



**Journal of Indian
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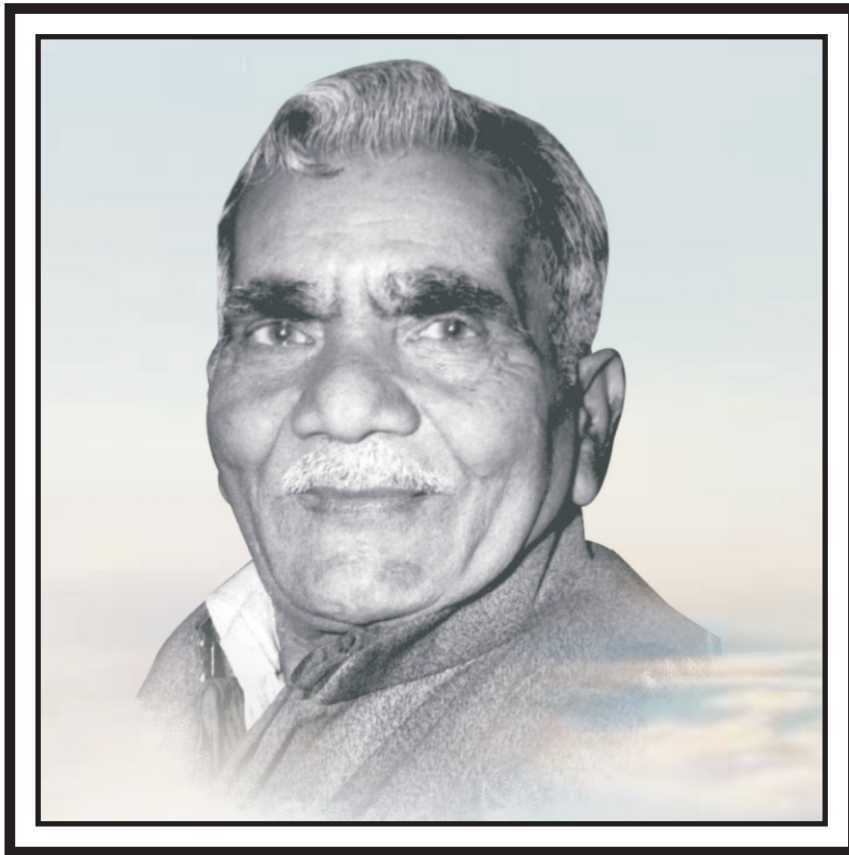


**Volume 3, Issue-II,
Sep, 2024**

Editor-in-Chief :

Dr. Saket Agarwal

Inspiring Soul



The actual fact of life is,
“To achieve Golden path to success;
one must strive hard from dawn to dusk.”

The crux behind this is,
“The hard work that you put in,
will be recognized as an appreciation by honor of success.”

- Mukut Behari Lal

Journal of Indian Institute for Engineering, Management and Science
Volume 3, Issue-II, September, 2024
ISSN : 2347-6184

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Journal of Indian Institute for Engineering, Management and Science
Volume 3, Issue-II, September, 2024
ISSN : 2347-6184

Editors - in - Chief Message

Dear All,

It's our immense pleasure to introduce you the Volume-3 Issue-II of Journal of Indian Institute for Engineering, Management and Science (JIEMS). We would like to extend a very warm welcome to all the readers of JIEMS. In this issue, focus is given to publish original research work that contributes significantly to strengthen the scientific knowledge in area of Engineering, Management, Science & Technology. The key focus would however be the emerging sectors and research which discusses application and usability in societal or consumer context whether individual or industrial. Through this journal, we provide a platform for academicians, research scholars and professionals throughout the world to present latest advancements in different areas. Our goal is to take the journal in a direction where it reflects the multidisciplinary nature and becomes the premier journal that covers all aspects of engineering, management, science & Technology.

The success of any journal is built primarily on four groups of people: the contributors, the reviewers, the associate editors, and the publications staff. For this journal, the contributions have come in not only from the academic community but also from the corporate world. We would like to thank all the contributing authors for providing outstanding research articles on a broad range of topics and we hope that the research featured here sets up many new milestones. We appreciate the efforts put by all the editorial team members, reviewers who have helped us in making this journal a possibility. We have had an overwhelming response from some very eminent editors and researchers globally to support as editorial Team. We look forward to make this endeavor very meaningful. We also thank all the publishing staff members and express my sincere appreciation for the support they have given to JIEMS.

Jiems is currently accepting manuscripts for upcoming issues based on original qualitative or quantitative research, an innovative conceptual framework, or a substantial literature review that opens new areas of inquiry and investigation. Case studies and works of literary analysis are also welcome. It would be definitely a privilege to publish a high quality research article which satisfactorily passes the editorial and peer review protocol. On behalf of the advisory board, we welcome your comments, views and suggestions. I hope to be able to bring about gradual changes in the near future for a successful indexation in the prestigious databases and more importantly for the improvement of the journal.

Please direct any manuscripts, questions or comments to: jiemsr@gmail.com

Editors-in-chief
JIEMS

Editors Message

Dear Authors and Readers,

Welcome to the latest edition of Volume 3 and Issue-II Journal of Indian Institute for Engineering and Management Sciences (JIEMS). As we navigate through the ever-evolving landscape of industrial engineering and management sciences, our commitment to fostering insightful research and facilitating scholarly dialogue remains unwavering. In this issue, we are proud to present a diverse array of articles covering a broad spectrum of topics within our field. From innovative approaches to supply chain optimization to cutting-edge advancements in operations management, each contribution represents a unique perspective and a valuable addition to the collective knowledge base of our discipline.

As editors, we are immensely grateful to the authors whose dedication and expertise have enriched the pages of this journal. Their rigorous research and intellectual curiosity continue to inspire and inform our community, driving progress and innovation in industrial engineering and management sciences. We also extend our heartfelt appreciation to our diligent reviewers, whose constructive feedback and insightful critiques ensure the quality and rigor of the articles we publish. Their commitment to excellence is essential in maintaining the standards of scholarly integrity and advancing the frontiers of knowledge in our field. Finally, we would like to express our gratitude to our readership, whose engagement and support are instrumental in the success of JIEMS. Your enthusiasm for scholarly inquiry and your commitment to advancing the boundaries of industrial engineering and management sciences are the driving forces behind our continued growth and success. We hope that you find this issue of JIEMS both informative and inspiring, and we encourage you to join us in our mission to promote excellence in research and scholarship in industrial engineering and management sciences.

Please direct any manuscripts, questions or comments to: jiemsr@gmail.com

With warm regards,
Sanjeev Kumar Arya
Editor
JIEMS

**Journal of Indian Institute for Engineering, Management and Science
(JIEMS)**

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Design and Simulation of Micro strip Patch Antenna for 6G Communication Network

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ABSTRACT

Antennas are playing the most important key role in wireless communication systems as the design of an air interface is mainly reliant on the antenna design. The rapid advancement of emerging technologies such as artificial intelligence, three dimensional (3D) media, virtual reality and the Internet of Things (IoT) has increased the volume of data traffic. This demand for substantial data rates led to the transition and upgradation of 5G technology to 6G communication. A wireless device has continuous technology improvement to provide better and interesting services. 6G technology is expected to support the gigantic amount of data traffic to cope the rise of connection wireless device. As a solution, a large bandwidth is supposed to be focused and a better gain is required. Then, a new frequency region that is at THz band is utilized. Since 6G technology is very new and not be defined yet, the previous work on 6G is reviewed to make a clear decision on antenna design specification. However, the main focus of 6G will be on higher capacity, ultra low latency, broader coverage and high security. The terahertz (THz) frequency band (0.1–10 THz) will primarily be used for 6G communication systems. The High Frequency Structure Simulator (HFSS) software is a finite element method of 3D electromagnetic simulation tool used in the design of radio frequency, high speed electronic devices and components. Microstrip antenna design for 6G technology using HFSS software is a promising solution that operates at a resonate frequency of 118 GHz - 300 GHz is proposed and analysis of gain improvement is presented in this paper. 6G wireless communications will be involved in a various applications like aircraft, spacecraft, satellite, missile, mobile radio and wireless communications. The benefit of microstrip antenna is that they are simple and inexpensive to manufacture. These low profile antennas can be printed directly onto a circuit board.

Keywords – Microstrip, 6G, High Gain, High Data Rate, Wide Bandwidth, HFSS, Efficiency, Return Loss

1. INTRODUCTION

The 6G communication system require substantial research and development in antennas, Radio Frequency (RF) front ends and wave propagation characterization intended for frequencies ranging from 118 GHz to 10 THz. 6G is an intelligent information system that is driven with modern artificial intelligence (AI) technologies. The high data rate can be acquired from a wider bandwidth. While for obtaining bandwidth above 100 GHz, it can be realized at terahertz (THz) frequency. Thus make future generation have to extend into THz region. This frequency region has antenna size from micrometer to millimeter. It is a crucial issue to fabricate and to measure a tiny antenna since a suitable material, technology, equipment and facilities need to be well considered. In this paper, a review on the previous work

of antenna design through the frequency selection, fabrication technique, material implementation and performance for 6G applications are presented. Then, a simulated antenna design is proposed at 300 GHz for 6G applications. A microstrip patch antenna consists of a thin metallic patch of any shape on a dielectric slab whose other side is grounded. The gain of the proposed antenna also is improved with a technique of additional substrate and air gap. 6G could be the best solution to provide the higher data rate and larger bandwidth to fulfill the current demands. The advanced features of the 6G technology include low latency, increased energy efficiency and improved coverage. This would reduce the delay between sending and receiving data, enabling real-time applications. The wavelength of the electromagnetic radiation for 6G is very short, which makes it challenging to use conventional antennas for wireless communication. However, research is ongoing to develop new types of antennas and technologies that can operate at these frequencies. Finally the paper mentioned several important trends in the antenna and radio frequency (RF) system towards 6G.

2. LITERATURE REVIEW

A Micro strip antenna has drawn the attention of researchers over the past work because of their many attractive features. The microstrip patch structures are relatively easy to manufacture and have turned microstrip analysis into an extensive research problem. Research on microstrip antenna in the 21st century aimed at size reduction, increasing gain, wide bandwidth, multiple functionality and system level integration. Microstrip Patch Antenna consists of a conducting rectangular patch of width "W" and length "L" on one side of dielectric substrate of thickness "h" and dielectric constant " ϵ_r ". Common microstrip antenna shapes are square, rectangular, circular and elliptical, but any continuous shape is possible. There are several techniques available to feed or transmit Electromagnetic energy to a microstrip patch antenna. The role of feeding is very important in case of efficient operation of antenna to improve the antenna input impedance matching.

3. MICROSTRIP ANTENNA & DESIGN ANALYSIS

3.1. Micro strip Antenna

In high performance aircraft, spacecraft, satellite and missile applications where size, weight, cost, performance, ease of installation and aerodynamic profile are constraints and low profile antennas may be required. Presently there are many other government and commercial applications such as mobile radio and wireless communications, which have similar specifications. To meet these requirements, microstrip antennas can be used. These antennas are low profile, conformable to planar and non-planar surfaces, simple

and inexpensive to manufacture using modern printed circuit technology, mechanically robust when mounted on rigid surfaces, compatible with MMIC designs and when the particular patch shape and mode are selected, they are very versatile in terms of resonant frequency, polarization, pattern and impedance. In addition, by adding loads between the patch and the ground plane, such as pins and varactor diodes, adaptive elements with variable resonant frequency, impedance, polarization and pattern can be designed. Microstrip antennas also exhibit large electromagnetic signatures at certain frequencies outside the operating band are rather large physically at VHF and possibly UHF frequencies.

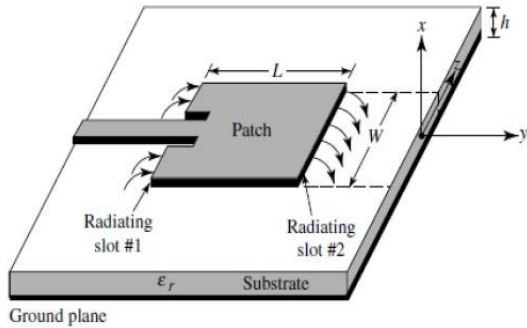
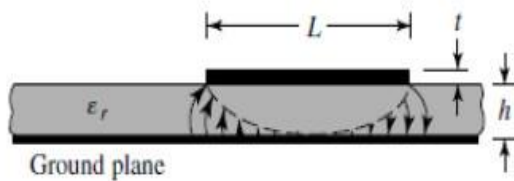


Figure.1. Microstrip Antenna - Top View



Figur.2. Microstrip Antenna - Side View

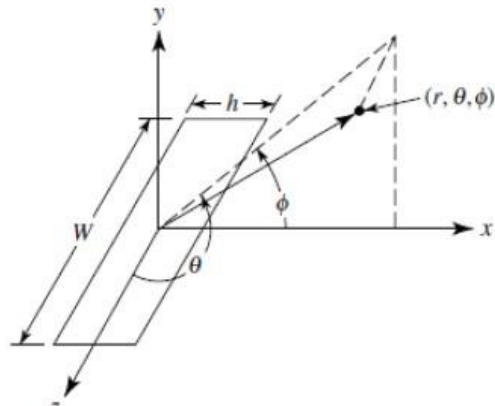


Figure.3. Microstrip Antenna - Coordinate System

3.2. Feeding Methods

There are many configurations that can be used to feed microstrip antennas. The four most popular feeding methods are microstrip line, coaxial probe, aperture coupling and proximity coupling. The microstrip line feed is easy to fabricate, simple to match by controlling the inset position and rather simple to model. Coaxial-line feeds, where the inner conductor of the coax is attached to the radiation patch while the outer conductor is connected to the ground plane. The aperture coupling is the most difficult of all four to fabricate and it also has narrow bandwidth.

The proximity coupling has the largest is somewhat easy to model and has low spurious radiation. However its fabrication is somewhat more difficult. The length of the feeding stub and the width to line ratio of the patch can be used to control the match.

3.3. Methods of Analysis

Transmission Line Model - The transmission line method is the easiest way to study the microstrip antenna. In this method the transmission line model represents the microstrip patch antenna by two slots, separated by a low-impedance transmission line of length L. Results we get are not the best accurate compared with other methods but it is good enough to design the antenna.

Cavity Model - The cavity model in analyzing the microstrip antennas is based on the assumption that the region between the microstrip patches and ground plane is a resonance cavity bounded by ceiling and floor of electric conductors and magnetic walls along the edge of the conductor

The Ground Plane Model - The ground plane should be infinite in size as for a monopole antenna but in reality this is not easy to apply besides a small size of ground plane is desired. Length of ground plane should be at least one wavelength, it means as the length of the patch is equal or less than half wavelength ($L \leq \lambda_o/2$) so ground plane will extend $\lambda/4$ from the edge of the patch.

3.4. Formula Used

The Microstrip Patch Antenna Calculation Process

Step 1: Calculation of the Width (W)

$$W = \frac{c}{2f_o \sqrt{\frac{\epsilon_r + 1}{2}}}$$

Step 2: Calculation of the Dielectric Constant.

This is based on the height, effective dielectric constant of the dielectric and the calculated width of the patch antenna.

$$\epsilon_{eff} = \frac{\epsilon_r + 1}{2} + \frac{\epsilon_r - 1}{2} \left[1 + 12 \frac{h}{W} \right]^{-\frac{1}{2}}$$

Step 3: Calculation of the Effective length

$$L_{eff} = \frac{c}{2f_o \sqrt{\epsilon_{eff}}}$$

Step 4: Calculation of the length extension ΔL

$$\Delta L = 0.412h \frac{(\epsilon_{eff} + 0.3) \left(\frac{W}{h} + 0.264 \right)}{(\epsilon_{eff} - 0.258) \left(\frac{W}{h} + 0.8 \right)}$$

Step 5: Calculation of actual length of the patch

$$L = L_{eff} - 2\Delta L$$

Where,
f_o is the Resonance Frequency

W is the Width of the Patch
 L is the Length of the Patch
 h is the thickness
 ϵ_r is the relative Permittivity of the dielectric substrate
 c is the Speed of light: 3×10^8

4. RESULTS AND DISCUSSION

As a result Terahertz radiation has several advantages over other frequency ranges, including the ability to penetrate many materials. This makes it a promising technology for a variety of applications, including security screening, medical imaging, and wireless communications. In microstrip patch antenna design, the use of terahertz frequencies lead to smaller antenna dimensions and higher directivity, which is desirable for many applications. Additionally, the high bandwidth available at terahertz frequencies allows for high-speed data transfer, making it useful for future wireless communication systems. However, designing antennas for terahertz frequencies is still a challenging task due to the short wavelengths involved, and there are many technical hurdles to overcome before terahertz technologies can be widely adopted. The bandwidth is greater than the previous work after air gap and substrate is added.

Table 1: Dimensions of Designed Antenna

Description	Parameter	Length
Substrate Width	WS	38.51 mm
Substrate Length	LS	47.15 mm
Patch Width	WP	29.52 mm
Patch Length	LP	38.17 mm
Feedline Width	Wf	1.0 mm
Feedline Length	Lf	5.2 mm

Microstrip patch antenna calculation analyzed with High Frequency Structure Simulator (HFSS) and then finalized. The simulated results of MPA designed comprises of Return Loss (S11 parameter), Voltage Standing Wave Ratio (VSWR), are examined.

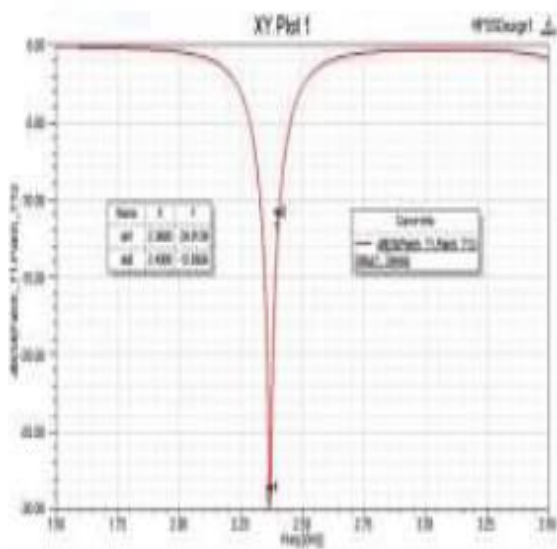


Figure.4. Return Loss

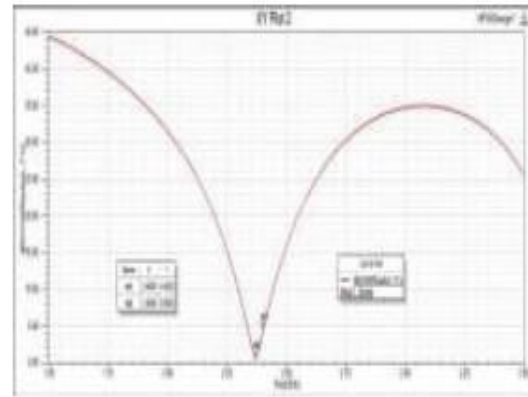


Figure.5. VSWR Plot

5. CONCLUSION

In this paper a terahertz microstrip patch antenna has been designed for future communication. The designed antenna is compact and lightweight which makes it suitable for compact electronic devices. Antenna performance is evaluated from the simulated results which are illustrated and analyzed in this paper. All the parameters were analyzed and compared with the previous work from which it is evident that the designed antenna is radiating perfectly and is suitable for future 6G communication. The designed antennas are simple and compact, making them to fabricate easily and are also their feed can be a simple microstrip feed line and hence can be implemented. The newly developed antenna structure will be employed for wireless applications on remote networks. Simulations demonstrate that the given antenna is suitable for wireless communication. The antenna will be made quickly so measurements can be compared to models. The results can be further enhanced in future for all shapes of microstrip patch antenna.

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Medicine Recommendation Using Machine Learning Technique

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ABSTRACT

Health is the main part of every human life. Without considering that, some might suffer from disease. Most of the people are taking medicine from medical shops for common diseases by telling their symptoms. Here, this paper introduces a disease prediction based on their symptoms. And according to those symptoms, they might prefer medicine through online/offline. This paper aims to predict common diseases and recommend medicine for the patients suffering from various diseases. This approach generates appropriate medicine recommendations for the patients suffering from acne, fever, constipation, etc. The dataset is collected from Kaggle named as 'Medicine Recommendation'. NLP is used for preprocessing the data. After pre processing the data, which includes 50 common diseases and 620 symptoms, Different Classification algorithms were used for disease prediction such as SVC, Random Forest and Gradient Boosting Classifier. After comparison of these three, Gradient Boosting classifier approach yields a very good prediction accuracy of 98.31% than the other classifiers.

Keywords - NLP, Machine Learning, GB Classifier, Disease Prediction, Medicine Recommendation

1. INTRODUCTION

Nowadays, Data Science leads to be an emerging field in the world in which they can reduce human works. Machine Learning is the branch of Artificial intelligence which includes lots of methodologies and includes lots of methodologies and algorithms. There are several types of machine learning algorithms, in which the first introduces supervised machine learning. This maps to inputs to outputs. In supervised algorithms, the classes are predetermined. These classes are created in a manner of finite set, defined by the human, which in practice means that a certain segment of data will be labeled with these classifications [2]. The task of the machine learning algorithm is to find patterns and construct mathematical models. These models are then evaluated based on the predictive capacity in relation to measures of variance in the data itself. There are two main methodologies used. The study contributes to classification. Although there are a variety of available techniques for machine learning, classification is the most widely used technique [1]. Classification is an admired task in machine learning especially in future and knowledge discovery. Coming to NLP which is a subfield of computer science, information engineering, and artificial intelligence concerned with the interactions between computers and human (natural) languages, how to program computers in order to process and analyse large amounts of natural language data [3].

2. LITERATURE REVIEW

There are numerous diseases that have been predicted by using data mining techniques so far. This study classifies

fifty different diseases. These are some common diseases in day-to-day life where the person may suffer. People might bother about consuming medicine from medicine shops even for small diseases. Now the area of recommendation comes into picture.

Table.1. Disease List

Types of Diseases				
Acne	Arthritis	Fungal	Hypotension	Phyrexia
Adhd	Cleanser	General	Hypot hyroidim	Scabies
Allergies	Constipation	Glaucoma	Infection	Schi zophernia
Alzheimer	Contaception	Gout	Malarial	Smooking
Amoebiasis	Dandruff	Haemato poiesis	Migraine	Supplement
Anaemia	Depression	Haemorroid	Mydrasis	Throm bolyasis
Angina	Diabetes	Hyperpig mentation	Osteoporosis	Vaccines
Anxiety	Diahorra	Hypert ension	Pain	Vertigo
Appetite	Digestion	Hyperthyroidism	Parkinson	Viral
Arthyh miasis	Fever	Hypnosis	Psychosis	Wound

Dahi wade et al. [4] proposed a ML based system that predicts common diseases. The symptoms dataset was imported from the UCI ML depository, where it contained symptoms of many common diseases. The system used CNN and KNN as classification techniques to achieve multiple diseases prediction. Building a classifier model using WEKA tool to predict diabetes disease by employing Naive Bayes, Support Vector Machine, Random Forest and Simple CART algorithm. Support Vector Machine performed best in prediction of the disease having maximum accuracy [5]. Anxiety and depression can happen to any elderly individual at any time. Ten classifiers such as BN, NB, LOG, MLP, SMO, KS, RS, J48, RF, RT were evaluated with the selected set of features. RF is the appropriate classifier for this data set. It has the highest accuracy (89%) [6]. Chen et al. presented an effective diagnosis system using Fuzzy k-Nearest Neighbour (FKNN) for the diagnosis of Parkinson's disease (PD). The chosen classifiers were KNN, SVM, Discriminant Analysis and NB which gives 15% higher accuracy [4]. Newly emerging infectious diseases could be detected using the news article data. Support Vector Machine (SVM), Semi-supervised Learning (SSL), and Deep Neural Network (DNN) were used for prediction. In terms of the accuracy, SSL shows the best performance of 88.3% [7]. Predict the thyroid disease and highlighted by investigation of supervised machine learning algorithms Naive Bayes, random forest, and decision tree algorithm for prediction of anaemia using CBC (complete blood count) data

collected from pathology canters. The results show that Naive Bayes outperforms in terms of accuracy [9].

3. METHODOLOGIES

3.1. Data Collection

In upcoming days, data science rules the world. Data is the main aspect of any field. It is most important when coming to the field of Data Science. Because without data, there is not at all possible to move forward by applying algorithms. This research paper collects data from Kaggle.com named as Medicine Recommendation. This dataset includes totally three features such as DRUG_NAME, REASON and DESCRIPTION. Drug Name contains all the medicine that is around 9260 in count. Reasons are all about diseases around 50 in count. In the Description feature, there are almost no preprocesses yet. Raw Data is all about un-pre-processed data in which the machine cannot understand. This is the total count of raw data where each feature is displayed below in a neat table.

Table.2. Raw Dataset Features

S.NO	FEATURES	TOTAL
1	DRUG_NAME	9260
2	REASON	50
3	DESCRIPTION	9260

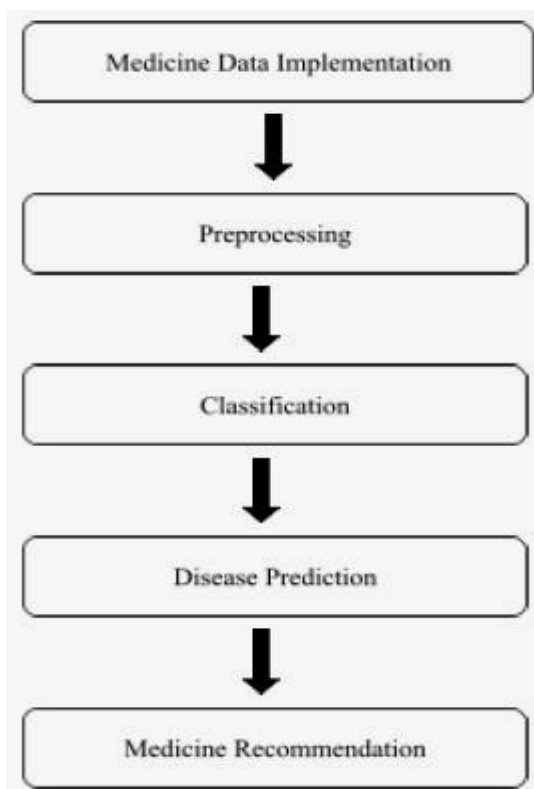


Figure.1. Flowchart of building Medicine Recommendation System

To make a recommendation, first the data should be converted as per the machine can understand. Now, we will proceed with the flowchart.

3.2. Preprocessing

Data Pre-processing Techniques are used to clean the data. In today’s world, a data mat contains lots of errors such as duplicate values, empty values, unwanted data, etc. So, the first step is to clear all these in which data will be understandable. This paper contributes to the field of NLP for preprocessing. Because, the dataset is full of words and sentence. There are lots of steps involved for cleaning purposes. The first step in this paper is to change the Description feature to lower case. After that remove punctuation and stop words. The last step is to perform lemmatization and stemming. That's all, now the dataset is completely error free and who ever can able to understand and make use this data for next step

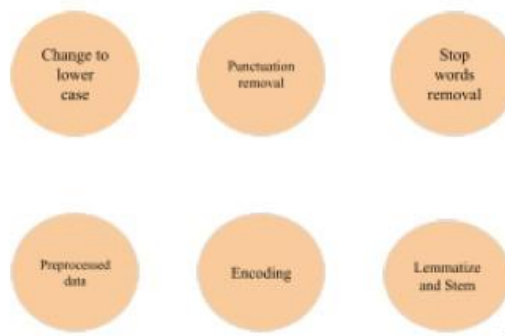


Figure.2. Preprocessing Steps

3.3. Classification

Classification comes under the supervised machine learning technique. The disease feature can be classified using label encoder which can convert text data into numerical data. This paper mainly takes three algorithms named as Support Vector Classifier, Random Forest Classifier and Gradient Boosting Classifier. These three classifiers are used to build models by splitting the data into train and test data. Performance Evaluation comes after the model building phase. Here, those models are under the usage of prediction. There are lots of metrics available to validate performance of the data. This paper takes up to four metrics such as accuracy, precision, recall, and f1 score. Matplotlib is one good graphical representation library used in python. In this paper, the line chart is taken to showcase the performance of each model and use the best classifier model for the prediction purpose.

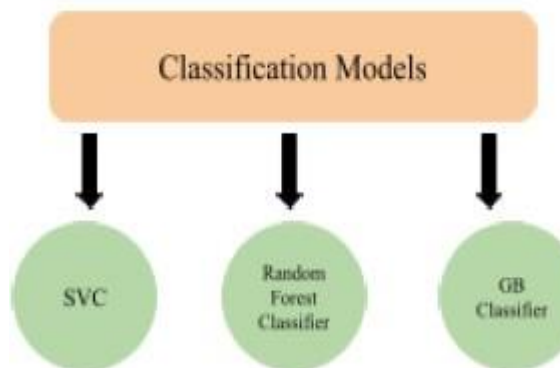


Figure.3. Classification Models

3.4. Disease Prediction

Prediction in the name itself shows that something that we want to predict accurately. Since, preprocessing has been done in the second stage itself. From that, 620 symptoms are classified. These symptoms are used to predict disease. Since there are lots of symptoms, one can't see all the symptoms in table format which is a complex way to analyze the features. But, Word Cloud helps to display all the symptoms in one picture. This is used for text categorization by word frequencies



Figure.4. List of symptoms

Use the Gradient Boosting Classifier Model to make prediction and add the symptoms in which the model will predict disease based on the given data. Symptoms can be of any number.

3.5. Medicine Recommendation

Recommendation System is mostly for users satisfaction and benefits. It is most helpful for new users. Because, they don't know about the new environment in which it will be easy to capture recommended products. In machine learning, it is one such good field where one can explore more domains to improve the user experience. This paper contributes to recommendations of English medicine based on the predicted disease. This will generate a list of medicines. It will be much encouraging to the users whenever they prefer to take medicine.

4. RESULTS

This paper listens to the prediction as well as recommendations related to the healthcare field. Disease prediction is based on the symptoms given by users and recommendation of medicine generated by predicted disease. The result of performance evaluation is improved by comparing existing models.

Table.3. Performance Evaluation

	SVC CLASSIFIER	RANDOM FOREST CLASSIFIER	GRADIANT BOOSTING CLASSIFIER
ACCURACY	97.67	98.15	98.35
PRECISION	97.67	98.15	98.35
RECALL	97.67	98.15	98.35
F1 SCORE	97.67	98.15	98.35

From the above table, we come to know that all the metrics give the same result as percentage. Therefore, it exactly shows that there will be less number of errors

while recommending the medicines. Prediction of disease is based on the model selection. This model selection is acquired by performance evaluation. So, there will be more importance given to the metrics. From the deep dig analysis of accuracy comparison using graphical representation that will give best model out of three models which is used for medicine recommendation.

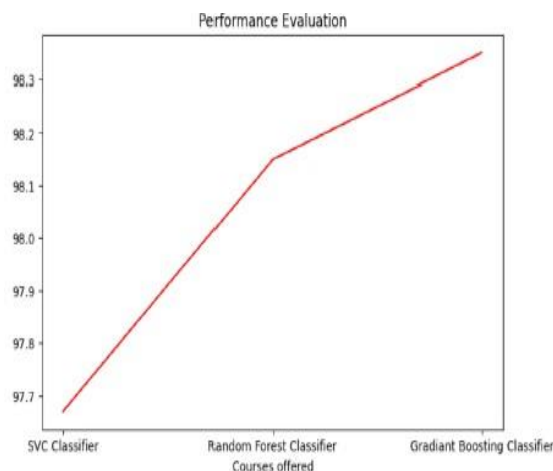


Figure.4. Model Comparison

Now, the medicine list is displayed with the of trained disease data with predicted disease data the medicine will be recommended. It will be shown using the pandas library.

Symptoms	Predicted Disease
0 gives_smooth_skin, good_for_allergic_skin, ski...	Allergies

Figure.5. Disease Prediction

From the above analysis, disease will be shown based on symptoms.

Index	Recommended medicine
0	1 AL Plus Capsule 10'S1 AL 10mg Tablet 15'S1 AL 5mg Tablet 10'S1 AL Max Tablet 10'S1 AL Syrup 30ml
1	1 AL M 10/5mg Tablet 10'S
2	ABICET M Tablet 10's
3	Acilane M Kfj Syrup 60ml
4	Adri Lotion 100ml
5	Alineday Tablet 10'S
6	AIR 180mg Tablet 10'sAIR 120mg Tablet 10's
7	Airtis 5mg Tablet 10'SAirtis Syrup 30ml
8	Arkasel L Tablet 10'S
9	Arlung Tablet 10'S
10	Arlung FX 19/120mg Tablet 10'S
11	Artak 10/5mg Tablet 10'S
12	Atair LC 10/5mg Tablet 10'S
13	Akumiric Syrup 60ml
14	Asapan 10mg Tablet 10'S
15	Asapan AM Tablet 10'S
16	Asapan Oral Solution 60ml
17	Alexin 10mg Tablet 10'S
18	Alcarex Eye Drops
19	Alcet 5mg Tablet 10'S
20	Alcon Plus Tablet 10'S
21	Alkay Duo 4/2.5mg Syrup 60ml
22	ALDEX SR 6mg Tablet 10's
23	Aldine 5mg Tablet 10'S

Figure.6. Medicine List

The above medicines are preferred based on disease prediction.

5. CONCLUSION

This paper contributes to machine learning, specifically prediction using classification methodology. Three types of classification models used such as SVC, Random Forest Classifier and Gradient Boosting Classifier. After comparison of each model, GB Classifier performs well against all other models with 98.35% accuracy. The predicted disease and trained disease helps to find out the medicine which will be preferable to the users. Future

work involving direct online medicine purchase features will be added and online consultation with doctors with scheduled appointments. Recommendation of medicine will be considered with the symptoms not by prediction. This will give exact medicine recommendations.

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The Role of Innovation Technologies in the Development of Students' Speaking Skills

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ABSTRACT

One of the main requirements of modern methods of teaching English present days is the implementing innovation technologies in learning process and the creation of an effective speech environment for students, both: during the lesson and in real life. Unfortunately, not all educational institutions have opportunities to provide FL teachers to ensure comfortable communication and interactive activities for learners. Many years ago in Uzbek schools, for speaking development was not given much importance in English language teaching, and English teachers developed speaking only through tasks such as repeating certain exercises and memorizing dialogues. The author of the article proposes some elements of a solution to these problems through the development of innovative technologies. The purpose of the article is to find ways to intensify the learning process, optimize the work of students and teachers, organize independent work and quickly assimilate educational material.

Key words: *IT technologies, digitalization, development, methodology, information, communication, language, traditional.*

1. THE MAIN FOCUS IN TEACHING ENGLISH AT SCHOOLS IN UZBEKISTAN.

The last decades, the main goal of teaching a foreign language at schools in Uzbekistan is mastering foreign language communicative competence. Learning to speak in a foreign language is learning to express your thoughts orally, that is, speaking as a means of communication. Present time, knowledge of English is becoming an integral part of our lives in all institutions of our country. English is considered the language of international communication. The school learning process is focused on practical knowledge of a foreign language and, as a result, great importance is attached to the problem of understanding foreign speech by ear: by using IT technologies and modern interactive activities focusing on improving students' speech.

Recently, methodologists are increasingly turning their attention to the problem of listening and speaking. Although theoretical research is being carried out in the study of this process, the practical application of certain teaching methods is not yet great. [1, p. 56].

