithm proves to be most efficient one,

VI. FUTURE SCOPE

Recent studies shows that people are more likey to prefer online shopping even in the future. The study we conducted also give us similar results that 82.5% prefer shopping online in the post covid era. So the possibilities for increased scam are not small. Efficient technologies will get developed in the future to prevent scams and to enable better shopping experience online. In this information era, value of data is quite similar to the value of a human life. Hence providing more data protection schemes will enhance the trust of customers. Also it enables better prevention from the scams and fraudulent experiences.

VII. CONCLUSION

In this, paper we conducted a review study on the impact of covid19 on online shopping and the role of data protection and privacy during the pandemic. The covid crisis shifted people to E-commerce platforms which hold the risk of data privacy. For this we organised a survey among consumers of different age groups to study the behaviour of shopping patterns and scam. We could find 12.3% scams in our survey too which shows the traces of more scams occur all over the world while shopping online during the pandemic..The aim of the study was to find the behavioural change in online shopping during the covid 19 pandemic and efficient data protection algorithm among J48, Random forest and random tree for which we reviewed papers concentrating on the efficiency of these algorithms. As a result, we found that Random forest was the most efficient one as it gave more accuracy value. Therefore we conclude that Random forest is more efficient the than other two and can be applied as a solution for data privacy.

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Innovative Approach to Resolving Ambiguity Using Deep Learning

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Abstract

Language is the center of Information trade, where world has around 5000 tongues in the spoken and composed structure, additionally accessible is boundless recorded data composed and put away in these tongues. It's a current day need in this Information innovation period to make accessible this data to the whole world in their reasonable structure for example in their regular language. By and by machine interpretation is endeavored by numerous analysts for coordinated language interpretation or for more than one language pair and with this to make an interpretation of from any to any language requires immense equal projects and corpus and significant issue of tremendous preparing and testing period with different intricacies like tongues in concern show an alternate design, not every one of the words in a single language have identical words in different tongues, various manners by which sentences are assembled, words with various implications which results into vagueness and so forth This paper proposes an open edge work for lingual machine interpretation with unclearness objective.

Keywords—Neutral language, ambiguity, lingual, machine translation

I. INTRODUCTION

Lingual machine interpretation is a need of the present mechanical society where colossal data is accessible normally as records. A large portion of the data is accessible in a specific language. It's anything but a significant worry in this day and age to handle these reports and get significant data where diverse bilingual individual foundation authorities can cooperate. Numerous organizations and associations looking for knowledge into worldwide market require lingual interpretation frameworks for deciphering enormous measure of data accessible in various dialects. Human interpreters with undeniable degree of classification and expert specialists perform interpretation in one specific language. Manual interpretation being costly and adapting up to the developing necessity of cost capability in interpretation of different dialects has made ready for multilingual machine interpretation.

The essential prerequisite for machine interpretation (MT) is accessibility of lexical assets and exhaustive comprehension of the planned language pair, which will be accessible from the syntax rules and its fundamental construction. Anyway every one of the standards are not officially or obviously characterized [4]. Intricacy of the framework again increments at whatever point it should be converted into various dialects. Lingual Machine interpretation from one language to numerous dialects and the other way around is a perplexing errand and accompanies a lot of difficulties arranged as

A. Language structure

- Scarcity of lexical assets
- Dissimilarity in portrayal strategies
- Structural contrasts
- Lexical hole

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B. Context meaning

- Word reliance
- Polysemy words
- Parts of discourse affectation
- Different ambiguities

Lingual machine interpretation shows different significant issues of tremendous preparing and testing period with various dialects in concern displaying an alternate design, not every one of the words in a single language have identical words in different dialects, various manners by which sentences are assembled, and so on One of the significant worries of any made an interpretation of text is to save the right importance of the content, which gives scope for shrewd disambiguation measure. These ambiguities happen in the setting where there are words with various faculties and decoding the inherent significance of the words in the setting becomes troublesome [10].

Contemplating the vogue of the dialects utilized and scattering of the data right now present in assortment of dialects its required that issues identified with word uncertainty ought to be settled so the deciphered data is in the right type of importance, syntax and sense.

Relationship among words in the sentence or setting portrays the proper significance of the planned word. Perceiving the connection between the words is accomplished by noticing the conditions between them. Language structure (subject-object action word) characterizes the conditions between different words. Because of language variety, discovering these conditions is an intricate errand which bodes well disambiguation a difficult issue among scientists. Our methodology focuses to plan a Lingual interpretation system which eases equivocalness by discovering these conditions. The errand our system address is the disambiguation of polysemy words and depends on the utilization of logical data, ontological data and reliance perception.

This paper proposes an imaginative open structure by presenting an unbiased language, planning storehouse and uncertainty goal utilizing the reliance check. Archive gives an advantageous method of incorporating data of various language words and their structures. Each word in the vault in any of the structure is alloted an exceptional code which is generally same for any language across the globe. The creative methodology for producing uniqueness of the code in the archive got from the significance and feeling of the source language will facilitate the Lingual interpretations and will go about as achievement in the advancement of language interpretation.

The proposed Lingual open structure at first advances utilizing three dialects, Hindi as public language, marathi as local language and English being worldwide auxillary language for research reason yet the system is versatile for future improvement utilizing any language. Rest of the paper is introduced as follows. Area II focuses on related work in Word sense disambiguation and Machine interpretation measure. Segment III presents the creative system of impartial language storehouse plan and reliance checking. Segment IV summarizes the end and future work.

II. LITERATURE REVIEW

Regular language preparing's capacity to change our mechanical society has acquired energy. One promising utilization of regular language handling is Machine interpretation and all the more as of late Neural Machine Translation (NMT) is viewed as exceptionally dynamic methodology [9]. NMT requires enormous measure of equal corpus which brings about broad preparing time. Language structure which is a significant part of interpretation is neglected in NMT. Navigli R. in [1] has perfectly introduced a study of Word sense disambiguation (WSD) featuring the inspiration for tackling the equivocalness of words and giving portrayal of the assignment. Lingual interpretation and word sense disambiguation overview was introduced in [6] which features different sorts of ambiguities and examines what way word sense disambiguation is useful in multilingual machine interpretation.

For a multilingual nation like India which is biggest popularity based country in entire world, there is a major prerequisite of programmed machine interpretation framework. With the appearance of Data Innovation numerous records and website pages are coming up in a neighborhood language so there is a huge need of good MT

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frameworks to resolve this load of issues to build up a legitimate correspondence among states and association governments to trade data among individuals of various states. Phadke and Devane in [7] focuses on insightful investigation of multilingual machine interpretation. It chiefly examines about major accessible system like CICC, Google Interpreter and Anglabharati.

The work in MT upholds three methodologies to be specific Direct, Move and Interlingua. The Immediate methodology is an in exactly the same words replacement between language sets utilizing a huge bilingual word reference. The Exchange approach works more than three phases: investigation, move and age. The Interlingua approach, include a comprehension of the substance of writings. Late advancement in interlingua MT is utilization of Widespread Systems administration Language (UNL) which can be utilized to make an interpretation of one language into different dialects without composing code for set of this load of dialects. A ton of exploration is going on UNL everywhere on the world. Presently it upholds English, Japanese and Chinese [12] [13].

It is obviously clear from the writing audit that mass of dialects makes it important to have innovatory multilingual machine interpretation frameworks. One language pair where two dialects are worried in itself adds to the intricacy of the framework. As more dialects are added, intricacies keep an eye on increase in the multilingual situation. Customary multilingual machine interpretation apparatuses like google decipher needs exact interpretation as setting is least considered for uncertainty goal and low quality in target language age. Consequently there is a need to foster a framework which is without equivocalness and gives better accuracy. It is additionally seen that gigantic measure of equal corpus is being utilized which burns-through the preparation time. Since the machine does not have the broad experience of idea insight as that of human, deciphering the right importance of the polysemy word turns into a troublesome issue. Review done on Word sense disambiguation and machine interpretation persuades us to plan another structure which centers around recovering the fitting importance of the equivocal word from the setting utilizing impartial language store and perform interpretation for multilingual frameworks.

III. PROPOSED FRAMEWORK

Lingual MT is a mind boggling task and to work on it, the system is isolated into two sections in particular word sense disambiguation[8] and Machine interpretation as displayed in Fig. 1.

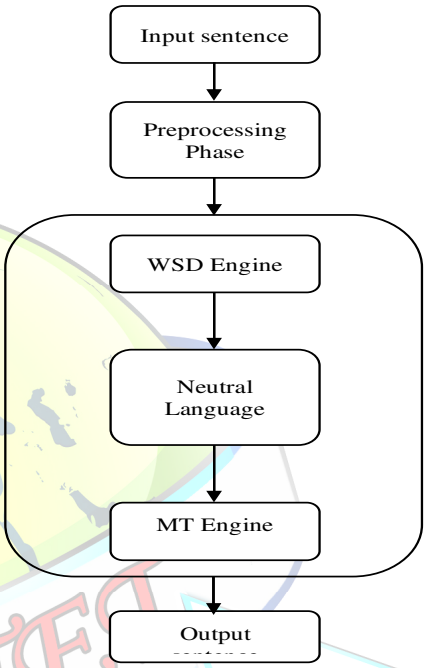

Fig. 1. Proposed lingual MT framework

Existing Lingual MT system experiences keeping up different equal corpus alongside the two route endeavors to help language pair. Allow us to consider the endeavors needed to make an interpretation of from one language to other is E1 which incorporates different handling steps of machine interpretation. It is determined as follows.

E1 = grammatical form labeling + morphological examination + syntactic investigation + semantic examination + uncertainty goal + others preparing required.

Likewise keeping up the equal corpus for the equivalent. Visa versa will be E2.[8] As displayed in Fig. 2, as we add another dialect, bidirectional endeavors are required which adds intricacy to the framework which increments with multilingual situation.

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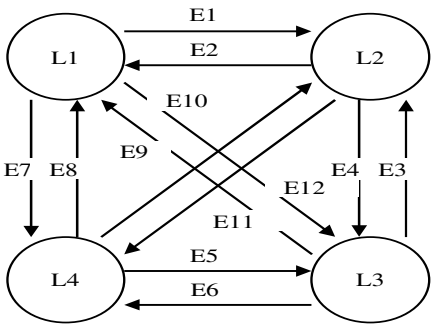

Fig. 2. Existing multilingual MT framework

With aim to help equivocalness free multilingual interpretation, this paper proposes an imaginative open structure that makes effective commitment by planning an Unbiased language alongside multilingual storehouse which incorporates things as well as all grammatical features and its various structures like sex, solitary, plural, tenses and so on It's anything but a helpful method of coordinating data of various language words and their structures which makes it not quite the same as lingual word reference. Each word in the store in any of the structure is relegated a remarkable code which is generally same for any language. Extraordinarily distinguished, the impartial language code is utilized to deliver productive and significant objective language interpretation. The possibility of system is addressed in Fig. 3 underneath.

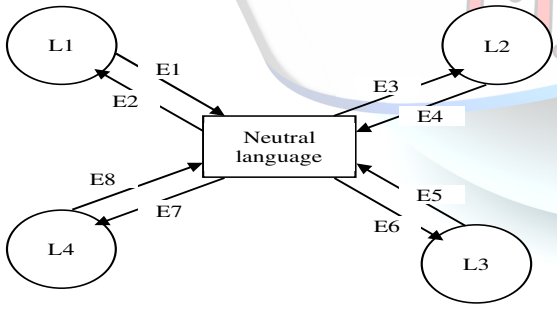

Fig. 3. Neutral language

It is unmistakably obvious from the proposed structure that there is continuous decrease in the endeavors needed to deal with another dialect in multilingual system which is likewise addressed in table I underneath. It contrasts the current multilingual framework and proposed multilingual MT system.

TABLE I. EFFORTS IN MULTILINGUAL MT FRAMEWORK

No. of Languages	Efforts in existing system	Efforts in proposed system
3	6	6
4	12	8
5	20	10
6	30	12
7	42	14
8	56	16
9	72	18
10	90	20

Number of efforts required in existing framework is calculated as

$$nP_r = \frac{n!}{(n-r)!} \quad (1)$$

Where n is number of languages used.

whereas the efforts required in proposed framework is twice the number of languages in concern.

$$\text{efforts} = 2*n \quad (2)$$

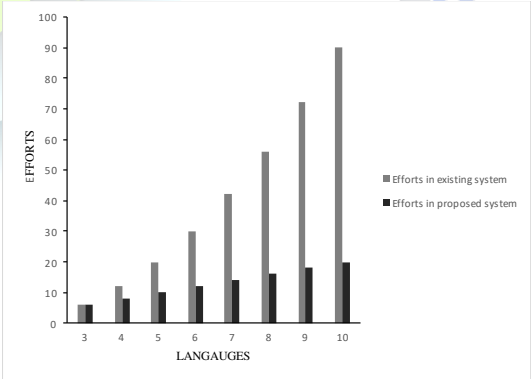

Fig. 4. Efforts

As seen from the chart in Fig. 4, as the quantity of dialects (n) builds, the between interpretation of sentences among

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dialects turns out to be dramatically unpredictable and tedious. An endeavor doesn't make any sense while between interpreting between at least 3 dialects bringing about isolated endeavors each time. The thought is to decrease this intricacy and endeavors required consequently by presenting the idea of Nonpartisan Language Subsequently when between interpretation of dialects is required, unbiased language goes about as focal listed asset accordingly lessening endeavors and intricacy for between deciphering dialects.

A. Word sense disambiguation

Design of neutral language includes forming a repository having expandable, lingual, multidimensional features in which ambiguities can be efficiently handled leading to successful multilingual translation. Design of neutral language includes each word represented uniquely. Context in any language will be reduced to a word for which codes will be assigned which is universally same for any language. This code is independent of any language and the idea behind designing such a neutral language code stem from the byte code concept of java virtual machine which is independent of any platform. For example, sense of bat in English, □□□□□□□□ in Marathi and □□□□□□□□ in Hindi corresponds to a single unique code. It also handles various forms of a given word. To eliminate ambiguities from the text, we perform dependency check by providing world knowledge to the word sense disambiguation (WSD) engine. World knowledge will be influenced by our knowledge repository and other sources.

World knowledge helps to determine the correct sense of the word in the given context. It provides various properties of a given word helpful for finding the dependency between the various words in the context. Neutral language code and world knowledge is fed to the WSD engine. Depending upon the context and world knowledge provided, the engine will select the appropriate sense of the ambiguous word. For example

Crane loves eating fish

Let us consider the ambiguous word crane having more than one meaning (machine, bird, etc). World knowledge says bird as a living species. Living species with properties like flying, eating, standing, etc marks crane as a bird sense. This scenario is just a glimpse of the uphill battle. The actual work needs lots of digging and learning to retrieve the world knowledge, facts that are available from the available repositories. Grouping of relevant properties of the given entity helps in resolving this issue. Word sense disambiguation engine returns the appropriate non ambigious neutral language code for the words in the input sentence. These codes are further used for Machine Translation (MT) process.

B. Lingual machine interpretation

Lingual machine interpretation is the fantasy of scientists to dispose of the interpretation heap of the human interpreters. The thought is to have a framework to give deciphered content in required language for the given contribution to a particular language. By considering the language variety taking care of lingual interpretation is an effortful errand. Indian dialects are wealthy in shifted structure. The intricacy is expanded with the utilization of dialects with various morphological highlights. The system manages two most famous Indian dialects viz Hindi and Marathi alongside the worldwide language English. Marathi is syntactically rich language and more endeavors are needed to deal with the particular types of the words. Hindi on the opposite side is like Marathi in certain angles yet needs additional endeavors [12].

