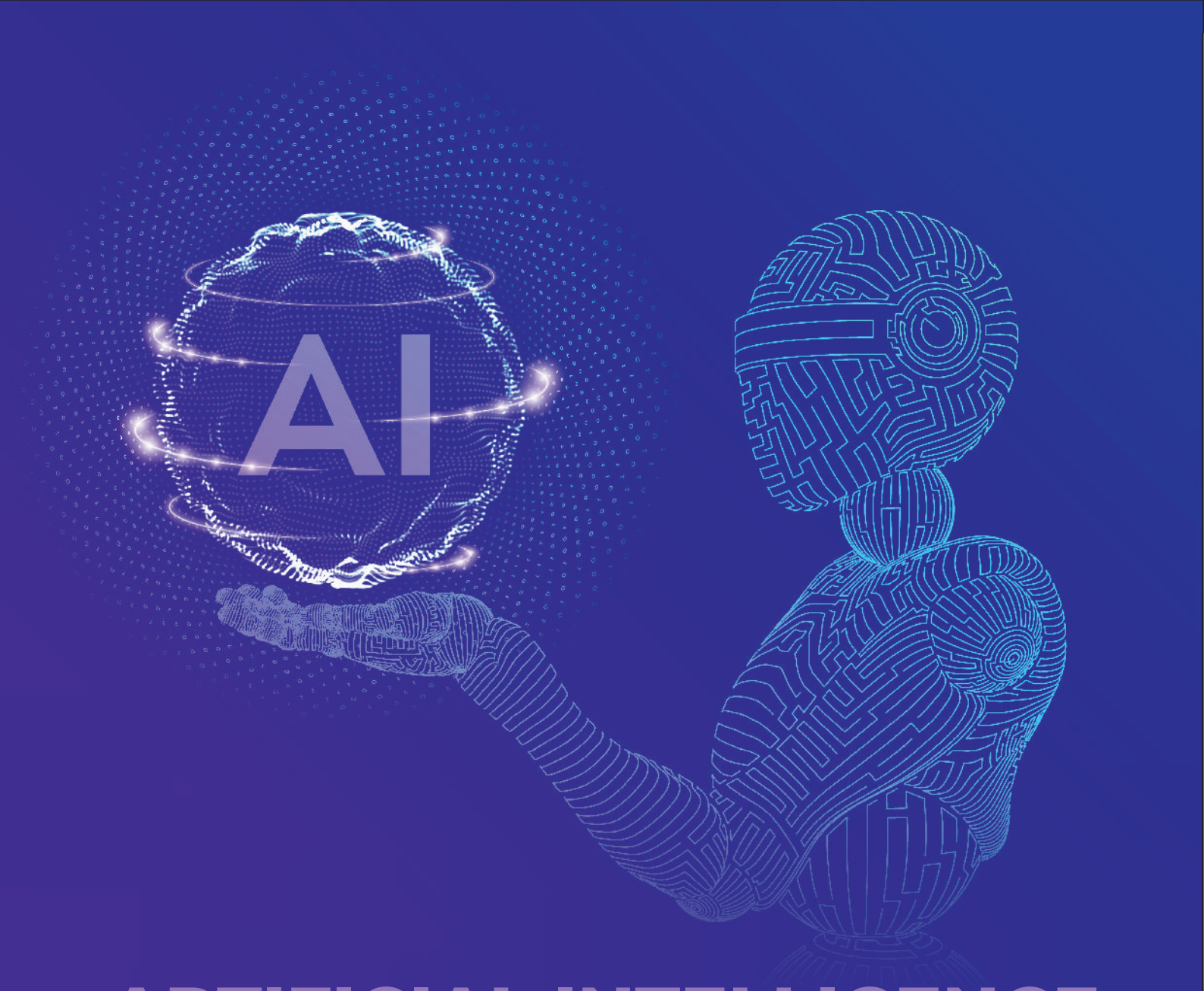

ARTIFICIAL INTELLIGENCE & MACHINES

Editors
Dr. Ajay D. Shinde
Mr. R. T. Thorat

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DEDICATION

This book is dedicated to Late Dr.A.D.Shinde renowned Chartered Accountant, Former Dean of Commerce Faculty, Shivaji University, Kolhapur, India, Founder Director of CSIBER, Kolhapur, India.

PREFACE

It gives us great pleasure to introduce this collection of papers presented at the 2022 International Conference on "The future global business and technology (challenges ahead)", December, 8-10 2022, at Chhatrapati Shahu Institute of Business Education and Research (CSIBER), Kolhapur, Maharashtra, India. Instead of publishing it as conference proceedings, it is decided to publish as a book with ISBN.