It is widely known that the methodology for teaching listening comprehension is the least developed. The main reason is precisely the fact that until recently listening was considered a fairly simple skill. It was also believed that if, when teaching oral speech, the teacher pays full attention to speaking and helps them master this skill, then the students will learn to understand speech without additional preparation. The inconsistency of this opinion has been proven both in theory and in practice.

2. THE INTRODUCTION OF IT TECHNOLOGIES.

The professionalism of a modern teacher is also determined by the skills of conveying information using information and communication technology tools. The process of teaching speaking skill in higher educational institutions and at schools must meet the trends in the training of highly qualified specialists which are masters in their field. This process is inseparably linked with the introduction of IT technologies and means of communication into human life. The authors note both negative and positive aspects of informatization of higher education, which manifested themselves especially clearly during the poke-down and the use of distance learning technologies. [3, p. 18].

The continuous process of modernization of the higher education system affects linguistic areas, which, in particular, entails high demands on the teaching of English. The teacher must introduce new information technologies in teaching English and compare them with the teaching load, goals and objectives. In modern higher education, information technology methods are actively used and language training is being improved. Along with traditional educational programs in higher educational institutions, there is an innovative and technological pedagogical component in the process of teaching foreign languages, in particular English.

The process of introducing information technology into education is called informatization of education. Today, a professional foreign language teacher must be able to convey the material using new modern information and communication technological methods, and be able to work with students using distance education technologies [6, p. 107-116].

3. THE ONLINE MEANS OF COMMUNICATION BASED ON SOFTWARE.

The development of electronic media has led to a "COM-computer-mediated" form of communication in higher education. In learning English, it is necessary to continue to use network interaction and online means of communication based on software that supports video telephony, video conferencing, broadcasting educational resources, etc. In secondary school, mainly two types of audio texts are used - descriptive text and plot text. In the practice of learning foreign languages, listening texts must be authentic, accessible in content and linguistic composition, short in length, and mostly monothematic. Based on the specifics of listening as one of the most difficult types of speech activity, it is important first of all to know the main difficulties of mastering it.

3.1. Language Difficulties:

- 1Features of the act of listening and speech activity listener's ability (wide range of topics,

rich lexical material, fairly fast pace of speech).

- Peculiarities of speech of native speakers (differences in spoken and written speech, authentic texts and educational texts, different styles).

3.2. Cultural Difficulties

- Sociolinguistic and socio cultural component, communicative competence (the language must be studied in the context of a particular culture).
- Successful mastery of listening involves removing or overcoming its difficulties.

4. COMPUTERIZATION OF MANY AREAS.

Internet information resources provide in-depth language learning. The modern world is permeated with flows of information, and society is increasingly called information society due to the intensive informatization of all types of human activity. The introduction of informatization in education is one of the first places in reforming the education system. Today it is important for teachers to understand the role of informatization in the modern world. Computerization of many areas today has shown our society the required level of foreign language proficiency, the conditions for its use, for example, in telecommunication networks, where the ability to communicate in writing and orally without intermediaries is very important. The main goal of using digital technologies in schools today is to prepare the new generation for a full life in the information society, improving the quality of accessibility and effectiveness of education.

Informatization of secondary schools is an integral part of the informatization of education. Digital technologies in teaching a foreign language at school have a number of advantages: students perceive and remember the material better; economical use of time; individualization of training, determination of the depth and sequence of assimilation, pace of work; intensification of training and increasing the level of motivation.

Innovative methods make it possible to achieve certain goals in the process of learning a foreign language, such as: 1) accessibility of perception of authentic knowledge; 2) systematization of educational material; 3) implementation of a creative approach; 4) self-development; 5) removing the psychological barrier (fear of communication, making a mistake). The use of innovative methods in the learning process presupposes mastery of digital technologies on both sides of the educational process. Thus, based on the theoretical and practical research of this problem, it can be stated that the hypothesis of this study has been proven. Learning with the help of innovative technologies involves the safe and productive use of gadgets and the capabilities of the Internet in the process of cyber-socialization of students. Therefore, the use of modern technical teaching aids is harmoniously combined with a creative approach in education. Let us give some examples from school practice.

5. THE USAGE OF DIGITAL TECHNOLOGIES IN THE

PROCESS OF TEACHING LISTENING AND SPEAKING SKILLS.

The use of digital technologies in the process of teaching listening as a type of speech activity to secondary school students is truly advisable. [4, p. 87].

The use of digital technologies in the educational process makes it possible to provide most students with:

- achieving the program level of listening and speaking skills and abilities;
- Formation, development of internal and external motivation for learning;

It can also be argued that the use of new information technologies in teaching does not exclude traditional technologies; however, it is new information technologies that become the main means of access to various sources of information, which is one of the most important aspects of the modern educational process.

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Integrated Eco Leather Revolutionising Sustainable Leather Waste Management

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ABSTRACT

The necessity for sustainable waste management techniques in the leather sector is urgently needed, and this study offers a novel solution. To maximise resource usage and environmental effect assessment, the Integrated EcoLeather system uses machine learning algorithms in multiple modules. Although the Chemical Treatment Analysis module improves comprehension of chemical processes for better resource management, the Collection and Sorting module effectively collects data from a variety of sources. The Binding and Forming Analysis module additionally concentrates on the application-specific binding of leather waste, while the Chemical and Biological Analysis module investigates the chemical composition and biodegradability of leather waste. Throughout the system, the admin module makes sure that data is secure, accurate, and flows well. The conversion of leather waste into useful resources through an integrated strategy is a noteworthy progress towards promoting a circular economy. The system helps to positively influence the transition to an eco-friendly leather industry by encouraging economic viability and environmental responsibility.

Keywords: *EcoLeather, circular economy, machine learning algorithms, sustainable waste management, and environmental responsibility.*

1. INTRODUCTION

1.1. Overview

This study offers a brief summary of the application of machine learning methods to leather waste management. This strategy aims to reduce environmental impact, maximize resource utilization, and streamline processes by utilizing machine learning. It attempts to address issues like fragmented data sources and ineffective treatment approaches through sophisticated algorithms and data analysis. Additionally, this methodology highlights the possibility of improved leather waste material utilization and recycling. By promoting a circular economy and raising overall competitiveness, the incorporation of machine learning holds the potential to completely transform the sector. This article outlines important tactics and ideas for using machine learning to manage leather waste, opening the door to long-term viability and sustainable practices.

1.2. Problem specification

The leather sector struggles with unsustainable waste management, which harms the environment and depletes resources. Fragmented systems have limited potential for reuse and inefficient chemical treatment due to a lack of centralised data collecting and sorting. Mitigation measures are hampered by the complexity of environmental effect assessment. Insufficient integration among solutions is impeding overall productivity. Recycling garbage into items that may be used again is

essential to a circular economy. Ineffectivemethods put a financial strain on manufacturers and reduce their ability to compete. Sustainable growth requires maximising the use of available resources. The secret to effective waste management is safe data management and advanced analytics. Widespread adoption requires continual monitoring and user-friendly systems. Establishing a sustainable waste management ecosystem that benefits stakeholders and the environment is the aim.

2. LITERATURE SURVEY

Various machine learning methods employed in solid waste management are examined by K. Sankaranarayanan et al. in 2021. Their findings lay the groundwork for investigating methods that might be used to the categorization, sorting, and possible repurposing of leather waste. In 2020, A. Rajaraman and S. Ramachandran explore the potential of artificial intelligence, encompassing machine learning, to enhance waste management procedures. Their study provides insightful information about how to improve the procedures for collecting, transporting, and treating leather waste. In 2020, M. Annapurani and K. Subramani explore how waste management systems can benefit from the combination of machine learning and the Internet of Things (IoT). In order to develop intelligent systems for the monitoring and segregation of leather waste in real time, their work investigates the potential use of sensor data and machine learning models. Machine learning applications in industrial waste management are examined by V. Bhatia and A. Kumar (2019). Their study offers insightful viewpoints on how machine learning can be used to recognise the features of leather waste, forecast waste creation trends, and enhance cutting procedures in the leather industry to reduce waste. A review of machine learning approaches used to waste management was conducted by M. Thakur et al. (2018). By using these insights, machine learning models for the effective classification of leather waste can be developed, opening up new opportunities for recycling and up cycling approaches.

3. MAIN OBJECTIVE OF THIS PAPER

"Integrated Eco Leather" aims to transform sustainable leather waste management through the application of machine learning technology. The system seeks to maximize resource utilisation, chemical treatments, and trash sorting through automation and sophisticated analytical tools. It aims to reduce environmental impact and increase efficiency by centralising data collecting and real-time monitoring. Reusing leather materials is encouraged and accurate waste classification is made possible by the inclusion of machine learning. Establishing a comprehensive, environmentally friendly waste management ecosystem that benefits stakeholders in the leather industry as well as the environment is the ultimate goal.

3.1. Existing Methods

Traditional waste management operations are inefficient because they rely on many software systems for data entry, coordination, and chemical analysis in addition to manual procedures. This dispersion makes communication and realtime insights difficult. Laboratory Information Management Systems (LIMS) are commonly used for chemical analysis; however, they often do not have standardised integration for comprehensive waste management. Current systems use a combination of simple instruments, manual techniques, and complex software. Our study aims to create a successful leather waste management system by integrating and optimising these processes. To get the most recent information, it is recommended to do a market analysis or get in touch with industry experts in trash and chemical analysis.

3.2. Disadvantages

- Inefficiencies in Workflow
- Limited Data Inconsistency Seeing
- Risks to Security

3.3. Proposed Method

Our suggested method uses the Django Framework, HTML, CSS, JavaScript, and PyCharm IDE to revolutionise the management of leather waste. Efficiency is increased by chemical treatments and automated sorting, which raises the bar for environmentally friendly operations. Comprehensive insights are obtained by evaluating chemical composition and biodegradability using advanced analytical methods. Sustainability is promoted via centralised monitoring, which guarantees scalability, strong security, and real-time tracking. Effective decision-making is facilitated by seamless workflow coordination, which provides a coherent, approachable strategy. Automation streamlines procedures and minimizes human involvement, and putting an emphasis on advanced analytics improves precision and expands comprehension of the environment. Monitoring in real time increases productivity and gives stakeholders a dynamic platform.

3.4. Advantages of proposed method

- Effective Automation
- Entire Analysis Instruments
- Monitoring in real time
- Interface that is easy to use
- Strong Security Protocols
- The ability to scale Adaptability
- Assessment of Sustainable Impact

4. METHODOLOGY

4.1. Data Collection

Chemical and Temperature Analysis: Create a dataset with attributes like sound absorption coefficient, abrasion resistance, thermal conductivity, electrical conductivity, and density. Labels indicating the amount of different chemicals (such as alkalis, reducing agents, chelating agents, solvents, etc.) used in the leather treatment process should also be included. Biological Analysis: Collect information on tissue inflammation score, lead content, histamine release, bacterial growth reduction, cell viability, and weight loss after a predetermined amount of time (e.g., 28 days). The label ought to specify

the leather waste's overall biocompatibility (safe, needs treatment, etc.). Binding and Forming Analysis: Gather information on the same physical characteristics (density, thermal conductivity, etc.) as in section 1 in addition to the costs and quantities of the various binders that are used to create IELs. The ideal quantity of binder and its corresponding cost are indicated by the labels in this section. Data Source: Newly created IEL materials and leather waste samples used in laboratory studies provide the data. Data collection may benefit from partnerships with biocompatibility testing laboratories and leather processing plants.

4.2. Preprocessing Data

Missing Value Imputation: Use appropriate approaches, such as mean/median imputation, or more advanced techniques, such as K-Nearest Neighbours (KNN) imputation, to handle missing values in the datasets. Outlier Removal and Detection: Locate and deal with outliers that could distort the performance of the model. Methods like isolation forests and z-score thresholding may be used for this. Feature Scaling: Apply methods such as Standard Scaler or MinMax Scaler to standardize the features within each dataset. This guarantees that every feature makes an equal contribution to the model's learning process.

4.3. Selection Of Model:

Chemical and Temperature Analysis: A Multi Output Regressor is advised since this assignment involves predicting multiple chemical amounts, which is a multi-target prediction. Because it can handle non-linear relationships and perform well with little data, an SVR model with a linear kernel can be a useful option in this situation. Biological Analysis: A classification model is appropriate because the goal variable in this instance is categorical (safe or requires treatment). Using feature significance scores to provide interpretability and managing imbalanced datasets are two benefits of using a Random Forest Classifier. Binding and Forming Analysis: This task includes predicting numerous continuous quantities (binder amount and price), much like the chemical analysis. Consequently, it is possible to reuse a Multi Output Regressor with an SVR (linear kernel).

4.4. Model Training :

Using a standard ratio (e.g., 80% training, 20% testing), divide each preprocessed dataset into training and testing sets. This guarantees that the model is assessed on untested data and trained on a representative subset of the data. Utilising the appropriate training sets, train the selected models (Random Forest Classifier for biological analysis, SVR with Multi Output Regress or for chemical/temperature and binding analysis). Optimise each model's hyper parameters with methods such as Grid Search CV or Randomized Search CV. This aids in optimising the models for enhanced functionality.

4.5. Model Evaluation

Analyse the trained models' effectiveness using the testing sets. Chemical and Temperature Analysis: To evaluate how well the model predicts the amounts of different chemicals, use Mean Squared Error (MSE). Biological Analysis: Determine the accuracy score to assess the model's performance in identifying the biocompatibility of the waste leather. Binding and Forming Analysis: To assess the model's forecast accuracy for binder quantity and pricing, utilise Mean

Squared Error (MSE), much as in chemical analysis. Examine the findings, and if the performance metrics are not acceptable, take into account different models or hyper parameter adjustments.

4.6. Additional Further Aspects

Ensemble Methods: Investigate whether using ensemble techniques, such as boosting or bagging, can enhance model performance above that of single models. Use methods such as Random Forest feature importance scores or permutation importance for SVR to determine which characteristics are most important at each stage of the analysis process.

5. RESULTS AND CONCLUSION

The leather waste project has a wide range of objectives, including industry acceptance on a large scale, research institution collaboration, global implementation to satisfy various regulatory needs, and educational programmes supporting sustainable behaviors. Crucial components include integration into leather supply networks and an approach to continual improvement that incorporates customer feedback. The project's overall goal is to be recognized as a flexible, impactful, and inventive approach to managing leather waste that is in line with changing industry demands and environmental goals.

6. FUTURE ENHANCEMENT

Predictive analytics will be used in the future, together with Internet of Things (IoT) devices for real-time monitoring, block chain exploration for transparency, and machine learning algorithms integrated for process optimisation. Creating measures for the circular economy, creating training tools for augmented reality, and investigating newly developed waste valorization technologies are further developments. To further improve project success, milestones such as integrating life cycle evaluation tools, encouraging community engagement, guaranteeing regulatory compliance, and creating a mobile application for improved accessibility should be considered.

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Development of Esp32 Board Using PCB

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Abstract

This paper presents the development process of an ESP32 board utilizing the EasyEDA platform, aiming to provide a cost-effective and accessible solution for Internet of Things (IoT) projects..

Key words: PCB – Printed Circuit Board, ESP32 – Espressif

1. INTRODUCTION

ESP32 is a chip that provides Wi-Fi and (in some models) Bluetooth connectivity for embedded devices – in other words, for IoT devices. While ESP32 is technically just the chip, the modules and development boards that contain this chip are often also referred to as “ESP32” by the manufacturer.

The original ESP32 chip had a single core Tensilica Xtensa LX6 microprocessor. The processor had a clock rate of over 240 MHz, which made for a relatively high data processing speed. More recently, new models were added, including the ESP32-C and -S series, which include both single and dual core variations. These two series also rely on a Risc-V CPU model instead of Xtensa. Risc-V is similar to the ARM architecture, which is well-supported and well-known, but Risc-V is open source and easy to use. Specifically, Risc-V and ARM have good support from GNU compilers, while the Xtensa needed extra support and development to work with the compilers. The ESP32 is a series of chip microcontrollers developed by Espressif. Low-power: the ESP32 consumes very little power compared with other microcontrollers, and it supports low-power mode states like deep sleep to save power. Wi-Fi capabilities: the ESP32 can easily connect to a Wi-Fi network to connect to the internet (station mode), or create its own Wi-Fi wireless network (access point mode) so other devices can connect to it—this is essential for IoT and Home Automation projects—you can have multiple devices communicating with each other using their Wi-Fi capabilities; Bluetooth: the ESP32 supports Bluetooth classic and Bluetooth Low Energy (BLE)—which is useful for a wide variety of IoT applications; Dual-core: most ESP32 are dual-core— they come with 2 Xtensa 32-bit LX6 microprocessors: core 0 and core 1.

Below is a proposed system design for an ESP32 PCB board, highlighting key components, design choices, and steps. To integrate the ESP32 microcontroller into a PCB design effectively, follow a structured approach that encompasses planning, design, verification, and optimization. Here’s a proposed method. Define the purpose of your PCB and the specific functionalities required from the ESP32 (e.g., Wi-Fi connectivity, Bluetooth communication, sensor interfacing). Below is a detailed guide to creating a custom ESP32 PCB board. Voltage regulator(3.3V). Power input options: USB, battery (Li-Po), or external DC source. Decoupling capacitors. USB-to-serial converter for programming and debugging. Integrated or external antenna for Wi-

Fi/Bluetooth. Place the ESP32 module centrally. Position required from the ESP32 (e.g., Wi-Fi connectivity, Bluetooth communication, sensor interfacing). Below is a detailed guide to creating a custom ESP32 PCB board. Voltage regulator (3.3V). Pin. Connect the LEDs to GPIO pins 12 and 14 on the ESP32. Use a 220-ohm resistor to connect each LED's positive leg to the respective GPIO pin, and connect the 9

2. METHODOLOGY

The ESP32 Board's operating voltage is between 2.2V to 3.6V. But we can supply 5V from the Micro-USB port. For applying 3.3V there is already an LDO voltage regulator on the module to keep the voltage steady at 3.3V. ESP32 can be powered using Micro USB port and VIN pin (from external supply). ESP32 contains an on-board LED, which is connected to GPIO2 general purpose Digital In / Out pin. Connect the LEDs to GPIO pins 12 and 14 on the ESP32. Use a 220-ohm resistor to connect each LED's positive leg to the respective GPIO pin, and connect the 9 negative leg to ground (GND) on the ESP32. Install the ESP board in the Arduino IDE. Copy the code provided into the Arduino IDE. 20 5v can be applied to the 5V pin. the power supply components close to the power input. Place the USB-to-serial converter near the USB connector. Arrange GPIO headers. Here’s a proposed method. Define the purpose of your PCB and the specific functionalities

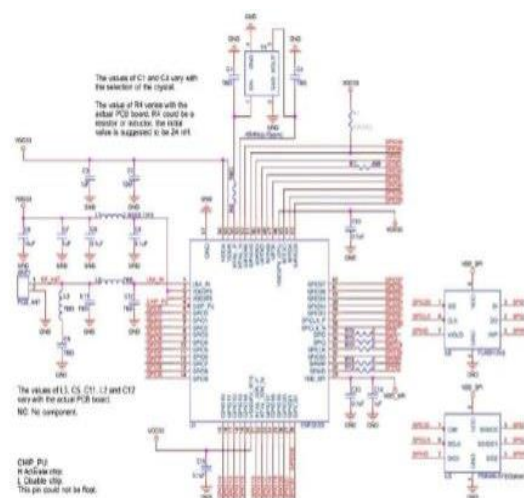


Figure.1. Block Diagram of Methodology

3. RESULTS & DISCUSSION

The ESP32 is a versatile and powerful microcontroller that has been widely adopted in various applications, including those involving Printed Circuit Boards (PCBs). Here are some key points that summarize the use of ESP32 in PCB projects. The ESP32 is known for its wide range of features, including Wi-Fi and Bluetooth connectivity, making it suitable for IoT applications. Its dual-core processor allows for efficient multitasking.

Integrating the ESP32 into a PCB design can significantly enhance the functionality of the board. Its built-in peripherals, such as ADC, DAC, UART, and SPI, reduce the need for additional components. Despite its advanced features, the ESP32 is relatively affordable, making it a cost-effective choice for many projects. This affordability, combined with its capabilities, makes it a popular choice for both hobbyists and professionals. The ESP32 has a large community of developers and extensive documentation, which can be very helpful during the design and implementation phases of PCB projects. Numerous libraries and example codes are available to simplify development. The ESP32 offers various power-saving modes, which can be crucial for battery-powered devices. This makes it suitable for applications where power consumption is a critical factor. The availability of development boards, like the ESP32 DevKit, allows for easy prototyping and testing. Once the design is validated, the ESP32 can be incorporated into custom PCB designs for production. In conclusion, the ESP32 is a robust and feature-rich microcontroller that enhances the capabilities of PCB designs. Its combination of connectivity options, processing power, cost-effectiveness.

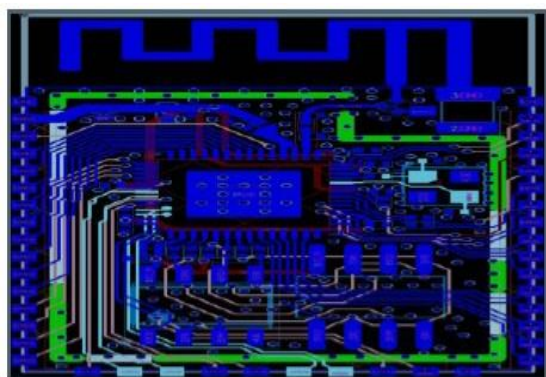


Figure.2. Layout of ESP32 Board

4. CONCLUSION

The ESP32 is a versatile and powerful microcontroller that has been widely adopted in various applications, including those involving Printed Circuit Boards (PCBs). Here are some key points that summarize the use of ESP32 in PCB projects. The ESP32 is known for its wide range of features, including Wi-Fi and Bluetooth connectivity, making it suitable for IoT applications. Its dual-core processor allows for efficient multitasking. Integrating the ESP32 into a PCB design can significantly enhance the functionality of the board. Its built-in peripherals, such as ADC, DAC, UART, and SPI, reduce the need for additional components. Despite its advanced features, the ESP32 is relatively affordable, making it a cost-effective choice for many projects. This affordability, combined with its capabilities, makes it a popular choice for both hobbyists and professionals. The ESP32 has a large community of developers and extensive documentation, which can be very helpful during the design and implementation phases of PCB projects. Numerous libraries and example codes are available to simplify development. The ESP32 offers various power-saving modes, which can be crucial for battery-powered devices.

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An Effective Classification of Brain Tumor using Deep Learning Techniques

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ABSTRACT

Brain tumor classification is a critical task in medical imaging, aiding in timely diagnosis and treatment planning. In this paper, we propose a comprehensive approach utilizing deep learning models for the classification of brain tumors into four categories: glioma, meningioma, pituitary tumors, and no tumors. We employ state-of-the-art convolutional neural network (CNN) architectures including ResNet50, DenseNet201, EfficientNetB3, and InceptionV3 for the classification task. To enhance the performance of the model, we employ resizing and augmentation techniques such as flips and rotation, thereby increasing the diversity of the training dataset. This is particularly crucial due to the limitations posed by small-sized datasets in previous methodologies. Our findings underscore the efficacy of deep learning approaches in brain tumor classification, with EfficientNetB3 emerging as a promising model for accurate diagnosis. Furthermore, our utilization of resizing and augmentation techniques demonstrates their significance in mitigating the challenges associated with limited training data.

Key words: Brain Tumor, CNN, Architecture, Deep Learning, Classification, Augmentation, Healthcare

1. INTRODUCTION

Many people are diagnosed with secondary brain tumors, but we don't know how many exactly. Detecting these tumors early is crucial for effective treatment, but MRI machines sometimes struggle to identify them accurately. This can lead to physical complications and disabilities. Different types of brain tumors exist, and they can affect movement, sight or hearing. Deep learning is a type of artificial intelligence that uses layered computations to teach computers to understand data at multiple levels. This method has improved technologies like speech recognition and object identification. In tumor recognition, deep learning transforms input data into abstract representations, gradually detecting features like tumor edges and shapes automatically.

Supervised learning models are designed to make predictions by learning from labeled datasets. In this process, algorithms receive input data along with corresponding labels to train the model for classification or regression tasks. Deep learning trains models to predict outcomes based on input data or unseen images, with the output impact connected through a single chain of relationships. Unlike parallel exploiters, which create closed-loop chains, none parallel manipulators benefit from additional flexibility and wider workspace. Unsupervised learning is a machine learning technique where the model operates independently without supervision. Instead of providing labeled data, the model learns on its own to discover patterns in unlabeled data. Unlike supervised learning, which relies on labeled data, unsupervised learning allows for more complex

processing. It is often considered more exploratory compared to other learning methods

1.1. Types Of Brain Tumors

Pituitary Brain Tumor

Pituitary brain tumor refer to abnormal growth in the pituitary gland. These tumors can affect hormone production, influencing various bodily functions such as growth, organ function, and gland function. While some tumor may lead to hormone overproduction, others result in reduced hormone levels. Most pituitary tumors are benign adenomas, which remain localized and don't spread to other parts of the body.

Glioma Brain Tumor

Glioma originate from the supportive cells surrounding nerve cells, aiding in their function. These tumors can arise from three types of glial cells. Gliomas are classified based on the specific glial cell involved and other inherited characteristics, which can help predict tumor behavior over time and potential treatments. Symptoms include dizziness, headaches, nausea, confusion, memory loss, behavioral changes, urinary problems, vision issues, speech difficulties, and seizures, especially in individuals without a history of seizures.

Meningioma Brain Tumor

A meningioma is a tumor that originates from the meninges, the protective membranes surrounding the spinal cord and brain. While not technically a brain tumor, it falls under this category because it can compress nearby brain structures, blood vessels, and nerves. Meningioma is the most common type of tumor found in the head. Symptoms typically develop slowly and may initially be subtle. Depending on the tumor's location in the brain or spine, symptoms may include changes in vision, headaches (especially worsened in the morning), hearing problems or ringing in the ears, memory loss, seizures, weakness in the arms or legs, and difficulty with language.

2. RELATED WORK

Over the past decade, researchers have increasingly focused on improving brain tumor detection using magnetic resonance images. [1] Traditional approaches typically involve feature extraction from the bottom layer of the network, which may not be optimal for medical images due to their complex nature. To address this limitation, the author proposed a model that utilizes the InceptionV3 convolutional neural network, a deep learning mechanism known for its ability to extract multi-level features. By employing deep learning techniques and optimizing hyper parameters, the model aims to enhance the early detection of brain tumors. In this study, the Adam Optimizer is utilized to optimize the model's hyper parameters, while a loss function is employed to facilitate the modeling process by guiding the machine to learn from input data. Furthermore, the softmax classifier is employed to classify images into

multiple classes, enabling the model to differentiate between various tumor types.

Nyoman and other researchers have explored the use of convolutional neural network (CNNs) for automated tumor classification. They employed a simple CNN architecture consisting of basic layers for convolution, max-pooling, and flattening, followed by a single hidden layer [2]. Despite its simplicity, the CNN achieved impressive results when trained on a dataset of T1 weighted CE-MRI images of glioma, meningioma, and pituitary tumors. The model achieved a training accuracy of 98.51% and a validation accuracy of 84.19%, comparable to more complex region-based segmentation algorithms.

The accurate diagnosis of brain tumor types is critical for effective treatment, and computer-assisted methods have shown promise in improving diagnostic accuracy. In this study [3], a novel approach using a convolutional neural network based on complex networks with a modified activation function is proposed for the classification of brain tumors from magnetic resonance imaging (MRI) scans. The results of the modified model demonstrate its effectiveness in brain tumor classification, achieving an impressive accuracy of 95.49%. Furthermore, the model outperforms several established models such as ResNet, DenseNet, indicating its superior performance in tasks. J.S. Paul and his research study aims to leverage deep learning methods for the classification of different types of brain tumors, including meningioma, glioma, and pituitary tumors. The research dataset comprises a substantial collection of T1-weighted contrast-enhanced MRI (CE-MRI) brain images, totaling 3064 images from 233 patients across axial, coronal, and sagittal planes. To ensure clarity and avoid confusion, the study [4] focuses specifically on the axial images, consisting of 989 images from 191 patients. Further experimentation involves augmenting the original axial images to enhance the training process. The findings of the study reveal that training neural networks on axial data yields highly accurate classifications, with an average five-fold cross-validation accuracy of 91.43% achieved by the best-trained neural network.

The field of medical image analysis, particularly in computer-aided diagnosis (CAD) for brain tumor classification, has witnessed a surge in research focusing on deep learning techniques. [5] One notable approach involves utilizing pre-trained convolutional neural networks (CNNs) and transfer learning to extract meaningful features from brain MRI images for accurate tumor classification. Studies have explored architectures like GoogleNet, VGGNet, and ResNet, assessing their performance in differentiating among glioma, meningioma, and pituitary tumors. Comparatively analyses have been conducted to evaluate the effectiveness and efficiency of these models, often employing patient-level cross validation techniques and standardized evaluation metrics. Results consistently indicate promising classification accuracies, with some studies reporting mean accuracies of up to 98%, outperforming traditional methods.

Advancements in technology have led to the utilization of 3D scanning for tumor analysis, as discussed in [6]. The study explores 3D image processing methods for brain tumor detection and classification, employing deep learning frameworks like MobileNetV2, MobileNetV3 (both small and large variants), VGG16, VGG19, and custom CNN models. Among these, CNNs demonstrated

superior accuracy, highlighting their effectiveness in tumor analysis. The proposed solution integrates a CNN developed with keras and TensorFlow with a comprehensive cross-platform application built using PyQt5 and MariaDB. This integrated approach is tailored for medical environments such as hospitals, enabling the analysis of clinical images. The primary objective of the research is to characterize brain damage caused by tumors using real-world data and detect abnormal pixels [7].

3. DEEP LEARNING METHODS

Dataset preparation, pre-processing, model training, and categorization are the four key phases of deep learning techniques used to diagnose brain tumors

3.1. Dataset Preparation

The dataset mentioned in [8] is publicly accessible and utilized for assessing the performance of classification and retrieval algorithms. Comprising 3265 brain MRI images, the dataset encompasses instances diagnosed with one of three tumor types: meningioma, glioma, and pituitary tumors, along with images indicating the absence of tumors. These images are captured using the T1-CE MRI modality and are presented in coronal, sagittal, and axial views. Specifically, the dataset comprises 926 brain MRI images depicting glioma, 937 images representing meningioma cases, and 902 images corresponding to instance of pituitary tumors. Additionally, 500 images are included in the dataset that don't exhibit any tumors. The images are stored in .jpg format having dimension of either 512x512 or 254x254 pixels. This dataset provides a valuable resource for researchers and practitioners in the field, facilitating the development and evaluation of algorithms aimed at brain tumor classification. Table 1 and Figure 1 demonstrates the dataset description.

Table.1. Tumor type distribution before and after data augmentation.

Tumor Types	Before Augmentation		After Augmentation	
	Training	Testing	Training	Testing
Glioma	787	139	2350	415
Meningioma	796	141	2373	419
No Tumor	425	75	1266	223
Pituitary	767	135	2281	403

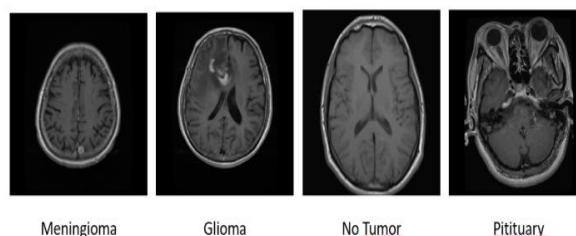


Figure.1. Dataset Description of Brain MRI Images.

3.2. DATA PREPROCESSING

3.2.1. Resizing

In the process of preparing the dataset of the research, we undertook crucial steps in data preprocessing, particularly in resizing the images to ensure uniformity and compatibility for subsequent analysis. Resizing refers to the adjustment of image dimensions to a standardized size, facilitating uniform processing and analysis across the dataset. Specifically, we resized the images to a standard dimension of 160x160 pixels, a common practice in image processing tasks. However, it's worth noting that in some studies [9], images are resized to 256x256 pixels, which may offer increased detail and resolution for analysis. Through python programming, specifically employing the OpenCV library, we iteratively processed the images from both the training and testing folders. Each image underwent resizing using the `cv.resize()` function, which allowed us to adjust the dimensions uniformly across the dataset. This meticulous data preprocessing lays the foundation for the subsequent phases of the model, enabling to leverage advanced machine learning techniques for effective brain tumor classification and diagnosis.

3.2.2. Data Augmentation

Data augmentation is a fundamental strategy in machine learning and computer vision, particularly pivotal in scenarios where dataset size or diversity is constrained. This technique involves the creation of additional training data by applying diverse transformations to existing samples, such as rotations, translations, flips, zooms, and color variations. The objective is to augment the diversity [10] of the training dataset, thereby bolstering the robustness and generalization capacity of machine learning models.

The data augmentation is implemented utilizing the Image Data Generator from the keras module, enabling real-time augmentation during model training. Notably, augmentation parameters like rotation range, width, and height shift ranges, zoom range, and horizontal flips are tailored to introduce variations in the training images. Figure 2 demonstrates the augmentation process done in the model. Furthermore, to mitigate storage requirements and optimize computational resources, the augmentation process is performed on-the-fly. This on-the-fly augmentation approach generated augmented samples dynamically during model training, eliminating the need to store the augmented data separately. This not the only conserves the storage space [11] but also streamlines the training process by generating augmented samples in real-time, enhancing efficiency and scalability.

Data augmentation stands as a pivotal technique [25] for enhancing the performance and robustness of machine learning models, particularly in scenarios constrained by limited training data. Before data augmentation, the training set comprised 3265 images with dimension of 160x160 pixels and 3 color channels, while the testing set consisted of 3265 samples. Following augmentation, the training set expanded significantly to 9730 images, maintaining the same dimensions and color channels. Likewise, the testing set also expanded to 9730 samples. Upon closer inspection, it is evident that the augmentation process balanced the distribution of tumor categories within both the training and testing sets. Table 2 shows the detailed version of data augmentation. The training data exhibited varying counts across tumor categories, with 2349 samples for category 0, 2371 for category 1, 1269 for category 2, and 2281 for category 3. Similarly, the testing data displayed similar disparities,

with 414, 419, 224, and 403 samples for categories 0, 1, 2, and 3, respectively.

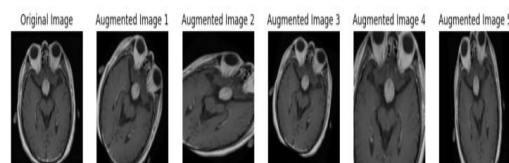


Figure2. Comparison of original images with the augmented images.

Post-augmentation, the training and testing sets showcased a more equitable distribution across tumor categories, with each category now comprising approximately one-fourth of the dataset. This balanced representation ensures that the model is exposed to a diverse range of tumor types during training and evaluation, enhancing its ability to generalize effectively to unseen data and improving overall performance and reliability.