After getting the nonpartisan language code from the WSD motor, it is relied upon from MT structure to deliver the significant interpretation as displayed in Fig. 5[8]. To accomplish this, language syntax rules are utilized. For a solitary word in English , Marathi and Hindi may go with a few unique structures relying on the specific situation.

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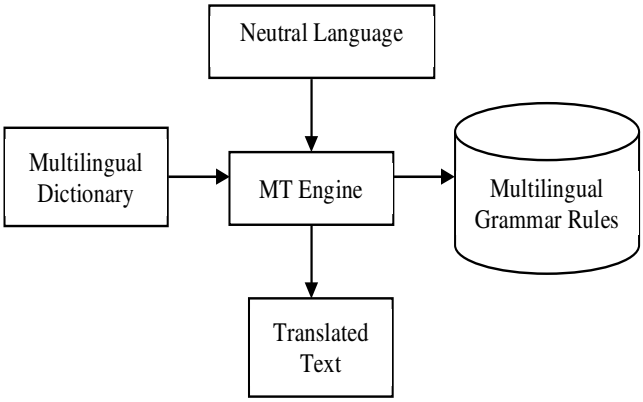

Fig. 5. Multilingual MT framework

Use of Multilingual word reference makes for more exact interpretation. Syntax design of the relative multitude of three dialects being extraordinary makes the interpretation interaction more intricate. Thus planning rules by considering all potential structures from the multilingual archive contributes towards productive machine interpretation.

IV. CONCLUSION

Lingual interpretation is the need of society to sort out the immense data accessible as reports in a specific language and converted into a language needed by the client. Proposed wise structure is a significant concern which will handle this information and get helpful data for interpretation between any to any language as human interpretation is a tedious undertaking. We present the idea of impartial language autonomous of any language for the assessment of word sense disambiguation and multilingual machine interpretation task. This system is versatile and open for normal language preparing clients to utilize it for interpretation task for any necessary language

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MACHINE LEARNING TECHNIQUES FOR MEDICAL DIAGNOSIS: A REVIEW

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ABSTRACT

Machine learning algorithm can essentially help in taking care of the medical services issues by creating classifier frameworks that can help doctors in diagnosing and anticipating infections in beginning phases. Nonetheless, removing information from clinical information is trying as this information might be heterogeneous, disorderly, and high dimensional and may contain commotion and exceptions. Most fitting strategy can be picked solely after investigating all the accessible AI procedures and approving their exhibitions as far as precision and fathomability. This writing has looked into the utilization of AI calculations like decision tree, support vector machine, random forest, evolutionary algorithms and swarm intelligence for accurate medical diagnosis. The reliance on clinical pictures for diagnosing an illness is on ascent. Since deciphering current clinical pictures is turning out to be progressively intricate, AI calculations in clinical imaging can give critical help with clinical finding. AI strategies could be utilized for huge scope and complex organic information investigation as these methods are effective and modest in taking care of bioinformatics issues.

Keywords: Decision Tree, Evolutionary Algorithms, Machine Learning, Medical Diagnosis, Protein Function Prediction, Random Forest, Medical Imaging, Swarm Intelligence, Support Vector Machine.

1.INTRODUCTION

Machine learning, a sub discipline in the field of Artificial Intelligence, explores the study and design of algorithms that can learn from data [1]. AI gives techniques/calculations that make framework computationally shrewd. Such calculations fabricate models dependent on information and afterward utilize these models to settle on expectations or choices.

AI is basically valuable in situations where algorithmic/deterministic arrangements are not accessible for example there is an absence of formal models or the information about the application space is scant. The calculations have been created in assorted arrangement of disciplines like statistics, computer science, robotics, computer vision, physics, and applied mathematics. Benefits of AI over factual models are precision, mechanization, speed, adaptability and versatility.

As medication assumes an extraordinary part in human existence, robotized information extraction from clinical informational collections has become a colossal issue. Research on knowledge extraction from medical data is growing fast [2]. All exercises in medication can be isolated into six undertakings: screening, analysis, treatment, visualization, checking and the executives. As the medical services industry is turning out to be increasingly more dependent on PC innovation, AI techniques are needed to help the doctors in distinguishing and relieving irregularities at beginning

phases. Clinical analysis is one of the significant exercises of medication. The precision of the finding contributes in choosing the right treatment and along these lines in fix of sicknesses. Machine Learning is extensively used in diagnosing several diseases such as cancer [3], [4], [5], diabetes [6], heart [7] and skin diseases [8]. Utilization of Machine learning calculations works on the indicative speed, precision and unwavering quality. Among various algorithms in data modelling, decision tree is known as the most popular due to its simplicity and interpretability [8], [9]. Recently, more efficient algorithms such as SVM and artificial neural networks have also become popular [2], [4], [10].

Further, medical imaging has also been one of the most successful techniques to diagnose diseases related to the internal human organs [11], [12], [5], [4], [13], [14]. Albeit the way toward recognizing any anomalies in the caught pictures is totally reliant upon the determination given by the radiologist/doctors, yet the development of the clinical information has made it hard for radiologists or doctors to keep record of all the conceivable finding of different sicknesses. Utilization of AI in clinical imaging can help less just as profoundly experienced radiologists in diagnosing the intricate cases.

It has been observed from literature review that research is also being done in application of machine learning algorithm in areas such as protein function prediction and gene expression [15], [16]. Dissimilar to arrangement and construction based techniques for protein work forecast, AI strategies don't need unequivocal information on homology and homology-determined boundaries with the end goal of capacity expectation. In this way research on creating proper AI methods for forecast of protein work for infection determination is on ascent.

This paper investigates the AI strategies that have been used in building PC supported conclusion. Segment II momentarily presents about the different characterization calculations utilized in clinical area. Segment III audits the writing canvassed in five significant regions: Decision trees, Support vector machine, Random timberland, Evolutionary calculation and Swarm insight. The last segment finishes up and underlines the future work in this area.

2.BACKGROUND DETAILS

Grouping calculations are generally utilized in different clinical applications. Information characterization is a two stage measure in which initial step is the preparation stage where the classifier calculation assembles classifier with the preparation set of tuples and the subsequent stage is arrangement stage where the model is utilized for grouping and its presentation is investigated with the testing set of tuples. Brief about the different order calculations in clinical space are:

2.1 Decision Tree Algorithm

The decision tree is one of the classification algorithms. The learning algorithm applies a divide and conquer strategy to construct the tree [17]. The arrangements of examples are related by a bunch of traits. A choice tree contains hubs and leaves, where hubs address a test on the upsides of a trait and leaves address the class of a case that fulfills the conditions. The result is true or false. The tree pruning must be done to eliminate superfluous preconditions and duplications.

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2.2 Support Vector Machine

SVM calculations depend on the learning framework which utilizes the factual learning technique and they are prevalently utilized for arrangement. In SVM procedure, the ideal limit, known as hyperplane, of two sets in a vector space is gotten freely on the probabilistic dissemination of preparing vectors in the set. This hyperplane finds the limit that is generally far off from the vectors closest to the limit in the two sets. The vectors that are put close the hyperplane is called supporting vectors. In the event that the space isn't straight distinct there might be no isolating hyperplane. The portion work is utilized to take care of the issue. The portion work examinations the relationship among the information and it makes an intricate division in the space.

2.3 Random Forests

Arbitrary backwoods calculation is truly outstanding among order calculations and can arrange huge sums of information with high exactness. It is an outfit learning technique building models that develops various choice trees at preparing time and yields the modular class out of the classes anticipated by singular trees. It is a blend of tree indicators where each tree relies upon the upsides of an arbitrary vector tested freely with similar circulation for every one of the trees in the woodland. The essential guideline is that a gathering of "feeble students" can meet up to frame a "solid student".

2.4 Evolutionary Algorithms

A Genetic Algorithm (GA) is a transformative and stochastic technique for discovering ideal arrangements in enormous and complex pursuit spaces. A GA is enlivened by normal development: a populace of encoded applicant arrangements (called "chromosomes") is developed through ages utilizing hereditary like tasks like hybrid and change. At every age, arrangements are probabilistically chosen dependent on their wellness, to produce posterity and make the future. The underlying populace is haphazardly created, and at every age, each up-and-comer arrangement is considered in contrast to a target work to acquire a wellness score. In a learning framework, the target work is normally the proportion of the exactness of an applicant over a preparation set of occasions.

2.5 Swarm Intelligence

Swarm intelligence (SI) is a computational intelligence technique to solve complex real-world problems. It involves the study of collective behaviour of individuals in a population who interact locally with one another and with their environment in a decentralized control system. The inspiration often comes from nature, especially biological systems. The agents follow very simple rules, and although there is no centralized control structure dictating how individual agents should

behave, local and to a certain degree random interaction between the agents lead to an "intelligent" global behaviour which is unknown to the individual agents. Some of the popular SI algorithms are Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO) and Artificial Bee Colony (ABC).

3. REVIEW OF LITERATURE

Classification of medical data is a complex optimization problem. The aim is not just to find optimal solution but to provide an accurate diagnosis. Many researchers are applying different kinds of machine learning algorithms for solving this problem. This section reviews the literature covered in five major areas: Decision trees, Support vector machine, Random forest, Evolutionary algorithm and Swarm intelligence.

3.1 Decision Trees

Research on using decision trees for medical classification or disease diagnosis purpose has caught a lot of attention in recent past [9], [18]– [21]. Among various algorithms in data classification, decision tree is known as one of the most popular due to its simplicity and interpretability [2].It has been utilized in the finding of sicknesses, for example, bosom malignant growth, liver malignant growth, cerebrum tumour and dermatologic infections.

Decision tree has been used as classifier for breast cancer diagnosis [18], [19], [20]-[22].It has been compared with different classification algorithms in each paper such as ANN, logistic regression, Bayesian network, KNN and case based reasoning. Case based fuzzy decision tree outperforms other approaches with an average accuracy rate of 99.5% in breast cancer diagnosis [21]. Azar and ElMetwally [9] proposed a decision support 3waEXzTD45tool for the detection of breast cancer based on three types of classifiers. They are single decision tree SDT, boosted decision tree (BDT) and decision tree forest and reported that BDT performed better than SDT with 98.83% and 97.07% accuracy respectively. Yeh et al. [23] presented decision tree model as the optimum model for cerebrovascular disease with accuracy of 99.59% in comparison to Bayesian classifier and back propagation neural network. Luk et al. [24] proposed classification and regression tree (CART) model that provides discrimination between Hepatocellular Carcinoma (HCC) and non-malignant liver tissue. HCC is known as the riskiest malignancy due to not being analysed until cutting edge tumour stages. Choice tree calculations were effectively applied for building characterization model dependent on secret example in the issue dataset. Further, Fan et al. [21] proposed model case based reasoning and fuzzy decision tree (CBFDT) for liver disease whose accuracy is highest among various other models with accuracy of 81.6%. Significant limits of choice tree in clinical information are imbalanced and cost affectability issue. Further they are touchy to conflicting information.

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3.2 Support Vector Machine

SVM calculations have been proposed as a successful measurable learning strategy for order as a result of their high speculation execution. Naturally, given a bunch of focuses which have a place with both of the two classes, a SVM can discover a hyperplane having the biggest conceivable part of points of a similar class on something similar plane. This hyperplane, called the ideal isolating hyperplane (OSH), can limit the danger of misclassifying instances of a test set.

There has been a lot of research on medical diagnosis of breast cancer using SVM with Wisconsin breast cancer diagnosis (WBCD) data in literature and most of them reported high classification accuracies [25] – [30]. In Polat and Gunes [26], least square SVM was used and an accuracy of 98.53% was obtained. Further, SVM model with grid search and feature selection was proposed [27], [28] for breast cancer diagnosis. When using SVM, two problems are confronted: how to choose the optimal input feature subset for SVM and how to set the best kernel parameters. Feature selection limits the number of input features in a classifier in order to a good predictive and less computationally intensive model. In addition to the function selection, right model parameters putting can improve the SVM category accuracy. The parameters that have to be optimized encompass penalty parameter C and the kernel feature parameters along with the gamma (c) for the radial basis feature (RBF) kernel. F-rating is customized to discover the essential functions, and the grid search approach is used to look the most beneficial SVM parameters. Proposed version showed 99.51% accuracy for eighty-20% training-take a look at partition. Hassanien and Kim [31] identified breast cancer using hybrid technique (ANN + SVM + Fuzzy). The proposed method utilized kind-II fuzzy algorithm for improving the quality of MRI photo. Then, segmentation became achieved using pulse coupled neural networks a good way to extract areas of hobby. Wavelet capabilities were extracted from these areas and finally, SVM became used for the real analysis and discrimination of various regions of interest to decide whether they constitute cancer or no longer. Results showed that the accuracy presented by proposed hybrid version using SVM turned into high in comparison to other system gaining knowledge of algorithms inclusive of selection tree, neural 0

SVM has been largely and efficaciously utilized in hybrid approach for clinical diagnosis of diverse sicknesses which includes Genetic + Fuzzy + SVM for the prognosis of diabetes, liver and coronary heart diseases [10], ANN + SVM for prostate cancer prognosis [32], ANFIS + SVM for ache identification [33] and nonnegative matrix factorization + SVM for Alzheimer's ailment [14]. However, sensible obstacle of the SVM-primarily based category model is its black-field nature. A viable answer for this trouble is the use of SVM rule extraction techniques or using hybrid-SVM model blended with other more interpretable fashions.

3.3 Random Forest

Research has been completed the usage of Random forest as a classifier and feature choice set of rules for clinical diagnosis. Ozcift [34] used nice first seek random forest set of rules to select most reliable features for 4 scientific datasets: colon cancer, leukemia cancer, breast cancer and lung cancer. The proposed model with extracted functions accuracy was in comparison with 15 broadly used classifiers educated with all functions and confirmed stepped forward classification accuracy. Nguyen et al. [35] extensively utilized random wooded area classifier mixed with function choice for breast cancer analysis and stated ninety 99.82% category accuracy. Taking into consideration

sensitivity, specificity and ordinary classification accuracy, random woodland is ranked first amongst all the classifiers tested in prediction of dementia the use of several neuropsychological assessments [36]. Random forest has been correctly used as a classifier in the analysis of illnesses along with Abdominal lymphadenopathy [37], Alzheimer's sickness and cardiovascular danger.

3.4 Evolutionary Algorithms

Genetic algorithms (GA) are utilized in growing the decision assist machine for the analysis of numerous diseases inclusive of breast most cancers [38], prostate most cancers [39], mind tumour [40], colon cancer [41] and heart illnesses [42]. Evolutionary algorithms (EAs) are commonly mixed with different type algorithms to form hybrid systems to expand pc aided diagnosis for certain organs [41] – [44]. Chaochang et al. [43] built a diagnostic version for high blood pressure by means of a hybrid of GA, apriori and decision tree with excessive accuracy. [41], [42] diagnosed coronary heart sicknesses, colon, lymphoma and leukaemia most cancers by hybrid fuzzy + GA. Asymptomatic carotid stenosis is considered as an important component of stroke. It has several threat elements inclusive of smoking, hypertension, diabetes, cardiac illnesses and physical state of no activity. Bilge et al. [44] discovered regulations for these hazard factors and asymptomatic carotid stenosis through hybrid technique of GA and regression. EAs are usually applied in scientific facts mining as a parameter finder. Evolutionary techniques search for the parameter values of the expertise illustration installation via the designer so that the mined facts are optimally interpreted (presence or absence of sickness). A GA efficiently searches the sizeable boundary functions of the mind tumour vicinity and feed them to ANFIS [40]. A GA searches for most fulfilling shape and training parameters of neural network for a higher prediction of lung sounds and consequently reducing the processing load and time [45]. A system has been developed to analyse digital mammograms the using of novel neuro-genetic algorithm [46]. The device starts first by using extracting capabilities, then the GA selects the maximum sizeable functions and makes use of them as input to a neural network. This machine has completed a completely exceptional overall performance. Genetic programming at the side of other class algorithms are used to broaden version for disease prognosis which includes ANN + GP to diagnose thalassemia [47], choice tree + GP for chest ache diagnosis [48] and GP with photo processing strategies to hit upon lung abnormalities at an early stage [49].