The important objective of the conference was providing a unique platform for a diverse community of constituents composed of scholars, researchers, developers, educators, and practitioners. The CSIBER has made sincere efforts to reach out to participants affiliated with diverse entities (such as: universities, institutions, corporations, government agencies) from all over the world. The CSIBER made rigorous efforts to connect participants from institutions that have teaching as their main mission with those who are affiliated with institutions that have research as their main mission. We are proud to report that this International Conference has authors and participants from 6 different nations representing variety of personal and scientific experiences that arise from differences in culture and values. The response for conference was overwhelming we received more the hundred research papers and articles out of which eighty were selected for presentation in 4 tracks in the conference.

The papers published in this book are mainly on Artificial Intelligence and Machine Learning, couple of papers are on networking and mobile technology. Most of the research ideas presented in the book are implemented using various technologies and authors have published the results of it. The book will be useful for the young researchers to ignite new ideas for research.

The program committee is thankful to all those who submitted papers for consideration. Each submitted paper was peer-reviewed by two experts in the field for originality, significance, clarity, impact, and soundness. In addition, papers whose authors included a member of the conference program committee were evaluated using the external referee. A couple of the papers from different tracks were selected for publication in the research Journal "South Asian Journal for Management and Research" (SAJMAR), and as it was not possible to include all papers in the journal rest of the papers are published in this book.

We are very grateful to the many colleagues who offered their services in organizing the conference. We would like to extend our appreciation to the members of the program committees of individual sessions, tracks, hospitality and stage; their names do not appear in this document but their contribution needs to be

mentioned. We express our gratitude to keynote, invited, and individual conference / tracks and tutorial speaker.

We present the proceedings of International Conference on “The future global business and technology (challenges ahead)” in the form of Book entitled “Artificial Intelligence & Machines”.

Dr.Ajay D. Shinde

Mr.R.T.Thorat

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RANDOM FOREST MODELLING FOR EDUCATIONAL DATA MINING

R.S.Kamath	P.G.Naik	S.S.Jamsandekar	M.B.Patil
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ABSTRACT : Educational data mining is an emerging field concerned with developing techniques that find out knowledge from data initiated from educational environments. It is a promising discipline, concerned with developing techniques for exploring the exclusive types of data that come from educational settings and making use of this useful information for the growth ofeducational institutes. It helps in providing stakeholders with deep insights into the learning process as a value-added to the learner environment. This chapter demonstrates Random Forest modelling for the prediction of students' performance. Training the model on the performance dataset of students is accomplished by adjusting the number of trees in the forest. Predicted versus actual values are used to compare the model's performance. The study concluded the aptness of Random Forest modelling for the prediction of students' performance. Early prediction helps in taking various measures for improving students' performance. The early prediction makes it easier to take various steps to boost students' performance.

Keywords **:** Random forest, Data mining, Machine learning

Introduction :

The growing use of technology in education is producing a lot of data every day, which has made many researchers all over the world interested in it. New algorithms and methods developed in various data mining and machine learning fields are present in the educational data mining field, which is expanding rapidly. Data mining in education (EDM) is assisting in the development of methods for the extraction of interesting, interpretable, useful, and novel information. This can lead to a better understanding of students and the learning environments they inhabit. Educational data mining (EDM) is the emerging field concern with developing techniques that find out knowledge from data initiated from educational environments (Kamath & Kamat, 2016). It is a promising discipline, concerned with developing techniques for exploring the exclusive types of data that come from educational settings and making use of this useful information for the growth of educational institutes. In this context, this researchportrays random forest (RF) modelling for the prediction of students' performance as an EDM technique. The student performance dataset from the UCI repository is used for the present study (Cortez & Silva, 2008). RF is a collection of unpruned decision trees. The random

forest classifier is designed by tuning the number of trees in the forest. The performance of the model is evaluated regarding predicted versus actual values.

Research Background :

EDM's primary objective is to extract useful information from educational data, such as student records, usage data, outdated tuition, and LMS systems. The educational system's teaching and learning process may be enhanced by the extracted knowledge. One of the papers by Algarni reported the most relevant studies in the field of EDM, including the data and methods used in some of the studies (Algarni, 2016). Algur et al have carried out a data mining experiment on MBA and MCA admission data for the academic year 2014-15 of Rani Channamma University (Algur et al, 2016). The authors have used various classifiers for the analysis of the data collected. A case study on students in four government schools in the Vellore district of Tamil Nadu demonstrates how educational data mining can be used to predict students' weka apparatus performance (Gowri et al, 2017). The authors have used the Apriori algorithm and K-means clustering for the analysis. The Apriori algorithm works by mining the rules to find patterns that are similar to one another and their connections to different sets of records. The K-means method is linked to a similar set of databases with the specific goal of efficiently placing students into a particular category.