The dataset has been divided into two distinct subsets: Training and Testing. This division is crucial for evaluating the performance of machine learning models. The split is accomplished using the test size parameter, which determines the proportion of data allocated to each set. In this particular scenario, a test size of 15% has been employed, signifying that 15% of the dataset is reserved for testing purposes, while the remaining 85% is designated for training the model. This partitioning strategy ensures that the model is trained on a substantial portion of the dataset, allowing it to learn the underlying patterns and relationships present in the data. Meanwhile, the testing set serves as an independent sample for assessing the model's generalization capability and

performance on unseen data. By segregating the dataset into training and testing subsets, we can effectively gauge the model's predictive accuracy and identify any potential issues such as overfitting or underfitting. This systematic approach to data splitting facilitates robust model evaluation and enhances the reliability of the machine learning process

Table.2. Tumor Type

Tumor Types	Before Augmentation		After Augmentation	
	Training	Testing	Training	Testing
Glioma	787	139	2350	415
Meningioma	796	141	2373	419
No Tumor	425	75	1266	223
Pituitary	767	135	2281	403

3.3. Model Training

Model training involves the process of feeding labeled data into a machine learning model, allowing it to learn patterns and relationships between input features and output labels. In the context of brain tumor classification, we utilize pre-trained convolutional neural network (CNN) architectures such as ResNet50, DenseNet201, EfficientNetB3, and InceptionV3. These models, available in keras library, are initialized with weights learned from large datasets like ImageNet, enabling them to capture intricate features from input images effectively. Additionally, data augmentation techniques are applied to mitigate overfitting, a common issue when dealing with limited datasets. Through this approach, we aim to train robust models capable of accurately classifying brain tumor types, enhancing diagnostic capabilities in medical applications.

3.4. Pre-trained Models

ResNet50

ResNet50 introduced residual learning, which simplifies the deduction of input characteristics [21] from specific layers. This is achieved through shortcut connections between every pair of the thirty-three filters, directly linking the input of the k th layer to the $(k+x)$ th layer. This prevents vanishing gradients by reusing initializations from the preceding layer until the adjacent layer has learned its weights.

DenseNet201

DenseNet201 is a convolutional neural network with a depth of 201 layers. It offers a pretrained version trained on over a million images from the ImageNet database. This pretrained network has the capability to classify images into 1000 object categories, including various objects and animals.

EfficientNetB3

Efficient Net is a convolutional neural network architecture and scaling approach that adjusts all dimensions of depth, width, and resolution using a compound coefficient. Unlike traditional methods that independently scale these factors, [23] Efficient Net uniformly scales network width, depth, and resolution using predetermined coefficients. This scaling method is based on the idea that larger input images require additional layers to enhance the receptive field and more channels to capture finer details.

InceptionV3

InceptionV3, a popular CNN architecture, consists of eleven stacked inception models. Each model includes pooling layers and convolutional filters with rectified linear units as the activation function. The model takes a two-dimensional image input comprising sixteen brain slices arranged in a 4-3-4 grid after preprocessing. This pre-trained model was trained on the ImageNet dataset and fine-tuned with a batch size and a learning rate of 0.0001.

Classifier Settings

In the process of training our models for brain tumor classification, we employed various pre-trained convolutional neural network architectures, including EffectiveNetB3, DenseNet201, ResNet50, and InceptionV3. Each model was initialized with weights obtained from ImageNet and adapted to classify brain tumor types based on extracted features from MRI images. To enhance model performance and mitigate over fitting, we utilized a range of hyper parameters and optimization techniques, such as dropout regularization and the Adam optimizer. Training was conducted on a dataset comprising labeled brain MRI images, with the dataset divided into training and testing sets to evaluate model generalization. The training process involving iteratively feeding batches of data into the models, adjusting the model weights based on computed loss, and optimizing performance metrics like accuracy.

For the proposed framework using Efficient Net, we developed a custom model architecture by integrating the Efficient Net base model with additional layers for classification. Figure 3 shows the architecture of proposed methodology. The architecture included global average pooling layers, dropout regularization, and fully connected dense layers with appropriate activation functions. During training, the model achieved exceptional accuracy of 99% on the training set and 97% on the testing set, demonstrating robust performance in

classifying the brain tumor types. By leveraging EfficientNet’s efficient scaling technique and feature extraction capabilities, our framework achieved superior classification accuracy while maintaining computational efficiency, making it suitable for deployment in real-world medical applications. The EfficientNet based model offers a promising approach for accurate and efficient brain tumor classification, contributing to advancements in computer-aided diagnosis and improving patient care

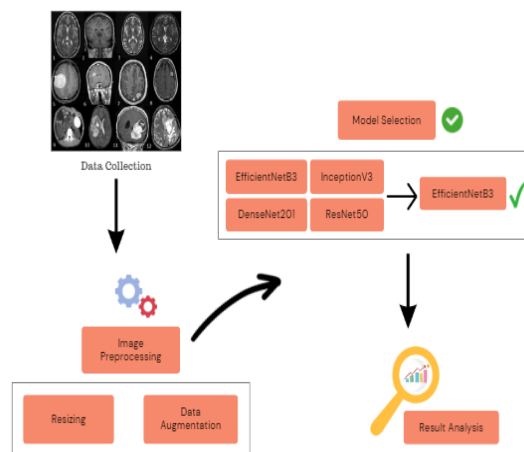


Figure.3. Overall architecture of the proposed model.

The EfficientNet was trained using the training set after the preprocessing. Figure 4 shows the hyperparameters of the network that were heuristically adjusted so as to facilitate the convergence of the loss function during training. The model architecture is being trained for a specific task, likely related to image classification given the use of softmax activation in the final layer. The choice of Adam optimizer with a specific set of hyper parameters indicated a thoughtful consideration of the learning dynamics during training. The dropout layers incorporated in the model architecture with the dropout rates of 0.55 and 0.3 suggests an approach to regularization, aimed at reducing the model’s reliance on specific features during training to enhance the generalization performance. The choice of GlorotNormal initializer for the dense layers emphasizes the importance of initializing model parameters appropriately to facilitate effective training. Table3 shows the hyperparameters settings of the model.

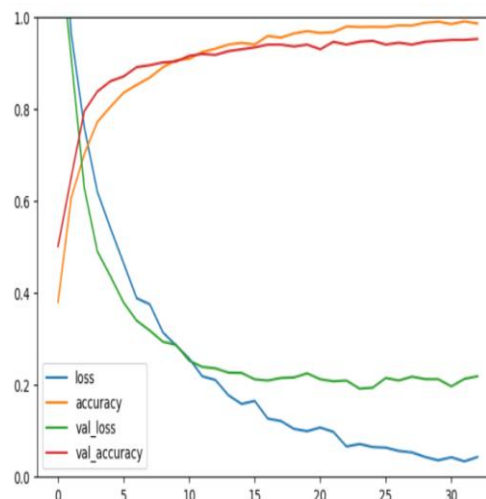


Figure.4. Loss functions of the model during training.**Table.3. Experimental Parameters.**

Optimizer	Adam
Learning Rate	0.000016
Loss	Sparse Categorical
Activation Function	Softmax
Kernel Initializer	GlorotNormal
Epoch	90

Performance metrics and evaluation

Various metrics are utilized to assess the performance of a classifier, with classification accuracy being the most commonly used index. It quantifies the proportion of correctly classified samples relative to the total number of data samples. In our experiments, the EfficientNetB3 model achieved the highest accuracy at 97%, outperforming DenseNet201, ResNet50, and InceptionV3, which attained accuracies of 95% and 94%, respectively. The results highlight the superior performance of EfficientNetB3 in brain tumor classification. However, accuracy alone may not suffice when dealing with imbalanced datasets, as is the case in our classification problem. Therefore, additional performance metrics are necessary for a comprehensive evaluation. Confusion matrices are employed to analyze the classifier's performance, enabling the derivation of metrics such as precision, recall, and specificity for each tumor class. Notably, the specificity values are high across all classes, indicating accurate identification of samples without a particular disease. The F-score, calculated as the harmonic mean of precision and recall, provides a comprehensive measure of classification performance, particularly beneficial in the presence of class imbalances. Table 4 presents the category-specific performance metrics obtained when employing the EfficientNetB3 with the features.

Table.4. Class-Specific evaluation of brain tumor classifier.

Tumor Type	Precision	Recall	F1-score
Meningioma	0.96	0.97	0.96
Pituitary	0.96	0.96	0.96
Glioma	0.97	0.99	0.98
No Tumor	0.99	0.98	0.99

3.5. Comparison With Related Work

In the realm of brain tumor classification using MRI, several models have been developed to tackle this challenging task. One notable model, referred to as Brain Tumor MRI classification, employed the InceptionV3 algorithm with an Adam optimizer. This model [13] was trained on a dataset comprising of 2880 samples, with 800 allocated for testing and an additional 800 for validation. Impressively, it achieved

commendable accuracy rates of 99.34% on the training set and 94% on the testing set. Another noteworthy model, [12] adopted a CNN-based approach and also utilized the Adam optimizer with cross-entropy loss. Trained on a dataset consisting of 1,672 samples, with 207 reserved for testing and 186 for validation, this model achieved an accuracy of 94% on the training set and 89% on the testing set.

In comparison to these existing models, our proposed model harnesses the power of EfficientNetB3, a cutting-edge neural network architecture known for its superior performance in image classification tasks. Leveraging the Adam optimizer and sparse categorical cross-entropy loss, our model was trained on a sizable dataset comprising 2880 samples, with 800 samples for testing and an additional 800 for validation. Impressively our model achieved outstanding accuracy rates of 99.32% on the training set and 97.14% on the testing set. Table 4 shows the comparison of the existing work with the proposed model.

While the existing models have demonstrated notable performance in brain tumor classification, our model stands out for its exceptional accuracy rates on both the training and testing sets. The utilization of EfficientNetB3, coupled with meticulous training and optimization, has enabled our model to achieve remarkable results, showcasing its potential for real-world application in medical imaging. Furthermore, the robustness of our model's performance underscores its effectiveness in accurately detecting and classifying brain tumors from MRI images, thereby offering valuable insights for clinical diagnosis and treatment planning.

4. CONCLUSION AND FUTURE WORKS

In conclusion, our study presents a novel approach to brain tumor classification utilizing the EfficientNetB3 neural network architecture. With impressive accuracy of 99.32% on the training set and 97.14% on the testing set, our model demonstrated significant advancements in the field of medical image analysis. By leveraging state-of-the-art deep learning techniques and optimizing model parameters, we have achieved superior performance compared to existing models, thereby enhancing the reliability and accuracy of brain tumor classification from MRI images. There are several avenues for future research and development in this domain. Firstly, further exploration of advanced neural network architectures, such as transformer-based models, could potentially improve classification accuracy and computational efficiency. Additionally, incorporating multi-modal imaging data, including functional MRI and diffusion tensor imaging, may provide richer information for more

Table.4. Comparison of existing works with proposed model

Title	Dataset		Algorithm	Loss	Optimizer	Accuracy	
An Effective Classification of Brain Tumor using Deep Learning Techniques [Proposed]	Training	8270	EfficientNetB3	Sparse Categorical Cross Entropy	Adam	Training	99.32%
	Testing	1460				Testing	97.14%
Brain tumor magnetic resonance image classification: a deep learning approach	Training	2880	Inception V3	Categorical Cross Entropy	Adam	Training	99.34%
	Testing	800				Testing	94%
	Validation						

		800					
Brain tumor detection from MRI images using deep learning techniques	Training	1672	CNN	Cross Entropy	Adam	Training	94%
	Testing	207				Testing	89%
	Validation	186					

Comprehensive tumor characterization. Furthermore, efforts to address class imbalance in the dataset through techniques like data augmentation and class weighting may lead to robust and generalizable models. Overall, our research represents a significant step forward in the field of brain tumor classification using deep learning techniques. By continuing to innovate and collaborate across disciplines, we can harness the full potential of artificial intelligence to improve diagnostic accuracy, treatment planning, and patient outcomes in the field of neuroimaging.

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Socio-Economic Status and Social Capital: An Exploration of Their Impact on Pregnant Women in Urban Slums of Firozabad City, Uttar Pradesh

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ABSTRACT

As India is a very diverse country, it is important to understand the socioeconomic status and social capital of pregnant women is essential for designing targeted interventions and policies aimed at addressing disparities and improving maternal and child health outcomes in India. Social capital can influence people's health either directly through its influence on social behaviour inside the network or indirectly through its effect on the broader social spectrum, which can then act as determinant of the health of the population. The observed socioeconomic gaps among pregnant women in India can be attributed to multiple causes. This paper aims to explore the association between socioeconomic status and social capital of pregnant women in the urban slums of Firozabad city, Uttar Pradesh, drawing upon existing literature and empirical evidence to highlight key challenges, and disparities. This cross-sectional exploratory study was conducted in urban slums of Firozabad City, Uttar Pradesh. The sample size, including the 10% of non-response rate, for the conducted study was 390. The urban wards where the pregnant women were sampled were chosen using the probability proportional to size (PPS) sampling method. The social capital questionnaire was used to gather the primary data. Sections on social capital and socioeconomic status were included in the questionnaire. Most of socio-economic status indicators have a significant association with social capital and decision-making indicators. A p-value less than 0.05 indicates a statistically significant association. However, some indicators like Religion and Caste do not show a significant association with all decision-making indicators. The results of the study indicate a significant association between membership in social groups and a woman's decision-making power regarding various aspects of her life, including money management, market access, health facility access, and community involvement. These findings underscore the importance of considering a wide range of social and economic factors in efforts to empower women and enhance their decision-making capacity. Future research should aim to further elucidate the complex relationships between these factors and women's decision-making, as well as their access to diverse resources, which is crucial for individuals.

Keywords: Pregnant Women, Social Capital, Socio-economic status, urban slums

1. INTRODUCTION

As India is a very diverse country, it is important to understand social capital of the community for any public health intervention program. According to the human development profile, there is significant regional patterning throughout India in social network usage, the number of members in formal organisations, and an individual or subjective measure of trust in institutions (Desai et al., 2010). Social capital can influence people's

health either directly through its influence on social behaviour inside the network or indirectly through its effect on the broader social spectrum, which can then act as determinant of the health of the population. (Agampodi et al., 2017).

Social capital has three dimensions i.e., 1) Bonding social capital refers to connections whereby there are similar characteristics in a group or network for example category, race, age etc; 2) Bridging social capital refers to different socioeconomic and sociodemographic status in across group; and 3) Linking social capital reflects connections between norms of respect and network of trust in the across the group and individuals. All three dimensions may affect to health. These forms may be improved the health and may also decline the health mainly bonding social capital (Moore & Kawachi, 2017). Story discovered significant gaps in the current social capital health research. (1) It is unclear whether social capital works as an individual or collective variable in relation to health-care utilization; (2) there are few experimental studies distinguishing different types of cognitive and subjective social capital; and (3) the majority of studies focus on the positive outcomes of social capital rather than the negative effects of social capital (Story, 2014).

Socioeconomic status (SES) encompasses various factors such as income, education, occupation, and access to resources, which collectively influence an individual's or a community's overall well-being and health-seeking behavior (Li X et al., 2020). The poor environmental condition and inadequate services (access of potable water supply, good sanitation, access of good health care services), along with high density of population altogether develop a wide range of unfavorable health situations such as under nutrition, birth outcome related complications, post-delivery morbidity and mortality etc. limited efforts are made so far in India to study individuals' health, specifically women who live in slums (Srivastava et al., 2015). Studies have shown that socioeconomic factors play a significant role in determining the quality of prenatal care, maternal health outcomes, and infant mortality rates (Lima Figueiredo et al., 2024).

The observed socioeconomic gaps among pregnant women in India can be attributed to multiple causes. The socioeconomic environment for pregnant women is shaped in part by social norms, cultural norms regarding gender roles and reproductive health, lack of access to healthcare, income disparity, and restricted educational possibilities. Understanding the socioeconomic status of pregnant women is essential for designing targeted interventions and policies aimed at addressing disparities and improving maternal and child health outcomes in India. By addressing socioeconomic inequalities and enhancing access to healthcare services, policymakers and healthcare providers can work towards ensuring equitable health outcomes for all pregnant women, regardless of their socioeconomic background.

2. METHODOLOGY

This paper aims to explore the association between socioeconomic status and social capital of pregnant women in the urban slums of Firozabad city, Uttar Pradesh, drawing upon existing literature and empirical evidence to highlight key challenges, and disparities. By shedding light on this critical issue, we hope to contribute to ongoing efforts aimed at promoting maternal health intervention to address the social capital with socio economic condition of pregnant women.

This cross-sectional exploratory study was conducted in urban slums of Firozabad City, Uttar Pradesh. The study population consisted of pregnant women residing in these slums. For this study, a minimum target sample size of 354 pregnant women aged between 15 and 49 years was required. Consequently, the numbers were augmented by approximately 10% in the sample size to compensate for non-response and other factors. In the end, the sample size, including the non-response rate, for the conducted study was 390. We used probability proportional to size (PPS) sampling method to select the urban wards with the sample of pregnant women.

The primary data was collected through social capital questionnaire tool using the survey CTO. SurveyCTO is a mobile application designed for data collection. It's a powerful tool for mobile data collection. The app allows you to collect data offline, making it possible to conduct interviews. After data has been collected with the app, it is uploaded to the SurveyCTO server when an Internet connection is available. social capital questionnaire tool is adopted from Social Capital Assessment tool. The questionnaire included sections on socio-economic status and social capital. It was designed to capture information on income, education, occupation, social group memberships and decision making with various aspects of her life, including money management, market access, health facility access, and community involvement. Descriptive statistics were used to summarize the data. The relationship between socio-economic status, social capital outcomes was explored using chi-square test, controlling for potential confounders. All participants provided informed consent before participating in the study. The study was approved through IRB of the IJHMR University, Jaipur Rajasthan.

3. ANALYSIS

3.1. Socio-Economic Status

According to the analysis of the data presented in table 1, The dataset presents a thorough exploration of the socio-economic status attributes of the sampled pregnant women through descriptive analysis. The results in table 4 indicate that the majority of the pregnant women in the sample are between the ages of 18-25 years (60.48%), followed by those in the 26-30 years age group (32.10%). A small percentage (7.43%) is in the 31-45 years age group. The mean age of pregnant women in the sample is 25.13 years.

Table.1. Socio-Economic Status of Pregnant Women

Variables	n=377	%
Age Group		
18-25 Years	228	60.48
26-30 Years	121	32.10
31-45 Years	28	7.43
Mean Age of PW	25.13	

Education Status		
Illiterate	33	8.75
Can sign/can read only	45	11.94
Madrasa	32	8.49
Primary schooling	37	9.81
Middle schooling	57	15.12
Matriculation	16	4.24
Senior secondary	35	9.28
Graduate	104	27.59
Masters/Postgraduate	18	4.77
Occupation Status		
Housewife	135	35.81
Domestic work	112	29.71
Daily labour/ labour/MGNREGA	72	19.10
Unemployed (> 18 years)	30	7.96
Skilled labour (ex: sewing)	14	3.71
Private job	14	3.71
Religion		
Hindu	268	71.09
Islam	109	28.92
Caste		
ST	15	3.98
SC	85	22.55
OBC	195	51.72
General	67	17.77
Others	15	3.98
Type of House		
Pucca	353	93.63
Semi-pucca	24	6.37
BPL Card		
No	347	92.04
Yes	30	7.96
Source of Lighting		
Electricity	377	100.00
Source of Drinking Water		
Tap Water	253	67.11
Surface water (River/Canal)	91	24.14
Hand-pump	22	5.84
Others	11	2.92
Type of Fuels for the Cooking		
LPG/Natural gas	338	89.66
Electricity	39	10.35
Toilet Facility		
Own flush/pit toilet	297	78.78
Shared toilet	80	21.22
Income in Rs		
0-10000	41	10.8
10001-15000	102	27.1
15001-20000	55	14.6
20001-60000	14	3.8
Refused to answer	88	23.3
Don't Know	77	20.4

The highest percentage of pregnant women in the sample is graduates (27.59%), followed by those who have only completed middle school (15.12%). A small percentage of the sample is illiterate (8.75%). Significant portions of the sample are housewives (35.81%) or engaged in domestic work (29.71%). A smaller percentage is engaged in daily labor/MGNREGA/other contract work (19.10%). The majority of the sample identify as Hindu (71.09%), followed by those who identify as Islam (28.92%). The largest caste groups in the sample are OBC (51.72%), followed by SC (22.55%) and General (17.77%). Small percentages belong to the ST caste (3.98%). The majority of the sampled houses are

categorized as Pucca houses (93.63%), with a smaller percentage being Semi-pucca houses (6.37%). A substantial majority of the sample, at 92.04%, does not possess a Below Poverty Line (BPL) card, whereas 7.96% do have one. Every household in the sample exclusively relies on electricity as the source of lighting, making up 100.00%. The primary source of drinking water for the majority is tap water (67.11%), followed by surface water (24.14%) and hand-pump (5.84%). A minor percentage depends on the other water sources (2.92%). The predominant choice for cooking fuel in the sample is LPG/Natural gas (89.66%), followed by electricity (10.35%). The majority of the sample possesses their own flush/pit toilet (78.78%), while 21.22% utilize shared toilet facilities. Income Levels (in Rs): The income levels range from Rs 8000 to Rs 60000. The most common income level is between Rs 10001 and Rs 15000, with 27.1% of the population earning this amount. 13.5% of the population earning Rs. 12000 amounts in this range. A significant portion of the population either refused to answer (23.3%) or didn't know (20.4%) their income level.

3.2. Study Subject's Social Capital

The evaluation of study subjects' social capital provides insights into the extent of their connections, relationships, and resources within their social networks. This assessment aims to quantify and understand the social assets that individuals can leverage for personal and community well-being.

3.3. Social Network-Group Membership

The study investigates whether individuals are members of various social, cultural, religious, business, or professional groups. This analysis sheds light on the extent to which study subjects are integrated into formal or informal networks, influencing their exposure to social interactions and support systems. The data provided in figure 1 suggests that in the urban slum area of Firozabad city, when pregnant women were asked if they are a member of any social, cultural, religious, business, or professional group, a significant majority (91.51%) indicated that they are not members of such groups. Conversely, only a small minority (8.49%) of respondents confirmed their membership in these types of groups.

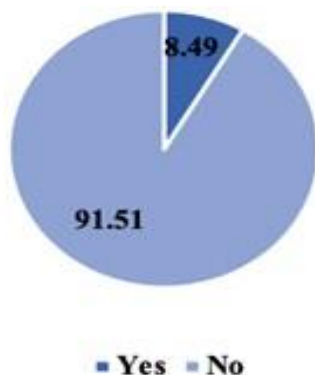


Figure.1. Membership of Any Social /Cultural /Religious Group (%)

3.4. Decision on Own Using The Money

The data in the Figure 2 represents the responses to the question "Do you have any money of your own that you can decide how to use?". Here's a description of the findings: 181 respondents, which is 48.01% of the total, answered that they do not have any money of their own that they can decide how to use. 196 respondents, which is 51.99% of the total, answered that they do have money of their own that they can decide how to use. In summary, the data suggests that a slight majority (51.99%) of the respondents have their own money that they can decide how to use, while a significant minority (48.01%) do not. This could indicate varying levels of financial independence among the respondents.

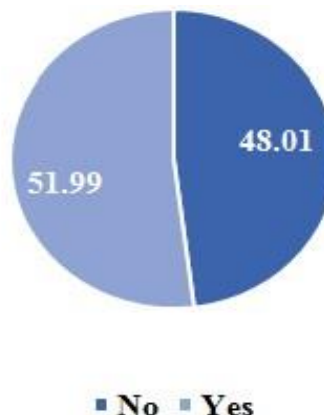


Figure.2. Decision on Using The Own Money (%)

3.5. Permission For The Go To Various Places

The data presented in the figure 3 illustrates the percentage of respondents permitted to visit various places either independently or accompanied by someone else. Here is an overview of the findings: A majority of respondents (55.17%) are allowed to go to the market alone, while 44.83% prefer to go with someone else.

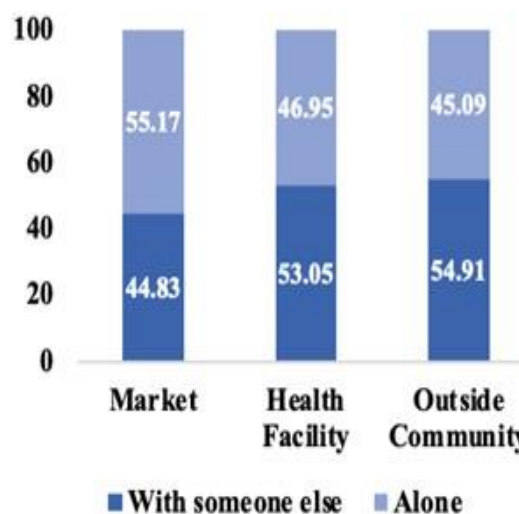


Figure.2. Permission for The Go to various Places (%)

When it comes to health facility visits, 53.05% of respondents choose to go with someone else, and 46.95% go alone. For activities outside their community, 54.91% of respondents opt to go with someone else, whereas 45.09% go alone. In summary, the data indicates that a significant portion of respondents is permitted to

independently visit the market. However, when considering visits to a health facility or activities outside the community, the majority of respondents prefer to be accompanied by someone else. Possible influencing factors for this preference could include considerations of safety, convenience, or the desire for company. The table 2 and 3 suggests that there is a significant

association between membership of social groups and a woman's decision-making power regarding money, her ability to go to the market, health facility, and outside, and her sense of belonging to the community. All these factors have p-values less than 0.05, indicating a statistically significant relationship.

Table.2. Significant Association Between Membership of Social Groups and Woman's Decision-Making Power Regarding Money

Indicators of SES	Membership of Any Social/Cultural/Religious Groups			Decision on Using the Own Money		
	Value	df	p-value	Value	df	p-value
Occupation Status	14.742	7	0.039	142.831	7	<.001
Education Status	22.317	8	0.004	161.396	8	<.001
Religion	4.583	1	0.032	0.368	1	0.544
Caste	11.708	4	0.02	27.186	4	<.001
Type of House	0.001	1	0.978	16.014	1	<.001
BPL Card	0.985	1	0.321	5.949	1	0.015
Source of Drinking Water	39.35	3	<.001	100.186	3	<.001
Toilet Facility	3.62	1	0.057	17.115	1	<.001
Source for Cooking	3.92	1	0.048	29.107	1	<.001
Source of Lighting	21.843	2	<.001	4.013	2	0.134
Type of Family	5.323	1	0.021	15.778	1	<.001
Income	39.424	15	<.001	35.098	15	0.002

Table.3. Significant Association Between Membership of Social Groups and Woman's Decision-Making Power Regarding Ability to go the Market, Health Facility, And Outside community

Indicators of SES	Market			Health Facility			Outside Community		
	Value	df	p-value	Value	df	p-value	Value	df	p-value
Occupation Status	75.468	7	<.001	115.791	7	<.001	110.719	7	<.001
Education Status	29.638	8	<.001	43.356	8	<.001	42.603	8	<.001
Religion	0.239	1	0.625	0.173	1	0.678	0.423	1	0.515
Caste	3.326	4	0.505	7.231	4	0.124	9.053	4	0.06
Type of House	0.904	1	0.342	0.919	1	0.338	4.179	1	0.041
BPL Card	13.359	1	<.001	7.299	1	0.007	16.212	1	<.001
Source of Drinking Water	42.626	3	<.001	52.045	3	<.001	53.732	3	<.001
Toilet Facility	74.766	1	<.001	55.664	1	<.001	57.963	1	<.001
Source for Cooking	14.408	1	<.001	17.372	1	<.001	19.562	1	<.001
Source of Lighting	3.285	2	0.194	4.568	2	0.102	79.765	1	<.001
Type of Family	76.039	1	<.001	78.697	1	<.001	79.765	1	<.001
Income	33.546	15	0.004	38.275	15	<.001	38.396	15	<.001

Occupation Status: The value is 14.742, degrees of freedom (df) is 7, and the p-value is 0.039 for membership in any social/cultural/religious groups. For other decision-making indicators, the p-value is less than 0.001, indicating a significant association. Education Status: The value ranges from 22.317 to 161.396, df is 8, and the p-value is less than 0.001 for all decision-making indicators, indicating a significant association. Religion: The value is 4.583, df is 1, and the p-value is 0.032 for membership in any social/cultural/religious groups. For other decision-making indicators, the p-value is greater than 0.05, indicating no significant association. Caste: The value ranges from 3.326 to 27.186, df ranges from 4, and the p-value is less than 0.05 for membership in any social/cultural/religious groups and decision on using own money, indicating a significant association. For other decision-making indicators, the p-value is greater than 0.05, indicating no significant association. Type of House: The value ranges from 0.001 to 16.014, df is 1, and the p-value is less than 0.05 for decision on using own money and permission for going to health facility, indicating a significant association. For other decision-making indicators, the p-value is greater than 0.05,

indicating no significant association. BPL Card: The value ranges from 0.985 to 16.212, df is 1, and the p-value is less than 0.05 for decision on using own money, permission for going to market, permission for going to health facility, and permission for going to outside community, indicating a significant association. For membership in any social/cultural/religious groups, the p-value is greater than 0.05, indicating no significant association. Source of Drinking Water: The value is 39.35, df is 3, and the p-value is less than 0.001 for all decision-making indicators, indicating a significant association. Toilet Facility: The value ranges from 3.62 to 74.766, df is 1, and the p-value is less than 0.05 for all decision-making indicators except membership in any social/cultural/religious groups, indicating a significant association. Source for Cooking: The value ranges from 3.92 to 29.107, df is 1, and the p-value is less than 0.05 for all decision-making indicators, indicating a significant association. Source of Lighting: The value ranges from 3.285 to 79.765, df ranges from 1 to 2, and the p-value is less than 0.05 for membership in any social/cultural/religious groups and permission for going to outside community, indicating a significant

association. For other decision-making indicators, the p-value is greater than 0.05, indicating no significant association. Type of Family: The value ranges from 5.323 to 79.765, df is 1, and the p-value is less than 0.001 for all decision-making indicators, indicating a significant association. Income is in Rs: The value is 39.424, df is 15, and the p-value is less than 0.05 for all decision-making indicators, indicating a significant association.

In summary, most SES indicators have a significant association with social capital and decision-making indicators. A p-value less than 0.05 indicates a statistically significant association. However, some indicators like Religion and Caste do not show a significant association with all decision-making indicators. Overall, the table suggests that social capital, as measured by membership in social groups, is associated with greater autonomy and a stronger sense of community for pregnant women.

4. CONCLUSION

The study concluded that there is a significant association between a pregnant woman's ability to make decisions regarding her own financial situation or money utilization, her accessibility to markets and health services, and her involvement in community affairs and affiliations with social groups. These outcomes highlight the pivotal role of social capital in nurturing women's empowerment and strengthening their ability to make decisions. It was found that an individual's occupation status significantly correlated with other decision-making variables as well as participation in any social, cultural, or religious group. This might be explained by the possibility that particular occupation allow women greater chances to socialise and form networks with other people (Agarwala, R., & Lynch, S. M. 2006).

Similarly, pregnant women's education status was found to have a significant association with all decision-making indicators. This could be due to the fact that education often equips women with the skills and knowledge necessary to make informed decisions and maintain their rights. (Pratley, P. 2016). However, the majority of decision-making indicators did not exhibit a statistically significant correlation with religion, indicating that a woman's ability to make decisions may not be directly impacted by her religious membership. It has been found that a pregnant women's caste significantly influences their decision to use their own money as well as their involvement in social, cultural, and religious groups. This might be as a result of how caste-based social institutions affect people's ability to access opportunities and resources (Richardson, R. A. 2018).

Certain decision-making indicators were found to be significantly correlated with the type of house, BPL card status, source of drinking water, toilet facility, source for cooking, source of lighting, type of family, and income. These findings suggest that factors that are indicative of an individual's socioeconomic status can impact a woman's ability to make decisions (Peterman, A., et al. 2015). These insights underscore the need to take into account a wide range of social and economic factors in initiatives aimed at empowering women and enhancing their decision-making capabilities. Future research should aim to elucidate the complex relationships between these factors and women's decision-making power.

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Deep Learning Approach for Shopper Review Sentiment Analysis and Recommendation (Role of review: Better Organization)

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ABSTRACT

Nowadays in this internet era, review plays a vital role in every organization. A review is all about hearing other people's previous shopping experiences that can assist potential customers in determining whether a product has previously lived up to the expectations of its purchasers. The objective of this paper is to extract meaningful information from reviews that can help organizations to improve revenues. The process of automatically extracting sentiment or opinions from these reviews heavily relies on sentiment analysis, a branch of Natural Language Processing (NLP) utilizing innovative techniques for mining consumer opinions. The project aims to establish a robust framework for sentiment analysis that accurately classifies emotions expressed in these reviews and also performs location recommendation for new branch. The proposed system incorporates advanced deep learning methods and clustering techniques to enhance data classification and extract fine-grained sentiment information. In this paper we have applied three machine learning models such as Simple Neural Networks (SNN), Convolutional Neural Networks (CNN), and long short-term memory (LSTM) Recurrent neural network (RNN) and K-means clustering algorithm. The evaluation indexes and the three algorithms are compared in different lengths of sentence and word vector dimensions. Clustering groups together reviews that are spatially close to each other, forming clusters based on their geographic distribution and Recommendation is based on the centroid of the clusters. The results present that recurrent neural network algorithm is effective in the sentiment classification of the review corpus. Finally, very interesting results were observed in terms of the Mapbox which represents the sentiment information of each store.

Keywords: *Sentiment analysis, Simple Neural Networks (SNN), Convolutional Neural Networks (CNN), long short-term memory (LSTM), Mapbox, K-means, Recommendation*

1. INTRODUCTION

In today's competitive market, consumers have more choices than ever before. They can quickly evaluate goods and services according to a number of criteria, including cost, features, quality, and reviews from customers. Product reviews are among the most important information sources that buyers trust. Customers can express their thoughts and experiences through reviews, but brands can also use them as a potent weapon to increase reputation, loyalty, and trust. In recent years, reviews have emerged as a crucial resource for buyers seeking guidance and facts before making a purchase. Sentiment analysis is necessary because of the volume of user-generated content that is available, as it helps automatically determine sentiments or views from

assessments. This research paper focuses on sentiment analysis in product reviews and new location recommendation. This paper aims to develop a robust framework that can effectively categorize the sentiment expressed in these reviews. The objective of this paper is to extract a meaningful information from reviews that can help organizations to improve revenues with the help of advanced techniques such as deep learning and Clustering.

2. RELATED WORK

Recent years have witnessed a wide range of studies interests in sentiment analysis and opinion mining [1]. This section covers a few of the several methodologies that can be recognized in sentiment analysis. Yuling Chen et. al. [2] noted the current emphasis in the field of Web information mining on sentiment analysis of online reviews. Text sentiment analysis using conventional approaches mostly depends on machine learning or emotion dictionaries. Nevertheless, the generalizability of these methods is restricted due to their reliance on creating emotion dictionaries and manually defining and extracting features. By comparison, deep learning models are more expressive and can therefore understand complex mappings from data to emotional semantics with greater ease.

Mohd. Istiaq Hossain Junaid et. al. [7] The data was split 80:20 across training and testing groups by the researchers. The texts were pre-processed using TFIDF, Glove Vector, Word2Sequence, and Count Vectorizer. With regard to the traditional machine learning classifier, Authors utilized the Random Forest classifier, Decision Tree, Linear SVM, Logistic Regression, and Multinomial NB; unigram and bigram features were used to train these models. For deep learning, they used RNN, GRU, and LSTM. The LSTM with word sequence model achieved the best testing accuracy of all the models. The results of decision trees, random forests, linear SVM, Naïve Bayes, and logistic regression with count vector were 74.52%, 68.75%, 69.23%, 69.71%, and 71.15%.

3. PROPOSED METHODOLOGY

In this case study, we aim to predict whether the input review is Positive, Negative or Neutral this is one case and the second case is user requested to upload csv file of their choice after the file upload the trained LSTM model classifies sentiment with the store location of latitude and longitude and the final case is to recommend the new location based on the user input. This proposed model will plot that information on the map using map box.