3.5 Swarm Intelligence

Swarm intelligence (SI) algorithms along with PSO, ACO are typically used as perfect pre-processing tools to help optimize function choice in classifier systems for clinical diagnosis. This will increase the classification accuracy and maintains the computational assets needed to a minimal [50]. Improved binary particle swarm optimization (IBPSO) is used to implement a feature (gene) selection, and a Knearest neighbour (K-NN) serves as an evaluator of IBPSO for gene expression information type problems [51]. The category accuracy obtained by the proposed method turned into the very best in 9 out of the 11 gene expression statistics take a look at problems. An ACO has been used to select appropriate wavelet coefficients from mass spectral records as function selection technique for ovarian most cancers analysis and has confirmed high category accuracy [52]. Hybrid class fashions are evolved the usage of PSO/ACO for the prognosis of several diseases. Case based totally reasoning + PSO (CBRPSO) and SVM +PSO hybrid fashions for analysis of breast cancer have additionally been proposed [53], [54]. The CBRPSO has been discovered to outperform the alternative procedures with

an average accuracy charge of round 97.4% for breast most cancers. The CBRPSO model is likewise used for liver problems with a mean accuracy of 76.8%. Hybrid version using PSO with different type algorithms for prognosis of coronary artery disease [55], leukaemia [56] and MR brain photo classifier [13] had been proposed with excessive category accuracy. Thus, SI algorithms had been used as optimization strategies in many regions consisting of feature optimization, ANN training, fuzzy system manipulate and medical analysis.

4. CONCLUSION

Successful implementation of device mastering algorithms in scientific diagnosis can help the mixing of computer-based systems inside the healthcare environment. Especially in developing and exceedingly populated country like India in which mortality ratio is excessive and there is handiest one health practitioner for each 1700 humans, machine mastering strategies in scientific prognosis can assist physicians to diagnose and remedy illnesses at early level. Technology can no way to update a doctor's experience and knowledge, but it is able to contend with exceptionally sincere but time eating diagnostic tasks and doctors can take in clinically extra disturbing method.

The dependence on scientific pictures for diagnosing a sickness is on rise. Since deciphering current clinical pictures is turning into more and more complicated, device getting to know algorithms in scientific imaging can offer sizeable help in scientific analysis. They can assist interns or much less skilled physicians to reliably evaluate medical pictures and therefore enhance their diagnostic accuracy, sensitivity and specificity.

Protein characteristic prediction is any other vital area wherein device studying techniques have a important role to play. Machine mastering techniques could be used for big scale and complex biological records analysis as those strategies are efficient and less expensive in solving bioinformatics issues. The research in this area will not only be beneficial for physicians in phrases of diagnosing diseases, it could also help fitness planners for diagnosing and stopping sicknesses at a big scale.

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ML-based Solutions for Designing an End-to-End Video Describing Service

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***Abstract*—Video content is created, stored, and consumed at an extremely fast pace in the modern world. Databases and warehouses currently store a very large amount of video data. This data is raw and unstructured in nature and thus would greatly benefit from a service that could read, understand, analyze and describe the data. In this paper, we study the services currently being provided for video data as well as the models that are trained for the purpose of video captioning. We also present an architecture and workflow dedicated towards creating a scalable, cost-effective, and efficient video description service. Our proposed workflow uses modern cloud services and pipelines to provide machine-generated video descriptions to allow indexing, enable smart video feeds and improve accessibility of any video that is hosted on the web, a local device or coming in as a stream. In order to increase accessibility, we also incorporate translation and text-to-speech services to provide regional language access and audio descriptions for the visually impaired. This workflow employs the pre-trained Bi-modal Transformer (BMT) [13] neural network model in order to generate video captions and also assess its performance in real-world use-cases.**

***Keywords*—Accessibility, Audio Descriptions, Cloud Computing, Machine Learning, Video Captioning**

I. INTRODUCTION

Image Processing tasks with the use of sophisticated neural networks has been one of the areas of study in Artificial Intelligence and Machine Learning in recent years that has yielded immensely promising results. Multiple applications such as object detection, labelling, action recognition, etc. have been made possible and are currently in widespread use. The ability to generate descriptions of video content is highly valuable for automated tasks such as labelling and tagging videos. Automated tagging and indexing of videos could help improve the results displayed by a video search engine as well as help generate summaries of thousands of hours of video content. Moreover, it could help visually impaired people to have better experience while accessing, interacting and consuming rich content on the web.

Of the numerous applications mentioned above, many have proven useful to the physically challenged or ones with special needs. Currently, YouTube and other streaming platforms use speech-to text algorithms on the audio to identify spoken words as well as sound effects to generate captions in real-time [1]. In an era of powerful processing on the cloud, extensive fiber network connections and tremendous amounts of online content consumption, accessibility is a major factor in determining the reach of a business as it addresses the most basic requirements of a significant segment of the worlds' population.

With advancements in the field of Image Captioning, there has been growing interest in generating video descriptions using deep learning technologies. Large datasets which contain video and their corresponding human generated captions, such as the ActivityNet [11] dataset have made it possible to train captioning and description generating models on large quantities of video data. The most popular example of this is the dense video captioning task [12] which aims to generate temporal captions based on video features. Multiple models have been trained to achieve this, which employ transformation, bi-directional evaluation, and other innovative methods. Bi-modal Transformer is one of the more advanced models trained to perform dense video captioning. The bi-modal transformer takes into account both the video and audio track of the input to generate richer descriptions. It makes use of a proposal generator model to detect events and a caption generator model to generate time-stamped descriptions of the events occurring in the video. We employ this model as the engine of our proposed application and architect a cloud-

based workflow around that which is scalable, efficient and accessible to the general audience.

II. Related Work

We survey existing solutions and how Machine Learning models are deployed in the cloud. In this section. We also provide background information about existing systems/ platforms which provide machine learning inference as a service.

A. Growth of Cloud Computing

Compute power has been getting cheaper and cheaper in the last decade, to the point where it's more convenient to use ad-hoc virtual machines to do compute-intensive tasks than buy, manage, and maintain physical machines. Developers have taken advantage of the cloud to train and optimize models online [5]. They also design data pipelines to continuously train and optimize their models which are served to real-world applications, all from the cloud. This enables low-latency inference at scale. The trained models are served over a REST API enabling a number of different clients like web and mobile apps to consume them.

B. ML-as-a-Service for Video

We compare the offerings by the three most prominent cloud service providers, namely Google Cloud Platform (GCP), Microsoft Azure and Amazon Web Services (AWS) in Table I. Google provides two AI-based Video services, namely AutoML Video Intelligence and Video Intelligence API as a part of their Google Cloud Platform offerings. The AutoML Video Intelligence service provides the user with a graphical interface and has two main tasks: classification and object tracking. It can classify the various parts of a video based on user-defined labels. Object tracking includes detection of objects and tracking them through the video. The Video Intelligence API provides all of these features and more, with extra features such as explicit content detection, optical character recognition, closed captioning, recognizing specific objects such as faces, logos, celebrities, tracking, auto-labelling, OCR, etc. Both of these products support streaming video data and can be used to send in live video feeds for analytics.

Microsoft with their Azure Media Services provides a Video Indexer, which outputs a JSON that includes data such as labels, faces, shots, written text, brands, sentiments, celebrities, etc. They also provide a web-based graphical console using which the user can interact with this data and create a sophisticated media workflow.

AWS's Amazon Rekognition Video service has a similar feature set which includes detection of objects, activities, scenes, text, faces, celebrities, inappropriate content, etc. Rekognition Video is also able to perform these tasks on an incoming stream, similar to Google.

These services are satisfactory for most common use-cases such as live-streaming, content moderation and delivery, analytics, etc. However, they may not be able to satisfy certain specific consumer requirements such as detailed descriptions of the actions and events that occur in the video. In-depth descriptions can be extremely beneficial for making audio-visual content accessible on the internet, video indexing and search based on events, summarizing long length detecting malicious activities on surveillance cameras, etc. Rekognition can be paired with Amazon Transcribe to generate captions and transcripts in real-time for streaming video.

III. Proposed System

In this section, we outline our approach, discuss the model we have selected and how our system, illustrated in Fig. 2 will work once deployed to the cloud.

A. Bi-modal Transformer

Bi-Modal Transformer is a model which can utilize data from both the visual as well as audio tracks in order to generate a list of captions for the video. These captions are temporal and thus suitable for chronologically describing and by extension summarizing the video.

TABLE I. COMPARISON OF FEATURES PROVIDED BY CLOUD PLATFORMS FOR VIDEO INTELLIGENCE

Feature	Cloud Service Provider		
	GCP	Azure	AWS
Graphical Interface or Dashboard	Yes	Yes	Yes
Labelling	Yes	Yes	Yes
Object Detection	Yes	Yes	Yes
Object Tracking	Yes	Yes	Yes
Person Detection	Yes	Yes	Yes
Person Tracking	No	No	Yes
Closed Captions	Yes	Yes	Yes
Native Live Stream Analysis	Yes	No	Yes
Event/Activity Description	No	No	No
Video summarization	No	No	No
Native Multi-lingual support for labels and objects	No	No	No

The model requires audio features as extracted by a VGGish model, video features as extracted using a pre-trained Inflated 3D model and Stanford NLP's pre-trained GloVe model for word corpus.

The ability of the model to accept both audio and video data enables it to create more rich, descriptive captions as it is able to take as input more data than a traditional model that only uses the visual elements.

The use of GloVe enables the model to have a large corpus of natural language words with their corresponding vector representations. This ensures that the caption sentence generated aptly captures the event or activity it describes.

B. Queues

The queue backend used in our system is Redis. Redis is an open source, in-memory data structure store, used as a database, cache, and message broker [6]. python-rq is a simple Python library for queueing jobs and processing

them in the background with workers [7]. It utilizes Redis as a backend.

After the video is received by the server, it is enqueued into the feature queue. The feature extraction workers are continuously polling this queue. As soon as a new video is enqueued, the processes start the feature extraction task. If the feature extraction worker is busy with another video, the moment it becomes free, it polls the queue and starts processing the next video in the queue.

After features have been extracted, the server enqueues a description generation job into the description queue, and provides the paths to the feature files to the job. Like the feature extraction workers, the captions workers also poll the queue and start generating the captions.

Queues help deal with the large number of incoming files and allow asynchronous processing of data. This improves the scalability of the application.

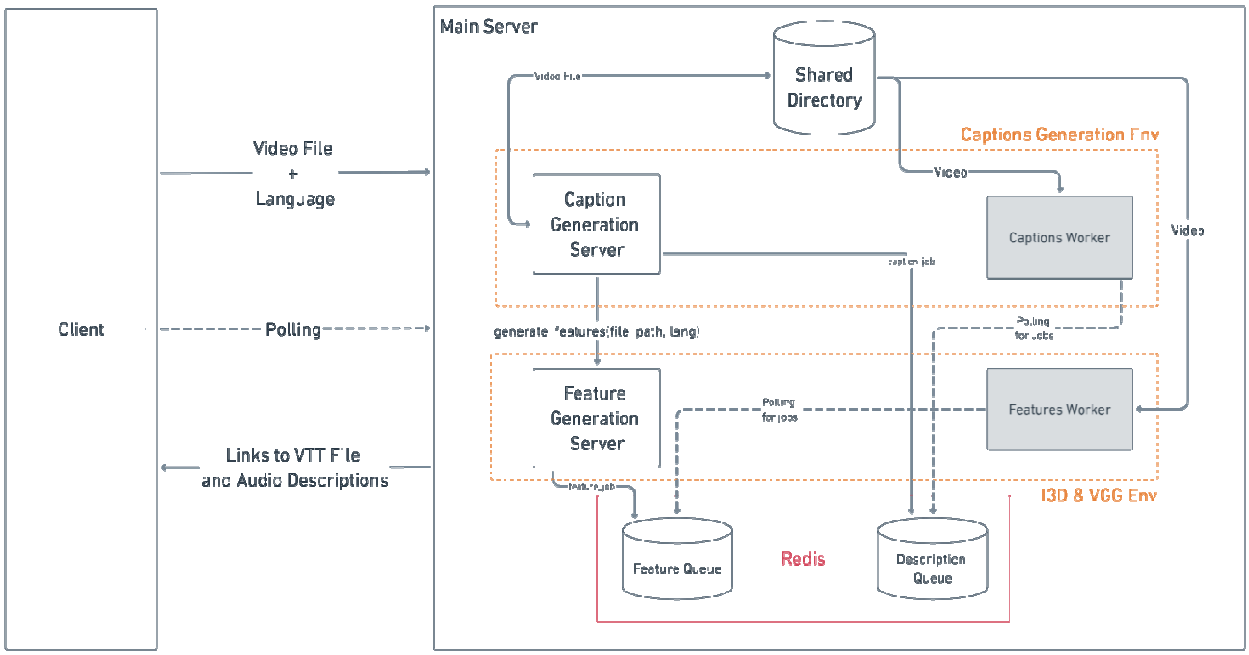

Fig. 1. Cloud-based architecture of the proposed video describing service

C. Backend Server

Our proposed solution employs a combination of 2 server instances to carry out the end-to-end video captioning task. The first server faces the client, and hosts BMT, our trained proposal and caption generator model as well. On initial request, it accepts the video and language choice from the request body and stores the video to the shared directory.

It then passes the video file name and language choice to the second server, the feature generation server, which returns a job ID. This job ID is then returned to the user who uploaded the video.

After features are generated, the captions for the video are generated by the second server, i.e. the caption generating server, and it uses the captions to generate VTT file containing the timestamped captions, and an MP3 file containing captions in a synthesized voice, in a language of the user's choice.

The feature extracting and caption generating servers are built using Flask. Flask is a microframework written in Python which enables the creation of web applications. Flask aims to keep the core simple but extensible, and does not include a database abstraction layer, form validation or any other components for which pre-existing libraries exist [8]. It allows us to build simple as well as complex web applications and leaves the decision of selecting third-party libraries to the developer.

1. Feature Extracting Servers

They are composed of Video and Audio Worker processes. The bi-modal transformer takes video features in the form of I3D features. I3D is a convolutional neural network model for video classification trained on the Kinetics dataset [9]. We use a PyTorch implementation of I3D to generate the I3D features for the video input. The BMT model also requires audio features. These features are generated using VGGish. VGGish is a pre-trained Convolutional Neural Network from Google [10]. The architecture of this network is inspired by the famous VGG networks used for image classification. We use a Tensorflow implementation of VGGish to generate audio features.

The feature extraction server accesses the video from the shared directory. After generating the features, they store them back in the shared directory.

2. Caption Generating Server

The caption generator loads the pre-trained proposal and caption generating models into memory when the system starts.

After feature generation, the caption generation server loads the features generated previously and generates the VTT file and the audio file of the captions in the choice of user's language, which is generated by the Google TTS service. The paths of the VTT file and the audio file are then returned as a JSON response to the client which is polling the server for status of the captioning job.

D. *Client*

The service is headless in nature, i.e., it is not limited to one client and can communicate with any program acting as the client. The client uploads the video to the Primary Server, which returns a job ID to the client. The client then continuously polls the Primary Server for status of the captioning job. Along with the video, the client also has the option to send a language, as visible in the demo client in Fig. 2.