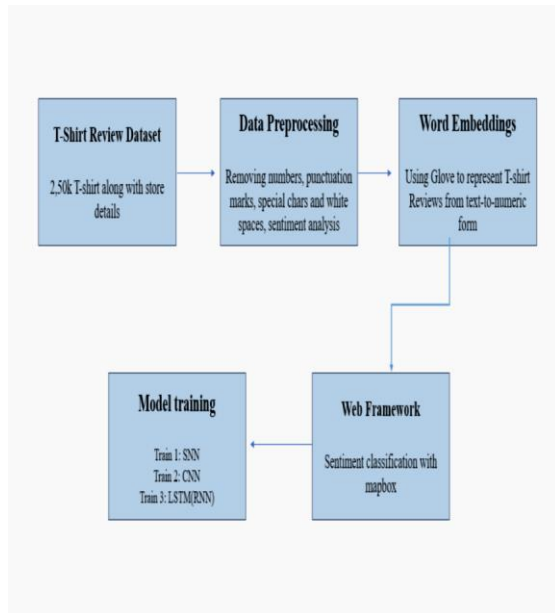


Figure.1. flow chart representation

3.1. Data Set Description

The dataset ‘‘TeePublic review’’ used in our experiments is composed of the following variables: Reviewer_id, store location, latitude, longitude, date, month, year, title, and review (fig.2) this dataset contains 2,50,000 rows and 10 columns.

reviewer_id	store_location	latitude	longitude	date	month	year	title	review	review-label
0.0	US	37.090240	-96.712891	2023	6	2015 00:00:00	Great help with lost order	I had an order that was lost in transit. When ...	5
1.0	US	37.090240	-96.712891	2023	6	2024 00:00:00	I ordered the wrong size tee and had difficulty	I ordered the wrong size tee and had difficult...	5
2.0	US	37.090240	-96.712891	2023	6	2017 00:00:00	These guys offer the best customer service in ...	These guys offer the best customer service in ...	5
3.0	US	37.090240	-96.712891	2023	6	2024 00:00:00	Good Stuff	Looked for an obscure phrase on a shirt. Teepu...	5
4.0	CA	58.130366	-106.346771	2023	6	2023 00:00:00	My order arrived in a good timely fashion & th...	My order arrived in a good timely fashion & th...	4
5.0	US	37.090240	-96.712891	2023	6	2015 00:00:00	Always top notch	Always top notch customer service. Never have ...	5
6.0	US	37.090240	-96.712891	2023	6	2019 00:00:00	Recent review	I have messaged sellers and get no response at...	4
7.0	US	37.090240	-96.712891	2023	6	2023 00:00:00	Great communication	Great communication. They let me know it was a...	5
8.0	CA	58.130366	-106.346771	2023	6	2021 00:00:00	Awesome	Very impressed with the quality. I had a hard ...	5
9.0	US	37.090240	-96.712891	2023	6	2014 00:00:00	Wonderful quality T-shirts for an amazing price	Wonderful quality T-shirts for an amazing price...	5

Figure.2. Tee Public review dataset

3.2. Data Pre-Processing and Exploration

In this step, we removed the missing data from each variable. Then we showed the distribution of the target variable review_label of the T-shirt Rating is impressive as almost all the Rating is five. So, let us have a look at the distribution of Rating by year. (fig 4) looking at the visual we see that the rating distribution each year looks the same. the next step is sentiment analysis [4] for this we used Text Blob Python library commonly used natural language processing (NLP) for sentiment analysis.

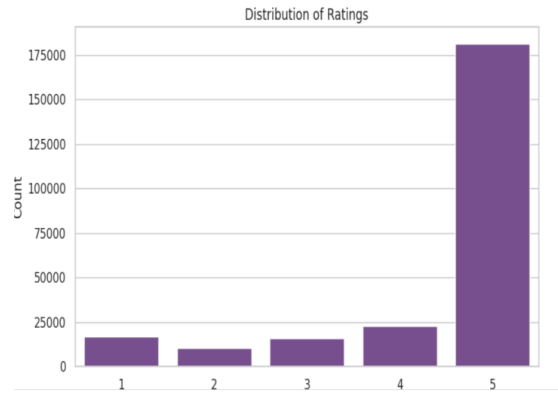


Figure.3. Distributions of Ratings

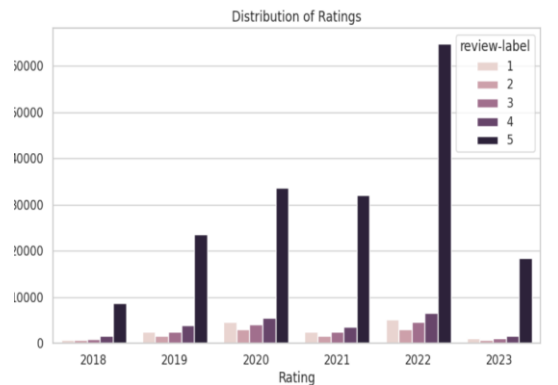


Figure.4. Distributions of Ratings and Year

3.2.1. Polarity Analysis

Polarity is a floating value that lies in the interval [-1, 1] which states that 1 indicates positive review, -1 indicates negative review and 0 indicates neutral. The distribution of the polarity score in the reviews is shown in Figure 5. Where the majority of the comments are situated on the positive side of the graph [0,1].

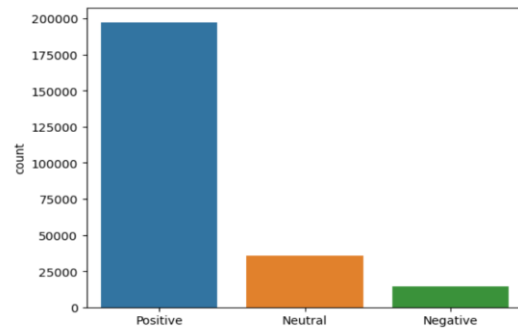


Figure.5. Sentiment Distribution Across Ratings

3.2.2. Text Pre-Processing

In this phase, punctuation is removed (!"#%&\'()*+,-./:;<=>?@[\\]^_`{|}~), and all text in the comments is converted to lowercase. Based on the values of the Text Polarity variable Three different sentiments can be derived. Positive sentiment is present if Text_Polarity is larger than zero then a negative sentiment is present if Text Polarity is less than zero and Neutral sentiment is presented if Text Polarity is equal to zero.

3.3. Word Embeddings

Tokenization is the process of separating the text into discrete words or units of speech. The purpose of it is to generate a dictionary word index [5]. In the word-to-

index dictionary, every word in the corpus serves as a key, and the value of the key is determined by a corresponding unique index. Then we compute the vocabulary size, in our corpus is 41181 unique words in this study. To ensure that every review is precisely 100 words long, padding must be applied next. The list will be trimmed to 100 if its size exceeds 100. Until the list reaches its maximum length, we will append 0 to the end of any entries that are less than 100. word embedding is the technique to convert each word into an equivalent float vector. In this study we use global vectors for Word Representation, [5] GloVe embedding is used to create a feature matrix. GloVe is an unsupervised learning algorithm that generates vector representations, or embeddings, of words. It is not necessary to train the model from scratch when using these pre-trained embeddings, which can be downloaded and used immediately in a variety of natural language processing (NLP). Here we use a pre-trained GloVe embedding in a dimension (100-d vectors). Here d stands for dimension. 100d means, in this file each word has an equivalent vector of size 100. GloVe files are simple text files in the form of a dictionary. Words are key and dense vectors are values of key.

3.4. Model Training And Testing

In this case study we approach three Deep learning models such as Simple Neural Networks (SNN), Convolutional Neural Networks (CNN), and long short-term memory (LSTM).

3.4.1. Simple Neural Networks

creating a sequential model then we created embedding layer with input length of 100 which is the maximum length and the output vector dimension is also 100 and the vocabulary size is 41181 words as mentioned above for weights we pass the embedding matrix. The embedding layer is then added to the model. Then we flatten the embedding layer and finally we add the dense layer with sigmoid activation function. compile the model once the model is trained, we compute prediction on the test set and we obtain the training accuracy of 78.65%. which is higher than the test accuracy 80.01%. Which means that the model is over fitting on the training set.

3.4.2. Convolutional Neural Networks

Convolutional Neural Networks is the type of network that is primarily used for 2D data classification, CNN works with text data as well though text data is one-dimension, we can use 1D CNN to extract features from data. In this model we use 1 convolutional layer and 1 pooling layer. The embedding layer is the same as we mentioned above then we compile and train the model and the training accuracy is 81.80% and the test accuracy is 81.70%. this model is also over fitting as you can see the difference between the accuracy.

3.4.3. long short-term memory (LSTM)

Recurrent Neural Network is the type of neural network that is proven to work with sequence data and since text is actually a sequence of words, a recurrent network is an automatic choice to solve text-related problems. In this study we are using LSTM which is a variant of RNN. Here with the same embedding layer, we created a

LSTM layer with 128 neurons. Then we compiled and train the model.

1540/1540 [=====] - 67s 43ms/step - loss: 0.2739 - acc: 0.8245

Figure.6. LSTM model Test Accuracy

This model performed well as compared to SNN and CNN with the training accuracy of 82.12% and the test accuracy of 82.45%. With this we can conclude that RNN based LSTM is the most suited approach for training the neural network

Model: "sequential_9"

Layer (type)	Output Shape	Param #
embedding_9 (Embedding)	(None, 100, 100)	4118100
lstm_9 (LSTM)	(None, 128)	117248
dense_9 (Dense)	(None, 1)	129

=====
 Total params: 4235477 (16.16 MB)
 Trainable params: 117377 (458.50 KB)
 Non-trainable params: 4118100 (15.71 MB)

Figure.7. LSTM model summery

Embedding Layer is utilized to transform word representations from integer indices into dense vectors of a predetermined size, with a vector for each word. This layer's input shape is (None, 100), which indicates that sequences of integers with a maximum length of 100 are expected. It outputs a 3D tensor with the shape of (batch size, sequence length, embedding dimension), as indicated by the Output Shape (None, 100, 100). The total number of parameters in this layer is shown by the value 4118100. Recurrent neural network (RNN) layers, such as the LSTM (Long Short-Term Memory) layer, are very good at identifying long-term dependencies in sequential data. This layer's output shape is (None, 128), indicating that it produces a 2D tensor with the shape (batch_size, units). The total number of parameters in this layer is indicated by the parameter value 117248.

Dense Layer: This layer is entirely connected, with every output node coupled to every input node. This layer's output shape is (None, 1), which indicates that a 2D tensor with the shape of (batch_size, 1) is produced. There are 129 parameters in this layer, which represents the total amount of parameters in this layer.

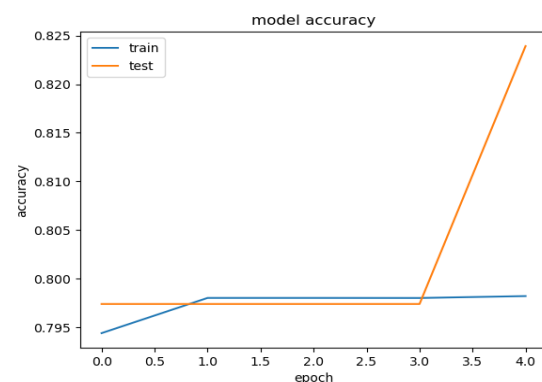


Figure.8. LSTM model Accuracy plot

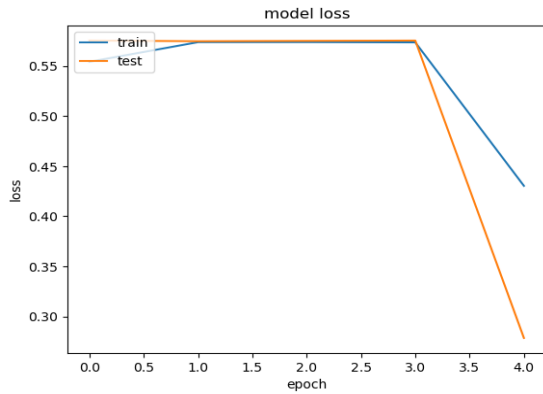


Figure.9. LSTM model loss plot

3.4.4. K-means Clustering

The reviews associated with the provided store locations are clustered using the K-means clustering algorithm. Clustering groups together reviews that are spatially close to each other, forming clusters based on their geographic distribution. Clustering helps identify spatial patterns in the distribution of reviews. By clustering the reviews associated with the provided store locations, we can identify groups of reviews that are spatially close to each other. The centroid of these clusters provides a representative location that captures the spatial distribution of reviews.

3.4.5. Location Recommendation

Once the clustering is performed, the centroid of the top clusters is computed. This centroid represents a central location that minimizes the overall distance to the reviews within the top clusters. This centroid is then recommended as a potential location based on the spatial distribution of the reviews associated with the provided store locations. The recommended location aims to optimize accessibility for customers based on the distribution of reviews. By choosing a central point, we minimize the overall travel distance for customers coming from the provided store locations.

3.5. Web Framework

In this case study, we used python framework streamlit to develop our web application. This web app contains three actions first input review classification and second file upload which request the user to upload a file then this web app will classify the sentiment of reviews and plot that information in map with store location name with latitude and longitude. Then the final process is to generate the new location based on the user input then plot the generated information in map using mapbox.

4. RESULT

Table.4. Results of Models

Model	Train loss	Test loss	Train Accuracy	Test Accuracy
SNN	33.34%	17.70%	78.65%	80.01%
CNN	-59.08%	-65.99%	81.80%	81.70%
LSTM	26.67%	27.39%	82.12%	82.45%

The LSTM model achieves the highest testing accuracy of 82.45%, followed by the CNN model with an accuracy of 81.70%, and then the SNN model with an accuracy of 80.01%. The SNN and LSTM models have similar testing loss values around 17.70% and 27.39%

respectively, while the CNN model shows a negative loss value, which could be due to the loss function or model architecture. the LSTM model seems to be the best choice among the three. With this model we build a streamlit application which contains three modules,

Module 1: Simple Text Classification



Figure.10. Module 1, Classify Review

This module takes reviews as input. Reviews could be in text format, such as customer reviews of products or services. In this module we used proposed model LSTM to classify the reviews.

Module 2: File upload and plot Graph

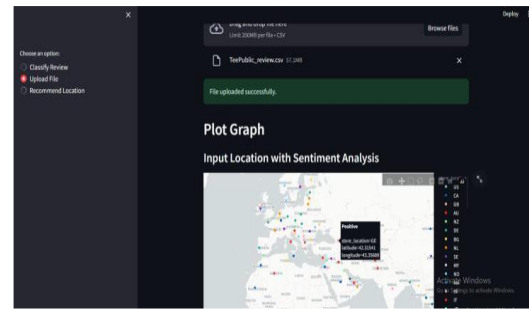


Figure.11. Module 2, Upload File and Plotting

In this module users are presented with the "Upload File" option in the Streamlit sidebar. Upon selecting this option, users can upload a CSV file containing reviews and their corresponding store locations. The uploaded CSV file is read and its encoding is detected using the chardet library to handle different encoding types. Once the encoding is determined, the CSV data is decoded and read into a panda Data Frame.

After successfully uploading the file, the sentiment analysis is performed on the reviews using the sentiment evaluation () function from Module 1. The data is visualized on a scatter map using Plotly Express, where each point represents a location, colored based on sentiment analysis results. The latitude and longitude columns from the Data Frame are used as coordinates for plotting. Finally, this scatter map box function provides interactive map visualization.

Module 3: Recommend Location

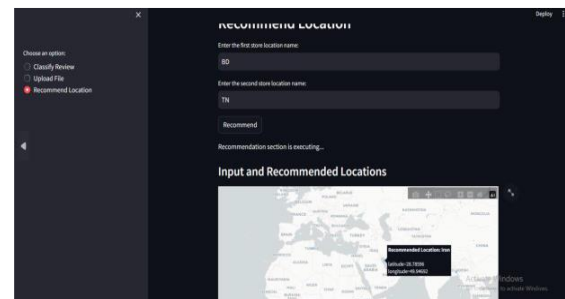


Figure.11. Module 3, Recommend Location

Users are presented with the "Recommend Location" option in the Streamlit sidebar. Upon selecting this option, users are prompted to input two existing store

locations. The user-inputted locations are used to filter the Data Frame to include only the data corresponding to these locations. If there are enough samples (at least 5) for clustering, the clustering process is initiated.

For clustering, the KMeans method is employed, and the number of clusters is dynamically determined by the sample size. The top three clusters with the greatest number of data points are determined by computing the centroids of each cluster. Using Plotly Express, the input locations and the suggested location are plotted on an interactive map. Every point has a label indicating the matching sentiment analysis score or suggested location. Users can see the suggested location as well as the input locations visually with the help of the map.

5. CONCLUSION

The proposed sentiment analysis system represents a significant advancement in accurately classifying sentiment in online product reviews. The exponential growth of user-generated content on product reviews has made it more difficult to extract sentiment and opinion from reviews. To address this difficulty, though, this method provides a proficient and effective response. Using advanced deep learning techniques is one of the system's primary benefits. Reviews play a major role in every organization, product review can be thought of as the opinions or feedback of customers regarding a specific product. The websites of many online businesses have a section labeled "reviews" that allows customers to rank and comment on the products they have purchased. When other people read a product review, they better understand what they're getting before they buy it. They may read the reviews, get all their questions answered, and then determine whether it is worthwhile to purchase the product or not. These reviews give informed decisions for an organization to conduct targeted advertising campaigns and another important suggestion they can open a new branch based on the output provided by the recommend location module. In this case study T-shirt reviews are converted into meaningful insights which is showed in fig11. These information helps an organization to make informed decisions. Therefore, the classification of reviews is another crucial area that calls for deep learning approaches.

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The Balancing Act: Judicial Activism and Shaping India's AI Future

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ABSTRACT

Judicial activism refers to court decisions that primarily or entirely consider the individual or political views of a judge instead of existing laws. It occurs when a judge bases a case decision on their personal views regarding public policy, even if it means deviating from legal precedents. In this manner, judges may identify constitutional violations and choose not to adhere strictly to precedents. Judicial activism operates by shifting the courts from their traditional role of interpreting laws to a more legislative role, where they create new laws, policies, and rules after hearing arguments from both sides. One of the landmark cases demonstrating judicial intervention through social action litigation was the "Hussainara Khatoon v. State of Bihar" case heard in the Bihar Court. Looking at post-emergency legal actions, it's clear that the Supreme Court has surpassed legal positivism and engaged extensively in judicial activism. This shift is often attributed to the emergence of public interest litigation and the modernization of the 'locus standi' rule.

Keywords: *Judicial Activism, Artificial Intelligence in India, AI Policy India, Indian Judiciary and Technology, AI Regulation Implications of AI Ethics in India Technology Law, Governance Courts and AI Policy Legal Law AI Legislation Role of Judiciary in AI*

1. INTRODUCTION

Artificial intelligence (AI) is rapidly transforming our world, and India, with its vibrant cultural tapestry and diverse socio-economic landscape, presents a unique case study. Here, judicial activism emerges as a crucial tool to address the legal, ethical, and social implications of AI technologies. Justice D.Y. Chandrachud, a leading voice in Indian jurisprudence, aptly captured this sentiment, stating, "The challenge for the judiciary is to adapt to these new technologies...to ensure that they remain instruments of human progress and not become sources of social or economic disparity". This paper explores how judicial activism, within the Indian context, can be leveraged to navigate the challenges posed by AI while promoting inclusive growth, ethical governance, and societal well-being.

2. THE UPSIDES OF JUDICIAL INTERVENTION

2.1. Championing Cultural Sensitivity and Inclusivity

India's 22 official languages and multitude of religions necessitate a nuanced approach to AI governance. A 2020 Pew Research Center survey found that 72% of Indians believe AI should be adapted to fit their culture. Judicial activism can ensure that AI policies and practices respect local customs, traditions, and values, fostering greater acceptance and adoption of AI technologies across diverse communities.

2.2. Socioeconomic Equity and Access

A 2021 report by the National Association of Software and Service Companies (NASSCOM) revealed that only 26% of India's workforce possesses the digital skills required for the AI age. Judicial activism can address these disparities by advocating for inclusive policies that prioritize marginalized and underserved populations. By promoting equitable distribution of AI benefits and resources, courts can contribute to reducing digital divides and advancing social justice in India.

2.3. Political Accountability and Transparency

In a democracy, judicial activism serves as a check on power. A 2023 Carnegie Endowment for International Peace report noted rising concerns about potential government misuse of AI for surveillance and social control. Courts can scrutinize government AI initiatives, ensure adherence to democratic principles (like privacy and freedom of expression), and safeguard citizens' rights.

3. THE POTENTIAL DOWNSIDES

3.1. Bureaucratic Inertia and Resistance to Change

India's vast bureaucracy may resist judicial interventions aimed at reforming AI governance and regulation. Overcoming this inertia requires sustained judicial activism coupled with public engagement, advocacy, and collaboration with other branches of government.

3.2. Legal Capacity and Infrastructure

India's legal system, burdened by a backlog of cases, may struggle with complex AI issues. According to a 2022 report by PRS Legislative Research, there is a shortage of judges across all court levels in India. Investing in legal education, training judges in AI, and adopting technology-enabled court systems is essential to enhance the judiciary's capacity.

3.3. Corporate Influence and Lobbying

Powerful corporate interests may attempt to influence judicial decisions and policymaking processes to favor their commercial agendas in the AI sector. Judicial activism must guard against undue corporate influence, upholding public interest and ensuring AI governance prioritizes societal well-being over private profits.

4. Transformational Strategies for Responsible AI

4.1. Judicial Education and Training

Specialized programs can empower judges to make informed decisions and navigate AI's legal complexities. The Indian Judicial Academy, for example, could introduce dedicated AI courses for judges.

integration-in-legal-research/articleshow/109265942.cms

4.2. Community Engagement and Public Participation

Public interest litigation (PIL), citizen advocacy, and stakeholder consultations can ensure judicial activism reflects diverse perspectives. Platforms like online forums can encourage public participation.

4.3. Interdisciplinary Collaboration

Collaboration between legal experts, technologists, social scientists, and policymakers can enrich judicial deliberations. Workshops and seminars can foster this collaboration.

4.4. Policy Innovation and Experimentation

Pilot projects, regulatory sandboxes, and adaptive policy frameworks allow for iterative learning and evidence-based decision-making. The NITI Aayog, India's policy think tank, could play a role in facilitating this experimentation.

4.5. International Cooperation and Knowledge Sharing

Learning from global best practices through international cooperation and knowledge-sharing platforms can benefit India. The Responsible AI for Development Alliance (RAIDA) is an example of such a platform.

5. CONCLUSION

Judicial activism, if exercised thoughtfully, presents a transformative opportunity for India to navigate the complexities of AI innovation. By leveraging its rich cultural heritage, diverse social fabric, and democratic ethos, India can harness judicial activism as a catalyst for positive change in the AI ecosystem. This approach can position India as a global leader in responsible AI innovation and governance, ensuring that AI technologies serve the greater good and empower all sections of Indian society.

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EMPOWERMENT OF WOMEN

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ABSTRACT

The world is dominated by the male community, whereas, women occupy half of the population of the world and works two-third of the total work of the world, more in, hygienic conditions than the men. Everyone says that women are equal to men or claims the equality. We say that they are not equal to men but superior to men. To test their equality or superiority, we have to empower them. In this article we are discussing the empowerments of women by international laws and by Indian constitution along with other statutes.

Keywords: *Women's Empowerment, Women And Law, Gender.*

1. INTERNATIONAL EMPOWERMENTS OF WOMEN

1.1. Charter of UNO 1945

The United Nations shall place no restrictions on the eligibility of men and women to participate in any capacity and under condition of equality in its principal and subsidiary organs.

1.2. Universal Declaration of Human Rights, 1948

- **All human beings are born free and equal in dignity and rights :**

All human beings are born free and equal in dignity and rights.

- **Equality before law and equal protection of law :**

All are equal before the law and are entitled without any discrimination to equal protection of the Law. All are entitled to equal protection against any discrimination in violation of this Declaration and against any incitement to such discrimination.

- **Everyone has the right to the protection of his privacy, family, home or reputation :**

No one shall be Subjected to arbitrary interference with his privacy, family, home or correspondence or to attacks upon his honour and reputation. Everyone has the right to the protection of the law against such interference or attacks.

- **Right to marry and to found a family :**

Men and women of full age, without any limitation due to race, nationality or religion, have the right to marry and to found a family. They are entitled to equal rights as to marriage during marriage and at its dissolution. Marriage shall be entered into only with the free and full consent of the intending spouses. The family is the natural and fundamental group unit of society and is entitled to protection by society and the State.

- **Right to work of choice, equal pay for equal work and join trade unions :**

Everyone has the right to work, to free choice of employment, to just and favourable conditions of work and to protection against unemployment. Everyone, without any discrimination, has the right to equal pay for equal work. Everyone who works has the right to just

and favourable remuneration ensuring for himself and his family an existence worthy of human dignity, and supplemented, if necessary, by other means of social protection. Everyone has the right to form and to join trade unions for the protection of his interests.

- **Right to have a standard of living adequate for the health :**

Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control motherhood and childhood are entitled to special care and assistance. All children, whether born in or out of wedlock, shall enjoy the same social protection.

1.3. Convention on Political Rights of Women, 1954

Under this convention the woman is empowered with following rights-

- **The right to vote :** Women shall be entitled to without any discrimination.
- **Eligibility for Election :** Women shall be eligible for elections to all publicly elected bodies established by national law on equal terms with men and without any discrimination.
- **Right to hold public office :** Women shall be entitled to hold public office and to exercise all public functions on equal terms with men.
- vote in all elections or equal terms with men,

1.4. International Convention on Civil and Political Rights, 1966

- **Right to marriage and have a family**

The family is the natural and fundamental group unit of society and is entitled to protection by society and the State. The right of men and women of marriageable age to marry and to found a family shall be recognized. No marriage shall be entered into without the free and full consent of the intending spouses. In the case of dissolution provision shall be made for the necessary protection of any children.

- **Rights of citizen :**

Every citizen shall have the right and the opportunity, without any of the distinctions of sex and without unreasonable restrictions :

- (i) To take part in the conduct of public affairs, directly or through freely chosen representatives.
- (ii) To vote and to be elected at genuine periodic elections, which shall be by universal and equal suffrage and shall be held by secret ballot, guaranteeing the free expression of the will of the electors.
- (iii) To have access, on general terms of equality, to public service in his country."

- **All persons are equal before the law and are entitled equal protection of the law:**

All persons are equal before the law and are entitled without any discrimination to the equal protection of the law. In this respect, the law shall prohibit any discrimination and guarantee to all persons equal and effective protection against discrimination on any ground such as race, color, sex, language, religion, political or other opinion, national or social origin, property, birth or other status.

1.5. The Declaration of Mexico on the Equality of Women, 1975

The world conference was held on the International Women's year at Mexico in 1975. The declaration of Mexico on the equality of women and their contribution to development of peace is incorporating the following important principles.

- (i) Equality between man and woman.
- (ii) Equal rights and responsibilities of woman and man in the family and society.
- (iii) Equal access to education and training.
- (iv) The right to work and equal pay for work of equal value.
- (v) The right of couples and individuals to determine the number and spacing of children.
- (vi) The right of every woman to decide freely whether to marry.
- (vii) The right to participate in and contribute to the development effort.
- (viii) The participation of women in the economic, social and cultural sectors.
- (ix) The role of women in the promotion of International co-operation and peace.
- (x) The role of women in promoting human rights of all the people.
- (xi) The need to eliminate violation of human rights committed against woman and girl.

1.6. The Convention on the Elimination of All Forms of Discrimination Against Women, 1981

States shall condemn discrimination against women in all its forms: According to Art. 2, States Parties to convention shall condemn discrimination against women in all its forms, agree to pursue by all appropriate means and without delay a policy of eliminating discrimination against women and, to this end, undertake:

- (i) To embody the principle of the equality of men and women in their national constitutions or other appropriate legislation if not yet incorporated therein and to ensure, through law and other appropriate means, the practical realization of this principle;
- (ii) To establish legal protection of the rights of women on an equal basis with men and to ensure through competent national tribunals and other public institutions the effective protection of women against any act of discrimination;
- (iii) To refrain from engaging in any act or practice of discrimination against women and to ensure that public authorities and institutions shall act in conformity with this obligation;

- (iv) To take all appropriate measures to eliminate discrimination against women by any person, organization or enterprise;
- (v) To take all appropriate measures, including legislation, to modify or abolish existing laws, regulations, customs and practices which constitute discrimination against women;
- (vi) To repeal all national penal provisions which constitute discrimination against women.

- **State shall take all measures to ensure the full development of women :** According to Art. 3, States Parties shall take in all fields, in particular in the political, social, economic and cultural fields, all appropriate measures, including legislation; to ensure the full development and advancement of women, for the purpose of guaranteeing them the exercise and enjoyment of human rights and fundamental freedoms on a basis of equality with men.
- **State shall take all measures to suppress all forms of traffic in women:** According to Art. 6, States Parties shall take all appropriate measures, including legislation, to suppress all forms of traffic in women and exploitation of prostitution of women.

Besides this, there shall be equality before law, in Government services, participation in politics, nationality, etc. In short, no woman shall be discriminated on the ground of sex in any matter. The State shall make special provisions relating to their welfare and empowerment.

2. CONSTITUTIONAL EMPOWERMENT OF WOMAN

2.1. Right to equality

The State shall not deny to any person equality before the law and the equal protection of the laws within the territory of India. It prohibits any discrimination on grounds of religion, race, caste, sex or place of birth. Constitution imposes prohibition on the State not to discriminate against any citizen on grounds only of religion, race, caste, sex, place of birth or any of them. But, nothing in this Article shall prevent the State from taking any special provisions for women. Women require special treatment on account of their very nature. The Government can make provisions for reservation of seats for women in educational institutions.

There shall be equality of opportunity for all citizens in matters relating to employment or appointment to any office under the State. No citizen shall, on grounds only of religion, race, caste, sex, descent, place of birth, residence or any of them, be ineligible for, or discriminated against in respect of, any employment or office under the State. The State Government can make provisions for reservation of seats for women in local bodies. The 73rd Amendment of the Constitution provides for the reservation of 1/3 seats in all tiers of local Government for women. The Hon'ble Supreme Court held Air India Regulation unconstitutional, as being discriminative against women. This regulation provides that "an air-hostess could not get married before completing four years of service. If, she gets married before completing four years of service, she had to resign and after reaching the age of 23 years, if, she continues

her service as a married woman, then she had to resign on becoming pregnant.

In pursuance of Art. 15 (3) Government of India has enacted 73rd and 74th Constitutional Amendment Act, providing 33% reservation of seats in each of the panchayats, i.e., Gram Panchayats, Block Samitis and Zila Panchayats. It shows that nearly one million women are elected to these local bodies. The Hon'ble Supreme Court held Central Government Service Rules unconstitutional, which provides that "no married women shall be entitled as of right to be appointed to the said service" being violative of Art. 14 and Art. 16 of the constitution."

2.2. Right to life and personal liberty

Art. 21 guarantees for the right to life and personal liberty. The explained horizon of right to life includes the right to have a dignified life, right over her body control, over her sexuality and reproductive functions to give or not to give birth to a child. This Article is the bunch of rights and heart of the constitution where blood is pumped by Art. 32. Within the ambit of Art. 21, the Hon'ble Supreme Court hold the bunch of rights, i.e., right to life, right to personal liberty (residue of Art. 19), speedy trial, free legal aid, right to compensation, right to privacy, environmental rights, right to education, right against virginity test, protection against sexual harassment, right to shelter, rights of prisoners, etc.

2.3. Protection against 'traffic in human beings' (prostitution) and forced labour

This Article prohibits traffic in human beings and begar and other similar forms of forced labour. Forced labour includes prohibition of prostitution where many women are forced to become prostitutes due to socio-economic reasons.

2.4. States shall ensure equal right for men and women regarding livelihood

The State shall, in particular, direct its policy towards securing the citizens, men and women equally, have the right to an adequate means to livelihood.

2.5. Equal pay for equal work

The State shall, in particular, direct its policy towards securing that there is equal pay for equal work for both men and women.

2.6. Provision for just and humane conditions of work and maternity relief

The State shall make provision for securing just and humane conditions of work and for maternity relief. The Hon'ble Supreme Court in its landmark judgement has given direction to the Central Government to extend the benefits of the Maternity Benefits Act, 1961, also to the women employees working on daily wages and on their muster roll.

2.7. Fundamental Duties

Constitution imposes fundamental duty on every citizen of India, to renounce practices derogatory to the dignity of women. In 1990, the Government has highly

empowered the women in India by enacting the National Commission for Women Act, 1990 to implement the duty of the citizen of India enshrined by fundamental duties under Art. 51-A (e).

This Act provides to constitute a Commission for Women. It looks after matters relating to women, as it can investigate and examine all matters relating to the safeguard for women under the constitution and other laws. It can also look into complaints and take suo moto notice of matters relating to deprivation of women's right.

3. OTHER EMPOWERMENT OF WOMAN IN INDIA

3.1. Empowerment under Criminal Law

Pregnant woman cannot be executed with death sentence : According to Section 416 of Cr. P.C, if a woman sentenced to death is found to be pregnant, the High Court shall order the execution of the sentence to be postponed and if it thinks fit, may commute the sentence to imprisonment for life.

Protection in certain offence not to be punished : Rape under Section 376, unnatural offence under Section 377 of IPC empowers woman. According to these sections, the act of man is punishable, but, similar act of woman is not punishable under IPC, because, 'these sections carry the word "sexual intercourse" and "penetration", naturally it is only possible by men. If, any woman commits similar act (outer-course with man) against his will and without consent of the offence, is not punishable, even though, she is not punishable with abetment Section 354 of IPC makes an act of assault or using criminal force to any woman, intending to outrage her modesty as punishable, but, similar act of woman is not punishable, if she does so with man's modesty. Adultery under Section 497, criminal elopement under Section 498, and cruelty by husband and his relatives under Section 498A, are also such offences where women are not punishable for the similar act on their part.

Protection from arresting a woman in night in absence of Lady Police : The Hon'ble Supreme Court directed the police not to arrest a lady without the presence of a lady constable and also prohibited the arrest of a lady after sunset and before sunrise under any circumstances. The Supreme Court found the objection behind the direction that a strict compliance of the said direction, in given circumstances would cause practical difficulties to the investigating agency and might even give room for evading the process of law by unscrupulous accused. While it is necessary to protect the female sought to be arrested by the police from police misdeeds, it may not be always possible and practical to have the presence of the lady constable when the necessity for such arrest arises, therefore the Supreme Court modified the said direction without disturbing the object behind the same. The object will be served if a direction is issued to the arresting authority that while arresting a female person, all efforts should be made to keep a lady constable present. But, in circumstances where the arresting officer is reasonably satisfied that such presence of a lady constable is not available or possible and/or the delay in arresting caused by securing the presence of a lady constable would impede the course of investigation, such arresting officer for reasons to be

recorded either before the arrest or immediately after the arrest be permitted to arrest a female person for lawful reasons at any time of the day or night depending on the circumstances of the case even without the presence of a lady constable.

Earlier, the Gujarat High Court held that arrest of a woman in night hours in violation of a Government Circular and directions issued by Supreme Court are violation of human rights enshrined under Art. 21 of the constitution. There were no exceptional circumstances for the arrest in the night that is after sunset and before sunrise. An unhappy incident happened during the night hours when a lady Sarpanch and her husband were arrested, handcuffed and paraded in the village after garlanding them with chappals, etc. As per directions of the High Court an enquiry was conducted and the incident was found to be correct. The public demanded the enforcement of fundamental rights. Rs. 20,000/- was awarded as compensation and this sum was to be recovered from the concerned Police Officers and it was held that such act violated human rights enshrined by Arts. 14, 19 and 21 of the constitution.

In pursuant with the above decisions, the Code of Criminal Procedure (Amendment) Act, 2005, has inserted clause (4) to Section 46 of Cr. P.C., which says that "no woman shall be arrested after sunset and before sunrise except under exceptional circumstances and where such exceptional circumstances exist, the woman police officer shall, by making a written report, obtain the prior permission of the Judicial Magistrate of the First Class within whose local jurisdiction offence is committed or the arrest is made".

Protection from Police harassment : A woman cannot be called to Police Station for an inquiry. She can only be interrogated at her residence. No woman can be kept in custody at night in a Police Station. Women cannot be imprisoned under Civil Court Decree.

3.2. The Married Women's Property Act, 1874

This Act provides certain liabilities on the husband of a married woman. But this Act is not applicable to any married woman who at the time of her marriage professed the Hindu, Mohammedan, Buddhist, Sikh or Jain religion, or whose husband, at the time of such marriage, professed any of those religions. Married women's wages and earnings shall be their separate property. This Act further explains the liability of husband and wife when arises in cases of post-nuptial and ante-nuptial debts, or breach of trust. Any benefit from the insurance of herself and her husband shall also be their separate property. At present this provision is also applicable to Hindus and Mohammedans.

3.3. Prohibition of Child Marriage

The Child Marriage (Restraint) Act (CMRA) was enacted in 1929 to stop the customary practice of child marriage. Since introduced, the CMRA has undergone various changes, largely in increasing the ages of marriage. According to the CMRA's statements of objects and reasons, the main purpose of this law was to create a check on population growth as it would result in a lower fertility rate, since it reduces the time period of marriages. It was also passed to eliminate potential dangers to the life and health of female children, who cannot withstand the stress and strains of married life and to avoid early deaths of minor mothers. Under this Act child means as males below 21 years of age and females

below 18-years of age, and a minor as a person of either sex who is below 18 years of age. The criminal provisions of this act do not apply to children. Besides this, some States enacted law to prevent the provision of devdasis. The Karnataka Devadasis (Prohibition of Dedication) Act, 1982, and Andhra Pradesh (Andhra Area) Devadasis (Prevention of Dedication) Act, 1947, ban the practice of marrying young girls to a deity.

The Child Marriage (Restraint) Act, 1929 has been substituted by the Prohibition of Child Marriage Act, 2006. The Act curbs child marriage more serious and empowers the woman to have maintenance from husband who marries to a girl below the age of 18 years and also empowers the court to give the custody of child in the best interest of the child.

3.4. Empowerment of women under Factories Act, 1948 :

This Act is applicable to the factories or establishments, where workers are working with power. Similar provisions are also provided to mines under Mines Act, and some other welfare labour laws. No woman shall be allowed to clean, lubricant or adjust any part of a prime mover or of any transmission machinery while the prime mover or transmission machinery is in motion, or to clean lubricate or adjust any part of any machine if the cleaning, lubrication or adjustment thereof would expose the woman or young person to risk of injury from any moving part either of that machine or of any adjacent machinery. In every factory/mine sufficient provisions for latrine, urinal accommodation, adequately screened washing facilities, changing for clothes, etc. shall be provided and conveniently situated and accessible to workers at all times while they are at the factory. Separate enclosed accommodation shall be provided for male and female workers.

In every factory/mine wherein more than thirty (30) women workers are ordinarily employed, there shall be provided and maintained a suitable room or rooms for the use of children under the age of six years of such women. Such rooms shall provide adequate accommodation, shall be adequately lighted and ventilated, shall be maintained in a clean and sanitary condition and shall be under the charge of women trained in the care of children and infants.

No woman shall be required or allowed to work in any factory/mine, except between the hours of 6 a.m. and 7 p.m. but may not be permitted to work between the hours of 10 p.m. and 5 a.m. No female child shall be required or allowed to work in any factory except between 8 a.m. and 7 p.m. One defect of this Act is that prostitutes are also treated as offenders and made punishable, whereas, they are the victim of the society. While judiciary interpreting this issue held that women are not accused but victims of the crime.

3.5. The Dowry Prohibition Act, 1961

The Legislature has enacted special law on prohibition of dowry in India. The aim of this Act is to prohibit the giving or taking of dowry, with effect from 1st July, 1961. This At provides penalty for giving and taking of the dowry and increased punishment twice, first in 1985 and second time in 1986. This Act also exempts some gifts at the time of marriage. Further, it prohibits the demanding of dowry and makes any agreement for giving or taking dowry to be void. If, any dowry is given,

it shall be transferred to the woman in marriage and if not transferred, such person is punishable. Offences under this Act are cognizable for certain purposes and to be non-bailable and non-compoundable.

3.6. The Maternity Benefit Act, 1961

This Act regulates the employment of women in certain establishments for certain period before and after child birth and to provide for maternity benefit and certain other benefits and came into force w.e.f. 1st Nov, 1963. Under this Act, woman means a woman employed, whether directly or through any agency, for wages in any establishment. This Act empowers the women to avail twelve weeks paid maternity leave at the time of each delivery, out of which six weeks before delivery and six weeks after delivery. This benefit is also applicable at the time of adoption of child. In case of miscarriage or medical termination of pregnancy, a woman shall, on production of such proof as may be prescribed, be entitled to leave with wages at the rate of maternity benefit, for a period of six weeks immediately following the day of her miscarriage or, as the case may be, her medical termination of pregnancy. In case of tubectomy operation, a woman shall, on production of such proof as may be prescribed, be entitled to leave with wages at the rate of maternity benefit for a period of 2 weeks immediately following the day of her tubectomy operation.

A woman suffering from illness arising out of pregnancy, delivery, premature birth of child miscarriage, medical termination of pregnancy or tubectomy operation shall, on production of such proof as may be prescribed, be entitled, in addition to the period of absence allowed to her, leave with wages at the rate of maternity benefit for a maximum period of one month. Every woman delivered of a child who returns to duty after such delivery shall, in addition to the interval for rest allowed to her, be allowed in the course of her daily work two breaks of the prescribed duration for nursing the child until the child attains the age of fifteen months.

3.7. The Medical Termination of Pregnancy Act, 1971

An enactment was enacted w.e.f. 10th August, 1971. The object of the Act was to provide for the termination of certain pregnancies by registered medical practitioners and for matters connected therewith or incidental thereto.

Further, it explains when and where pregnancy can be terminated, and by registered medical officer only. The termination of a pregnancy by a person who is not a registered medical practitioners shall be an offence punishable under IPC.

3.8. Equal Remuneration act, 1976

This Act provides for payment of equal wages for work of same and similar nature to male and female workers and for not making discrimination against female employees in the matters of transfers, training and promotion etc. Central Government is the appropriate Government in respect of industries/establishments under the Industrial Disputes Act. 1947. The object of the Act is to provide for the payment of equal remuneration to men and women workers and for the prevention of discrimination, on the ground of sex, against women in the matter of employment and for matters, connected therewith or incidental thereto.

3.9. The Commission of Sati (Prevention) Act, 1987

Sati or the burning or burying alive of widows or women is revolting to the feelings of human nature and is nowhere enjoined by any of the religions of India as an imperative duty. It is necessary to take more effective measures to prevent the commission of Sati and its glorification. This Act to provide for the more effective prevention of the commission of Sati and its glorification and for matters connected herewith or incidental thereto was enacted w.e.f. 2nd March, 1988. Some powers are given to the Collector or District Magistrate to prevent offences relating to Sati. For this purpose Special Courts are constituted. Person convicted of an offence of abetment of Sati is to be disqualified from inheriting certain properties. Offences under this Act are : (a) attempt to commit Sati, (b) abetment of Sati, and (c) glorification of Sati.

“Sati” means the burning or burying alive of,- (i) Any widow along with the body of her deceased husband or any other relative or with any article, object or thing associated with the husband, or such relative; or (ii) Any woman along with the body of any of her relatives, irrespective of whether such burning or burying is claimed to be voluntary on the part of the widow or the woman or otherwise.

Glorification means in relation to Sati, whether such Sati, includes, among other things,-(i) The observance of and ceremony or the taking out of a procession in connection with the commission of Sati; or (ii) The supporting, justifying or propagating the practice of Sati in any manner; or (iii) The arranging of any function to eulogize the person who has committed Sati; or (iv) The creation of a trust, or the collection of funds, or the construction of a temple or other structure or the carrying on of any form of worship or the performance of any ceremony thereat, with a view to perpetuate the honour of, or to preserve the memory of, a person who has committed Sati.

3.10. The Pre-Conception & Pre-Natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act, 1994

The PCPNDT Act was brought into operation w.e.f. 1st Jan, 1996. This Act was intended to regulate the use of pre natal diagnostic techniques for detecting genetic and metabolic disorders, chromosomal abnormalities, certain congenital mal-formations and/or sex linked disorders. In practice the techniques for pre-natal determination of sex of the foetus led to female foeticide and reinforced the gender bias. This technology is misused on a large scale for sex determination of the foetus, and mostly if the foetus is pronounced as female, this prompts termination of pregnancy bringing to an abrupt end the growth of an unborn child. It also prohibits any advertisements relating to pre-natal determination of sex and prescribes punishment for its contravention. The person who contravenes the provisions of this Act is punishable with imprisonment and fine. Offences under the Act are : (a) determination of sex-selection before or after conception, (b) non-registration under Section 3, (c) conduct of PNDT under Section 4, (d) communication of sex of foetus under Section 5, (e) determination of sex under Section 6, (f) advertisement under Section 22 and (g) non-maintenance of records under Section 29. Further, S. 27 states that every offence under this Act shall be

cognizable, non-bailable, and non-compoundable. In 2002, mass amendment has been made under this Act, in pursuant of decreasing the female ratio in the country. The punishment under the Act was increased to 5 years' imprisonment, or fine Rs. 1,00,000.

3.11. Empowerment under other laws

Extra grounds for divorce than man : The married woman has some extra grounds for divorce than those available to the husband under various family laws. Courts are also showing their attitudes towards women so that they benefit in the case of divorce.

Safeguard of women married to NRI: The Supreme Court has highlighted the need and necessity for appropriate steps to be taken to safeguard the interests of women married to NRIs and issued the following guidelines.

- (i) A foreign court may not annul the marriage between a NRI and an Indian woman, which has taken place in India.
- (ii) Provisions may be made for adequate alimony to the wife in the property of the husband both in India and abroad.
- (iii) The decree granted by Indian Courts may be made executable in foreign courts.

Right of maintenance from husband : If a husband having sufficient means, neglect or refuses to maintain his wife who is unable to maintain herself, the wife can through court order get monthly allowance from her husband for her maintenance. Only Muslim women have no right to get such maintenance allowance from their husbands except during iddat period.

Muslim Women also entitled to Maintenance under Section 125: The Hon'ble Supreme Court has held in the case of Shah Bano Begum, that if the divorced woman is able to maintain herself, the husband's liability ceases with the period of iddat but if she is unable to maintain herself after the period of iddat, she is entitled to maintenance under Section 125 of the Cr.P.C. This led to controversy as to the obligations of the Muslim husband to pay maintenance to the divorced wife. The Muslim Women (Protection of Rights on Divorce) Act was passed to dilute the judgement given in the decision of Shah Bano case. Further, the court has observed, "Whether the spouses are Hindu, Muslim, Christian, Parsis, Pagans or Theathans is wholly irrelevant, in the application of these provisions". Section 125 of the Cr.P.C. said that this section is secular in nature and does apply to all the religions equally. The Andhra Pradesh High Court held that a Muslim minor girl would be entitled to claim maintenance from her father even after the enforcement of The Muslim Women (Protection of Rights on Divorce) Act, 1986.

3.12. The Protection of Women from Domestic Violence Act, 2005

Violence against women in the family occurs in almost all the countries. India has passed the Protection of Women from Domestic Violence Act, 2005 to curb this problem. The Act came into force with effect from 26th May, 2006. The prime aim of the Act is to save women from the evil of domestic violence in general and in particular provide protection to the wife or female live-in partner from violence at the hands of the husband or

male live-in partner or his relatives. It is very wide in its applicability and covers all kinds of domestic harassment, i.e., sexual, physical, economic or verbal and emotional abuse or beating by husband or living-in relations. The Act also protects women by providing many forms of relief. Undoubtedly, the Act empowers the women in true sense by providing various rights with their remedies and appoint a person as protection officer and service provider to file a case on behalf of her (victim).

4. CONCLUSION

The women are empowered by constitution and many other legal provisions in India but, most of them are limited to books only. All these empowerments should be implemented strictly, then only it can be called empowerments. If under any Act any rare case conviction is held then the punishment awarded is only nominal according to reformatory theory of punishment. Whereas, all the offences against the women should be treated by exemplary theory and punishment should be awarded as the maximum prescribed by laws. Almost all the enactments are discussed in details under this article.

The landmark judgment directed by Supreme Court in the Vishakha v. State of Rajasthan is also an important law decided by Supreme Court under Art. 141 of Constitution relating to gender injustice.

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Image Based Floral Plant Diversity Assessment Utilizing Pl@ntNet an AI based Application for Comprehensive Analysis

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ABSTRACT

In this study we have used an AI based application Pl@ntNet for identifying flowering plant species within the Rajshree campus. Utilizing this application, the study evaluated factors influencing identification accuracy, such as picture quality and the specific plant part captured. Results showed identification accuracy ranging from 9% to 98%, with 16 out of 22 species accurately predicted. Challenges were noted, particularly concerning hybridized species. The study emphasizes the importance of further validation through local communication and morphological analyses. While Pl@ntNet serves as a valuable educational tool, its usage should be supplemented by botanical expertise. Future research directions include enhancing the application's effectiveness and deploying it in diverse ecological settings to enrich biodiversity knowledge.

Keywords: Pl@ntNet, Artificial intelligence, Plant identification, Diversity

species. Pl@ntNet facilitates the seamless recognition of plants, by merely using an image empowering researchers and enthusiasts to delve deeper into the intricacies of botanical diversity.

Pl@ntNet is a platform for identifying plant species with millions of contributors globally (across more than 200 countries). Established in 2010 by collaboration between French research organizations (CIRAD, Inria, INRAE and IRD), currently joint head of this project is Alex jolly. It utilizes cooperative learning principles, involving users in its development. Available on web (<https://identify.Pl@ntNet.org/>) and smart phone apps (<http://bit.ly/1K4D1eU>), (<http://apple.co/2cMtWgu>), Pl@ntNet allows users to simply take a picture for identification this application becomes more popular in spring season, it is translated in more than 11 languages and downloaded by more than 3 million user in about more than 170 countries (Valde et al., 2023). With its advanced artificial intelligence, the platform offers accurate species suggestions. It's a pivotal tool for biodiversity observation, fostering a participatory approach to botanical data collection. As we know this application operates on cooperative learning, allowing users to share observations for community review, enhancing the AI's plant recognition abilities. Expert users' (such as scientist and botanist) input holds more weight than novices'. Only confident observations are added to the public database, refining the AI's knowledge. This inclusive approach fosters accurate plant identification and contributes to ongoing botanical research (Joly et al., 2014, 2017; Affouard et al., 2017).

Pl@ntNet regularly updates its AI by re-training it on new observations and revisions from the community. This occurs monthly to minimize energy usage. With over a billion plant images collected, only a fraction is shared with global researchers through platforms like GBIF, emphasizing the importance of including GPS coordinates for mapping species. Image quality filters ensure accurate identifications, underscoring the need for clear photos. Pl@ntNet's rigorous selection process results in millions of high-quality observations shared, making it a significant contributor to the GBIF international database (Figure 2).

1. INTRODUCTION:

In our daily lives, plants often capture our attention primarily for their aesthetic appeal rather than their intrinsic value. However, beneath their beauty lies a treasure of essential compounds crucial for sustenance, clothing, and even medicinal purposes. The interdependence between humans and plants for survival has been evident since ancient times, although in modernized societies, this relationship may not always appear as direct. Yet, in tribal regions like the Northeast, Odisha, Chhattisgarh tribe where plants are integral to daily existence, their importance remains palpable. Recognizing plants goes beyond merely showcasing their scientific names; it encompasses comprehending their diverse roles and contributions to ecosystems. Accurate identification of plant species becomes important not only for data collection but also for driving scientific research forward. Fortunately, advancements in technology, particularly the emergence of plant identification software, offer valuable tools in this venture. Among these plant identification applications, Pl@ntNet stands out as a prominent platform utilizing artificial intelligence to aid in the identification of plant



Figure.1. A flowchart showing workflow of Pl@ntNet application and major events during development of this application.

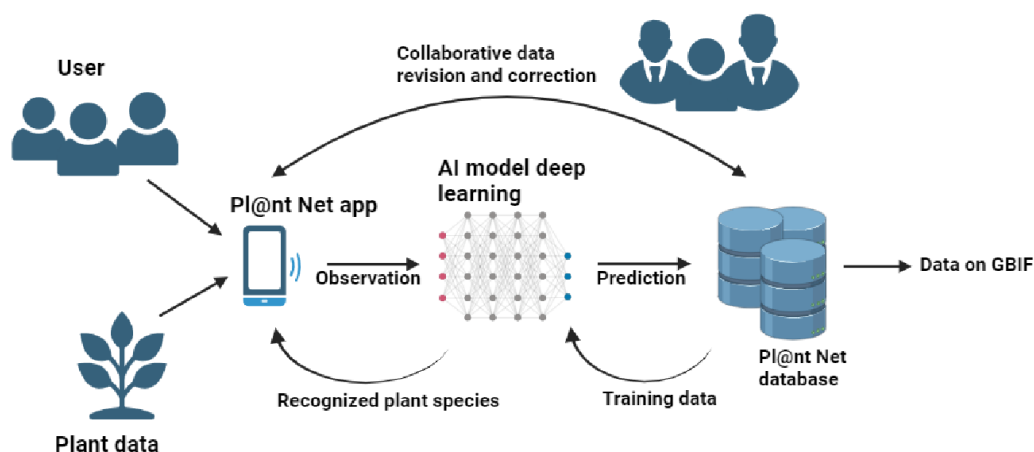


Figure.2. Diagrammatic representation of working of PI@nt Net (Created in Biorender.com)

In this manuscript, without going into computational intricacies of this application, we simply conducted a survey of flowering plants on the Rajshree campus using the PI@ntNet smartphone app. This allowed us to assess the diversity of flowering plants present and to evaluate the accuracy of the PI@ntNet application. By utilizing this approach, we aimed to gain insights into the campus's floral diversity and validate the effectiveness of the PI@ntNet app for plant identification.

2. MATERIALS AND METHODS:

Identification of Flowering Plants: Flowering plants were located and marked throughout the Rajshree campus via a comprehensive field survey conducted by students.

Validating the Identity of Flowering Plants using PI@ntNet: PI@ntNet application was installed on students' smartphones without creating individual profiles. A total of 22 flowering plants were identified and individually photographed by students. These

Photographs were then utilized for plant identification within the PI@ntNet app. Each photo was selected from the device's gallery and uploaded to the app, with the respective organism's feature chosen for identification (e.g., selecting "flower" or "inflorescence", "leaf", "fruit", "bark", "habit" or other). Most observations in our study were based on floral features. Multiple results were generated for each plant species. Based on observations and literature review, the accurate identification of each plant species was determined.

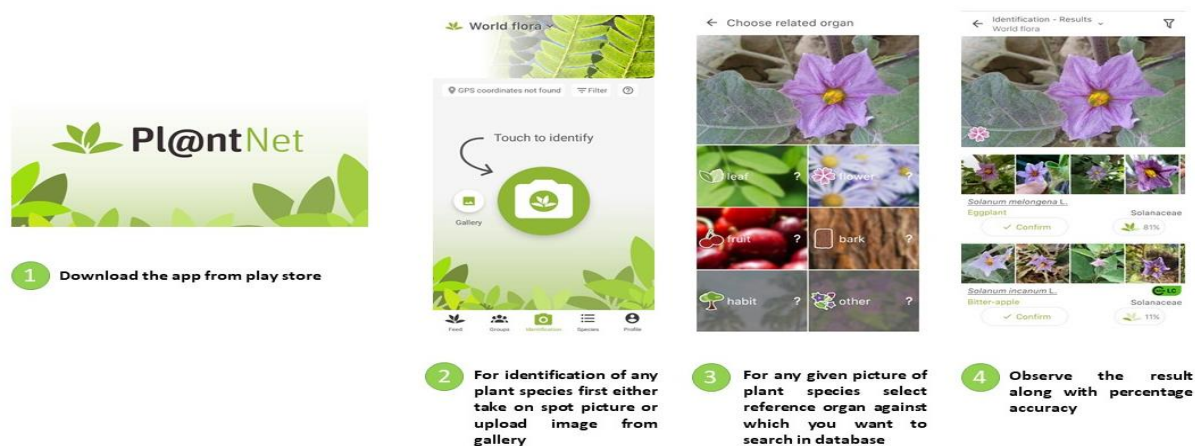


Figure.3. Steps involve in identification of plant species through PI@ntNet application in smartphone.

3. RESULT AND DISCUSSION

In this study, we have identified a total of 22 flowering plant species inside Rajshree campus (Table 1, Figure 4A, 4B, 4C). The accuracy of species identification ranges from 9% to 98%, with *Jasminumsambac* exhibiting the highest accuracy and *Brassica oleracea* showing the lowest. Notably, the variety *botrytis* of *Brassica oleracea* posed a challenge for the identification app, resulting in a low

accuracy of only 9%. We have observed that the accuracy of prediction is influenced by factors such as the quality and angle of the pictures taken and the specific plant organ captured in the image. Despite these challenges, the PI@ntNet application accurately predicted 16 out of the 22 identified species (meaning more than 60%

confidence). However, as botanists, we recognize the importance of further confirmation of species identification, especially considering the prevalence of hybridization in modern plant species. For instance, the identification of *Viola lutea*, *Nerium indicum*, and *Petunia hybrida* by the application with varying degrees of accuracy raises questions about potential hybrid origins. Validating these identifications requires local communication, nursery observations, and analyses of other morphological and biochemical traits beyond just floral characteristics (Stehmann et al., 2009; Scoppola et al., 2022).



Figure.4A. A compilation of flowering plant present in Rajshree campus (A1 to A8), their scientific name is written in table.1.



Figure.4B. A compilation of flowering plant present in Rajshree campus (B1 to B8), their scientific name is written in table.1.



Figure.4C. A compilation of flowering plant present in Rajshree campus (C1 to C6), their scientific name is written in table.1.

While the application serves as a valuable tool for plant identification, particularly for educational purposes, it is essential to encourage its use alongside botanical expertise. Additionally, future studies should explore the incorporation of other morphological features to enhance the applications effectiveness further. Deploying such applications in tribal areas can contribute significantly to biodiversity knowledge and plant identification efforts, particularly in regions like northeastern India, Odisha, and Jharkhand, where unique plant species are abundant

Table.1. Accuracy of plant

Plant ID	Scientific name	Family	% Accuracy
A1	Tecomastans	Bignoniaceae	65%
A2	Hibiscus rosa-sinensis	Malvaceae	88%
A3	Catharanthusroseus	Apocynaceae	77%
A4	Nerium oleander	Apocynaceae	35%
A5	Neriumindicum	Apocynaceae	54%
A6	Datura inoxia	Solanaceae	72%
Plant ID	Scientific name	Family	Percentage accuracy
A7	Thunbergiaerecta	Acanthaceae	74%
A8	Papaver dubium	Papaveracea	70%
B1	Tageteserecta	Asteraceae	91%
B2/B3	Glebioniscoronaris	Asteraceae	84%
B4	Brassica oleracea	Brassicaceae	9%
B5	Helianthus debilis	Brassicaceae	58%
B6	Tabernaemontanadiv-aricata	Apocynaceae	91%
B7	Petunia hybrida	Solanaceae	29%
B8	Solanum melogena	Solanaceae	81%
C1	Cupheahyssopifoliab	Lythraceae	82%
C2	Ruellia simplex	Acanthaceae	72%
C3	Coriandrumsativum	Apiaceae	92%
C4	Jasminumsambac	Oleaceae	98%
C5	Solanum lycopersicum	Solanaceae	50%
C6	Viola lutea	Violaceae	50%

4. CONCLUSION

In conclusion, our study highlights the efficacy of PI@antNet application in identifying flowering plant species, even though with varying levels of accuracy. While the application proves useful for initial identification, particularly for students, our findings underscore the necessity for further validation of species identities, especially in the context of hybridization. Botanical intervention remains crucial in confirming plant species, as software limitations may lead to inaccuracies, as evidenced by our observations with certain species such as *Brassica oleracea*.

Additionally, our study emphasizes the importance of expanding research beyond floral-based identification to encompass other morphological features, enhancing the software's effectiveness in plant recognition.

Looking ahead, future investigations should prioritize refining application algorithms and incorporating additional morphological traits for improved accuracy. Furthermore, initiatives to deploy such tools in tribal and local areas can significantly contribute to biodiversity knowledge and facilitate plant identification efforts, particularly in regions abundant with unique species.

Acknowledgements

I extend my sincere gratitude to RIMT campus for generously providing the essential facilities needed for this study. Additionally, I would like to express my appreciation to the diligent efforts of the B. Sc. (ZBC) IIIrd year students Lalita, Priyanshi, Shazia Bi, and ChandniKashyap for their assistance in surveying the college campus to identify the plant species.

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CURRENCY EXCHANGE RATE FORECASTING

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ABSTRACT

The impact of fluctuations in currency exchange rates on a nation's economy underscores the critical need for precise forecasting within the realm of the money market. This research delves into the efficacy of various hybrid models, namely LSTM-ARIMA, LSTM-SVR, LSTM-RF, and SVR-RF, in their capacity to predict FOREX fluctuations. Leveraging datasets containing information on EUR/INR, NZD/USD, and USD/INR, this study meticulously evaluates the performance of each model. The findings consistently demonstrate that the LSTM-SVR hybrid model exhibits superior predictive capabilities compared to its counterparts. By employing the adaptive learning rate method (ADAM) optimization approach, this research endeavours to ascertain the optimal weights for the suggested model. This innovative methodology not only enhances precision but also provides a more nuanced understanding of foreign exchange rate estimation. The commendable performance of the LSTM-SVR hybrid model underscores its potential as a robust forecasting tool for discerning currency exchange rate movements. These insights carry significant implications for policymakers, financial institutions, and investors alike, as they navigate the intricacies of the global currency market with heightened accuracy and confidence.

Keywords: LSTM; ARIMA; SVR; RF; MSE; RMSE.

1. INTRODUCTION

The foreign exchange market plays a crucial role in global trade and finance. Accurate exchange rate forecasting is vital for businesses, investors, and policymakers. However, predicting exchange rates is notoriously difficult due to the market's sensitivity to various economic, political, and social factors. Traditional statistical models, such as ARIMA, have been widely used for exchange rate forecasting. These models excel at capturing trends and seasonality but struggle with non-linear relationships and complex market dynamics.

Alternatively, machine learning techniques like neural networks offer flexibility in capturing complex patterns but may overlook underlying trends. This paper proposes a hybrid model that combines the strengths of LSTM and Support vector machine to enhance exchange rate forecasting accuracy. The model leverages the LSTM's ability to capture relationships while utilizing the SVR's capability to learn other relationships from historical data.

The main objective of this research is to validate the efficiency of a computationally streamlined LSTM model designed for forecasting foreign currency exchange rates. The proposed LSTM-SVR model was employed to predict the closing prices of three major currency pairs: NZD/USD, USD/INR, and EUR/INR, with forecasts extending up to seven weeks in advance. The study evaluates the model's performance using

established metrics such as Root Mean Square Error (RMSE), Mean Absolute Percentage Error (MAE), and the coefficient of determination (R²). A comparative analysis is conducted against other models including LSTM-ARIMA, LSTM-RF, and SVR-RF based on these metrics. While previous research has explored foreign exchange forecasting, the current focus lies in developing novel models to better understand market dynamics. Amidst the array of machine learning and deep learning techniques applied in finance, traders are consistently seeking innovative strategies to gain a competitive edge. This proposed model aims to provide traders with a systematic approach to achieving their objectives.

The paper's structure unfolds as follows: Section II delves into the relevant literature concerning currency exchange rate prediction. In Section III, we detail the dataset utilized in our experimentation, along with several prominent models, including our proposed approach, employed for exchange rate prediction. Section IV outlines the criteria for evaluating performance. The experimental results are dissected in Section V, leading to concluding remarks in the subsequent section.

2. RELATED WORK

Countless studies have proposed and developed numerous ways to examine and predict ER activity in the last few years. The following is a concise discussion of the important investigations

A wide array of prediction methods has been explored for time series forecasting. The ARIMA model, also known as the Box-Jenkins model, has long been recognized as a predominant approach in this domain. However, its limitations have led to the exploration of alternative methodologies. The ARIMA-GARCH model, for instance, has been applied successfully in forecasting Ghana's GDP, showcasing its ability to mitigate error variance and enhance forecast accuracy. Linear models, while commonly employed, often fall short in capturing the complexities inherent in real-world monetary time series data. Hence, this document delves into the realm of non-linear models, particularly artificial neural networks (ANNs), which have shown promise in surpassing the performance of linear counterparts for non-linear prediction tasks.

In recent years, numerous researchers have turned to the Long Short-Term Memory (LSTM) technique for forecasting currency exchange rates. LSTM networks have demonstrated proficiency in handling time series data for tasks such as classification, analysis, and prediction. Particularly for short-term forecasting, approaches like ARIMA, LSTM, and Recurrent Neural Networks (RNNs) have been employed. Various window sizes ranging from 5 to 55 days were utilized for prediction, with the 22-day window exhibiting an average accuracy of 71.76 percent, proving to be optimal for short-term validation. Given the volatile and intricate nature of the forex market, investors are continuously

seeking more accurate methods. The model proposed in this paper achieves an impressive average accuracy of 93% for one-month ahead prediction, categorized as short-term forecasting. Additionally, for projecting prices 10 and 30 minutes ahead, the GRU-LSTM approach is utilized, evaluated across key currency pairs such as EUR/USD, GBP/USD, USD/CAD, and USD/CHF. Comparisons with other models, including GRU, LSTM, and statistical models based on simple moving averages (SMA), indicate superior performance of the GRU-LSTM model, particularly in terms of R2. Furthermore, our proposed CNN with Random Forest (CNN-RF) model consistently outperforms alternative

approaches across all datasets, as assessed by metrics such as MAE, MSE, and RMSE. In a separate experiment, three alternative models leveraging Google Trends and macroeconomic data were employed to predict the value of the Ghanaian Cedis against USD, British Pounds, and Euros for the next 30 days. The LSTM model exhibited adeptness in managing exchange rate data variance compared to the other two models, although it's acknowledged that Google Trends might not always accurately predict changes in the Ghanaian cedi's exchange rate against all other currencies.

A hybrid model, ANN-GJR (Glosten, Jagannathan, and Runkle), was utilized to forecast currency exchange rates across five currency pairs. In comparison to the benchmark model, the ANN hybrid model demonstrates superior performance. Prediction horizons of 14 days, 21 days, and 28 days were considered, with the hybrid model achieving forecasting accuracy exceeding 90% for a 21-day horizon. Notably, as the prediction horizon extends, the hybrid model's accuracy improves, whereas the benchmark model excels for shorter horizons, rendering the hybrid model suitable primarily for long-term forecasting. The proposed CNN-RF model exhibits an average accuracy of 93% for one-month prediction and 95% for seven-month prediction, thus showcasing improved performance across both short and longtime spans. An alternative hybrid model, ANN-GA (genetic algorithm), was employed for predicting the INR (Indian Rupees) versus USD currency exchange rate.

However, it's acknowledged that ANN has certain limitations, including the need for extensive training data and susceptibility to over fitting. The Support Vector Regression (SVR) method is employed for short-term financial time series forecasting, concentrating on predictions ranging from one to four days ahead. Specifically designed for short-term forecasting, the proposed PCA-ICA-SVR model enables accurate prediction of stock values with minimal error. Notably, this approach has been adopted by various researchers for currency exchange rate prediction as well. Several machine learning techniques have been explored for multi-currency exchange rate prediction, including Support Vector Regression (SVR), Neural Networks (NN), and Long Short-Term Memory (LSTM) networks, which are a type of deep learning model with hidden layers. These models have been applied to forecast exchange rates between major global currencies.

While initial research suggests promising results, most methods suffer from limitations in long-term prediction accuracy. For instance, a Deep Belief Network (DBN) applied to INR/USD and CNY/USD pairs exhibited decreasing accuracy as the forecast horizon increased. This highlights the ongoing challenge of developing

models effective for long-term currency exchange rate prediction.

3. DATA AND MODELS APPLY FOR FORECASTING FOREIGN CURRENCY EXCHANGE RATES

This section outlines the sources of data collection and explores various algorithms relevant to Forex.

3.1. Data

Three datasets downloaded from Google Finance database, As mentioned in the past chapters since three pairs of currency tested, their historical data needed. Through the searching in many global active currency exchanger banks and organizations Google Finance provides complete and clean data of our target currency pairs. The range of the data for 1stpairs of currency which is NZU/USD are from 01- 01-2002 to 31-12-2023 with 7964 observations .and, the range of the data for 2st pairs of currency which is USD/INR are from 01- 01-2002 to 31-12-2023 with 7512 observations. The range of the data for 3stpairs of currency which is EUR/INR are from 01- 01-2002 to 31-12-2023 with 7716 observations because of unavailability of the data. The data is daily which means the currency exchange rate between two currencies in a daily based; one record for one day. These three datasets have the following attributes which are used for the forecasting task.

- Date
- Close

The first attributes used as inputs of the training algorithms and the last attribute which is close is used for output and forecasting each day close price.

3.2. LSTM (Long Short-Term Memory)

Long Short-Term Memory is an advanced version of recurrent neural network (RNN) architecture that was designed to model chronological sequences and their long-range dependencies more precisely than conventional RNNs.

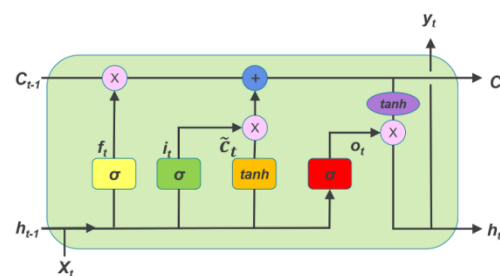


Figure.1.Architecture LSTM model

$$\begin{aligned}
 i_t &= \sigma(x_t U^i + h_{t-1} W^i) \\
 f_t &= \sigma(x_t U^f + h_{t-1} W^f) \\
 o_t &= \sigma(x_t U^o + h_{t-1} W^o) \\
 \tilde{C}_t &= \tanh(x_t U^g + h_{t-1} W^g) \\
 C_t &= \sigma(f_t * C_{t-1} + i_t * \tilde{C}_t) \\
 h_t &= \tanh(C_t) * o_t
 \end{aligned}$$

Figure.2.LSTM calculates hidden states

3.3. Auto Regressive Integrated Moving Average (ARIMA)

It is the most popular approach used for forecasting. The future value of a variable is a linear combination of past error and past value.

The Autoregressive Integrated Moving Average (ARIMA) model is a widely used statistical method for time series forecasting. It combines three key components: autoregression (AR), differencing (I), and moving average (MA). Each of these components helps capture different aspects of the time series data: Auto regression (AR): This component represents the relationship between an observation and a number of lagged observations (i.e., previous time points). It models the dependence of the current value on its own past values.

Differencing (I): The differencing component is used to make the time series stationary, meaning that its statistical properties such as mean and variance remain constant over time. Stationary is essential for many time series modeling techniques, including ARIMA. Differencing involves taking the difference between consecutive observations to remove trends or seasonality. Moving Average (MA): This component represents the relationship between the current observation and a residual error term based on past forecast errors. It helps capture short-term fluctuations or noise in the time series data.