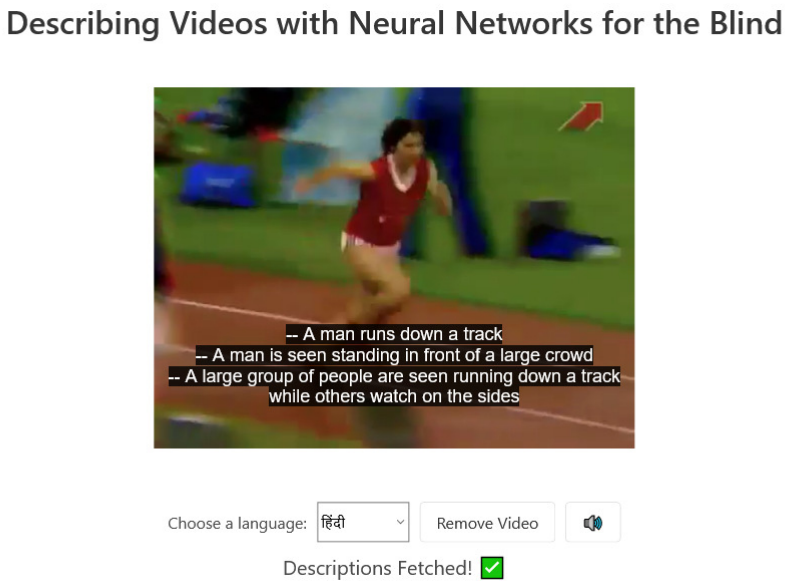

Fig. 2. A user has uploaded a video and selected the Hindi language. The application fetches the VTT captions for it, which are shown to be embedded in the player, and also the audio descriptions in Hindi, which plays when the user presses the speaker icon in the UI.

This language can then be used by the backend to translate the captions to, and also generate text-to-speech for it. The text-to-speech audio can then be played by the client. This allows a potential use of such a system to work as an accessibility mechanism for those who are unable to consume the video content visually.

In case the backend fails to generate captions, the 'status' field of the response reads 'failed', notifying the client that the job has ended in failure, and the client can notify the user through an error message and sound notification.

IV. Results and Future Scope

We have created a React [14] application to demonstrate the working of this system. React is a JavaScript library to create dynamic user interfaces.

```
[
  {
    "start":0.1,
    "end":4.9,
    "sentence":"We see a title screen"
  }
]
```

Fig. 3. Structure of video description for a single event given by the BMT model. The start and end fields denote starting and ending timestamps in seconds.

Using React allowed us to create an application that is minimal and automate tasks such as sending network requests when the user has selected a video and a language.

This reduced the number of steps required from the user's side, making it easier for those using screen readers, etc. to access it and thus more accessible.

The application allows the user to upload a video from their local machine. As soon as the video is selected, it is also uploaded to the backend where it starts getting processed. Once the descriptions are successfully generated the backend transforms the JSON output from the model into the Web Video Text Tracks Format (VTT), and if a language is specified by the user, it also creates audio descriptions for the descriptions in the specified language. Figure 3 shows a sample JSON output of a single event by the BMT model. These are returned to the client, which dynamically adds the VTT descriptions to the video track and enables a button to play the audio descriptions.

VTT is the recommended standard set by the W3C for serving closed captions over the web. VTT is compatible

with a large number of screen readers which are utilized by people with visual impairments.

The implementation can be made more cloud native by using a microservice architecture and taking advantage of managed offerings from cloud providers like AWS. The feature and caption generation servers could be independent microservices, using a blob storage service like AWS S3 to store and share video files and their corresponding feature files. These microservices will listen to their respective queues, which could be AWS SQS instances. Additionally, these microservices can use a database like DynamoDB to store state of the jobs, ensuring that captions generate after features for it have been generated.

V. CONCLUSION

In this paper we conducted a comparative study on the existing machine learning based services offered for video. We discussed the various use-cases of these services and the areas where they could possibly fall short, namely video descriptions and summarization. We discussed the dense video captioning task, the models that can perform it and also employed the BMT model into a proposed cloud-based workflow for a video description generating service. We concluded that the technology is still in its infancy and that we should see many improvements with newer research and models which would improve the overall performance of the system in terms of video description accuracy. There are yet many areas in which the end-to-end system could improve, but overall shows promise with a lot of potential in real-world applications.

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Needs of Green Computing: A Step For Saving Global Environment

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Abstract

Cloud Computing is most prominent internet based computing technology, wherein almost all IT companies are planning and designing their software. It stands-out as the ever-growing and competent technology due to advancement in computing hardware, economically feasible and simplicity in use for technophile engineers over the world. In today's world where use of computer systems are increasing day by need the need of energy management and care for environment is also a need. Therefore, the need to focus in Green Cloud Computing is of high priority. Green Computing is defined as the study of designing, engineering, manufacturing, using and disposing of computing devices in a way that reduces their environmental impact. This paper discuss about the details, needs, some successful implementations, advantages and disadvantages of Green computing.

Keywords : Cloud Computing, Green Computing, Energy-saving

Introduction

Computing technology is emerging day by day for the last few decades. It has became an essential part in the life of people and the global infrastructure because it is leading to the rise in data usage and computing devices. Green computing is a pathway which opens up a new world in which computing resources are becoming useful in a more environmentally friendly way. Because even though technology is making our world advance in many ways the need for protecting environment is still a necessity which can't be replaced. In this era 70 percentage of energy is consumed by computers which is not properly used and that is a major reason for CO_2 emission [1]. That's when the need of Green Computing becomes more evident. It can be defined as designing, manufacturing or engineering, using and disposing of computing devices in a way that reduces their environmental impact. This paper will first give some basic details about Green Computing, Cloud Computing and it's services, then Green IT

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barriers and benefits of it will be discussed.

What is Cloud Computing?

Cloud Computing, as name suggests, is basically a service-oriented architecture that involves delivering hosted services over internet. It delivers faster and accurate retrievals of applications and data. It is most efficient and better for promoting strong workflow and is more cost effective than traditional computing solutions.

What is Green Computing?

Green Computing is the term used to denote efficient use of resources in computing. It is known as Green IT. Green Computing is where organizations adopt a policy of ensuring that the setup and operations of Information Technology produces the minimal carbon footprint. Green Cloud is the study and practice of designing, manufacturing, using and disposing of computers, servers and associated subsystems.

Difference Between Cloud Computing and Green Computing

Cloud Computing	Green Computing
It delivers computing services including servers, storage, database, networking etc.. over internet.	It is energy efficient use of computing devices.
It offers utility-oriented IT services to users worldwide.	It helps in using least amount of computing resources for doing most amount of work.
Its main goal is to provide magnitude improvement in cost effective, dynamic provisioning of IT service.	Its main goal is to attain economic viability and improve way of how computing devices are used.
It reduces energy consumption, waste and carbon effective, dynamic provisioning of IT services.	It reduces use of hazardous materials, increase energy efficiency during product's lifetime, manage power and energy efficiency, create sustainable business processes etc.
It increases revenue of business organizations and help them to achieve business goals, provide faster communication, secure network collaboration, promote efficient utilization of existing resources, etc..	It reduces carbon footprint of business and provide a reputation boost, helps business responsibly use energy and keep business running on energy-lean diet.
It lower IT costs, maintain business	It lowers energy bills, lower overall power

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continuity, provide scalability, allows automatic software integrations, etc.	usage, cost-effective due to less energy usage and cooling requirements, etc.
It allows company to diversify its network and server infrastructure.	It allows companies to improve disposal and recycling procedures.
It is less cost effective as compared to green computing.	It is more cost effective as compared to cloud computing.

Table 1.1[2]

Services Models of Cloud Computing

1.SaaS

Software as a Service offers applications that are accessed over the web and are not managed by your company, but by the software provider. This relieves your organization from the constant pressure of software maintenance, infrastructure management, network security, data availability, and all the other operational issues involved with keeping applications up and running. SaaS billing is typically based on factors such as number of users, usage time, amount of data stored, and number of transactions processed.

2.PaaS

Platform as a Service is halfway between Infrastructure as a Service (IaaS) and Software as a Service (SaaS). It offers access to a cloud-based environment in which users can build and deliver applications without the need of installing and working with IDEs (Integrated Development Environments), which are often very expensive. Additionally, users can often customize the features they want included with their subscription.

3. IaaS

Infrastructure as a service offers a standardized way of acquiring computing capabilities on demand and over the web. Such resources include storage facilities, networks, processing power, and virtual private servers. These are charged under a "pay as you go" model where you are billed by factors such as how much storage you use or the amount of processing power you consume over a certain timespan. In this service model, customers do not need to manage infrastructure, it is up to the provider to guarantee the contracted amount of resources and availability[3].

Cloud Computing And Environment

Is Cloud Computing Environmentally friendly? The answer for this question is a clear YES. It is environmentally friendly and sustainable too. It has a greater potential in fostering environmental friendliness of business fields. Cloud computing helps in reducing the use of paper, electricity, packing materials and so much more. Shifting of some companies from traditional servers to cloud services helped in reducing the emission of carbon footprint and emission and it helped in increasing the use of renewable energy.

Companies use cloud computing to reduce the amount of carbon released into the air

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by 88%. They're also using 77% fewer servers and 84% less power than they were previously. SaaS helped to move common applications from individual computers to the cloud and thereby reducing carbon footprint. Accessing and sharing stored information among employees became efficient. It eliminated the need to print contracts as it provided the way to sign contracts digitally using software like DocuSign. Large companies that use a cloud server typically need 60% to 70% of the space on it. But smaller companies tend to use only 5% to 10%. This means more of them can use a single data center. Shared data centers can be kept at an ideal temperature while still using energy efficiently. Public cloud servers can be placed anywhere renewable energy is available. Companies using public cloud run their operations at peak efficiency. This prevents them from taking up more space on the server than they need to.

Cloud Computing indirectly decrease automobile emission too. Because it facilitates remote work. Remote employees help companies run more effectively. Lesser the number of employees there in office lesser will be the use of resources and energy. Companies can function with less office space. By condensing the workspace, companies can remain productive and be environmentally responsible at the same time. The world's environmental ecosystem is stronger and more secure, partly because of cloud computing. Using cloud servers means companies produce half the amount of carbon emissions they otherwise would[4].

History of Green Computing

Have you ever thought how much energy does your computer uses? If not go for a research and surely you'll get wonder. That's when importance of Green computing emerges. If you do study about those old computers which were required more space while consuming more energy, so more time was taken in managing those computers.

In the starting Green Computing was named as Energy Star, and it began in 1992. Even though it was used in printers, televisions and refrigerators initially it was not used in computers at that time. After some times the name got changed into Green Computing and started to use in the case of computers too.

Why Go Green?

According to Pranav Prakash, the presales consultant at Photon,

"Seventeen percent of the total carbon footprint caused by technology is due to data centers. The electricity that is needed to run these data centers is nearly 30 billion watts. These servers waste 90 percent of the energy they use because they run on full capacity all day long"[5].

The extensive use of computers and IT made our life easier and it eventually led to the increase in need of computers in every sector. This eventually led to greater power consumption. Greater power consumption means greater emission of greenhouse gases like CO_2. From the studies it has been found that most of the energy is often wasteful. This is because we leave computer ON even when the system is not in use. The CPU and fan consume power; screen savers consume power even when the system is not in use.

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Insufficient power and cooling capacities can also results in loss of energy. Most of the data centers do not have sufficient cooling capacities and this finally led to environment pollution. This can be because of defects in Manufacturing techniques, packing, disposal of computers and components. There are toxic chemicals used in the manufacturing of new computers as well as disposal of old computers and its components which can create adverse effects on environment.

Core Objectives of Green Computing

- To reduce the power consumption.
- To reduce the harmful effects to the environment through the use of hazardous materials.
- To increase the time of the product.
- To promote recyclability of defunct products and factory waste.
- To maximize energy efficiency during the product's life time.[6]

Green IT Barriers and Benefits

Barriers	Benefits
Initial costs	Reduction in power and resource consumption
Challenges of reengineering processes and business practices.	Better resource utilization.
Reluctance to change cultural and behavioral practices.	Improved operational efficiency.
Enterprise green initiatives are not aligned properly.	Reduced environmental impact and carbon footprint.
Lack of management drive and support.	Total cost savings
Need and reluctance to learn new skill.	Improved corporate image.
Lack of motivation among stakeholders.	Meeting compliance and regulatory requirements.
Fear of loss of job or need for retraining.	Meeting sustainability demands of consumers and employees.

Table 1.2[7]

Implementations Of Green Computing

1.Blackle

Blackle is an internet search engine powered by Google. Blackle was created by Tony Heap of Heap Media Australia, which aims to save energy by displaying a black background with a grayish - white text color on search results. It came into being based on the concept that when a computer screen is white presenting an empty word page or the google homepage, your computer consumes only 59W. Based on this theory if everyone switched from

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Google to Blackle, mother earth would save 750W each year. This was a really good example of implementation of Green Computing.

2.Zonbucomputer

The Zonbu is a new, very energy efficient PC. The Zonbu consumes just one third of the power of a typical light bulb. The device runs the Linux operating system using a 1.2 gigahertz processor and 512 meg of RAM. It also contains no moving parts, and does even contain a fan.

3.Fit PC

The fit-PC is a small, light, fan-less nettop computer manufactured by the Israeli company CompuLab. Many fit-PC models are available. fit-PC 1.0 was introduced in July 2007, fit-PC Slim was introduced in September 2008, fit-PC 2 was introduced in May 2009, fit-PC 3 was introduced in early 2012, and fit-PC 4 was introduced in 2014. The device is power-efficient (fit-PC 1 was about 5 W) and therefore considered to be a green computing project, capable of using open source software and creating minimal electronic waste. If you ever wished for a PC to be compact, quiet and green-then fit-PC is the perfect fit for you.

4.Sun Ray thin client

Sun Microsystem is reporting increased customer interest in its Sun Ray, a thin desktop client, as electricity prices climb, accordingly to Subodh Bapat, vice president and chief engineer in the Eco Responsibility office at Sun. Thin clients like the Sun Ray consume far less electricity than conventional desktops, he said. A Sun Ray on a desktop consumes 4 to 9 watts of power, because most of the heavy computation is performed by a server.

5. Eee PC

The "ultra-portable" class of personal computers is characterized by a small size, fairly low power CPU, compact screen, low cost and innovations such as using flash memory for storage rather than hard drives with spinning platters. These factors combine to enable them to run more efficiently and use less power than a standard form factor laptop. The Asus Eee PC is one example of an ultraportable. It is the size of a paperback, weighs less than a kilogram, has built-in Wi-Fi and uses flash memory instead of a hard drive. It runs Linux too.

Advantages of Green Computing

1.Energy Savings

Green computing makes sure that very less amount of energy is consumed by the IT processes. Thus, this can save plenty amount of energy overtime.

2.Cost Savings

Green computing is highly cost effective that helps people save money. Since lots of energies are saved when using a green computing solution, it also substantially leads to financial gains. Even though green computing is with high upfront costs, still it is cost effective in the long run.

3.Recycling process

Green computing encourages recycling process by reusing and recycling electronic wastes. Most parts of the computer are constructed using eco-friendly materials

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instead of plastic so that it can have less environmental impacts. This makes all the electronic wastes to get separated efficiently. Hence by implementing green computing strategies, companies overall can improve their recycling process.

4.Brand Strengthen

Some customers are so well concerned about the environment that they are solely preferring to go with companies that support green computing. Green computing is capable of creating public images so that they can strengthen their brand and market position all around the world.