The ARIMA model is defined by three parameters: p, d, and q, which correspond to the order of the AR, I, and MA components, respectively. The model is denoted as ARIMA (p, d, q).

p: The number of lagged observations included in the autoregressive component.

d: The degree of differencing required to make the time series stationary.

q: The number of lagged forecast errors included in the moving average component.

$$Y_t = c + \phi_1 Y_{t-1} + \dots + \phi_p Y_{t-p} + \theta_1 e_{t-1} + \dots + \theta_q e_{t-q} + e_t$$

Where:

- Y_t = the variable that will be explained in time t;
- c = constant or intercept;
- ϕ = coefficient of each parameter p;
- θ = coefficient of each parameter q;
- e_t = Residuals or errors in time t.

Figure.3.ARIMA model Statistical Formula

3.4. SVR

Support Vector Regression (SVR) is a supervised learning algorithm used for regression tasks, particularly in cases where the relationship between the independent variables and the target variable is nonlinear or complex. SVR is an extension of the Support Vector Machine (SVM) algorithm.

The key idea behind SVR is to find a hyperplane (or multiple hyper planes in the case of non-linear kernels) that best fits the data while maximizing the margin, i.e., the distance between the hyperplane and the closest data points (support vectors). Unlike traditional regression techniques that aim to minimize prediction errors, SVR focuses on minimizing the margin violations while still satisfying a given tolerance level (epsilon-insensitive

tube) around the regression line. The SVR model can be mathematically formulated as follows:

$$y = w^T \cdot \phi(x) + b$$

Where:

- y is the predicted output.
- w is the weight vector.
- $\phi(x)$ is the feature mapping function.
- b is the bias term.

Figure.4.SVR Mathematical Formula

3.5. Random Forest

Random Forest Regressor is a popular ensemble learning algorithm used for regression tasks. It is an extension of the Random Forest algorithm, which is primarily used for classification tasks. Random Forest Regressor builds multiple decision trees during training and outputs the average prediction of the individual trees for regression tasks.

3.6. Workflow of proposed model:

The proposed approach for currency exchange rate forecasting leverages a combination of LSTM and SVR models. First, we begin by downloading historical exchange rate data from Google Finance, focusing on the closing price for each date. After preprocessing the data, feature engineering may be employed to identify and incorporate additional relevant factors. The data is then split into training and testing sets. An LSTM model is trained on the training set to capture temporal dependencies in the closing prices. Subsequently, the residuals, the difference between the actual and LSTM-predicted values for the testing set, are calculated.

These residuals are used to train a separate SVR model, potentially capturing non-linear relationships not fully addressed by the LSTM. Finally, the final predictions are obtained by summing the individual predictions from the LSTM and SVR models. The effectiveness of this approach is evaluated by comparing the mean squared error between the actual closing prices in the testing set and the final predictions. This approach can be building other hybrid models

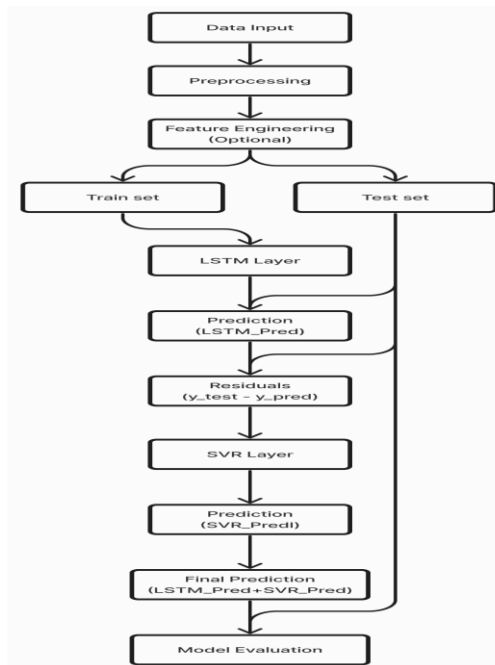


Fig5: Work Flow Diagram of Proposed Model

Figure.5. Work flow diagram of proposed Model

4. PERFORMANCE EVALUATION CRITERIA

The model performance is measured by four indices R2, RMSE, MAE. The MAE is computed as

$$MAE = \frac{1}{n} \sum_{i=1}^n |y_i - \hat{y}_i|$$

where,

n : number of observation

y_i : the actual value of the i^{th} observation

\hat{y}_i : the predicted value of the i^{th} observation

Figure.6. mean absolute error

$$RMSE = \sqrt{\sum_{i=1}^n \frac{(\hat{y}_i - y_i)^2}{n}}$$

$\hat{y}_1, \hat{y}_2, \dots, \hat{y}_n$ are predicted values

y_1, y_2, \dots, y_n are observed values

n is the number of observations

Figure.7. Root Mean Squared Error

The range of MAE, MSE, RMSE lies within 0 to 1 if the value is Smaller the model is better.

5. RESULTS AND DISCUSSION

To explore our datasets, each dataset is plotted to show the movement of each currency against US dollar over periods of time. These plots can show the volatility and changeability of the prices. The first plot is from NZD/USD dataset



Figure.8. NZD/USD dataset

The second dataset is from EURINR within the same date.

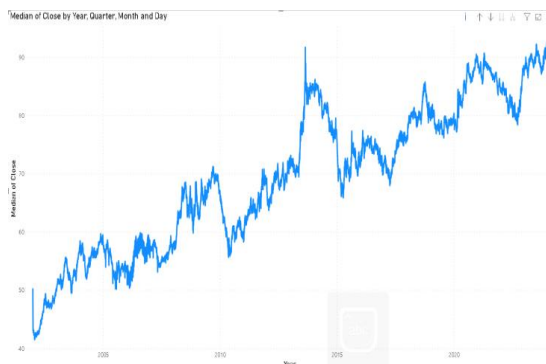


Figure.9. EURINR within the same date.

The Third dataset is from USDINR within the same date.

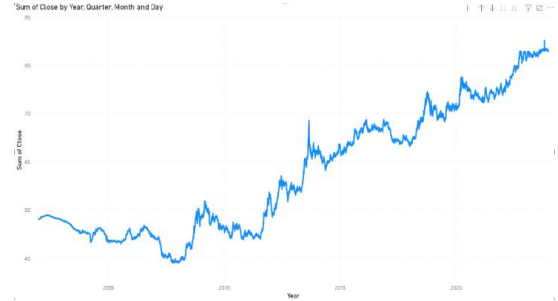


Figure.10. USDINR within the same date.

5.1. Algorithms Overview

In the realm of predictive modeling and forecasting, various algorithms are employed to analyse and predict trends in data. Among these algorithms, LSTM (Long Short-Term Memory), SVR (Support Vector Regression), ARIMA (Autoregressive Integrated Moving Average), and RF (Random Forest) are prominent choices due to their effectiveness in handling different types of data and capturing complex patterns.

Below is an overview of these algorithm combinations:

- LSTM-ARIMA
- LSTM-SVR
- LSTM-RF
- SVR-RF

5.2. LSTM-ARIMA

LSTM-ARIMA is a hybrid forecasting model that combines the strengths of two powerful time series forecasting techniques: Long Short-Term Memory (LSTM) and Autoregressive Integrated Moving Average (ARIMA), with a focus on incorporating residuals. In this approach, the LSTM neural network is used to capture the nonlinear patterns and long-term dependencies present in the data, while ARIMA is employed to model the remaining linear components and short-term dynamics.

The residuals, representing the difference between the observed and predicted values from the ARIMA model, are then fed back into the LSTM model to refine its predictions further. by leveraging both LSTM and ARIMA in conjunction with residuals, this hybrid model aims to enhance forecasting accuracy by effectively capturing both linear and nonlinear patterns in the time series data, making it well-suited for applications where traditional linear models may fall short.

These parameter being used for the training of the model. Different values have been tested and the best ones among them selected. After training the model, the performance evaluation techniques implemented to measure the accuracy of training and testing separately. Needed to mention that since, the model is tested with three pairs of currencies, the evaluation results are different from currency to another that each of them has different movements and impact factors in the global market. The results of the NZD/USD, USD/INR and EUR/INR currency pairs are presented in Tables

EUR/INR	MAE	MSE	RMSE
LSTM	0.012628	0.000233	0.015277
ARIMA	0.836306	0.706579	0.840582
Hybrid	0.011947	0.000208	0.014432

Table.2. NZD/USD evaluation results with LSTM-ARIMA

NZD/USD	MAE	MSE	RMSE
LSTM	0.0057653	0.0000862	0.009285
ARIMA	0.6572968	0.433622	0.658499
Hybrid	0.0042453	0.00006747	0.008214

Table.3. USD/INR evaluation results with LSTM-ARIMA

USD/INR	MAE	MSE	RMSE
LSTM	0.0202487	0.0006364	0.0252273
ARIMA	0.9943487	1.0044847	1.0022398
Hybrid	0.0260441	0.0008961	0.0299359

The model worked well for the prediction purpose; it gives an acceptable result which can be used as a model to predict the future close rate of these currency pairs. To make it more understandable that how much the model is able to forecast these, better sightseeing is visualized to show how close or far the prediction and the real values are

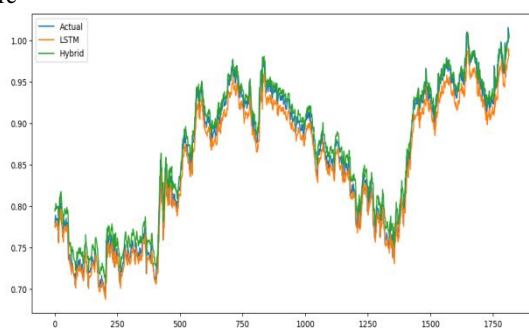


Figure.11. EUR/INR actual and predicted price visualization with LSTM-ARIMA



Figure.12. NZD/USD actual and predicted price visualization with LSTM-ARIMA

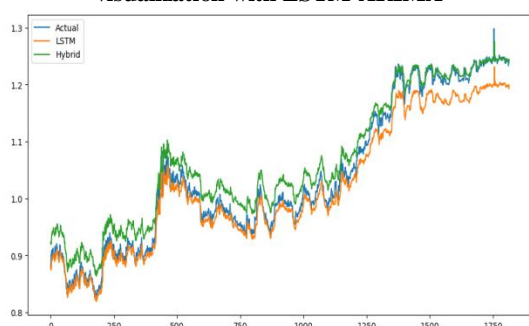


Figure.13. USD/INR actual and predicted price visualization with LSTM-ARIMA

5.3. LSTM-SVR

LSTM (Long Short-Term Memory): LSTM is a type of recurrent neural network (RNN) designed to model sequential data by capturing long-term dependencies. In

the context of time series forecasting, LSTM can effectively learn patterns and trends from historical data.

SVR (Support Vector Regression): SVR is a machine learning algorithm used for regression tasks. It works by finding the hyperplane that best fits the data while maximizing the margin between the hyperplane and the data points. SVR is known for its ability to handle non-linear data and robustness to outliers. Residuals: Residuals are the differences between the actual values and the predicted values by the LSTM model. By incorporating residuals into the LSTM-SVR model, we aim to capture and correct the errors or deviations made by the LSTM model.

The LSTM-SVR model with residuals typically follows these steps:

- Train an LSTM model on historical time series data to generate initial predictions.
- Compute the residuals by taking the differences between the actual values and the LSTM-predicted values.
- Train an SVR model using the residuals as additional features, along with other relevant input features.

Combine the predictions from the LSTM model and the SVR model to obtain the final forecast

These parameters being used for the training of the models. Different values have been tested and the best ones among them selected. After training the model, the performance evaluation techniques implemented to measure the accuracy of training and testing separately. Needed to mention that since the model is tested with three pairs of currencies, the evaluation results are different from currency to another that each of them has different movements and impact factors in the global market. The results of the NZD/USD, USD/INR and EUR/INR currency pairs are presented in Tables

Table.4. EUR/INR evaluation results with LSTM-SVR

EUR/INR	MAE	MSE	RMSE
LSTM	0.011382	0.0001332	0.0115422
SVR	0.844820	0.720899	0.8490580
Hybrid	0.001744	0.00000417	0.0020435

Table.5. NZD/USD evaluation results with LSTM-SVR

NZD/USD	MAE	MSE	RMSE
LSTM	0.0013002	0.00000169	0.0013014
SVR	0.510348	0.26769	0.517395
Hybrid	0.00005968	0.00000000486	0.00006975941

Table.6. USD/INR evaluation results with LSTM-SVR

USD/INR	MAE	MSE	RMSE
LSTM	0.011256	0.0001582	0.0125809
SVR	1.0233880	1.063144	1.031089
Hybrid	0.006235	0.00004498	0.0066707

The model worked well for the prediction purpose; it gives an acceptable result which can be used as a model to predict the future close rate of these currency pairs. To make it more understandable that how much the model is able to forecast these, better sightseeing is visualized to

show how close or far the prediction and the real values are.

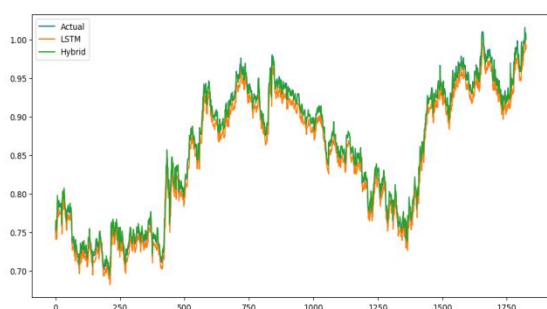


Figure.14. EUR/INR actual and predicted price visualization with LSTM-SVR.



Figure.15. NZD/USD actual and predicted price visualization with LSTM-SVR



Figure.16. USD/INR actual and predicted price visualization with LSTM-SVR

5.4. LSTM-RF

The LSTM-RF (Long Short-Term Memory - Random Forest) model with residuals is a hybrid approach to time series forecasting that combines the strengths of LSTM and Random Forest algorithms while incorporating residuals for enhanced prediction accuracy. Here's an overview of how this model works:

- **LSTM (Long Short-Term Memory):** LSTM is a type of recurrent neural network (RNN) that is well-suited for processing and making predictions on sequential data, such as time series. LSTM models excel at capturing long-term dependencies and patterns in time series data.
- **Random Forest (RF):** Random Forest is an ensemble learning algorithm that consists of a collection of decision trees. Each decision tree in the forest is trained on a random subset of the training data and makes predictions independently. The final prediction is typically the average or majority vote of the predictions from individual trees.
- **Residuals:** Residuals are the differences between the actual values and the predicted values obtained from the LSTM model. By incorporating residuals into

the LSTM-RF model, we aim to capture and correct any errors or deviations made by the LSTM model.

The LSTM-RF model with residuals typically follows these steps:

- Train an LSTM model on historical time series data to generate initial predictions.
- Compute the residuals by taking the differences between the actual values and the LSTM-predicted values.
- Train a Random Forest model using the residuals as additional features, along with other relevant input features.
- Combine the predictions from the LSTM model and the Random Forest model to obtain the final forecast

These parameters being used for the training of the models. Different values have been tested and the best ones among them selected. After training the model, the performance evaluation techniques implemented to measure the accuracy of training and testing separately. Needed to mention that since the model is tested with three pairs of currencies, the evaluation results are different from currency to another that each of them has different movements and impact factors in the global market. The results of the NZD/USD, USD/INR and EUR/INR currency pairs are presented in Tables

Table.7. EUR/INR evaluation results with LSTM-RF

EUR/INR	MAE	MSE	RMSE
LSTM	0.009196	0.000135	0.0116421
RF	1.030978	1.077449	1.038002
Hybrid	0.004382	0.0000516	0.007185

Table.8. NZD/USD evaluation results with LSTM-RF

NZD/USD	MAE	MSE	RMSE
LSTM	0.0066836	0.000164	0.012840
RF	0.511961	0.269397	0.519035
Hybrid	0.005924	0.000155	0.012480

Table.9. USD/INR evaluation results with LSTM-RF

USD/INR	MAE	MSE	RMSE
LSTM	0.009196	0.0001355	0.0116421
RF	1.030978	1.077449	1.0380027
Hybrid	0.004382	0.000051438	0.0071859

The model worked well for the prediction purpose; it gives an acceptable result which can be used as a model to predict the future close rate of these currency pairs. To make it more understandable that how much the model is able to forecast these, better sightseeing is visualized to show how close or far the prediction and the real values are.



Figure.17. EUR/INR actual and predicted price visualization with LSTM-RF



Figure.18. NZD/USD actual and predicted price visualization with LSTM-RF



Figure.19. USD/INR actual and predicted price visualization with LSTM-RF

5.5. SVR-RF

Support Vector Regression with Random Forest (SVR-RF) with residuals is an interesting hybrid approach that combines the strengths of Support Vector Regression (SVR) and Random Forest (RF) algorithms.

- **Support Vector Regression (SVR):** SVR is a supervised learning algorithm that is used for regression tasks. It works by finding the hyperplane that best fits the data points. SVR is particularly useful when dealing with high-dimensional data and situations where there are non-linear relationships between the independent and dependent variables. SVR aims to minimize the error, or in other words, maximize the margin, between the predicted values and the actual values.
- **Random Forest (RF):** RF is an ensemble learning method that builds multiple decision trees during training and outputs the mean prediction (regression) or the mode of the predictions (classification) of the individual trees. It's known for its robustness and effectiveness in handling complex datasets with high dimensionality.

In SVR-RF with residuals, the residuals from the SVR model are used as additional features in the Random Forest model. Residuals represent the difference between the actual target values and the predicted values from the SVR model. By incorporating residuals into the Random Forest model, the aim is to capture any remaining patterns or relationships in the data that were not captured by the SVR model alone. This can potentially lead to improved predictive performance, especially if there are complex interactions or non-linear relationships in the data that are better captured by the ensemble nature of Random Forest.

These parameters being used for the training of the models. Different values have been tested and the best

ones among them selected. After training the model, the performance evaluation techniques implemented to measure the accuracy of training and testing separately. Needed to mention that since the model is tested with three pairs of currencies, the evaluation results are different from currency to another that each of them has different movements and impact factors in the global market. The results of the NZD/USD, USD/INR and EUR/INR currency pairs are presented in Tables.

Table.10. EUR/INR evaluation results with SVR-RF

EUR/INR	MAE	MSE	RMSE
LSTM	0.0334221	0.0018321	0.0428041
RF	0.8242595	0.686464	0.828531
Hybrid	0.005548	0.000065595	0.008099

Table.11. NZD/USD evaluation results with SVR-RF

NZD/USD	MAE	MSE	RMSE
LSTM	0.0278439	0.0011271	0.0335727
RF	0.4874032	0.241501	0.491427
Hybrid	0.0062535	0.00015	0.012436

Table.12. USD evaluation results with SVR-RF

USD/INR	MAE	MSE	RMSE
LSTM	0.2112614	0.085067	0.291663
RF	0.82724944	0.691692	0.8316807
Hybrid	0.0058193	0.000075933	0.00871400

The model worked well for the prediction purpose; it gives an acceptable result which can be used as a model to predict the future close rate of these currency pairs. To make it more understandable that how much the model is able to forecast these, better sightseeing is visualized to show how close or far the prediction and the real values are.

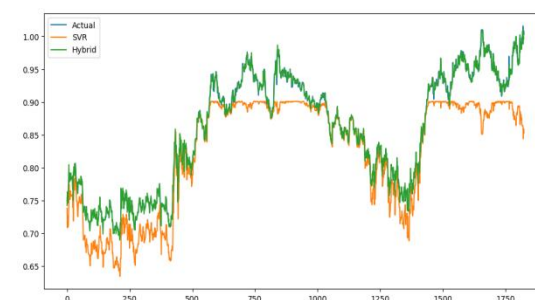


Figure.20. EUR/INR actual and predicted price visualization with SVR-RF

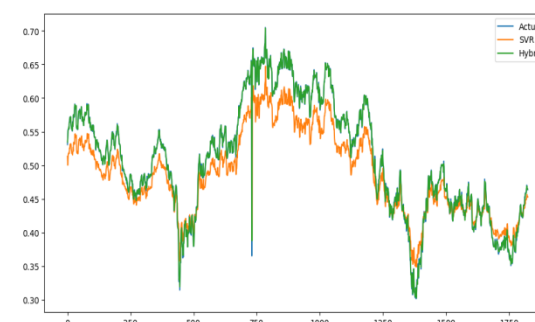


Figure.21. NZD/USD actual and predicted price visualization with SVR-RF

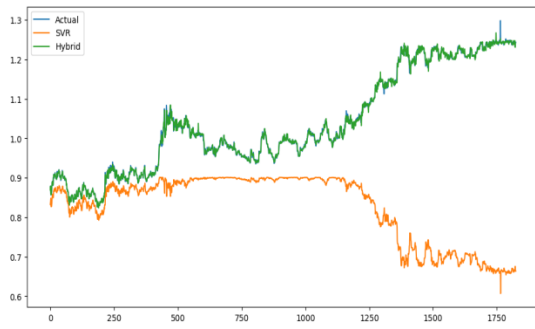


Figure.22. USD/INR actual and predicted price visualization with SVR-RF

6. COMPARISON AND THE BEST MODEL AMONG THE MODELS

The results of tested models for three pairs of currencies presented in details each has good and bad results in different situations. For instance, for EUR/INR and USD/INR and NZD/USD, LSTM-SVR which performed best in all cases. To conclude the discussion better to evaluate and compare their performance in a visionary way

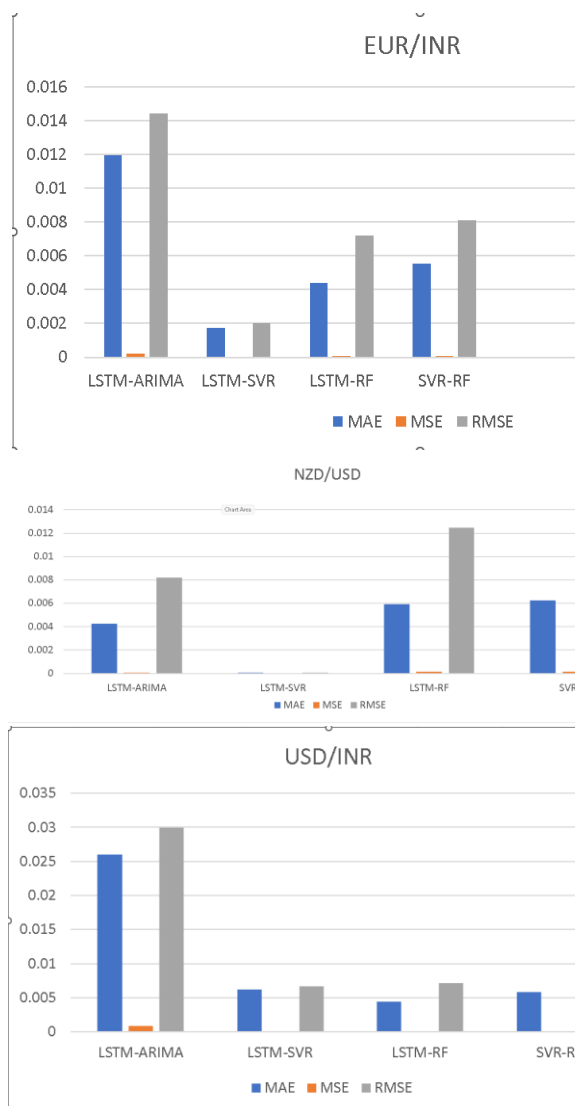


Figure.23. Comparison of model

As clearly shown LSTM-SVR performed better than three other models. And the values for MSE, RMSE, and MAE which are error measurement techniques shows that LSTM-SVR had less errors compared to others. At the same time, LSTM-RF is worked better than the other two models and the SVR-RF is the last one.

7. CONCLUSION

Growing economies in parallel to the rapid strong technology improvements brought the needs for forecasting in almost every industry. Whether it is customer-based marketing, car demands, mobile devices or currency exchange rate. Currency exchange rate forecasting became a challenge for human beings. Almost everybody’s economy directly or indirectly connected to foreign currency prices. Therefore, currency exchange is vital for humans in this era. Machine learning and generally artificial intelligence technologies going to help humans predict currency rates.

This study developed four models to forecast three pair currency prices in Forex market comparatively. The models are worked well. More suggested Models were selected based on literature review. Which the LSTM-SVR outperformed other three models and LSTM-ARIMA performed least than others. The procedure is described in details, from head to tail. The model’s performance was great due to rich data on the training phase. But the fact that different factors still remain which the currency rate has many aspects thus forecasting only time series and historical data is good but not enough.

The volatility property of rates is affected by those factors. The limitation of this study was not considering those factors which likely to be received from financial and political news of the media.

8. FUTURE WORKS

Since the limitation for the study which is mentioned earlier is crucial, resolving those challenges would be a great help for improving the accuracy and reliability of the result of this study. Therefore, the first future work can be a combination of historical data with daily financial and political news analysis with Natural Language Processing (NLP) models.

The second suggestion for accuracy and reliability improvements is to analyse the factors which are mentioned in last chapters and examine whether collecting the data from those factors which affects the currency prices directly can be combined with historical data or not. How would be the accuracy if some futures of those factors combine with historical data in order to train and test the algorithms based on them. According to believe of the author they will have crucial impacts on the result if the extraction and collection of data conduct precisely and accordingly. Reaching to the point of predicting the currency exchange rate does not look impossible. According to the author’s believe machine learning will be able to predict currency rate precisely soon. The impact would be, if the technology is handed to the world business leaders, the gap between the societies will increase rapidly as it did somehow. But there is one hope that each technology that humans invent is able to control itself and balance the damages and its usefulness

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A Study on Artificial Intelligence (AI) In Indian Banking Sector

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ABSTRACT:

Artificial Intelligence (AI) has first adopted by State Bank of India (SBI) by using SIA for its working, account opening and fraud detection, also used by banks for improving its efficiency, security and better customer service. These are some benefits which customers are availing only because of AI i.e 24 hours support system, reducing operational cost, automates routine tasks such as data entry, fund transfer, opening various kinds of accounts and fraud detection. India's rapidly growing base of digital banking customers expects an ever-greater array of services and products. AI and generative AI provide Indian banks with the opportunity to create an evolving banking ecosystem while meeting expanded risk management and compliance demands.

Over several years banks are introducing and adopting latest technologies for providing better services to their customers. Banks introduced ATM in 60s, card based payment system in 70s, online banking in 2000, and mobile based banking in 2010. In this paper researcher elaborate AI with its utilizing trending banking section India with its advantages to the customers. The data has been collected from various research papers and it's based on secondary data.

Keywords: Artificial Intelligence (AI), Banking role in Artificial Intelligence (AI), Indian banking sector

1. INTRODUCTION

AI has introduced a high technology and better service to its customers. Prior all the customers' needs to go to the banks for availing any of the services but after the new technology and advancement adopted, a customer can use the internet and mobile for opening an account, transfer of funds and investment. Banks took time to use AI in its operations but now it is primarily used to provide services to its customers, risk management and fraud detection. Banks are utilizing AI throughout the customer life cycle, from acquisition to servicing. The utilization of chatbots in credit decision-making, customer interactions for sales and marketing, and collections were formerly the most prominent application of AI in the Indian banking sector.

Historically, banks have been slow to integrate AI into their operations. Today, AI is primarily utilized for risk management and fraud detection. Most banks are still in the process of expanding AI across their entire organization from limit use cases. Some causes go back in time and may be related to antiquated legacy systems, data silos, a disjointed and haphazard AI strategy, or dated operational paradigms.

2. ADVANTAGES OF AI IN BANKING SECTOR

2.1. Detecting Fraud

Cyber security and operational hazards have grown in tandem with the popularity of online banking. Banking

systems leverage ML and Image Recognition Technologies to detect abnormalities in user behaviour and minimize fraud incidents by evaluating consumer conduct in real-time. Analytical procedures, including statistical parameter determination, regression analysis, probability distribution and model construction, and data matching, are all examples of how AI is used. Common forms of fraud in the banking industry include false identification, money laundering, credit card fraud, and mobile banking fraud. By analyzing additional secondary and tertiary data, we can better evaluate genuine transactions and strengthen identity verification using biometric-based approaches, reducing false positives.

2.2. Credit & Loan Determinations

Banks have begun using **AI-based algorithms** to make better, safer, and more profitable credit and lending decisions. Many financial institutions still rely heavily on a borrower's credit history, credit score, and customer references when making lending decisions. Customers with thin credit files can be evaluated for creditworthiness using an AI-based loan and credit system that examines their behaviour patterns. The technology also notifies financial institutions when it detects certain actions that may increase the probability of default. In summary, these innovations are crucial in shaping the future of consumer credit.

2.3. Measures to Prevent Money Laundering

Full-service banks have always required assistance with transaction monitoring. Artificial intelligence (AI) has the potential to significantly help banks transition from rule-based analyses to risk-based assessments, thereby alleviating this persistent problem. Modern technology can improve efficiency in regulatory reporting, a key link in the "Anti-Money Laundering" (AML) value chain. The use of Robotic Process Automation (RPA) can electronically archive reports and populate regulatory reporting formats with previously collected data.

The goal of the policies, rules, and regulations that make up AML is to prevent criminals from laundering the proceeds of their illegal activities. To combat money laundering and other forms of financial terrorism, governments worldwide have established regulatory bodies and enacted accompanying regulations. Although complying with these requirements is challenging, businesses must do so. As a result, many banks and financial institutions now employ compliance teams and invest in related technologies.

2.4. Keeping an Eye on Market Shifts

Banks can utilize artificial intelligence in financial services to analyse massive amounts of data and anticipate market movements, currencies, and stocks. Cutting-edge machine learning methods enable in-depth market sentiment analysis and investment recommendations. AI in banking can provide

recommendations on when it's safe to buy stocks and when it might be unwise. This new technology benefits banks and their customers by enabling high-capacity data processing, expediting decision-making, and simplifying trading.

2.5. Collecting and Analyzing Data

Financial organizations record millions of transactions every day, resulting in a massive amount of data. The sheer volume of data makes it challenging for workers to track and organize effectively. Innovative artificial intelligence technologies can assist in data collection and analysis. Additionally, the collected data can be used for credit analysis and fraud detection.

3. DIGITALIZATION IN BANKING

Since 2010, 550 billion dollars have already been invested in fintech (a new era of banking). Yet despite their best efforts, no fintech has managed to break into the global top-250 list of banks by assets. It appears the world does need banks after all. We have the technology but it's up to us for its success because without the efficient use of any technology is a waste. It is a challenge for AI to ensure its use that benefit for the mankind. There are trend of AI:

3.1. Rise of AI

Banking sector gets benefited by AI, the productivity of banks has increased by 22-30%. It is not only by AI but its efficient use by mankind or employees. Banking is likely to be more affected sector than any other. There must be a proper relationship of AI and mankind to work for bank's profitability and efficiency.

3.2. Meaningful conversation:

Banking not only known by its name but only by its services to its customers. All the banks have a mobile app for customers, most of them rate good to these apps. Digitalization help to work correctly but it cut the emotional link to its customers. Accenture's Life Trends 2024 survey found that 42% of consumers find it hard to distinguish between financial services brands. In the process, customer loyalty has weakened. The average consumer has 6.3 financial services products, only half of which are from their primary bank— 73% acquired at least one financial services product from a new provider in the past 12 months.

4. LITERATURE REVIEW

2023 Krutika Sawant, Harshvardhan Soni, Parthraj Maharaul, Saurabh Agarwal 'Study on AI in Banking System' elaborate the key applications of AI in banking and impact on its operations and performance also to identify the challenges associated with AI adoption in banking and to analyze the future outlook of AI, its sustainability and adoption in banking industry. During the study it is found that AI benefited to the banks and its customers but some time it is also being observed that customers need advice which AI cannot do. It is also said that AI has future.

2020 Krunoslav Ris, Zeljko Stankovic, Zoran Avramovic 'Implications of Implementation of Artificial Intelligence in the Banking Business with Correlation to the Human Factor' analyzed the machine leaning model with cost effective, reduce the workforce, improve

banking experience and maximize profits also to learn the human and AI experience of work. AI work more efficiently than human, it is a future for now onwards.

5. RESEARCH METHODOLOGY

The study is based on secondary data collected from various journals, research papers and data available on websites. It is a descriptive study based on the important aspects of AI in banking.

6. CONCLUSION

Since the era of advancement, it is not the first time to adopt something new from virtual banking to mobile banking. Some of the executive believe that it is a future for banking. It is believed that by adopting AI, the profit of banks has increased. But there is not a doubt to say that tools need to be used efficiently. So we can say AI is the future for banks or any other industry but it is also depending upon its use and how it is being used.

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Exploring the Impact of Artificial Intelligence (A.I) on the Legal Profession: Challenge and Opportunities

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ABSTRACT

As Artificial Intelligence A.I. continues its widespread integration across diverse sectors, its impact on the legal field is extensive and profound. This presentation delves into the dynamic interplay between A.I. and the legal arena, scrutinizing both the obstacles it presents and the prospects it offers. A.I. technologies are revolutionizing conventional legal procedures, from expediting legal research and document scrutiny to refining predictive analysis for case outcomes. Nevertheless, this shift prompts crucial inquiries about the future landscape of legal employment, ethical considerations, and accountability. Utilizing contemporary research and real-life instances, this presentation investigates the potential advantages and drawbacks of A.I. assimilation within legal practice. Moreover, it explores strategies for legal practitioners to adapt to this evolving technological milieu while upholding the core tenets of justice and impartiality. Join us as we navigate the intricate intersection of A.I. and the legal sphere, exploring how innovation and tradition can synergize in the pursuit of legal excellence.

Keywords: *Artificial intelligence, Legal Profession, Decision making*

1. INTRODUCTION

Artificial intelligence has emerged as a distributive force in a variety of industries changing the way of jobs are completed this wave of Technical innovation applies to the legal profession as well while A.I. is not yet ready to replace human lawyer it is making considerable progress is opening the legal profession. This study paper's goal is to examine how legal research and decision-making are impacted by machine learning, expert systems, and natural language processing. The purpose of the study is to examine the possible advantages and disadvantages of these technologies in the legal field, as well as the effects they may have on attorneys, clients, and the legal system at large.

2. RISE OF A.I. IN LEGAL PROFESSION

The use of A.I. in the legal field is a symptom of a major shift in the provision and administration of legal services. A growing number of legal tasks, such as research, document review, predictive analytics, and more, are incorporating A.I. technologies. The promise of artificial intelligence A.I. to boost productivity, optimize procedures, and enhance the caliber of legal services is what is driving this movement.

Legal research is one important field where A.I. is having an influence. Artificial intelligence (AI)-enabled systems can swiftly evaluate vast amounts of court cases, precedents, and legal papers to give attorneys guidance and assistance. Algorithms for natural language processing (NLP) allow computers to comprehend and

analyze legal language, which facilitates the extraction of pertinent data and the identification of patterns.

Document review and due diligence are also being transformed by AI. Instead of manually analyzing mounds of documents, AI-powered software can sort, evaluate, and mark essential information, saving time and minimizing the possibility of errors. This is especially important for duties like contract review, e-discovery, and compliance monitoring. Predictive analytics is another area where A.I. is making an impact in the legal profession. By studying historical data and patterns, A.I. systems can assist lawyers in predicting case outcomes, identifying potential dangers, and optimizing legal strategies. This enables lawyers to make better decisions for their clients.

Despite the obvious benefits of A.I. in the legal field, there are some obstacles and issues that must be addressed. Data privacy, algorithmic prejudice, and the impact on lawyers' roles are all ethical and legal consequences that must be carefully considered. Traditional legal practitioners may also be resistant to A.I. adoption, as they are concerned about technology replacing human judgment.