5.Less Pollution

Through conventional computing, lots of pollution issues take place in the environment. For an example, if not properly recycled all the electronic wastes from the computer may end up circulating on land. Thus, leading to soil as well as water pollution. By using green computing, the users can minimize the impact created by pollution at least to some extent.

6.Green House Gas Emission

During the production of IT hardware, tremendous amount of green house gases are released to the atmosphere. Especially, since harmful gases such as carbon dioxide are emitted, it could lead to global warming. Hence, for lowering the amount of green house gases emitted, the production of hardware components must be reduced as well. This is how green computing works effectively.

7.Chemical Exposure

In most of the electronic devices, harmful chemicals such as mercury is used. If a human happens to get contacted with those substances, he/she will probably suffer from health risks. Some of the known health risks are triggering of immune responses, nerve damage or even cancer. The companies which practice green computing potentially avoid the use of non-toxic substances during the production of computer hardware.

Disadvantages of Green Computing

1.Perfomance

For those companies that are green are always considered to be underpowered both in terms of system performance and network. This is especially true, if it is not implemented properly. For the companies that relies upon powerful computers, this can drastically decrease their employee productivity which in turn affects the company's profit.

2.Maintenance

Besides implementation, the maintenance of a green computing system is considered to be highly difficult that can be costly as well as time consuming. This is because the technology behind green IT is entirely new and changing rapidly which makes the maintenance efforts eminent.

3.Implementation Cost

Although green computing is cost effective in the long term, still many companies refrain from switching to green computing due to its high upfront cost. When implementing a green computing system,

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it takes lots of time and research, all that costs plenty of money. This makes the technology more expensive than the average model.

4.IT Knowledge

In order for using the green IT infrastructure, IT experts who has well knowledge about the technology needs to be deployed. Those experts are rare to find, and if found they need to be paid plenty of money. If not appointed, your systems could eventually experience downtimes and other technical issues.

5.Security Leaks

When using a green computing system, there are some serious concerns regarding security. The employee who work under companies that practice green computing regularly exchange their workstations and other devices. This eventually opens up many security leaks such as hacking. Therefore, the companies have to take necessary measures for avoiding such problems.

6.Adaptation

The success of green computing does not solely depend on an individual person. It is based on the effort and preferences of each staff members. They must adopt to this new system. If one the members does not corporate to this, the implementation idea may go in vain. So just because of those people, firms must decide migrating to green computing.

7.System Support

Day after day, the technology is evolving at high speed. Whatever the changes that is done today, needs to be updated soon. Same applies to green computing as well. The companies are always with an insecurity that when they switch to green computing, they are not left finished. Very soon they will be in need of migrating to an advanced system.[8]

Conclusion

Green Cloud Computing is the emerging technology and topic for research in this technocratic world of technical enthusiast. Now a days, IT companies are advancing towards the cloud computing due to increase in the large data storage and computational demands leading to the growth of the cloud infrastructure with ecological and frugal balance. Cloud Computing has designed and developed a top-notch approach to virtualize servers and data centers with maximum energy efficiency. This paper reviews brief discussions on green cloud computing, it's advantages, disadvantages, the need it offers to the world and how environmentally friendly is Cloud computing. The paper conclude that in this emerging technical world the need for Green Computing is undeniable. For the better implementation of Green Computing in many areas we still have to over come some barriers or disadvantages of it.

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Academic Behavioral Intentions (BI) towards a Multi Cloud Approach Using Social Cognitive Theory (SCT)

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Changanassey,kerala.

Abstract- *Multi Cloud computing is one of the top most technology innovation. The wide spread of this technology in the academic remains unexplored. The main purpose of this paper is to examine academic behavioral intentions(BI) towards multi cloud computing in an educational platform by using the concept of social cognitive theory. The study was tested among a group of students to develop an understanding about the inclination, multi cloud tendencies, academic intentions, self-efficiency and output cracks on behavioral intention and learning future enhancement of multi cloud computing technology. The outcome indicates that the multi cloud tendencies and academic intension indicates the academic behavioral intention to adopt multi cloud computing as an educational learning resource. The statistical analysis were conducted to support the view of social cognitive theory can help to understand the main internal and external drivers of increasing an individual's in academic intention to adopt multi cloud computing as an educational learning instrument. The model was growing as one of the important invention to push huge resources to the multi cloud. Academic institutions were taken an interest to adopt the multi cloud model to facilitate the individual intention. In this paper , the interactive technology, educational and digital by integrating social cognitive theory (SCT) with multi cloud computing services to highlight the importance of individual's learning about innovations and adopting them in a higher educational setting.*

Keywords- Multi Cloud, Behavioral Intentions(BI), Multi cloud tendencies, Academic intentions, Social Cognitive Theory (SCT)

1. INTRODUCTION

Multi Cloud Computing is one of the most popular technologies available in this era as a Utility, customers utilize the concept of cloud computing in the way of "pay-as-you-go" for applications, computing and storage resources . this technology is evolved from the grid computing, cloud computing, and distributed cloud computing such as mobile applications , online platforms and other available virtual platforms. The model was growing as one of the important invention to push huge resources to the multi cloud With the concept of pay-as-you-go , the elasticity in upgrading or downgrading in major resources makes Multi Cloud Computing a popular model for organizations, industries and in academics. The innovative technologies and different types of services available(Infra structure as a Service, Platform as a services, software as a services) in the cloud computing can also be integrated in the multi cloud also. Moreover, the cost factor of Multi Cloud Computing is encouraging its adoption; needed a high level behavioral intentions of and about to decide whether to build up their own IT

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infrastructure or to utilize Cloud infrastructure may find that using a Multi cloud infrastructure will give a better balance between cost and elasticity.

Multi Cloud Computing can be defined as "a system, where the resources of a data centers is shared using virtualization technology", which provide elastic, on demand and instant services to its customers and charges customer. Typically, the term "multi-cloud" refers to organizations using two or more public cloud providers and, their own private cloud to deliver IT resources. The model is growing as powerful enterprises continue to push more resources to the public cloud. Often, such a move arises from an effort to stop overreliance on anybody public cloud provider. As with the cloud and automation are vital to a true multi cloud strategy. The statistical analysis conducted supports the view that social cognitive theory can help to know the most internal and external drivers of accelerating an individual's intention to adopt cloud computing as a learning instrument. This paper contributes to the interactive technology, educational and technology marketing literature by integrating social cognitive theory (SCT) with multi cloud computing services to highlight the importance of individual's.

The goal of our work is to understand academic behavioral intentions towards Multi Cloud approach using social cognitive theory. I try to sense the academic behavior that may indicate to a possible attack based on a proposed attack model. Cloud computing is one among the main innovation advances in information technology. More consumers to adopt cloud computing as a technological innovation there needs to be a better understanding about the innovations. While there is an increasing amount of interest in cloud computing as a technological academic innovation there is an important need to examine the reasons why consumers adopt cloud computing. The technology accepts and social cognitive theory are identified because the theoretical frameworks to understand the academic scholar adoption process of multi cloud computing. A set of research hypotheses are stated from both theoretical frameworks to test their relationship with a academic intention to adopt Multi cloud computing as a technological innovation. These hypotheses focus on perceived usefulness, perceived ease of use, online academic behavioral advertising knowledge, social cognitive, ethical tendencies and online privacy concerns. The findings of the study outline the various areas of technological innovation research that are needed so as to advance the knowledge technology industry within the future.

The findings suggest that perceived ease of use, perceived usefulness and online privacy concerns can determine a academic intention to adopt multi cloud computing but online academic behavioral intentions knowledge and social networks differ amongst scholars in different countries. Some of the key issues influencing the scholars to adopt the concept of cloud computing are outlined, which due to the emerging nature of this technological innovation will influence the regulation and education of cloud computing services by firms and governments in the technology sector.

2. MATERIALS AND METHODS

Multi Cloud computing consist of virtual computers ,storage devices and servers. The three types of cloud computing offers collaborative support and services, cloud transfer, back-up, resources on demand, simplifies operation. The demand of multi cloud technology has been increasing the day by day. The concept of this technology can be established and extended to the academic section also. Also identifies this multi cloud technology as a major contribution to all of the sectors that uses the advantages of the cloud computing. Moreover that, highlighted shared technologies doesn't reach to the level of extreme in the academic . hence Multi Tenancy remains as a threats to Multi cloud computing. Virtualization is one of the leading process hosting layer such as servers issues where competitors will have separate VM in the same physical machine. The theories has attempted to elaborate the academic behaviors intention(BI) is the key factor in the usage of IT system services. Several areas considered as danger in Clouds.

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2.1 The key features multi-cloud computing are:

1. Dealing with service/resource on demand;
2. Cost effective or improving quality of services;
3. Acting as intermediary;
4. constraints;
5. High availability of resources and services;
6. Avoiding dependence;
7. Ensuring backups;
8. Reacting to changes;
9. Enhance own Cloud service/resources offers;
10. Consuming different services.

2.2 Academic behavior with cognitive factors:

Few studies give the assumption that the social cognitive theory (SCT) aggregates the concept of academic behavioral Intention. The multi cloud computing is a critical factor in the initial stage of the academics. Lots of scholars are now using the concept of virtual learning , in this area the behavioral intentions can help us a lot. The concept of cloud logical progress can form multi cloud. Social Cognitive Theory between the individuals and their environment is both structural and social. The three key factors of this theory (observational learning, self-efficiency, outcome expectations) helps to develop a logical thinking towards the multi cloud computing technology in academics.

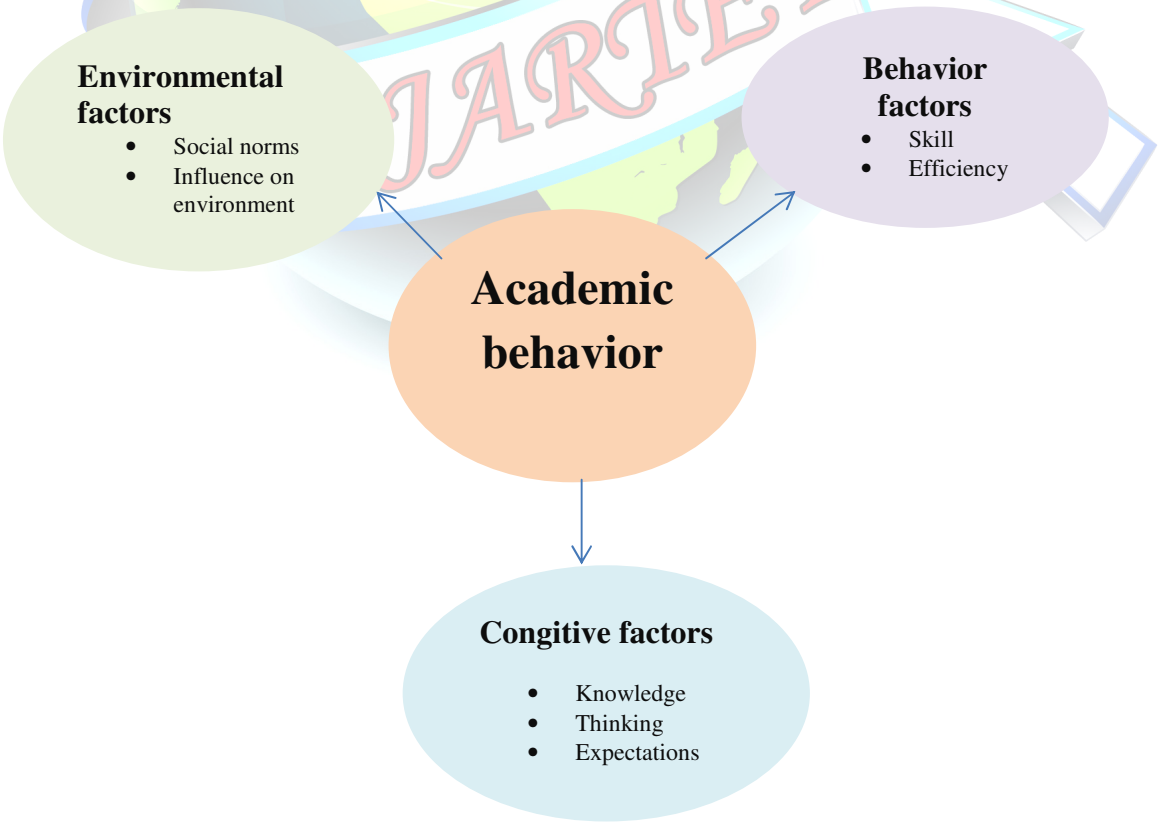

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Fig 1: Academic behavior architecture with cognitive factors

2.3 Applications of Social Cognitive Theory in multi cloud:

Applications of Social Cognitive Theory in multi cloud research are related to a study in academic workplace learning and innovative academic behavior that has been designed to create new thoughts on: (1) academic information literacy; (2) skill management; and (3) the relationship between information behaviors and innovation processes. It is also understandings about the Social Cognitive Theory as a valuable tool for implementing multi cloud domains that focus on learning processes.

• **Observational learning:** Individuals are more likely to perform a desired behavior if they observe others modeling that behavior and experiencing the next positive rewards.
• **Self-efficacy:** Individuals are more likely to practice a desired behavior if they perceive that they have the specified skills and capacity to undertake to so.
• **Outcome expectations:** Individuals are more likely to practice a desired behavior if they believe the advantages of performing that behavior and outweigh the prices .

2.4 Multi cloud learning:

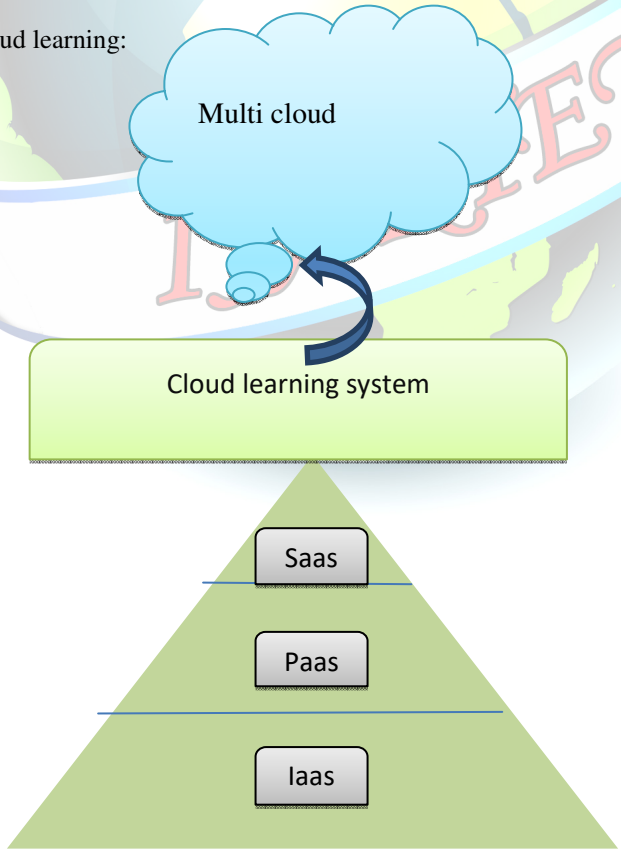

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Fig 2:Multi cloud learning architecture

Multi-cloud is the concept of two or more cloud computing services from number of different cloud vendors. A multi-cloud aspects may be all-private, all-public or a combination of both (hybrid). Many of the companies and academic institutions use multi-cloud environments to distribute computing resources and minimize the risk of downtime and data loss. They can also increase the computing power, throughput and storage available to a business aspects. Innovations in cloud in recent years have resulted in move from single-user private clouds to multi-tenant public clouds .