3. CHALLENGE AND ETHICAL CONSIDERATION

While the benefits of A.I. in the legal profession are clear, there are also significant challenges and ethical considerations that need to be addressed. Coordination A.I. into the legitimate calling presents an interesting set of challenges and moral contemplations. Whereas A.I. can streamline forms, improve inquiry about capabilities, and move forward decision-making, it too raises concerns approximately work uprooting and the potential for predisposition in calculations. Within the lawful setting, guaranteeing the precision, decency, and straightforwardness of AI-driven law ful arrangements is vital. Moral contemplations incorporate keeping up client secrecy, guarding against unintended results of A.I. suggestions, and tending to issues of responsibility when A.I. frameworks are included in lawful choices. Striking a adjust between leveraging AI's capabilities and maintaining moral benchmarks requires astute control, progressing checking, and a commitment to maintaining the standards of equity and astuteness inside the legitimate calling.

3.1. One side decision making

The one-sided decision-making of A.I. within the legitimate calling alludes to circumstances where A.I. frameworks or calculations independently make choices or suggestions without adequate human oversight or mediation. Here are a few key focuses to consider:

3.1.1. Automation Bias

One concern is that people may concede as well promptly to AI-generated choices, accepting they are

fair-minded or trustworthy, without basically assessing the basic information or presumptions.

3.1.2. Legal complexity

Legitimate choices frequently include nuanced elucidation of laws, directions, and points of reference, which may be challenging for A.I. frameworks to completely comprehend. Over-reliance on A.I. might ignore relevant variables vital to legitimate investigation.

3.1.3. Ethical Concerns

The utilize of A.I. in lawful decision-making raises moral questions almost the assignment of such critical assignments to non-human substances, possibly influencing due process and crucial rights.

3.1.4. Human Oversight

To address these issues, there's a require for strong systems guaranteeing human oversight of A.I. frameworks in legitimate decision-making. This incorporates occasional reviewing, approval, and persistent observing to identify and rectify predispositions or mistakes.

Whereas A.I. can increase lawful decision-making processes, caution is fundamental to dodge the pitfalls related with one-sided dependence on A.I. without human oversight and basic assessment. The adjust between leveraging AI's capabilities and protecting human judgment and moral contemplations is significant within the evolving landscape of A.I. within the legitimate calling.

3.2. Fairness and A.I. transparency in decision making

Decency and straightforwardness are basic in A.I. decision-making. Decency guarantees that A.I. frameworks don't segregate unreasonably, whereas straightforwardness makes A.I. choices reasonable. Accomplishing reasonableness includes recognizing and rectifying inclinations in information and calculations, utilizing differing preparing information. Straightforwardness is accomplished by clarifying A.I. choices clearly and making improvement forms open to examination. Prioritizing decency and straightforwardness builds belief in A.I. frameworks and their affect on society.

3.2.1. Transparency and Accountability

A.I. decision-making in lawful settings can need straightforwardness, making it troublesome to get it how a choice was come to. This raises issues of responsibility, particularly when choices have critical results.

3.2.2. Bias and Fairness

A.I. calculations can acquire predispositions from preparing information, driving to biased results that excessively affect certain bunches. Without cautious oversight, these inclinations can go unchecked.

3.3. Lack of Explanation

Efforts are needed to develop A.I. systems that provide clear explanations for decision-making and allow lawyers and clients to evaluate the reliability and fairness of results produced by AI.

3.4. Data protection and Data security

Data protection and data security are also important aspects when using A.I. in the legal industry. A.I. systems often require access to sensitive customer information and may require the transfer of data to third-party platforms. Appropriate security precautions must be taken to protect customer confidentiality and prevent unauthorized access or compromise. Law firms must take strict data protection measures and ensure compliance with relevant data protection regulations.

4. BENEFITS AND DRAWBACKS OF AI IN THE LEGAL PROFESSION

Artificial intelligence (AI) is making critical impacts on the legal profession, advertising both benefits and downsides:

4.1. Advantages of AI in the legal profession.

A.I. provides various benefits to the legal industry, including increased efficiency and accuracy of legal services. One of the key benefits is higher productivity. A.I. algorithms can do tasks far faster than human lawyers, allowing them to assess contracts, conduct legal research, and analyze documents more efficiently. This greater efficiency allows lawyers to handle a bigger volume of cases while devoting more time to complicated legal matters requiring human experience.

A.I. can also help raise the standard of legal work by guaranteeing consistency and lowering errors. When evaluating huge datasets, A.I. systems can maintain a high degree of accuracy and are less likely to make mistakes. A.I. frees up lawyers' time to concentrate on more strategically and intellectually challenging areas of their work by automating repetitive and time-consuming duties. Increased client happiness and better client service may result from this.

The potential for A.I. to improve access to justice is another benefit for the legal industry. The difficulty of offering many people access to reasonably priced legal services has long plagued the legal profession. AI-powered systems that provide affordable options for the creation and evaluation of legal documents can aid in closing this gap. Basic legal services are now more affordable for clients who would not have been able to pay for legal representation in the past. A fairer legal system may benefit from this improved accessibility.

4.2. Drawbacks of AI in the legal profession.

4.2.1. Job displacement

A.I. selection may lead to a decrease in certain lawful employments, especially those including dreary assignments. This may affect paralegals and junior legal counselors.

4.2.2. Moral Concerns

A.I. frameworks may fortify predispositions show in preparing information, driving to one-sided choices. Guaranteeing fairness and transparency in A.I. calculations could be a challenge.

4.2.3. Information Protection and Security

A.I. depends intensely on information, raising concerns approximately information security and security, particularly when managing with touchy legitimate data.

4.2.4. Dependence on Innovation

Over-reliance on A.I. devices may reduce basic considering aptitudes and lawful thinking in attorneys, possibly influencing the quality of legitimate counsel.

4.2.5. Administrative Challenges

Lawful systems and controls around A.I. within the lawful calling are still advancing. Tending to issues like obligation for AI-generated mistakes is complex.

In outline, whereas A.I. offers various benefits in terms of proficiency, fetched diminishment and precision in legitimate errands, there are moreover challenges related to work uprooting, moral contemplations, information protection, and the require for vigorous administrative systems. Adjusting these variables will be significant for realizing the total potential of A.I. within the legitimate calling whereas relieving its disadvantages.

5. CONCERNS REGARDING A.I

5.1. Violation of privacy law

First concern is violation of privacy laws. Some countries have comprehensive data protection laws that restrict A.I. and automated decision making involving personal information. The EU General Data Protection Regulation (GDPR) recommends that organizations using automated data processing, such as AI, take certain measures to ensure information is processed fairly. A.I. providers may face challenges in defining the purpose of processing information when developing A.I. because it is impossible to predict what algorithms will learn and use data for. Basically, data might be used for new purpose.

5.2. A.I. in Intellectual property

Second concern is related to utilize of A.I. in Intellectual Property (IP). Work made by the A.I. cannot be secured beneath existing copyright laws. And same is with developments. With its capacity to memorize and to be imaginative it might create new innovations that got to be ensured as developments. But A.I. cannot be considered as the proprietor of IP itself, proprietors are as it were a common individual or a lawful substance. So, whether the client of the A.I. framework ought to possess the IP rights or the rights ought to go to the innovator of the A.I. framework? Or the A.I. framework itself ought to be permitted to hold the rights?

6. CONCLUSION

A.I. may be a welcome apparatus within the cause of equity. It is since A.I. is able to work on tedious errands exceptionally rapidly, it has capacity to memorize, make fair-minded choices and create tall quality work, offer assistance legal counselors by foreseeing case (trial) results, utilize past results when making unused ones, distinguish designs and utilize rationale whereas being a inventive issue solver, exhort legitimate experts (lawyers, judges, etc.) but too prompt clients on legitimate issues and numerous more.

As A.I. innovations proceed to create, they are as of now opening numerous openings to convert and progress the field of law. Most vital advantage is that A.I. spares time. Computers can analyze huge sums of information, more completely than people can, in a little division of the time. Time investment funds cruel financial reserve funds, since less legitimate proficient time is included in finding answers and distinguishing botches. Those reserve funds can rapidly make up for the fetched of unused innovation. A.I. can be both the greatest opportunity and possibly the most prominent danger to the legitimate calling. Nowadays Counterfeit Insights speaks to an opportunity for a law firm to be a pioneer in a legal profession, but before long it'll be a matter of keeping up instead of being a pioneer. The budgetary quality will permit only big law firms and companies to utilize AI. At slightest, within the begin. In any case, one thing is certain — A.I. is venturing in a legitimate calling and taking over, and attorneys have to be grasp the modern innovations. Something else, they won't be able to keep up with the competition.

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B-H Curve of Magnetic Material Neodymium (Nd)

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ABSTRACT

In this report we have discussed the B-H curve of Magnetic material Neodymium. We have studied the unmagnified material under the cycle of magnetization (M). We have investigated the intensity of magnetization and the magnetizing field (H) at every stage. The results obtained from the closed loop plotted between M and H, predict the applicative properties for the use of neodymium in modern devices. The hysteresis loop of this material has been further studied for suitability in making permanent magnets of loudspeakers and other devices.

Key words: *Magnetic field, Magnetization*

1. INTRODUCTION

Hysteresis, a term coined by Sir James Alfred Ewing in 1881, a Scottish physicist and engineer (1855-1935), defined it as: When there are two physical quantities M and N such that cyclic variations of N cause cyclic variations of M, then if the changes of M lag behind those of N, we may say that there is hysteresis in the relation of M to N". The most notable example of hysteresis in physics is magnetism. Iron maintains some magnetization after it has been exposed to and removed from a magnetic field. Neodymium is a rare earth element. Neodymium-iron-boron magnets were developed by General Motors and Hitachi in the 1980s. Because it provides high magnetic force even in lesser amounts, it has been increasingly given a more prominent role in the manufacture of strong permanent magnets made up of rare earth elements. In the field of information technology, neodymium magnets are particularly used in hard disc drives, mobile phones, video and audio systems of television. Magnets are now used widely in electric motors, speakers, turbines, cathode ray tubes, credit cards, magnetic resonance imaging devices, transformers and more.

Alnico magnets were some of the first magnetic materials produced made up of aluminum, nickel and cobalt. These had poor magnetic properties, but overall good temperature properties. Ceramic and ferrite magnets were developed in the early 1950's. The 1960's saw the creation of samarium cobalt magnets, which had the highest energy product of any magnetic material. Due to an increase in the cost of cobalt, there began a large push for an iron-based permanent magnet. Neodymium-iron-boron magnets were developed with the largest energy product. Since the discovery of neodymium-iron-boron, few advances have been made in magnetic materials [1].

2. EXPERIMENTAL TECHNIQUE

Examination of the composite target showed an irregular racetrack had been created during sputtering [Anderson 2010]. In a number of areas material had been sputtered from the iron plate rather than the Nd₂Fe₁₄B plugs. Comparing the coverage area of the racetrack on both the

Nd₂Fe₁₄B plugs and the iron plate showed an excess of approximately 7% iron was sputtered during deposition. TEM examination confirmed that the clusters were approximately 8nm in size. Determining the composition of the clusters proved difficult due to the small volume of material contained on the TEM grid. 1

Sputtering methods, such as radio-frequency and magnetron sputtering, allow for vaporization of the material without the heating of the target material. Cluster-assembled materials can be created from metals, ceramics, semiconductors, or even composites. These structures can consist of nano-scale phases, crystalline, quasi crystalline or amorphous [Sigmund,1969]. Sputter deposition is a series of quasi-elastic collision processes induced by a bombarding ion. Sputtering can be thought of as a multiple collision processes involving a with the target surface releasing target atoms.

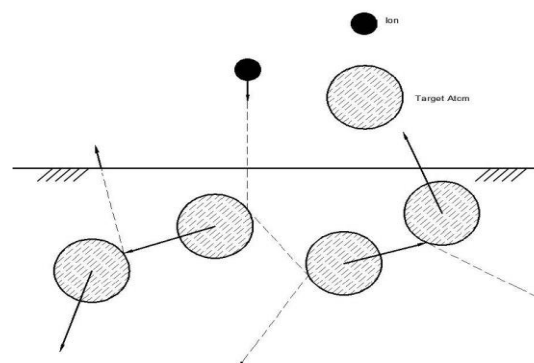


Figure.1. During sputtering an ionized particle collides

cascade of moving target atoms. When sputtering with a target material, the majority of the atoms are sputtered by random collision processes. The sputtering yield is mostly accounted for by the target's surface atoms [Sigmund,1969]. There is a wide range of materials that can be sputtered. However, due to the bombardment process and the vacuum environment, materials such as, organic solids or volatile components cannot be sputter deposited [Chapman,1980].

To understand sputtering theory, both transport theory and single collision arguments must be taken into account. During the sputtering process an ion undergoes a series of collisions within the target. Atoms then recoil with sufficient energy to cause secondary collisions, creating more recoiling atoms. The ion and the energetic recoil atoms have the possibility of being scattered from the surface. After a material has been vaporized, it can now be deposited. A suitable substrate is selected to grow a film of the sputtered material. The vaporized material condenses onto the substrate surface and forms a thin film.

Nd₂Fe₁₄B Clusters of uniform size and shape were created with the gas condensation system [Anderson 2010]. In order to create Nd₂Fe₁₄B clusters from a Nd-Fe-B target a moderate sputtering power of approximately 50 watts needs to be used as well as relatively high flow rates of both argon and helium.

Nd₂Fe₁₄B Clusters were created were two-phase Nd₂Fe₁₇ and bcc-Nd; the bcc-Nd phase is stabilized by oxygen during the annealing process. Magnetic properties of the Nd₂Fe₁₄B clusters were similar to the properties of Nd₂Fe₁₇. Although annealing increased the coercivity of the deposited clusters at room temperature, this ultimately leads to a deterioration of properties at lower temperatures. The as-deposited samples became ferromagnetic at low temperatures and exhibited super paramagnetic properties at room temperature. These properties are indicative of amorphous rare-earth transition metal clusters. The addition of boron to the sputtering target should increase the coercivity and energy product of the samples.

3. MAGNETIC HYSTERESIS

As a magnetic field is applied and the strength of it increased, the domains of the material change size and shape by the movement of the domain boundaries. In fields of high magnetic strength, the magnetization becomes constant or saturated, known as the saturated magnetism. From the saturation point, as the field is reduced by reversal of the field direction, the curve does not retrace its original path. When the magnetic field strength is reduced to zero after saturation, the material will remain magnetized. This magnetization is referred to as the remanence. Materials in which the magnetization does not reduce to zero when the applied magnetic field is reduced to zero are permanent magnets. If the applied field is reversed, the remaining induction will decrease to zero when the reverse field equals the coercivity. The area within a loop represents the energy loss per unit volume of material during the demagnetization process which appears as heat generated within the material. The energy product of the magnet is represented by the maximum area formed in the second quadrant (BH-max)

Soft magnetic materials are used in areas subjected to alternating magnetic fields. Energy losses in soft magnetic materials are low, which can be seen by the minimal area occupied by the hysteresis loop. A low coercivity is caused by the movement of domain walls. Voids and non-magnetic particle inclusions can be inserted in soft magnetic particles which will consequently increase the coercivity by the hindrance of domain wall motion. Additionally domain walls are pinned by defects such as dislocations, magnetostriction, or plastic deformation thereby increasing the coercivity.

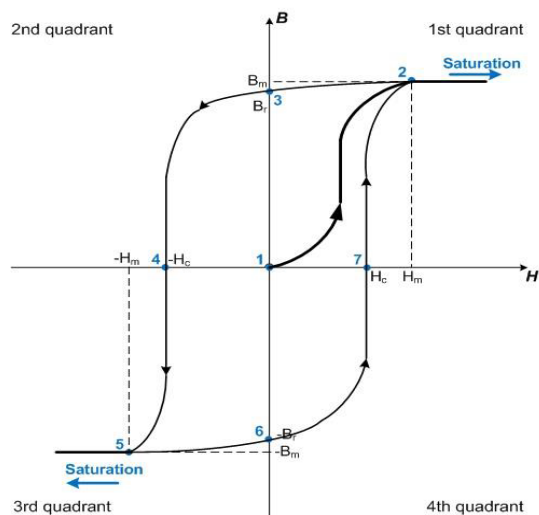


Figure.2. Magnetic Hysteresis Curve

Hard magnetic materials are characterized by high coercivity, remanence, saturation flux density, high hysteresis energy losses, as well as low initial permeability. Like soft magnetic materials, restricting domain wall motion will enhance the coercivity of the material. Hard magnetic materials are often desired in numerous applications because they require no external power source and consequently generate no heat during usage. Hard magnets are essentially energy storage devices, which with proper handling, can retain their magnetism

4. RESULTS & DISCUSSION

In our discussion, magnetic material, Neodymium, being subjected to a cycle of magnetization. The graph intensity of magnetization (B) vs. magnetizing field (H) gives a closed curve called B-H loop. Consider the portion AB of the curve given below. The intensity of magnetization B does not become zero when the magnetizing field H is reduced to zero. Thus the intensity of magnetization M at every stage lags behind the applied field H. This property is called magnetic hysteresis. The B-H loop is called hysteresis loop. The shape and area of the loop are different for different materials.

4.1. Properties of Neodymium Magnets

Neodymium magnets offer the highest (BH) max and high Hci (BH) max, the maximum energy product, of neodymium magnets is highest of any kind of permanent magnets today in the world. (BH)max at different grades of neodymium magnets is 27 to 52 MGOe. Neodymium magnets have extremely resistance to demagnetization with Hci, Intrinsic coercive force, over 12,000 Oe. Because of very high (BH)max and Hci, neodymium magnets could be used as a reversible medium for large amount of energy transformation in miniaturized application where a strong magnetic demagnetization field exist, such as computer hard drive. An Armstrong Magnetics N40 neodymium magnet in disk and rectangle shapes for customers' immediate needs and accept special orders for custom neodymium magnets. Neodymium magnets are most powerful of any kind of magnetic materials Br of neodymium magnets are much more than 11,000 Gauss. Therefore, Neodymium magnets have strong holding strength on metal surface and could be used as component for holding, separating, etc. Neodymium magnets must be carefully handled to avoid personal injury and material damage due to its extremely magnetic strength and brittle property.

Neodymium magnets are sensitive to temperature change and even lose magnet properties at high temperature Neodymium magnets lose -0.09 ~ -0.13% of Br/oC and can work stably under 80oC for low Hci Neodymium magnets and 150oC for high Hci Neodymium magnets.

Neodymium magnets are corrupted in humid environment Surface protection is strongly recommended, such as plating, varnishing and encapsulating. Neodymium magnets are hard and brittle Neodymium magnets can be abrasively machined with coolant served to absorb heating and dust. Without coolant, rare earth magnets could crack and chip by the heat produced during high speed cutting or grinding, and the sparks contain the easily oxidized grinding dust that could cause fire! Tolerance of Neodymium magnets Unless otherwise specified, tolerance on dimension of

magnetization is +0.005". Other dimensions are +1.5% or +.010", whichever is greater.

5. CONCLUSION

The significance of hysteresis loop is that it provides information such as retentivity, coercivity, permeability, susceptibility and energy loss during one cycle of magnetization for each ferromagnetic material. Therefore, the study of hysteresis loop will help us in selecting proper and suitable material for a given purpose.

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Fuzzy Controller-Based Sensor less Control Strategy for AC-DC Boost Converter, Voltage and Current Monitoring-Free Solution

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ABSTRACT

Fuzzy Controller-Based Sensor less Control Strategy for AC-DC Boost Converter is about decreasing the DC current ripples, about minimizing the settling time, about decreasing the THD value as per IEEE standards. A sensor less control of a Single-Phase AC-DC boost converter it removes the complexity and it is flexible to use. We can reduce the cost also, It is common knowledge that the nonlinear controller design for power factor adjustment of an AC-DC boost converter depends critically on the precise measurement of the input voltage and current as well as the feed forward and feedback terms. The simultaneous estimation of the input voltage and current from the output voltage in a full-bridge AC-DC boost converter is the topic of this research. When the control input is zero, those variables in the lossless model of the system are not visible from the output voltage. In order to get around this, a fresh filtering transformation submerges the system dynamics in a suitable form. We can also reduce the DC current ripples and THD. So, our aim is to decrease the harmonic content which decreases the output and increase the performance of the converter.

Key words: AC-DC boost converter, DC current ripples and THD

1. INTRODUCTION

The introduction of AC-DC boost converters has made it easier to integrate renewable energy sources into systems such as motor drive systems, LED drive systems, flexible AC transmission systems, and hybrid microgrids. It is common knowledge that the nonlinear controller design of a feed forward AC-DC boost converter for power factor correction requires accurate input voltage and current measurements, just like the feedback terms[1]. Furthermore, limited control results from the system's phase mismatch with the output that needs to be regulated because only one signal is needed to govern everything. These characteristics have brought attention to the control problem from both a theoretical and practical perspective, aside from the system applications. A recommended current increase dc/dc converter sensor-less control method to begin with, a switched observer was made. to calculate the output voltage and inductor current during arbitrary switching using the switched boost converter model [2]. Sensor less control of a single-phase AC-DC boost converter is a sophisticated technique that enables the regulation of voltage and current without the need for direct measurements. Therefore, current sensor less control techniques can bring cost effective and reliable solutions for various boost converter applications. According to the derived accurate model, which contains a number of parasitic, the boost converter is a nonlinear system [3]. This method enhances the efficiency and reliability of power electronic systems, particularly in applications where minimizing hardware components and costs is crucial.

However, the extensive use of current sensors not only increases the cost of the overall system, but also affects the reliability. In this paper, the sensor less control problem of DC-DC boost converters is addressed to avoid the need for the current sensor [4]. In this comprehensive exploration, we delve into the principles, challenges, and advancements associated with sensor less control in the context of a single-phase AC-DC boost converter, focusing on strategies that eliminate the need for measuring input voltage and current. Renewable energy is identified as a potential alternative to conventional utility grid-based electricity to meet the present-day requirements of a variety of consumers [5]. The demand for energy-efficient power electronic systems has spurred research into innovative control strategies for converters. The adaptive law and the error response are formulated in a single equation, which determines the system performance. A systematic sliding mode control design procedure of a class of DC-DC converters is hence carried out[6]. Sensor less control techniques have gained prominence due to their potential to reduce complexity and cost, making them particularly attractive for single phase AC-DC boost converters. In this extensive study, we explore their potential to reduce costs and complexity, which makes them particularly desirable for single phase AC-DC boost converters. A PI-PBC was proposed as a way to stabilize this system. To do away with the need for the current sensor, the GPEBO was designed to reconstruct the current information. [7]. Sensor less control eliminates the need for specialized sensors to monitor input voltage and current, which lowers hardware complexity, increases overall system efficiency, and improves dependability. The sensor less control problem with DC-DC boost converters is to remove the need for the current sensor. discussed.[8] Understanding the fundamental principles of the converter and the well-known issue of non-minimum phase behavior are essential to identifying the challenges and possible solutions associated with sensor-less control. Analyze conventional control schemes that rely on accurate measurements of the input voltage and current. Draw attention to the limitations and drawbacks, establishing the need for sensor-less control. Examine the fundamental concepts of sensor-less control, with an emphasis on getting relevant data straight from the converter and doing away with the need for extra sensors. Discuss the advantages of this approach for single-phase AC-DC boost converters, such as less hardware needs and enhanced system dependability. It also holds true for particular sensor-less control systems. This section looks at different strategies, such as back-EMF sensing, prediction algorithms, and observer-based techniques, and contrasts their benefits and drawbacks. The challenges associated with sensor-free control. Explain the challenges that come with implementing sensor-less control in a single-phase AC-DC boost converter. Increasing the reliability and efficiency of the sensor-less control system requires the use of adaptive algorithms, noise reduction, and signal filtering. Use in Practice Review case studies where sensor-less control

has been successfully applied to real-world situations. Highlight the financial savings, improved output, and overall advantages that result from adopting

Discuss the advantages of this approach for single-phase AC-DC boost converters, such as less hardware needs and enhanced system dependability. It also holds true for particular sensor-less control systems. This section covers techniques such as sensor-less approaches, observer-based approaches, back-EMF sensing, and predictive algorithms. Points to Take into Account for a Realistic Application Discuss the most effective approaches to execute pros and cons. The challenges of control without sensors describe the challenges that an AC-DC boost converter operating in single phase faces when sensor less control is incorporated. In addition to the hardware requirements, software formulas, and tuning methods, this single-phase AC-DC boost converter also features adaptive algorithms and noise reduction sensor-less control.

2. CIRCUIT DESCRIPTION

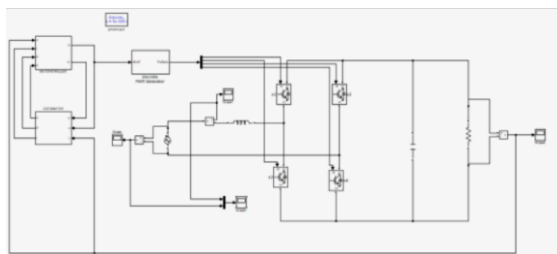


Figure.1. circuit diagram

2.1. IGBT/Diode

Implements ideal IGBT, GTO, or MOSFET and anti parallel diode. Library: Power Electronics



Figure.2. IGBT

2.2. Purpose

The forced-commutated device and diode forward voltages are disregarded in the IGBT/Diode block, which is a simplified mode of an IGBT (or GTO or MOSFET)/Diode pair.

3. DISCRETE PWM GENERATOR

Library : Power Electronics

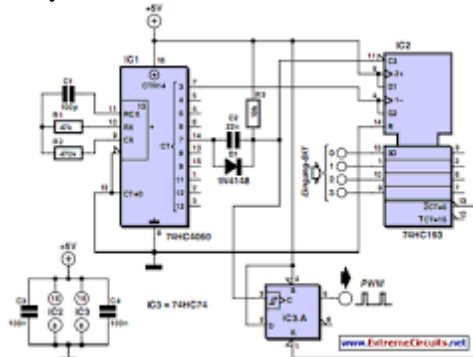


Figure.3. Power Electronics
3.1. Discrete PWM Generator

A PWM circuit constructed with individual electronic parts, such as transistors, resistors, capacitors, and occasionally integrated circuits (ICs), is referred to as a discrete PWM (Pulse Width Modulation) generator. This is in contrast to PWM generators that are part of dedicated PWM ICs or microcontrollers.

3.2. Three-Phase Programmable Voltage Source

Install a three-phase voltage source that can have its frequency, phase, amplitude, and harmonics' times altered.

Library: Electrical Sources

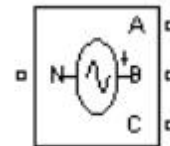


Figure.4. Three Phase Voltage Sources

Purpose: With the help of this block, you may produce a three-phase sinusoidal voltage with variable characteristics throughout time. The source's basic component's amplitude, phase, or frequency can be controlled using time variations. Furthermore, the fundamental signal can have two harmonics programmed and layered upon it.

3.3. Estimator

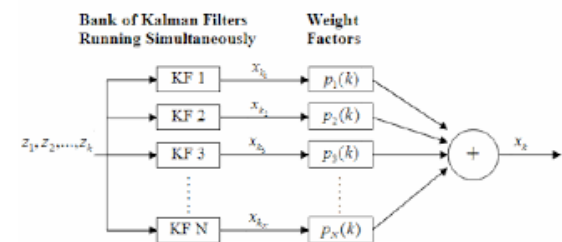


Figure.5. Estimator

In the field of electrical engineering, an adaptive estimator is a kind of estimator that may modify its parameters or structure in response to shifting environmental factors. Adaptive estimators can adjust to fluctuations in the system being estimated or changes in the operating conditions, in contrast to static estimators, which have set parameters or structures.

3.4. Scope

Signals produced for display during a simulation. In relation to simulation time, the input is displayed via the Scope block. The scope block can include more than one axe (one for each port); each axe has an independent y-axe and a common time range. You can change the duration and the displayed input value range using the Scope. Throughout the simulation, you can adjust the Scope's parameter settings and move and resize the window.



Figure.6. Scope

3.5. Power GUI

A graphical user interface (GUI) for managing, controlling, monitoring, and evaluating power-related systems or processes may be referred to as a "POWER GUI" in software applications or platforms. A concentration on applications pertaining to electrical power, energy management, or power electronics is probably indicated by the name "POWER".

3.6. Fuzzy Controller

A fuzzy controller is a kind of controller that uses fuzzy logic in decision-making to operate in control systems. Fuzzy controllers operate with approximate or inaccurate information, in contrast to standard controllers that employ precise mathematical models. They are especially helpful in systems when it is challenging or complex to appropriately model the links between inputs and outputs.



Resistor: A resistor is an electrical component that impedes the flow of electric current in a circuit. It accomplishes this by introducing resistance, which is measured in ohms. Resistors are crucial for controlling current levels, setting voltage levels, and dividing voltage in circuits. They are used in various applications, from limiting current flow in LEDs to shaping the

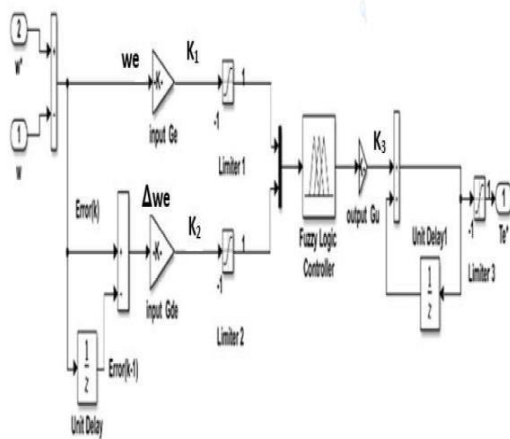
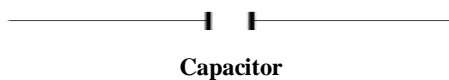


Figure.7. circuit diagram

Inductor: An inductor is an electrical component that stores energy in the form of a magnetic field when current passes through it. It opposes changes in current flow by inducing a voltage in the opposite direction, according to Faraday's law of electromagnetic induction. Inductors are characterized by their inductance, measured in Henries, and they are essential in circuits involving energy storage, filtering, and impedance matching. They are commonly used in power supplies, signal processing circuits, and radio frequency (RF) circuits



Capacitor: A capacitor is an electrical component that stores energy in an electric field between two conductive plates separated by an insulating material, known as the dielectric. Capacitors are characterized by their capacitance, measured in farads, and they store electric charge proportional to the voltage applied across them.

Capacitors are utilized in circuits for energy storage, filtering, timing, and coupling. They play crucial roles in smoothing power supplies, blocking DC while allowing AC signals to pass, and stabilizing voltage levels in various electronic devices

Detailed construction of the fuzzy controller
Membership function of FLC (we), (Δwe), (Δu)

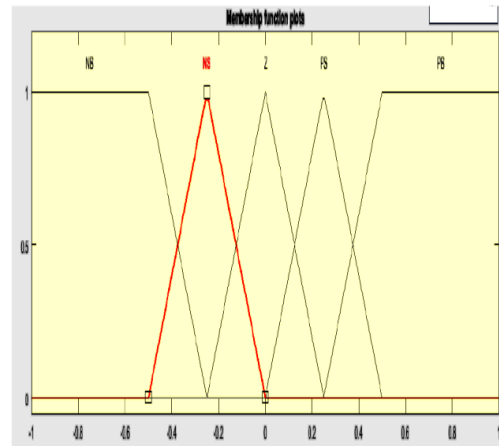


Figure.8. Construction of Fuzzy Controller

Table.1. Rules of the FLC

	NB	NS	Z	PS	PB
NB	NB	NB	NS	NS	Z
NS	NB	NS	NS	Z	PS
Z	NS	NS	Z	PS	PS
PS	NS	Z	PS	PS	PB
PB	Z	PS	PS	PB	PB

4. SIMULATION STUDIES

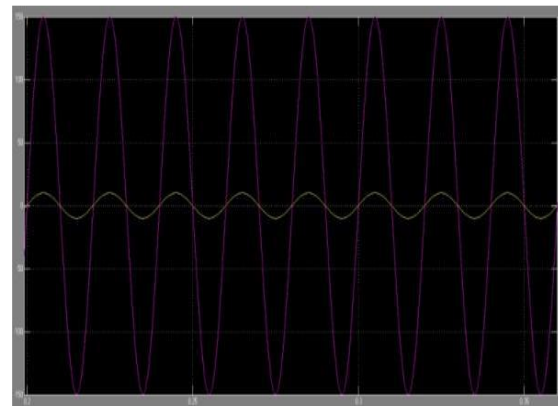


Figure.9. Input voltage and current vs time



Figure.10. Output voltage vs time

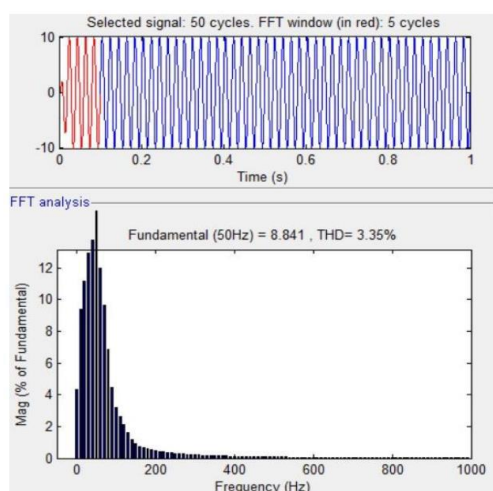


Figure.11. THD Percentage value is 3.35%

Table.2. Comparison Table

S. No	Parameters	PI Controller reading	Fuzzy logic controller
01.	Input voltage	146v	150v
02.	THD value	4.8%	3.35%
03.	Settling time	0-3-0-4sec	0-2sec

4. CONCLUSION

In conclusion, Fuzzy controller based sensor less control strategy for ac- dc boost converter, voltage and current monitoring free solution presents a promising avenue for advancing power electronics technology. Through the utilization of fuzzy logic controller, this approach offers significant advantages in terms of simplified system design, cost reduction, improved robustness, and enhanced flexibility. This innovative approach offers a unique solution by leveraging fuzzy logic to control the converter without the need for explicit voltage and current monitoring. The strategy's numerous advantages make it a compelling choice in various applications, ranging from industrial power electronics to renewable energy systems. One of the key strengths of this strategy lies in its cost effectiveness. By eliminating the requirement for dedicated voltage and current sensors, the overall cost of the system is significantly reduced. This is particularly advantageous in applications where budget constraints are a primary consideration. The simplified design resulting from the absence of external sensors further enhances the overall reliability of the system, as it minimizes potential points of failure associated with sensor integration.

In summary, the Fuzzy Controller-Based Sensor less Control Strategy for ACDC Boost Converter offers a compelling solution for power electronics applications. Its blend of cost-effectiveness, adaptability, and energy efficiency positions it as a viable choice in a range of scenarios. The advantages are simplified design, adaptability to varying operating conditions, and sensor less operation make it an attractive option for industries seeking efficient and reliable power conversion solutions. The THD value percentage is and settling time is 0.2 sec.

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Navigating the Future Impact and Implementation of Artificial Intelligence in Industrial Education

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ABSTRACT

Artificial Intelligence (AI) is transforming industries worldwide, and education is no exception. In industrial education, the integration of AI has the potential to revolutionize training and skill development, preparing workers for the demands of modern industries. This paper explores the impact of AI on industrial education, discussing its benefits, challenges, and implementation strategies. Industrial education plays a crucial role in equipping individuals with the skills and knowledge needed to thrive in today's industrial sectors. However, traditional approaches to industrial education often struggle to keep pace with rapid technological advancements and changing industry demands. AI offers a solution to this challenge by providing innovative tools and techniques to enhance industrial education.