3. RESULTS AND DISCUSSION

Based on the reviews, search on different articles and statistical analysis I focus a conclusion that Academic Behavioral Intentions (BI) towards a Multi Cloud Approach Using Social Cognitive Theory (SCT) is good in almost all the area of academics. Many universities worldwide are trying to keep in touch with new technologies and services. The factors affecting academic behavioral intention of using cloud technologies through analyzing factors that affect staff acceptance of cloud services.

4. CONCLUSION

The cloud computing is one of the fastest utilizing technology with the many applications in lots of industries as well as in the academics. Many universities worldwide are trying to keep in touch with new technologies and services. The cyber security have taken major concern about the hybrid clouds and multi cloud in the case of schedule maintenance and services. By using the concept of the social cognitive theory (SCT) the academic behavior intention towards the multi cloud technology has been blossoming. Multi-cloud paradigms combine with other technologies such as machine learning , crypto currency and big-data can elaborate the cloud computing and also to solve some of the current issues with cloud computing.

5. ACKNOWLEDGEMENT

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Performance Evaluation Of Random Forest Classifier For Depression Detection From Tweets With Different Word Embedding Models

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***Abstract*: Due to spontaneous growth in internet usage , immense amount of data is generated in social media. And these online data can used for various purposes, in this paper data generated as tweets are used for detecting depression of twitter account holders at an early stage. Early detection of depression is very crucial while considering mental health issues. Machine learning and deep learning classifiers are more commonly used in the area of sentiment analysis. As sentiment analysis is the base for detecting depression from tweets, here we consider Random Forest classifier for the objective and evaluated performance with different word embedding models like CBOW ,Skip Gram and FastText .**

Keywords* : *Social media,Depression detection,Machine learning,Sentiment analysis,Random Forest.

I. INTRODUCTION

As per WHO more than 264 millions of people were affected by Depression ,which is a common disorder that will hurt a person critically and can cause to perform poorly at their profession and even in their family. And to some extent it can become a reason for suicide [1]. In most of the times, Depression is not detected at an early stage, but by analyzing tweets it become now possible to recognize the depressive nature of the text like sentiment analysis extract the sentiment polarity of text. By identifying depressive tweets, treatment can be started early and which may be significant for the patient.

Sentiment analysis combines text mining, NLP and computational intelligence in order to classify texts as per their emotion polarity. Different Machine learning techniques and deep learning models were used in this area and ensemble techniques also provides better results. In this paper an Ensemble classifier Random Forest resolves the classification problem, combines base classifiers and decision is based on majority voting or on an average depending on the combination, which in turn results in better accuracy than base classification methods. In addition to the classifier ,preprocessing and word embedding models also have vital role in the classification process and they all are also explored in this paper.

Rest of the paper is arranged as section 2 covers Related works, Proposed Methodology in Section 3, Experimental Results in Section 4 and paper is concluded in Section 5.

II. RELATED WORKS

[12]In the proposed work, detection of depressive and non depressive tweets from Arabic tweet set is performed. Different machine learning models Random forest,Naive bayes,Adaboost and Liblinear were used for implementing the classification process and Liblinear provides higher accuracy.

[13]Authors focused on analyzing the sentiments on tweets and thus by determining the depressive or non depressive tweets. Different machine learning

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algorithms were used here for classification process- Tf- IDF,Bag of words and multinomial naive bayes and they reached at the conclusion that multinomial naive bayes algorithm shows better accuracy when compared with the rest.

[14]As per authors, machine learning classifiers can be used for classifying tweets as depressed or not depressed. Processes that done on the dataset were preprocessing, feature extraction, taking account measures based on user activity in their twitter accounts and then applied classifiers for the final result. SVM and Naive bayes are used in this work and found that SVM gave better result.

[15]In this paper authors proved through their experiment that traditional vectorisers affect the accuracy of classifiers in sentiment analysis, so they used word embedding model ,word2vec for generating high dimensional vectors. From the results it is found that accuracy of classification process improves when vectorizers are replaced with word embeddings.

[16]In the proposed work, sentiment polarity classification on four data set is performed. Different vector representations, lexicon based,word embedding based and hybrid approaches were used. Based on experiments, it is concluded that hybrid approach results better accuracy.

[17]Through this work, authors stated that word embeddings helps to classify different types of words in an efficient way than the old bag of words approach while implementing with supervised machine learning approaches. Analysed patterns of negativity in Australian parliamentary speeches. In the work accuracy of machine learning classifier employing word embedding is compared with that of bag of words vectorisation. It is stated that word embedding helps to identify semantics of the words even if they are not included in the training data set.

[19]In this work sentiment analysis on amazon data set is performed to recognize the polarity of sentiment involved in the text. Here a hybrid approach for classification is employed by combining SVM with Random Forest and through experiment , it is found that the combined classifier provides better results than pure SVM or RF.

[20] Authors worked on tweets for sentiment analysis by employing different machine learning techniques using various embedding models like Word2Vec,Fasttext and Glove.GaussianNB,Linear SVC,NuSVC,Logistic Regression,SGD and Random forest were explored and reached at the conclusion that Fasttext embeddings performance out weigh other embedding models.

III. PROPOSED METHODOLGY

This section presents the methodology used in the proposed work. Process is completed as a sequence of steps. Fig. 1 depicts the system architecture.

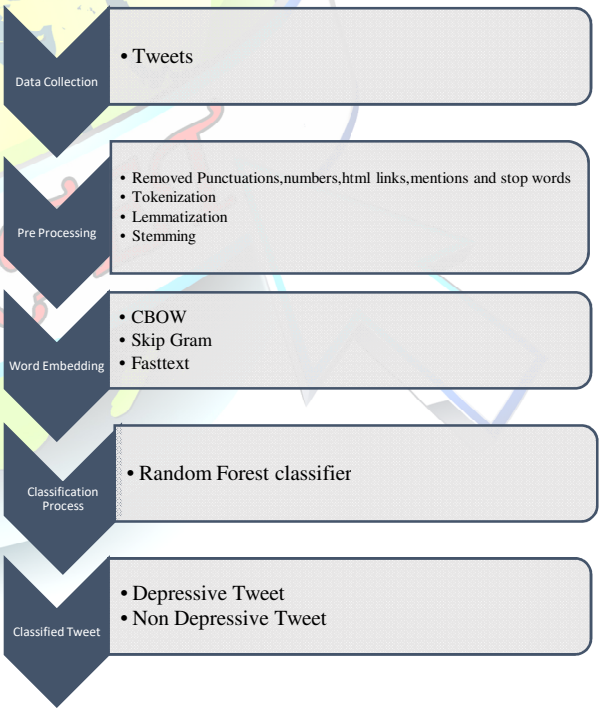

FIG. 1. SYSTEM ARCHITECTURE

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A. Data Collection

Our work is on Tweets and here we collected tweets from an open Kaggle data set ,containing 3657 depressed tweets and 3356 non depressed tweets its count is represented in Fig. 2.

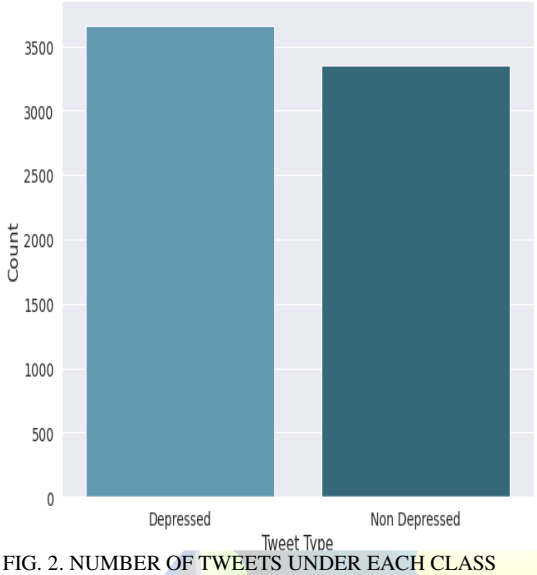

FIG. 2. NUMBER OF TWEETS UNDER EACH CLASS

B. Data Preprocessing

Quality of classification process depends on the quality of data [2]. Usually online data contains lots of noises and hence preprocessing is required to clean the data for better results [2]. Tasks that are done during preprocessing are Removed numbers, punctuations,stop words,html links, and mentions like #,@,https:// etc. ,done tokenization and performed lemmatization and stemming.

C. Word Embedding

After the preprocessing task, data is to be converted into numerical values as the classifiers could not able to process texts in its raw form. In earlier classification methods vectorisers like one hot encoding,count vectorizers etc. were used but due to its large dimensional size and similarity issues word embeddings were brought into usage[3]. They are dense, distributed, fixed-length word vectors, built using word co-occurrence statistics as per the distributional hypothesis[4]. In this work three embedding methods were used for evaluating performance of Random Forest classifier with different embedding models.

1. WORD2VEC
   Syntactic meaning of words are maintained in Word2Vec model and words are organized by their syntactic similarity[5]. For prediction of supplementary words in a sentence, Word2Vec have two algorithms[6]:
   - CBOW(Continuous Bag of Words) – In this model context is given by multiple surrounding words and the center ,target word is predicted with the help of these surrounding words[7].
   - SG(Skip Gram) – In this model, trying to predict the surrounding context words with the help of center word[18]
2. FASTTEXT
   This model , for each n-grams generates vectors ie. for sub parts of words[8]. Its base is Skip Gram model, but provides more accuracy for classification process.

D. Classification

For classification process data set available will be split up into training and testing set[9]. A classifier model is developed with the help of training dataset and accuracy of the model is checked with testing dataset.

Different classifiers were popularly used in the area of sentiment analysis including Machine learning models, ensemble models and Deep learning models. In this proposed work an ensemble model is used. Ensemble model helps to improve the performance of the classifier by merging up of

different base classifiers. Random Forest is used in this work as classifier.

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- Random Forest

It is one of the most popular ensemble algorithm. Random forest algorithm trains on multiple decision trees driven on slightly different subsets of data. In Random forest classification method, many classifiers are generated from smaller subsets of the input data and after that their individual results are aggregated based on a voting mechanism to generate the desired output of the input data set[10].

E. Performance Evaluation

After classification model is developed, their accuracy is to be measured. Metrics considered for performance evaluation are Accuracy, Precision, Recall and F1 score and these measures are based on true positivity and true negativity on result of classification process [11].

$$\text{Accuracy}=\frac{TP+TN}{TP+TN+FP+FN} \quad (1)$$

$$\text{Precision}=\frac{TP}{TP+FP} \quad (2)$$

$$\text{Recall}=\frac{TP}{TP+FN} \quad (3)$$

$$\text{F1Score}=2\text{x}\frac{Recall x Precision}{Recall+Precision} \quad (4)$$

IV. EXPERIMENTAL RESULTS

In this work, Random Forest classification is employed for implementation. Before training the model ,pre processed data set need to be vectorised and for that three word embedding models are applied here-CBOW,Skip Gram and FastText. Vectors

obtained from these three embedding models were passed to the training phase and then the result accuracy of these three were compared and shown in Table 1.

TABLE 1. PERFORMANCE EVALUATION METRICS FOR RANDOM FOREST CLASSIFIER

Classifier	Word Embedding Models	Accuracy	Precision	Recall	F1-Score
Random Forest	CBOW	87.17	84.21	92.56	88.18
	Skip Gram	93.65	93.21	94.62	93.91
	FastText	94.15	93.75	95.04	93.36

From the results obtained, it is observed that both Skip gram and Fasttext shows better accuracy, but Fasttext exhibit a slight greater accuracy . Fig. 3 shows chart representation of accuracy.

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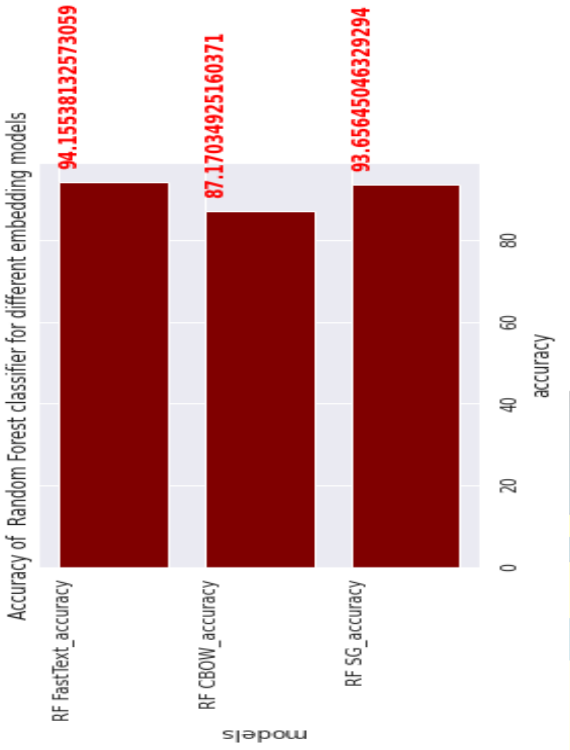

FIGURE. 3. ACCURACY MEASURES OF RANDOM FOREST CLASSIFIER FOR DIFFERENT EMBEDDING MODELS

V. CONCLUSIONS

In this work , researchers tried to identify depressive tweets from set of tweets using an ensemble classification model Random Forest with three different word embedding models-CBOW,Skip gram and FastText. As word embedding models also have a significant role in the performance of the classifier we tried with different embedding models. From the result obtained, we arrived at the conclusion that optimal accuracy performance was with FastText word embedding model with Random Forest classifier. With this work we got the assurance that selection of word embedding model for a classifier is also vital in concern with its accuracy. In our future work we will try to find out an optimized machine learning model with suitable word embedding model by exploring various classifier models with different embedding models.

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PREDICTING THE EFFECTIVENESS OF COVID-19 VACCINES USING MACHINE LEARNING TECHNIQUES

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Abstract—*Covid-19 pandemic had unfavorable effects on mankind and it has changed the view of one's life. People had to go through tough times during this period. This pandemic has taken millions of lives, governments all around the world was forced to take grating restrictions on humans to minimize the spread of the virus. This pandemic has affected people in all walks of life, the whole world was fighting over a deadly virus. To rescue came covid-19 vaccines, covid-19 vaccinations is providing a passage to move out of this pandemic, as natural immunity was not sufficient to fight covid-19.*
By the beginning of 2021, many vaccines were given approval and began to roll out worldwide. Immunization reduces the risk of getting diseases. Efficiencies of vaccine differ from one another and from person to person. Therefore, through this paper we try to predict the effectiveness of covid-19 vaccines available in India through data mining and machine learning. This focuses on prediction algorithms that can sort out an optimal result. The optimal classifier must be able to deliver the near results to that of the real-world clinical outcomes. Data Mining classification techniques such as Naive Bayes, Random Forest, Logistic Regression are used to conduct the analysis.

Keywords—Logistic Regression, Data mining, Naïve Bayes, Random Forest, Machine Learning.

I. INTRODUCTION

Covid-19 pandemic, that originated from Wuhan (China) had spread like wildfire across various countries which effected the mankind in a disastrous manner. Many countries had faced substantial difficulty in controlling the transmission of the disease. One such country was India. The outbreak of this pandemic had adverse effects on the citizens of India. Multiple strategies were used to bring the situation under control like implementing lockdowns, spreading awareness etc. Covid-19 had affected the day to day life of citizen declining the economy slowly. This pandemic has taken lives of many which caused immense pressure on different countries to take prominent decision to tackle the situation. One such decision was the production of vaccine. To provide vaccination was the only way to save lives. Vaccination is an easy, safe, and successful way for shielding people against injurious diseases. Vaccines reduce the possibility of getting diseases by functioning with body's natural defenses to build protection. When vaccines are injected, body's immune system responds to it by producing antibodies to fight against pathogens. Extensive testing and monitoring have shown that covid-19 vaccines are safe and effective and all citizens are advised to take vaccine and immunize themselves.

Data mining is a very promising area for making different types of decisions in the Medical field. During this period, it is crucial for us to understand the importance and efficiency of vaccinations. We could use different classification techniques and algorithms such as Naïve Bayes,

Random Forest, Logistic Regression, J48, MLP, Bagging e.tc to find the efficiency in different dimensions of medical fields. The utilization of machine learning and its applications deliver efficient results by extracting useful information from a dataset of group of citizens who have received the covid-19 vaccine. Selected information from the dataset could be used to analyze and predict the effectiveness of covid-19 vaccines.

II. PROPOSED METHODOLOGY

Machine learning can be used to predict the efficiency of vaccines. The key objective of this paper is to find the optimal algorithm that can predict the efficiency of vaccines. A survey was taken from a group of people belonging to different age groups to predict the efficiency of covid-19 vaccines. Questionnaire was prepared based on criteria on whether they have received covid-19 vaccinations dose 1, dose 2, whether they have been infected after dose 1 or dose 2. By using Google form, responses were collected from a group of people. These responses were collected and evaluated using the Weka tool. The results are envisioned using classification techniques like, Naive Bayes, Random Forest, and Logistic Regression.

III. IMPLEMENTATION METHODS

The application of data mining would be different for different sectors and is a vast topic. In the medical field, scope of Data mining (KDD) is very large and huge number of data sets are generated and computing a predication is out of the league for humans. So, data mining and machine learning algorithms come to play. Without data mining and machine learning, we could only draw this conclusion by plotting graphs manually, questionnaires etc. This would make the analysis difficult and prone to error (human error). Here using different implementation methods data were analyzed and results were evaluated.

A. Dataset Description

Attribute	Possible values
Email address	Email address of a person.
Age category	18+, 40-44, 45+, 60+
Existing diseases	Yes /No
Name of vaccine	Covaxin, Covishield, others
Received dose 1	Yes /No
Received dose2	Yes /No
Covid-19 infected after dose 1	Yes /No
Covid-19 infected after dose 2	Yes /No
Post vaccine side effects	Yes /No

Implementation was done through different stages. First stages involved the data collection from various group of citizens, second stage mainly consisted removing the duplicated data and extracting the relevant data from the data set and the last step involved the evaluation classification techniques to form a decision to obtain. Firstly, described how the data set should be formed and the different types of attributes to be involved. Table 1 shows the possible attributes and their descriptions.

Attribute	Description
Email address	Email address of a person.
Age category	Age of a person.
Existing diseases	Suffering from any other diseases.
Name of vaccine	Name of the vaccine a person has received.
Received dose 1	If a person has received dose 1 of vaccine.
Received dose2	If a person has received dose 2 of vaccine.
Covid-19 infected after dose 1	A person has been infected after dose1.
Covid-19 infected after dose 2	A person has been infected after dose 2.
Post vaccine side effects	Any post vaccine side effects.

Table. 1. Dataset Description.

B. Data collection

A questionnaire was created through google form and the collected data was stored in Microsoft Excel. Around 70 – 100 responses were collected and evaluated. Machine learning used in medical sector is gaining popularity due to the effectiveness in gaining accurate and flexible output. This dataset was collected from a group of citizens of different age group. This dataset was used to find the efficiency covid-19 vaccines in India. This paper mainly has two phases: First they were classified into their attributes as yes or no and second this paper deals with the use of classification techniques such as Random Forest, Naïve Bayes and logistic regression. Table 2 describes all the possible ranges of values of an attribute.

Table. 2. Possible values for attribute

C. Data preprocessing and feature selection

a. Data selection is a process where only essential information that could produce accurate results are selected. It is basically a filtration process to get useful information and discard wanted data. To get accurate result only useful data are required unwanted and unnecessary features would reduce the accuracy in the outcomes [**3**].

Data pre-processing is one of the most important process of data mining, that converts feasible data to useful information. Pre-processing includes steps like Data Cleaning, Data Transformation, Data Integration and Data Reduction.

D. Data mining

Data mining is commonly used technique to extract beneficial information from raw data to useful information. Data mining is also called knowledge discovery from data (KDD) which is used in different application like science, genetics, sales, marketing etc. Data mining include many steps such as extraction, data cleaning, transformation, management of data etc. These results are then manipulated into different visual representation such as decision trees, visualization graph etc. to make the data user understandable. All the useful data is retrieved through data mining algorithm and the main algorithm used are K Mean Algorithm, Naive Bayes Algorithm, J48, Random Forest, etc.

E. Applying Machine learning techniques

Data mining is an interdisciplinary area, that includes various sets of data. Classification helps to understand and match requirements. Classification algorithms are used to identify new observations on the basis of data sets. Classification algorithms in machine learning accepts data to predict a result that a particular data will fall into one of the pre-existing sets. Classification algorithms could be used to categorize data into different categories. It could be done on data that are structured or unstructured. There are different types of classification: binary classification, multiclass classification and multilabel classification. Classification is an important aspect as it used to predict instances of various data sets to receive a valid, classified, accurate, discrete outcome [**4**].

1. Random Forest

Random Forest is a type of supervised learning algorithm used for regression analysis and classification. As the name suggests, like a forest is made up of trees, a random forest algorithm is made up of decision trees and each decision tree in random forest gives a predicted outcome. By the process of voting an optimal solution or result is found. It can run efficiently on large datasets. This method is used for classification problems. It is said to be better than single decision tree because it reduces each method by averaging the results.

2. Naive Bayes

Naive Bayes algorithm [**19**] is a supervised algorithm that roots from the Bayes theorem used for classification. It is one of the most simple and effective classification algorithms which helps to make quicker predictions in machine learning. It is called Naive Bayes because it uses Bayes law for prediction, and it assumes that all features are independent and not related (naive).

3. Logistic Regression

Logistic regression [**20**] is a machine learning algorithm that comes under supervised learning, Logistic regression operates on categorical dependent variable and predicts feasible outcome. Hence the outcome could only be a categorical or discrete value. It can be either (Yes or No), (0 or 1), (true or False), etc. and it can't give exact value as 0 or 1 but gives only the probabilistic values that lie between 0 and 1.

IV. EXPERIMENTAL METHODOLOGY AND RESULTS.

A survey was conducted using google form and the data received was stored in Microsoft excel and converted to csv file. An .arff file, (Weka) file is generated from csv file through online converters. The Weka is a software that gives tools for data preprocessing, implement machine learning techniques etc. The accuracy, precision, recall, F-measure of each classification algorithm could be found using the equations given below.

$$\text{Accuracy} = \frac{\text{No.of correct prediction}}{\text{Total No of predictions}}$$

$$\text{Precision} = \frac{\text{True Positive}}{\text{Actual Results}}$$

$$\text{Recall} = \frac{\text{True Positive}}{\text{Predicted Results}}$$

$$\text{F- measure} = \frac{2 * (precision * recall)}{precision + recall}$$

Table 3 is the description of results obtained from the classification techniques used:

Algorithm	Accuracy	Precision	Recall	F-measure
Random forest	94.50%	0.94	1.00	0.97
Naïve Bayes	71.57%	0.97	0.70	0.81
Logistic Regression	88.99%	0.89	1.00	0.94

Table. 3. Performance Comparison of Classifiers

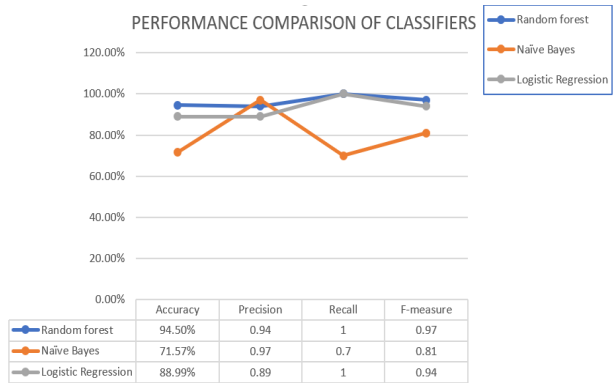

Fig. 1. Graphical representation of Performance comparison of Classifiers

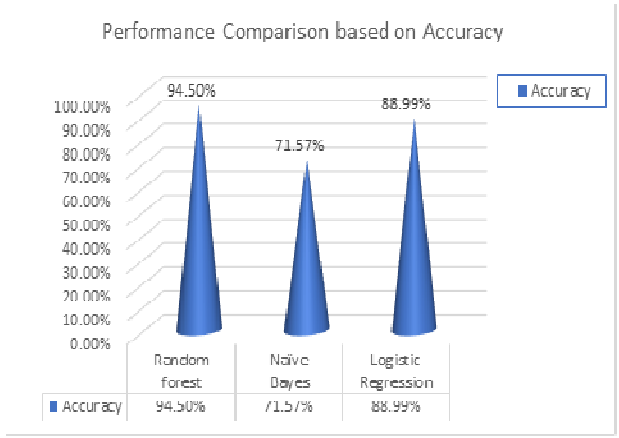

Fig. 2. Performance comparison on accuracy.

It is very important to plot data in graphical form, as graphical visualization plays a crucial role in understanding the data and its characteristics. Figures 1 and 2 are created based on results obtained, for better understanding.

Through these observations we say that the accuracy of these classification techniques is more in Random forest than other techniques. By classification techniques we found that random forest has 94.5 % accuracy, Naïve Bayes has 71.57% accuracy and logistic regression has 88.99% accuracy. And from the above observations, Random forest is the most appropriate technique for predicting efficiency of Covid-19 vaccines accurately.

V. CONCLUSION

In this paper we have tried to predict the efficiency of covid-19 vaccines available in India using classification techniques. The study shows that majority of the citizen have been vaccinated efficiently and more than 90% of citizens have not been infected after dose 1 or dose 2 of the vaccination. This shows that being immunized will help people fight against covid-19. The effectiveness of vaccines can differ from one person to another, and the type of vaccine taken. Not all vaccines have the same efficiency, to predict the efficiency of vaccines machine learning techniques could be used with the help of machine learning attributes like Data mining. Results obtained from the google form was not sufficient to conclude a decision, so with the help of Weka tool and classification techniques like Random Forest, Naïve Bayes, Logistic regression we could predict the efficiency of covid-19 vaccines. In terms of accuracy random forest stands at position one. It has the highest accuracy among all classification techniques. From this paper, we can conclude that, the best classification technique used to predict the efficiency of covid-19 vaccines is Random Forest.

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Prediction of 3rd Wave of COVID Using Artificial Intelligence

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Abstract

Artificial intelligence (AI) can be defined as the intelligence demonstrated by machines and is divergent to the natural intelligence showcased by humans or animals, it can also be described as any task performed by a program or a machine. Understanding AI can be a complex task, even with the current technology in hand, it can take several hours or days and depending on the task to be performed it can take even years to perfect an AI.

AI technology provides us with an invaluable prospective to develop early recognition and alert systems that are highly required, especially for rapid and dynamic decision-making skills to reduce risk and ambiguity under the current pandemic of COVID-19 virus.

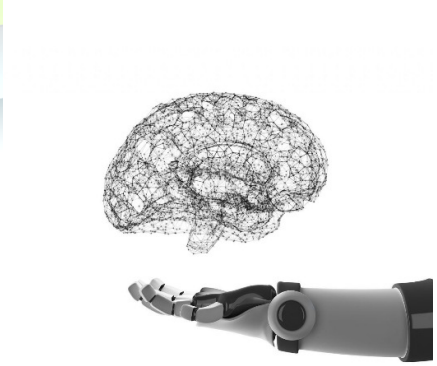
Keywords: AI, intelligence, prediction, COVID-19, virus, COVID-ResNet

Introduction

Artificial intelligence (AI) is one of the most important and yet a vital technology that has never seemed to stop evolving and growing. Even though it might be still be anonymous to a lot of people, but with the gradual evolution of technology, it has quickly become a part of our human lives.

In 1955, John McCarthy, an American computer scientist coined the term Artificial Intelligence (AI). He is also credited as the Father of AI.

From providing users with the right recommendations on songs or shows or in certain cases, suggestions on what consumers might need to buy from an e-commerce store, to even predicting the next wave of a deadly virus, both Artificial intelligence (AI) and Machine Language (ML) are playing an important role in



almost every sector around the globe.

Why AI?

Even though in the past, the present and the future, Artificial intelligence has been impacting the future of effectively almost every industry and every human being. Emerging technologies such as big data, robotics and (IoT)Internet of Things, AI has been acting as the main driver and will continue to act as a technological trendsetter for the foreseeable future.

One of the most recent examples on the brilliance of Artificial Intelligence (AI)-based algorithm which was used to predict the 3rd wave of COVID-19 in the provinces of South Africa, was designed by the University of the Witwatersrand (Wits University) in partnership with the York University, iThemba LABS, and the Provincial Government of Gauteng, providing an aftermath that there was a low risk for a third wave of COVID-19 infection in all provinces of South Africa.

An AI-based algorithm works alongside the analysis of an already existing algorithm and is based on relatively, upon the data provided to it.

Using AI for diagnosis and Predictions

According to the research paper published by Neelima Arora, Amit K Banerjee, and Mangamoori L Narasu on US National Library of Medicine National Institutes Of Health.

AI was used for the detection and quantification of COVID-19 cases from chest x-ray and CT scan images.

Researchers have developed a deep learning model called COVID-19 detection neural network (COVNet), for differentiating between COVID-19 and community-acquired pneumonia.

On the basis of the visual 2D and 3D features extracted from the volumetric chest CT scan, Singh *et al (*describes a novel function for autophagy in regulating lipid metabolism*),* developed a novel deep learning model using Multi-Objective Differential Evolution (MODE) and convolutional neural networks for COVID-19 diagnosis.

COVID-ResNet developed using automatic and discriminative learning rate together with progressive image resizing performed better than COVID-Net in diagnosing COVID-19.

Upon perceiving how the research has helped and improved the different ways by which the virus can be predicted, we find it to be more useful than ever especially in saving lives.

Prediction of the 3rd wave

With the pandemic happening around the world, everyone especially medical staff, scientists and all the people supporting them in various ways trying to help fix this situation as quickly as possible, but we are all limited to what we can do.

Although an AI may not give the impression that it may be capable of predicting or diagnosing a deadly virus, taking the above case of South Africa where AI was able to predict a 3rd wave of virus even though it was in its low-risk mode.

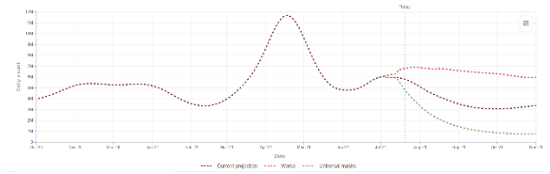
With the rise of the trend in learning AI and improving it the world performs an innovation each time an application or a product is created and is controlled by AI.

The graph for the number of cases of COVID-19 is still at a rise (according to an article published on Big-India) for countries having large population it becomes problematic as the spread of the virus is quicker and harder to control.

With almost 19.6 crore cases worldwide for COVID-19 and with a petrifying 3.15 crore cases in India alone. (Information as of 30th July 2021-Google COVID-19).

According to indiaai.gov.in, studying pandemics and disease outbreaks isn't new; but advances in AI can provide a new dimension to disease tracking. By applying advanced algorithmic calculations and predictive modelling, we can get an idea of the imminent problem at hand, allowing governments, healthcare workers and businesses to take appropriate preventive measures.

Scientists at IIT Kanpur, following a mathematical study, estimate that India will witness a third wave on October 2021.