Keywords—Artificial Intelligence, Industrial Education, Innovation, Personalized Learning, Intelligent Tutoring Systems, Challenges, Recommendations

1. INTRODUCTION

Artificial Intelligence (AI) is rapidly transforming industries worldwide, and its impact on education, particularly in industrial settings, is becoming increasingly profound. Industrial education, which focuses on training individuals for careers in fields such as manufacturing, construction, and logistics, faces unique challenges in keeping pace with technological advancements and evolving industry demands. AI offers a promising solution to these challenges, with the potential to revolutionize training methods and enhance workforce readiness.

In industrial education, AI can improve the effectiveness and efficiency of training programs by personalizing learning experiences, providing real-time feedback, and simulating realistic work environments. By analyzing large amounts of data, AI can identify trends in industry skills requirements, allowing educational institutions to tailor their programs to meet these demands [1]. The integration of AI in industrial education is not without its challenges. Implementation costs, ethical considerations surrounding data privacy and algorithm bias, and ensuring equitable access to AI technologies are all key issues that need to be addressed.

2. LITERATURE REVIEW

The literature on the impact and implementation of Artificial Intelligence (AI) in industrial education highlights several key themes and findings. AI is increasingly being integrated into training programs in industries such as manufacturing, construction, and logistics to enhance learning outcomes and prepare workers for the demands of modern workplaces.

One of the primary benefits of AI in industrial education is its ability to personalize learning experiences. AI-powered tools can adapt to individual learning styles and pace, providing targeted training that is more engaging and effective. For example, AI can analyse data from simulations and virtual reality environments to create personalized learning paths for students. AI also offers opportunities to improve the efficiency of training programs by automating administrative tasks such as grading and scheduling [2]. AI can free up educators' time to focus on more impactful activities, such as mentoring and coaching.

The implementation of AI in industrial education is not without challenges. Ethical considerations, such as data privacy and algorithm bias, need to be carefully addressed to ensure that AI benefits all students equitably. Additionally, there are concerns about the digital divide, as access to AI technologies may not be equal for all students [3].

2.1. Impact of AI in Industrial Education

Personalized Learning: AI can customize learning experiences based on individual needs and preferences, ensuring that each student receives targeted training.

Enhanced Training Programs: AI-powered simulations and virtual reality environments can provide realistic training scenarios, allowing students to practice skills in a safe and controlled environment.

Efficient Resource Allocation: AI can analyse data to identify areas where resources are most needed, ensuring that training programs are cost-effective and impactful [4].

Real-time Feedback: AI can provide instant feedback to students, helping them track their progress and improve their performance.

Predictive Analytics: AI can analyse data to predict future industry trends and skill requirements, enabling educators to tailor their programs to meet future needs [5].

3. METHODOLOGY

The methodology for exploring the impact and implementation of Artificial Intelligence (AI) in education involves a comprehensive literature review, analyzing existing AI applications in educational settings. Surveys and interviews with educators, administrators, and AI experts will provide qualitative insights. Quantitative data will be gathered through student performance metrics and AI adoption statistics.

Comparative case studies will assess the effectiveness of AI tools in diverse educational environments. Ethical considerations and potential challenges through content analysis. The study will employ a mixed-methods approach to triangulate findings, ensuring a robust

understanding of AI's role in shaping the future of education [6].

Qualitative Interviews: Semi-structured interviews were conducted with educators, policymakers, and technologists to gather insights and perspectives on the use of AI in education. The interviews aimed to explore the opportunities, challenges, and ethical considerations related to AI implementation in education.

Quantitative Survey: A survey was administered to a diverse group of educators and students to collect data on their experiences, perceptions, and expectations regarding AI in education. The survey aimed to quantify trends, patterns, and differences in opinions among various stakeholders.

Data Analysis: The qualitative data from interviews was analyzed thematically to identify common themes and insights. The quantitative data from the survey was analyzed using statistical methods to identify trends and patterns [7].

Synthesis: The findings from the literature review, interviews, and survey were synthesized to provide a comprehensive understanding of the impact and implementation of AI in education. This involved integrating qualitative and quantitative data to draw meaningful conclusions and recommendations for educators, policymakers, and researchers.

4. OBJECTIVES

Assessing the Impact of AI in Industrial Education:

This objective involves evaluating the current state of AI implementation in industrial education, including its benefits and challenges. It aims to assess how AI is transforming training methods, improving learning outcomes, and preparing workers for the demands of modern industries [9].

Guidelines for Ethical and Effective AI Implementation:

This objective focuses on providing practical guidelines for educators, policymakers, and industry stakeholders to ethically and effectively implement AI in industrial education. It aims to address issues such as data privacy, algorithm bias, and equitable access to AI technologies, ensuring that AI enhances education while minimizing potential risks and inequalities [8].

5. FINDINGS

The research findings indicate that Artificial Intelligence (AI) has the potential to significantly impact education by enhancing personalized learning, automating administrative tasks, and providing real-time feedback. AI-driven tools can adapt to students' individual learning styles and pace, leading to improved learning outcomes [10]. Moreover, AI can assist educators by automating grading, lesson planning, and other administrative tasks, allowing them to focus more on teaching and mentoring students [11]. The research also highlights challenges in the implementation of AI in education. Ethical concerns, such as bias in algorithms and the use of student data, need to be addressed to ensure equitable and responsible AI deployment [12].

6. CONCLUSION

AI has the potential to revolutionize industrial education, providing innovative solutions to enhance training and skill development. However, successful implementation

requires addressing challenges such as cost, ethical considerations, and the digital divide. By adopting collaborative approaches and continuous evaluation, industrial education can harness the full potential of AI to prepare workers for the industries of the future. Artificial Intelligence (AI) is poised to revolutionize industrial education, offering innovative solutions to enhance training methods and prepare workers for the evolving demands of modern industries. The impact of AI in industrial education is significant, with personalized learning experiences, improved efficiency, and enhanced training programs being key benefits.

The implementation of AI in industrial education is not without its challenges. Ethical considerations, such as data privacy and algorithm bias, need to be carefully addressed to ensure that AI benefits all students equitably. Additionally, the digital divide remains a concern, as access to AI technologies may not be equal for all students. To successfully implement AI in industrial education, collaboration among educators, policymakers, and industry stakeholders is crucial. Guidelines and frameworks for ethical and effective AI implementation should be developed, with a focus on providing training and support for educators and ensuring equitable access to AI technologies.

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Artificial Intelligence's (AI) Limitations in Education

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ABSTRACT

Our capacity to adequately assess the long-term educational implications of artificial intelligence (AI) has been hampered by the current exaggeration surrounding this technology. This presentation highlights some critical difficulties and concerns that should be given more weight in future educational discourse on artificial intelligence. These include: (i) the limitations of statistical modeling and calculation for educational processes and practices; (ii) the ways in which AI technologies run the risk of sustaining social harms for students from minority backgrounds; (iii) the costs associated with rearranging education to make it more "machine readable"; and (iv) the environmental and ecological costs of data-intensive and device-intensive forms of AI. The paper's conclusion makes a case for slowing down and recalibrating the current discourse on artificial intelligence (AI) and education, with a focus on themes of power, resistance, and the potential to reimagine education AI along more egalitarian and beneficial lines for education.

Keywords: *damages, digital, education, automation, and artificial intelligence.*

1. INTRODUCTION

Artificial intelligence (AI) has garnered unprecedented levels of public and political attention in the last year, surpassing anything witnessed in the field's sixty-year history. A large portion of this has been fueled by investors seeking rapid returns, legislators eager to show that they are in favor of domestic innovation, and large tech companies rushing to keep up with more nimble niche start-ups. One effect of this uproar is that having rational, balanced conversations about the problems and societal ramifications of AI has become more challenging. The majority of US individuals, for instance, are now willing to acknowledge that "the rapid growth of artificial intelligence technology could put the future of humanity at risk" (Reuters, 2023).

The education sector has been experiencing its own form of AI fever, but one that does not correspond with the tremendous highs and lows of the broader public discourse surrounding AI. Perhaps the clearest example of this is how educators have responded to Chat-GPT and other "generative AI" writing programs that can generate pages of believable-sounding prose in response to brief textual cues. Initial reports of this specific type of AI at the start of 2023 caused a lot of people to worry about the possibility that students might use these tools to create fake written assignments. This led to a series of "bans" at universities and schools, hurried rewriting of assessment assignments, and an immediate rush of new AI countermeasures that promised to identify work produced by algorithms. From the outside, it appeared concerning how quickly the educational discussion surrounding Chat GPT got out of hand, with many otherwise reasonable observers drawing sweeping conclusions about the revolutionary implications of this technology. This paper advocates for more thoughtful

responses to the educational potential of artificial intelligence. Educators should reject the more extreme aspirations and worries that the idea of AI technology continues to arouse, even though they should not dismiss current breakthroughs around machine learning, large-language models, and the like. However, there is also a need for more in-depth examination of difficult problems and subjects that have so far tended to be ignored in AI education talks. This calls for a long-term, transparent debate that includes viewpoints that are not typically discussed in relation to digital innovation and the future of education. This calls for paying more attention to the perspectives and experiences of the groups most likely to lose out on, as well as least likely to benefit from, the unrestricted use of AI in education. This short study first lays forth some relevant beginning points from which these conversations can move forward seriously.

2. A FEW DEFINITIONAL BASICS REGARDING AI AND SCHOOLING

Perhaps it would be beneficial to start by describing the type and structure of the technology in question. Although it makes sense that many educators and students might think they have not used this technology yet, real-world uses for artificial intelligence in education are quickly taking shape. To model "business decisions" ranging from future school building priorities to teacher recruitment, government authorities and agencies, for instance, are starting to implement various forms of "automated education governance," where AI tools are used to process big data sets from entire school systems. On the other hand, some schools are starting to give AI a variety of responsibilities that were formerly assigned to instructors. These include chat bots that automate routine teacher-student exchanges, systems for online exam proctoring and automatic grading, and surveillance tools that determine whether or not a class is working diligently. Simultaneously, AI diagnostics and tools are routinely integrated into student support programs. This includes the use of artificial intelligence (AI) to drive search, natural language processing to offer automated writing assistance, and personalized learning systems to select online learning activities and content for various students based on their past performance. Interestingly, all of these applications—which may seem incredibly sophisticated when compared to educational technologies of the 2000s and 2010s—represent what is known as "narrow artificial intelligence." That is to say, these AI systems are made to handle a single, specific task (like grading essays or forecasting student behavior). These artificial intelligence technologies are honed by training data related to this particular field of study. They then function inside pre-established parameters to identify patterns in a constrained set of incoming data. Therefore, the types of AI that are currently being used in classrooms and schools are very different from the theoretical types that are frequently brought up in conversations about how "sentient" AI could eventually replace teachers, make schools obsolete, or even eliminate the need for people to learn things on their

own. Accordingly, a seemingly sentient AI tool like Chat GPT, for instance, is better understood as assembling and rearranging previously published text fragments from the internet in ways that are statistically likely to resemble more comprehensive previously published text. Like any other AI tool, generative AI is a non-human entity that has no greater ability to "know" or "understand" what it is doing than any other. A generative AI language tool has no "understanding" or "knowledge" of what its output might signify, even if it is producing seemingly believable reams of text. Rather, a huge language model can replicate human speech in the same way as a parrot can do so without considering meaning, but it will do so by employing complex probabilistic information about the way that text has previously been assembled by human authors (Bender et al., 2021). Therefore, these are, at most, statistical simulations—or, to put it another way, replications of human-written text—that lack any of the creativity, inspiration, or insight that went into creating the original source materials.

3. AI AND EDUCATION: A FEW ISSUES TO CONSIDER

Comprehending AI technology as a multifaceted statistical process that relies heavily on massive processing power and data analysis forces discussions on AI education to include some of the evident but seldom discussed drawbacks of this technology. Because of all of this, the use and results of any AI system are intrinsically constrained and very context-specific. It is worth considering further how this statistically-derived "brittleness" might be evident in educational AI, especially in light of the computer scientist Melanie Mitchell's (2019, n.p.) statement that "people have been trying to get machines to reason since the beginning of the field [...] but they are what people call 'brittle' - meaning you can easily make them make mistakes, and reason incorrectly." Furthermore, it is important to pay attention to how the statistical limitations of AI might conflict with educational contexts and goals. The fundamental ontological tenet of educational artificial intelligence is that every student's social environment can be statistically controlled and is broadly quantified. The notion that the social environment may be simplified, portrayed, and modeled in an abstract manner is crucial in this context. Put otherwise, this presupposition that every essential aspect of any given social situation can be represented, arranged, and made calculable is what Wajcman (2019) refers to as a "engineering" attitude. According to this viewpoint, a social system (like a classroom) may be easily modelled as a collection of factors that can be changed to get the highest level of effectiveness. For this reason, educational AI applications require the input of data about educational phenomena. This could be in the form of sensor-collected data from classrooms, data generated from students' use of devices and software, or pre-existing contextual data generated offline (such as demographic information, assessment results, and so forth). As a result, the majority of AI systems in use in colleges and universities today rely on a variety of "proxy" variables, or readily extracted data points that can be utilized in place of direct measurements of a given educational component. One possible indicator of a student's "engagement" with the material of an online educational video could be the amount of time they spend watching it. When substantial amounts of this kind of data are gathered and examined, computational models can be

created to predict potential outcomes for comparable future occurrences. The ability of these systems to adapt and "learn" from mismatches is crucial in this situation. All in all, the assignment of important educational decisions and actions to these statistical logics undoubtedly represents a radical shift in the supply, organization, and governance of education. Put simply, machine learning entails a computer developing a mathematical model on its own and improving it every time an error occurs. Concerns are mounting that this may not be the case, even while many seem ready to assume that the AI technologies just discussed can improve efficiency, accuracy, consistency, and standardization of results as compared to conventional human-centered approaches. These sections provide a quick overview of four such areas of ambiguity and resistance.

4. ISSUES WITH REDUCTION AND REPRESENTATION

The first is the degree to which education may be accurately modeled, data-driven, and portrayed. There is a compelling case to be made for the fact that a large number of fundamental elements of teaching and learning are not well represented in data. This is especially true when it comes to portraying and capturing the social circumstances of students or the intricacies of a classroom. The limitations of representativeness, reductiveness, and explain ability affect all data-driven processes, but they are particularly relevant when using AI to simulate "real world" problems that are present in social settings like schools. To borrow a metaphor from Murray Goulden (2018), in a real-world setting like a school, even the most "technologically smart" invention is probably "socially stupid." Maths functions magnificently on well-defined problems in well-defined contexts with well-defined parameters, according to Meredith Broussard (2019, p. 61). The antithesis of well-defined is school. As a result, no matter how advanced AI gets, attempts to statistically model the contextual layers that are implicit in any educational episode or moment will still produce crude computational approximations of the real-life complexities that are ostensibly being captured. Schools are among the most exquisitely complex systems that humans have ever built. This phenomenon was demonstrated by a Princeton University study that gave teams of statisticians, data scientists, and researchers studying AI and machine learning access to extensive data sets encompassing more than 4,000 households. Despite having access to an abundance of data spanning more than 15 years and approximately 13,000 data points per child, none of these expert teams were able to create statistical models that even somewhat predicted how children's life outcomes would relate to their school grades and skills. Karen Hao (2020, n.p.) noted at the time that "even with a ton of data, AI can't predict how a child's life will turn out."

5. THE NEGATIVE EFFECTS OF AI ON SOCIETY

Recent reports of "algorithmic discrimination" in education reflect this. Examples include automated grading systems that give higher grades to privileged students who match the profile of those who have traditionally received high grades, or voice recognition software that falsely accuses students of cheating on language exams when they have non-native accents

(NAO, 2019). "Quality-of-service harms," or situations in which AI systems routinely fall short of performing consistently and to the same standards regardless of a person's history or circumstances, are another cause for concern. This has already been demonstrated in situations where facial recognition software used in US schools frequently fails to identify students of color (Feathers, 2020) or in systems designed to identify artificial intelligence (AI)-generated writing that targets non-native English speakers unfairly because their work is more likely to be formulaic and use common words in predictable ways (Sample, 2023). What Shelby refers to as "representational harms"—that is, the ways in which AI systems rely on statistical categorizations of social characteristics and social phenomena that frequently do not split into neatly bounded categories—combine with the emergence of educational AI systems that are particularly concerning because they rely on processes that are inappropriate for disabled and neurodiverse students (Shew, 2020). Misrepresentations of students' identities, histories, and behaviors may result from this, which may support unfair hierarchies and socially formed notions about social groups. Concerns about AI technologies negatively affecting social relationships in educational settings—what Shelby refers to as "interpersonal harms"—also exist? Examples of these include the marketing of AI-driven "student activity monitoring systems," which enable teachers to monitor students' laptop usage at home, or the use of students' online activity by school administrators to create an algorithmic profile of students who may be considered "at risk" of failing a course. The underlying worry that even the most "benign" use of AI in a classroom or school setting are likely to intensify and solidify already-existing institutional forms of control permeates all of these cases. The foundational functions of monitoring, classifying, standardizing, synchronizing, and sorting are shared by AI technology and schools. All things considered, even while such discriminatory bugs may not have been intentional features of the design, AI technologies are showing a propensity to reproduce and reinforce oppressions that marginalized students are likely to experience on a regular basis throughout their academic careers. Accordingly, one of the most crucial discussions we ought to be having at this point regarding the integration of AI and education is about how AI has "a tendency to punch down," meaning that the disadvantaged are harmed as a result of its statistical fragility (McQuillan, 2022, p. 35).

6. ADAPTING INSTRUCTION TO AI'S REQUIREMENTS

The third issue is the worry that focusing on what can be recorded in data when interacting with students, instructors, classrooms, and schools suggests a number of essential reorganizations and rearrangements of education, or what could be called a recursive standardization, homogenization, and narrowing of education. This pertains to the subject of what AI technologies anticipate from the educational system (and, more specifically, from the educators themselves). Because "technological promises, if they succeed, end up making demands on the world," as Tennant and Stilgoe (2021, p. 846) remind us, there is already a greater need than ever to set up educational environments in "machine readable" ways that will generate data that AI technologies can recognize and capture. This is consistent with the phenomena known as "reverse

adaptation," which was first described by Langdon Winner in 1978. This means that most people are really quite eager to adjust their social environments to technologies, rather than expecting technology to adapt to them. One obvious worry in this regard is that teachers and students are starting to feel pressured to adopt new behaviours due to AI technologies. For instance, there are stories of students now needing to behave in a way that can be read by a machine; this could be referred to as "adjusting to the algorithm" (Høvsgaard, 2019). This could include that students write or speak in a way that computers can understand, or they could act in ways that generate data that an AI system can handle with ease. In a similar vein, educators may need to create "parseable pedagogies," or simply readily defined teaching strategies that produce results that can be entered into the system. The worry that educators and learners may wind up performing empty acts in an attempt to elicit suitable algorithmic answers is perhaps less evident. In order to meet their automated "empathy" metrics, call center employees have been observed, for instance, to repeatedly say "sorry" during interactions with callers (Christl, 2023). AI as environmental burden Lastly, the underlying concern is that the data-intensive and device-intensive forms of AI currently being adopted in education incur unsustainable ecological and environmental costs. For instance, the MIT Technology Review stated in 2019 that it was projected that the carbon emissions from training a single AI model exceeded 626,000 pounds of carbon dioxide, or the emissions from 62 passenger cars driven by gasoline for a whole year. Similarly, it is projected that 500 cc of water are used during a "conversation" using Chat GPT that consists of 20 to 50 prompts (Li et al., 2023). It is therefore starting to be argued that educators need to temper any enthusiasm for the increased uptake of AI with the growing environmental and ecological harms associated with the production, consumption, and disposal of digital technologies. In this sense, AI should not be seen as an immaterial, other-worldly technology – somehow weightless, ephemeral, and wholly 'in the cloud.' In reality, AI is reliant on a chain of extractive processes that are resource-intensive and have negative planetary consequences. To put it briefly, the increasing use of AI technologies in education has a significant negative impact on the environment. It is linked to the loss of rare minerals and metals needed to produce digital technologies, the enormous energy and water consumption needed to support data processing and storage, and the rapidly rising levels of pollution and toxic waste that result from disposing of digital technology (see Brevini, 2021). Considering everything mentioned above, any enthusiasm for using AI in education more must take into account the growing concerns among environmentally conscious observers that it might not be desirable (or even possible) to justify the development and use of AI technologies in the medium to long term. On the one hand, this means that those who support educational AI must investigate how using AI in schools and colleges going forward could be consistent with "green-tech" ideas and even help foster eco-growth. Thus, investigating the degree to which educational AI may be focused on cutting-edge advancements in fields like "carbon-responsive computing" and "green" machine learning is undoubtedly necessary. This entails, for instance, pushing past "brute force" computational methodologies and creating various AI models based on limited datasets and sophisticated processing methods (Nafus et al., 2021). But, we also

need to seriously examine the argument that AI is ultimately an unredeemable addition to education and should be categorically rejected. There are compelling arguments being made that attempts to promote "greener" digital technologies that are carbon neutral and "cleaner" renewable energy sources cannot make up for the ecological and environmental harms caused by the usage of AI. Because of this, educators would be well to consider the idea that the majority, if not all, of AI technologies "are intrinsically incompatible with a habitable earth" (Crary, 2022, n.p.). In light of the current climate catastrophe and environmental degradation, it would be counterproductive to keep pushing for a reframe of education in relation to these technologies. Therefore, seen from this angle, artificial intelligence is nothing more than a hazardous diversion from far more serious and urgent global problems.

7. EDUCATION AND AI: SOME FUTURE DIRECTIONS

Educators' primary task going forward is to stay out of the significant hype around artificial intelligence in the coming months and maybe years. The rise of AI is already evoking a well-known reaction that has frequently followed educational talks about earlier "new" technology throughout the course of the previous forty years or so. The sudden emergence of "common-sense" arguments, to put it briefly, has involved the following: (i) more AI tools will inevitably find their way into classrooms; (ii) teachers must quickly up skill (become "AI literate") in order to make the best use of these technologies; and (iii) we must seriously reconsider how traditional educational forms and practices might need to change and adapt to the affordances of AI. Put simply, educators are in a position where they have limited influence over the type, rate, and course of this technological revolution. Teachers are positioned as being behind the times, with current schooling and school forms being seen as obstacles and restrictions to the seamless use of technology. The underlying reasoning behind this is straightforward: education must adapt swiftly to "catch up" with this seismic technological shift, which has the potential to drastically alter every aspect of education and education itself. In contrast, this paper aims to reframe the imperatives of artificial intelligence and education in a significantly different way. Above all, it has emphasized how important it is for educators to take charge of the discussions and actively influence the agendas that are developing around the potential implications of artificial intelligence (AI) for education and how, if at all, it might be used in the classroom of the future. This entails actively participating in the discussions and arguments that are currently taking place on AI and education, which are primarily being led by voices that have little to no experience directly related to teaching or learning. Experts in education require greater courage to stand up and take the lead in these discussions. The precise definition of "added-value" that AI technology can be deemed to deliver is one hot topic of debate. Here, educators have a crucial role to play in refuting nebulous claims that AI will drastically reduce teacher workloads or serve as a "one-to-one tutor for the world." Perhaps more immediately, educators have a crucial role to play in highlighting the limited results that come from limited educational AI technologies. Therefore, education communities should be looking to play a major role in collectively counterbalancing the hyperbole that has

engulfed recent debates around AI and education. At the same time, it is also important for educators to speak out about the other forms of AI technology that we might collectively believe are capable of being of genuine education benefit. This means opposing the ideas of the IT industry about the best ways to restructure and/or deconstruct education, as well as the concomitant ceding of public education interests to the political and economic forces that persist in pushing artificial intelligence (AI) into the classroom. This calls for highlighting the drawbacks and negative effects that are currently being recognized as major facets of education depend more and more on AI technologies. These range from worries about algorithmic discrimination and administrative violence motivated by AI to lower-than-expected quality educational support and services. Above all, this calls for changing the way that artificial intelligence (AI) is portrayed in education from that of a technical item to that of a system that is intertwined with the complex reality of political, economic, and educational systems, among other social systems. In light of these explanations, rebuttals, and criticisms, educators should also discuss potential alternatives to AI that would be more appropriate for the classroom—that is, methods in which AI might actually be helpful in meeting educational needs. As explained by Nick Couldry, criticizing the recent shift in AI does not always mean that AI technology is being rejected completely: we do not oppose the application of AI tools to solve particular issues within well-defined boundaries that are established and overseen by real social communities. We are against the expansionist discourse and tactics that present AI as the panacea for all problems. In light of this, the education community must now start figuring out how to create a new wave of conversations about AI in education that are framed in ways that are more egalitarian, emancipator, or maybe just kinder than the brut(ish) forms of corporate algorithmic control that are currently available (Couldry, 2023, n.p.). In fact, there are a few emerging instances of how this could be accomplished.

8. CONCLUSION

All things considered, this study has started to lay out the argument for refocusing, slowing down, and readjusting the current discourse on artificial intelligence and education. Even while it might not seem like an easy endeavor, it is obvious that the present discussions about AI and education are urgent yet ultimately pointless. It makes sense for educators to strive to detach themselves from the seeming demands of AI-driven educational "transformation," and instead focus on slowing down and incorporating a nuanced and reflective element into conversations about AI and education. We should work to create public discourse formats that address the social and technological complexity of artificial intelligence (AI) instead of resorting to overly simplified stereotypes and anxieties. It also behoves us to pay more attention to "the oppressive use of AI technology against vulnerable groups in society" (Birhane & Van Dijk, 2020, n.p.), given the obvious injustices and inequities already resulting from AI technologies. Furthermore, every issue brought up in this study points to a central topic of power: the decision of which AI tools are used in the classroom will unavoidably have a significant impact on what transpires there. According to Dan McQuillan (2023, n.p.), AI is an intervention that aids in creating the reality it purports to represent rather than a means of

describing it. In one way or another, setting it up modifies what becomes problematized and what becomes naturalized. The essential question of power becomes who gets to set up the AI. In light of this, it would seem imperative that educators and the larger education community participate more in discussions and decision-making on who gets to "set up" AI and education. Education and AI's future are not set in stone, and we must not only adjust to it. Rather, there is undoubtedly room to reject and rethink the introduction of AI into education.

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Importance and Possibilities of Artificial Intelligence in Education

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ABSTRACT

In India, Artificial intelligence, it is said to have started in 1950. Artificial intelligence means intelligence created by humans. Man created a machine that could work like him and help him in his work. The main difference between humans and artificial intelligence (robots) is that the human works according to his own discretion and the robot works according to the human. Artificial intelligence is a computer-controlled robot, which works with the help of specially developed software. It uses machine learning. Today, courses related to Applied Artificial Intelligence as well as Robotics and Automation Engineering etc. are being started in universities. Today, efforts are being made to bring significant changes in the traditional methods through Artificial Intelligence in education. Whether we talk about teaching methods in education today or the universal development of students and institutions, new dimensions of learning are being created by using Artificial Intelligence. Man invents new machines according to his needs. In the same direction, to make our work easier, simpler and easier, a computer-controlled robot has been created. It has the ability to think, understand and act like a human being. Today, experiments are being done on it by most of the countries all over the world. The use of artificial intelligence in India is still in its infancy. Studies are being conducted on this in different areas of the country. Strategic plans are being prepared on this in India. In the National Education Policy 2020, emphasis has been given on the study of Artificial Intelligence and its use in the teaching process, especially along with the development of digital education. The coming time will be of Artificial Intelligence i.e. machines, which will provide intensity and efficiency in human work. For this, it is necessary that the government should also make policies and rules regarding human interest, keeping in mind its benefits and disadvantages. Artificial Intelligence will bring changes in education along with other sectors. This will bring changes in the methods of teaching and will also bring revolutionary changes in technologies like virtual reality. Artificial intelligence, machines that are instruction-oriented and can perform tasks automatically without human intervention. The use of artificial intelligence in education and learning and other sectors helps in improving services, enabling them, improving analytics, accuracy, data analysis and automating management. Certainly, human capabilities can be enhanced through the use of artificial intelligence. Through this system man can continuously improve his abilities. It can even play an important role in space exploration. But its excessive use and dependence can prove dangerous for human life because it is yet certain that it cannot be equal to human intelligence.

Key words: Artificial intelligence, Education system, National Education policy 2020

1. INTRODUCTION

The role of Artificial Intelligence is increasing in every field. There have been many changes in the field of

education in India after the coronavirus pandemic. Everyone including students and teachers have strengthened their trust in technology. Artificial Intelligence technology has the power to optimize both learning and teaching. Artificial Intelligence technology paves the way for the development of the education sector. Artificial Intelligence technology will strengthen the teaching-training system in the future. Much of the work in the educational process is done manually, but with the help of Artificial Intelligence technology, routine tasks like grading, evaluation, admission, progress reports and organizing resources for lectures will be done easily.

2. ROLL IN EDUCATION

It will help in developing the skills of teachers and students. Artificial Intelligence technology can ensure that education is personalized to individuals. Artificial Intelligence technology can not only meet the needs of each student, but also address the specific subjects the student is weak in. This will create a unique and tailored learning path for each student. Artificial Intelligence technology will help in creating smart content. This will benefit all students, including those with special needs. Artificial Intelligence technology can break down the barriers that prevent students from progressing. Teacher Training Teachers must constantly update their skills to be able to effectively impart knowledge to students. Artificial Intelligence technology will help teachers to keep themselves updated on things which they did not know. With this, they will have a more in-depth and broader knowledge base to teach the new generation. Learner Support and Tuition Students can solve their questions at their own pace and without waiting for teachers. Whereas Artificial Intelligence technology can help students improve their weak areas. With the help of Artificial Intelligence technology, teachers can deliver their experiences more effectively. Artificial Intelligence technology can not only help academics and educational boards in designing the curriculum but it can also help in getting instant feedback about the success of the curriculum. Artificial Intelligence technology systems can be used in schools, especially for online monitoring and to alert teachers if there is a problem with student performance. When one thinks of the role of Artificial Intelligence in education, smart content always comes to mind. Smart content is personalized and can be dynamically updated according to demographic, contextual and behavioral data. Artificial Intelligence technology is bringing a big change in our daily life as well as in various fields. Artificial intelligence is a branch of computer science whose job is to create intelligent machines.

3. GOVT. POLICY

Recently, government think tank NITI Aayog and Google have agreed to work together with the aim of promoting India's emerging Artificial Intelligence (AI) and Machine Learning (ML) ecosystem. We will work together on several initiatives, which will help in building an ecosystem of Artificial Intelligence in the

country. NITI Aayog has been entrusted with the responsibility of formulating a national program for developing and researching technologies like AI. On this responsibility, NITI Aayog is developing a National Action Policy on Artificial Intelligence along with National Data and Analytics Portal, so that it can be used widely. When Asia's biggest Tech Fest-2017 was organized in Mumbai, Robot Sophia also appeared in its Talkfest. Sophia adopted the Indian style in this program and was wearing a white and orange saree in Indian attire. Sophia greeted the people present there by saying 'Namaste India, I am Sophia'. Three thousand people at Tech Fest-2017 were curious about how Sophia talks and answers questions. Sophia answered all the questions very cleverly and effectively. Sophia spoke in Hindi to the people present there. Artificial intelligence is used for computer programs that try to solve problems that humans can easily do, such as describing a photo by looking at it. For this, many algorithms etc. have to be developed so that computers can learn to make better estimates.

4. STUDY OF LITERATURE REVIEW

AIEd faces the essential problems in the general education field, e.g., how to meet learners' needs, what to provide to the learners and when, and how to empower learners to take agency for their own learning.

Du Boulay,(2000). Although AIEd integrates advanced computing and information processing techniques in education, it does not guarantee the good educational outcomes and high quality of learning.

Castañeda & Selwyn, (2018) and Selwyn, (2016). The use of technology should be tightly connected with educational and learning theory to inform instructional design and technological development.

Bower, (2019). A series of systematic reviews have been conducted by different research teams to point out the common problem in AIEd, i.e., the lack of connection between AI techniques and theoretical underpinnings, which in turn critically influence the effect of implementations of AI in education. For example, after reviewing 146 articles of research on AI applications in higher education.

Zawacki-Richter et al. (2019) concluded that there was a lack of critical reflection of theoretical, pedagogical, and ethical implications with the implementation of AI applications in higher education.

Chen, Xie, Zou, and Hwang (2020) conducted a systematic review of 45 influential AIEd studies and summarized that only several studies used learning theories to ground AIEd research, including the situated learning theory, collaborative learning theory, and adapting learning theory.

Deeva et al. (2021) conducted a review of 109 articles on automated feedback systems and concluded that the applied learning theories or educational frameworks had not been reported in most cases, even though the theories played an important role in understanding the context in which a system was implemented. Since the distinct classes of educational technologies generally imply different pedagogical perspectives, it is essential to examine the different roles of AI technologies in education by considering the existing educational and learning theories

Hwang et al., (2020). As a consequence, this position paper summarizes the major paradigms with the descriptions of relevant theoretical foundations, conceptual research, and practical implementations, and offers a reference framework for future AIEd practice, research, and development. For much of the last 25 years, the Artificial Intelligence in Education (AIEd) community has been focusing, to a large degree, on solving the two-sigma problem by creating systems that are as effective as human one-on-one tutoring

Over the years, we have made many significant advances towards that goal. To use Ford's analogy from the quote above, we have become very good at building "faster classrooms". Indeed, many interactive learning environment (ILE) papers show improvements in efficiency by demonstrating similar learning gains in a reduced amount of time (cf. Cen et al., 2007).

By making the human tutor our gold standard, a typical use-case has often been that of one student working with a computer in a math or science classroom to solve step-based problems focused on domain-level knowledge (cf. VanLehn, 2006).

However, this use-case fails to account for many recent developments in practices and theories of education. The introduction of 21st century skills (Trilling & Fadel, 2009) and Next Generation Science Standards (NGSS, 2013) have highlighted the importance of more general learning skills and competencies such as met cognition, critical thinking, and collaboration. Subsequently, today's educational environments and theories strive to incorporate authentic practices using big problems in collaborative settings. To maintain its relevance and increase its impact, the field of AIEd has to adapt to these changes. These transitions in education are also an opportunity: current educational theories advocate for more agency and personalization (Collins & Halverson, 2010).

However, many existing classroom structures are inapt for engaging students in "big" problems (Kirschner et al., 2006; Tobias & Duffy, 2009) or for offering students choice (Collins & Halverson, 2010).

5. CONCLUSION

Artificial Intelligence will drastically change the way we live and work. Technologies like robotics and virtual reality will see revolutionary changes in the methods of production and construction. According to a study by Oxford University, 1.5 lakh jobs will be lost in the next two decades in America alone. We can deal with the challenges posed by employment in the world of Artificial Intelligence, but it will be difficult to avoid the biggest threat. Therefore, it is clear that there are as many dangers as there are benefits from machines with artificial intelligence. Experts say that if thinking robots start considering humans as their enemies for some reason or circumstance, then it can pose a threat to humanity. All machines and weapons can revolt. Such a situation has been imagined in Hollywood films like 'Terminator'. We have learned to use fire and electricity for the benefit of humanity, but it is important to overcome its bad aspects. Similarly, Artificial Intelligence is also a similar technology and it can also be used in the treatment of cancer or to overcome the problems related to climate change. The creation of Artificial Intelligence is one of the biggest events in the history of our civilization. But the truth is also that if a way is not found to avoid its risks, it can have serious

consequences, because despite all the benefits, Artificial Intelligence has its own dangers. Overall, the rise of a powerful artificial intelligence can be both beneficial and harmful for us. At present we do not know what its form will be in the future, that is why more research is needed in this context.

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