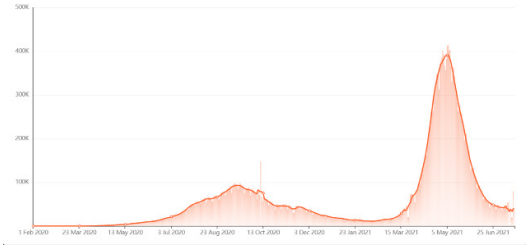


(Graph-1)

Graph showcasing the daily infections and testing.

An AI-based predictive model will be essential to manage a third wave of COVID-19 and this continuous learning model would be based on a real-time and robust data that would aid governments and policymakers with guiding economies to a phased reopening.

For any AI expert, data is what lies at the core of comprehensive AI applications. The biggest challenge that countries face is gathering quality data to build robust pandemic prediction models, data like fatality rates, R-values, virus transmission rates and herd immunity levels are tough to collect and can only be used as an estimate in certain cases.



(Graph-2)

Graph showcasing the number of COVID cases in India.

Pros & Cons

Just like Emily Fisk Giffin once quoted," Nothing is perfect, it is what you make of it". Even after years of development and technological advancements that has taken place, we can never say that an (AI)Artificial Intelligence is completely right, even though it can have its own benefits, just like the two sides of a coin an AI too has its own shortcomings and benefits.

The benefits of AI may include:

1. Performing Faster Decisions:
   With the 21st century witnessing the different changes of technology evolving throughout the years, AI has also evolved alongside it and is now a part of several unique technologies in almost all major sectors of our lives.
   According to the App Developer Magazine, during one of their experiments the team succeeded in training two popular deep neural networks called AlexNet and ResNet-50 in just 4 minutes and 6.6 minutes respectively.

2. Improving Efficiency:
   Automation using AI is possible in many spheres of business and productions. With the help of artificial intelligence, you can automate certain manufacturing processes which ultimately increases efficiency and productivity (based on how the AI is created to perform).

3. Less room for errors:
   Since some of the AI is created with the idea that it should perform certain purposes and actions, an AI should able to use its intelligence based on how the AI's path for thinking has been created.

4. Always Available:
   An AI is apparently not a human so it neither gets tired or feels overwhelmed, hence it is always available 24/7.

5. Allows humans to extend their experiences:
   Provided human beings use AI in the right ways, it allows us human beings to extend our experiences.

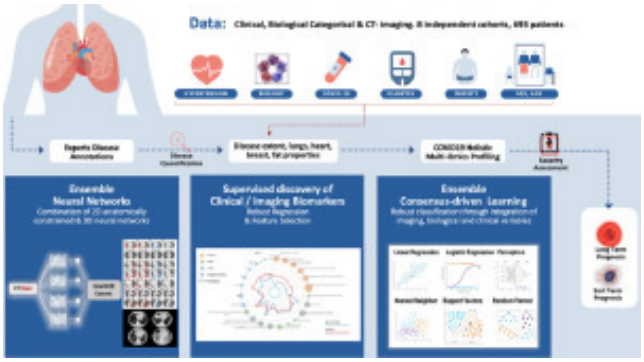
The limitations of AI may include:

1. Steep Price Tag:
   An AI is never cheap, since building, coding, creating, planning goes behind the creation of an AI, therefore better the AI, greater will be its cost. Maybe in the Future AI might be cheaper than what it is today.

2. Reducing Creativity:
   An AI is created to perform certain task which might help make human lives easier and allow us to focus on certain things, but since an is AI performing the work, it is foreseeable that the creativity in human beings ultimately gets reduced (In this case, creativity is

based on experiences, the work to be performed and actions taken).

3. Cannot be precise at all times:
   Calculations of large amounts of data is not easy and not a lot of ordinary computers are capable of performing high amounts of calculations (excluding super computers). Hence the value given can only be considered as an estimate. Even for the prediction of the COVID wave, we believe no matter what the outcome might be it can only be considered as an estimate.



4. Loss of Data:
   Data is a major factor in today's world and storing it, is another crucial yet tiresome task. Data loss may occur at any time and at any computer (computer here refers to any technological device that uses data and performs some operation on it) without any kind of warning. Hence it is always advised storing data backups separately.

5. Reduces Employment Opportunities:
   Since the growth of AI allows development of technology and once this technology is capable of performing tasks earlier performed by human beings, it automatically reduces the employment opportunities.

Conclusion

At the end of the day, AI has developed to be a part of our daily lives. It has advanced to such a point where it is able to predict the rate of a deadly virus, the number of affected people, number of vaccinated people and even the number of deaths recorded.

With a cast-iron certainty we can surely say that artificial intelligence will continue to develop because of the increasing interest in it. Humans will continue to make new discoveries in the field of AI and discover new improved and superior things.

With all the evolutions in technology we find that AI has provided to be of more than just a new technology but rather a life saver.

Artificial intelligence (AI) was always considered or developed with the idea in mind, to be similar to a human intellect and to perform functions and operations

quicker and faster in a much more evolved way.

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Properties of Relativistic Thermal Electrons in Plasma Channel by Propagation of Intense Laser Radiation

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***Abstract* - A strong electromagnetic laser beam over under dense plasma ousts electrons and ions from the central spot by the ponderomotive force and create a path in the form of channel. Transport characteristics of supra thermal electrons has been observed in the route of electromagnetic laser beam propagation and having energy bands of thermal character. Often one finds two different species of electron with two distinct thermal characteristics. Based on this idea in this paper we work on an analytical investigation of transport characteristics that generates such electron distributions through relativistic ponderomotive pressure. Corresponds to the values of laser and plasma frequency two species of electron with two different thermal characteristics are characterized by dimensionless beam width parameter and dimensionless power. Necessity of dielectric function of plasma on dimensionless power in relativistic ponderomotive laser plasma interaction process has been calculated. The change in the value of beam width parameter with distance of propagation has also been observed for different parameters of plasma for both species of electron with distinct thermal characteristics.**

I. Introduction

The transport characteristics involved in laser-based plasma interaction, up to 10^{17} W/cm^2, are now well unstated; on other side, a large number of fundamental issues remain open in the study of the ultrahigh intensity relativistic interaction regime. At very high laser power, transport characteristics of the laser-electron interaction may lead to nonlinear interaction, thus, resulting in an extensive variation of new phenomena. Now it has become possible to produce supra thermal electrons in a plasma as observed in recent experiments with solid targets [1], preformed plasmas [2], or pulsed gas jets [3]. The fast ignitor concept [4], applicable to the inertial confinement fusion (ICF), enhances the interest in this process as well as in laser beam propagation and channel formation in plasma. The channel formation procedure can be improved by the growing effects of ponderomotive pressure and relativistic self-focusing which increase the laser beam intensity during propagation. In the article we have made a critical study, followed by mathematical calculations to observe transport phenomena of supra thermal electrons in plasma. In section II mathematical formulation are presented for the transport phenomena with two different species of electrons with distinct temperature. Result and discussion are made in section III with experimental significance.

II. Mathematical Formalism

For a circularly polarized beam the ponderomotive pressure that separately accelerated the two electron fluid components is given by [5].

$$\mathrm{F}_{h,c} = -(\omega_{ph,c}^2 / 2\omega^2)\,\nabla I \sim n_{h,c}\,\nabla I \tag{1}$$

the suffix h and c denotes hot and cold electron, m_0 is the rest mass of the electron and $n_{h,c}$ is the density of hot and cold electrons. The relativistic Lorentz factor γ depends on the electric field **E**. The factor γ for a circularly polarized beam of frequency 'ω' is given by

$$\gamma = \left[1 + (e/m_0\omega c)^2 E^2\right]^{1/2} \tag{2}$$

Following [6], the self-focusing equation can be written as

$$\varepsilon_0(z)\frac{d^2 f}{dz^2} = \left(\frac{c^2}{r_0^4\omega^2} + \frac{\varepsilon_1(r,z)}{r^2} f^4\right) \tag{3}$$

The parameter 'f' is the beam width parameter, which can be defined as $r(z) = r_0 f(z)$ (4)

r_0 being the beam width at $z = 0$. Using dimensionless variables, $\xi = (ze / r_0^2 \omega)$ and $\rho = (r_0 \omega / c)$ equation (3) can be represented as

$$\varepsilon_0(f)\frac{d^2 f}{d\xi^2} = \left\{1 + \rho^2 \frac{r_0^2}{r^2}\varepsilon_1(r, f) f^2\right\}\frac{1}{f^3} \tag{5}$$

The z variable in $\varepsilon_0(z)$ and $\varepsilon_1(r, z)$ has been replaced by 'f', which is a function of z only. The effective dielectric function due to ponderomotive pressure with relativistic nonlinearity comes out as

$$\varepsilon = 1 - \Omega_{ph,c}^2 \left(1 + \alpha^2 EE^*\right)^{-1/2} - \frac{\Omega_{ph,c}^2}{2}\left(1 + \alpha^2 EE^*\right)^{-3/2} \tag{6}$$

here $\alpha = (e / m_0 \omega c)$ and $\Omega_{ph,c} = (\omega_{ph,c} / \omega)$

$$EE^* = \sqrt{\frac{\varepsilon_0(1)}{\varepsilon_0(f)}}\left(\frac{E_{00}^2}{f^2}\right)\exp\left(-\frac{r^2}{r_0^2 f^2}\right) \tag{7}$$

Using equation (7) in equation (6) and substituting $p = \alpha^2 EE^*$ and replacing $\exp(-r^2 / r_0^2 f^2)$ by $(1 - r^2 / r_0^2 f^2)$ in paraxial approximation one obtains

$$\varepsilon_0(f)\frac{d^2 f}{d\xi^2} = \left\{1 - \rho^2 \frac{\Omega_{ph,c}^2 p}{2}(1 + p)^{-3/2}\right\}\frac{1}{f^3} \tag{8}$$

For $(d^2 f / d\xi^2)$ to vanish equation (8) requires at $z = 0$ ($f = 1$),

$$\rho_0^2 = \frac{2}{\Omega_{ph,c}^2}\frac{(1 + p_0)^{3/2}}{p_0} \tag{9}$$

Equation (9) expresses the dimensionless beam width ρ_0 (at $f = 1$) as a function of a dimensionless quantity p_0 proportional to E_{00}^2 and hence, also to the initial beam power.

III. RESULTS AND DISCUSSION

For the analysis of transport phenomena, we arrive at distinct set of equations for nonlinear dielectric function in a two electron temperature plasma given by equation (6), relativistic self-focusing equation (8) and the critical power by equation (9). The function of equation (9) can be drawn, as a curve in the (p_0, ρ_0) plane and in known as the critical curve as shown in Fig. 1. Here we draw two different critical curves with respect to cold electron $(\omega_p/\omega)^2 = 0.7$ and hot electron $(\omega_p/\omega)^2 = 1.2$. If the initial value of p and ρ of a laser beam are in such a way that the (p_0, ρ_0) lies on the critical curve the value of $(d^2f/d\xi^2)$ will be disappear at $\xi = 0$ ($z = 0$) since the original value of $(df/d\xi)$ is zero, the value of $(df/d\xi)$ endures to be zero as the beam propagates along the plasma. Hence, the original value of 'f', which is unity (at $z = 0$), will become unchanged. Thus, the laser beam propagates without any variation in its width. This type of propagation is known as uniform waveguide propagation. For original point (p_0, ρ_0) of the laser beam lying under the critical curve $(d^2f/d\xi^2) > 0$ and for the points lying on the other side $(d^2f/d\xi^2) < 0$, thus, for the original point not lying on the critical curve the beam width parameter will either decreases or increases, as the laser beam propagates. The f versus ξ graphs have been obtained by numerically investigation of equation (8) and are represented in Fig. 2. The (p_0, ρ_0) coordinates for these three sets of curves for cold electron and hot electron are (2.5, 3.0), (3.0, 2.0) and (3.0, 1.0). From the figure it is appear that hot electrons converge and diverges sooner as related to cold electrons. The above condition is attributed to the statistic that thermal wavelength of hot electron is less as compared to cold electrons. As a outcome, self-focusing increases, hence channel creation phenomena can be improved by relativistic self-focusing which increase the laser beam intensity and generates supra thermal electrons.

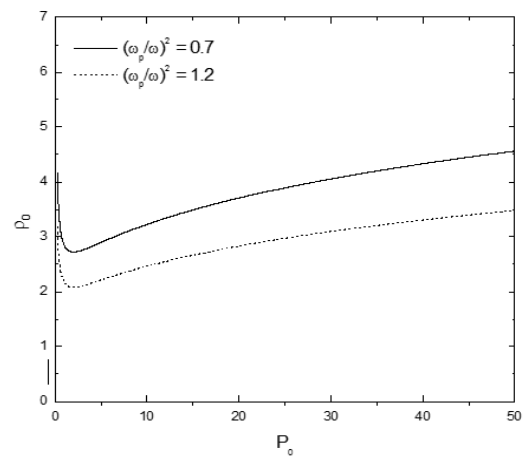

Fig. 1. Variation of dimensionless initial beam width versus dimensionless initial beam power.

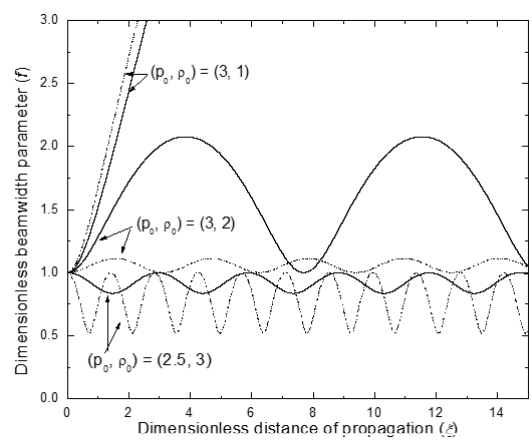

Fig. 2. Variation of beam width parameter f versus dimensionless distance of propagation ξ for $(\omega_p / \omega)^2 = 0.7$ (solid line) and $(\omega_p / \omega)^2 = 1.2$ (dotted line).

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Rehabilitation of Post-Stroke Patients Using Virtual Reality and Brain-Computer Interface

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Abstract

Upper Limb Rehabilitation of Post-stroke Patients can be made possible with the help of the Brain-Computer Interface (BCI) framework which combines the BCI and Virtual Reality (VR) technologies. The idea behind this framework is that Virtual Reality feedback is shown to the patients to experience a great activation of the brain regions thus can be helpful in the repair of brain cells involved with the performing of upper limb motor tasks. The brain activity is recorded using an electroencephalograph (EEG). This framework also uses an Adaptive Neuro-Fuzzy Inference System classifier also called ANFIS classifier to differentiate between a motor task and rest condition of the upper limb of the patient. During the First step, a classification is made between the motor task and rest condition. During the second step, a classification is made between flexion and the rest conditions. To support the working of this system around eight healthy subjects were participated in the sessions. Experimental procedures were conducted and the best result of these experiments was shown to be around 99.3% and 88.9%. This method can be directly implemented in the treatments of patients having partial palsy or total palsy due to stroke and also can be implemented in those patients having any neurological diseases or brain injury.

Key Words: Brain-Computer Interface (BCI), Virtual Reality (VR), Adaptive Neuro-Fuzzy Inference System Classifier (ANFIS), Electroencephalograph (EEG)

1. Introduction

Stroke is a chronic disease that is caused when the blood supply to the brain is interrupted, this prevents the brain tissue from getting oxygen and nutrients. This may cause partial or total palsy of the patient. There are around 15 million people was suffering due to stroke per year and around 6 million people were dying because of that. For motor recovery of the patients, physical therapy is needed so that they can recover