The book on Educational Data Mining presents research entitled “Miningof Educational Data for the Analysis and Prediction of Students’ Academic Performance” carried out by the authors (Kamath & Kamat, 2016). The outcome of the research, as presented in this book emphaticallypresents that, Educational Data Mining is a rising order, worried with creatingtechniques for investigating the extraordinary sorts of data that originatefrom instructive settings, and utilizing those strategies to better comprehendunderstudies, and the settings in which they learn.

Against the backdrop of the research portrayed here, this paper reports random forest (RF) modelling for the prediction of students' performance as an EDM technique. Students' performance dataset for the present study is retrieved from the UCI machine learning repository (Cortez & Silva, 2008). This data was collected by using school reports and questionnaires. There are 649 instances reporting students' achievement in secondary education in two Portuguese schools. The dataset is composed of 33 attributes connected to grade, demographic, social, and school-related features. RF is a collection of unpruned decision trees. The random forest classifier is designed by tuning the number of trees in the forest. The importance of predictors is measured by considering "%IncMSE” and “IncNodePurity". The performance of the model is evaluated regarding predicted versus actual values.

Exploratory Data Analysis :

Some interesting insights are discovered in the dataset. Figure 1 shows the distribution of gender by opinion for pursuing higher education. Maximum students are interested in higher education where gender is not an issue here. Figure 2 shows the distribution of schools by reason to choose that school. Students have opted for their corresponding school mainly because of course preference.

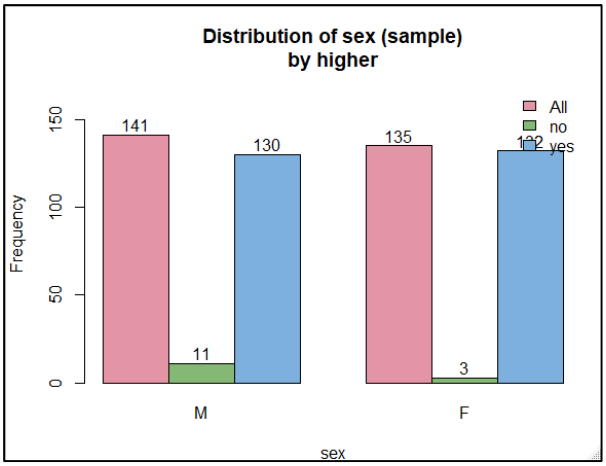

Figure 1. Distribution of Gender

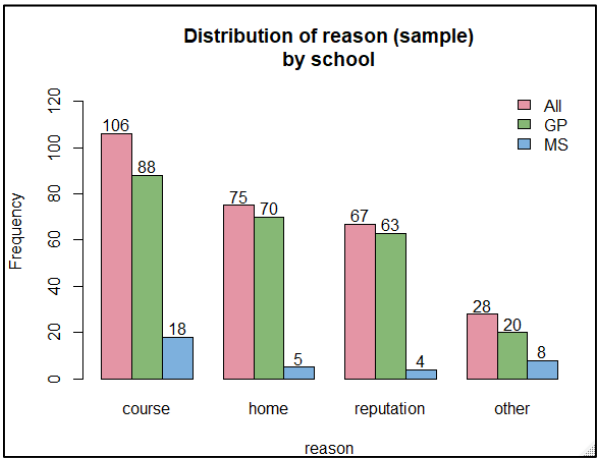

Figure 2. Distribution of selecting the school

As there are 33 variables it is required to select variables that play the most important roles. Random Forest technique is applied to find the relative importance of variables (Williams, 2011). The parameters “%IncMSE” and “IncNodePurity" measure variable importance. The variables are listed in their variable importance value in Figure 3. The response variable G3 has a strong correlation with predictors

G1 and G2. This is because G3 is the final year grade while G1 and G2 correspond to the 1st and 2nd-period grades. We have chosen 18 different variables as predictors of 7 categorical variables and 11 numerical variables. Grade G3 is considered a response variable for the construction of the model. Figure 4 gives a basic statistical summary of the pre-processed dataset.

	%IncMSE	IncNodePurity		%IncMSE	IncNodePurity
G2	30.09	1081.36	famsize	1.48	11.66
G1	24.61	761.17	Medu	1.26	37.73
absences	16.40	208.65	paid	1.18	22.57
failures	8.46	121.41	reason	1.17	49.37
age	5.37	71.67	activities	1.10	15.65
guardian	5.26	47.57	famsup	0.90	11.44
higher	4.11	27.76	studytime	0.65	47.31
Mjob	3.57	74.56	address	0.39	9.58
internet	3.11	15.15	nursery	0.16	11.75
schoolsup	2.92	14.54	romantic	0.15	21.15
health	2.87	36.66	Fjob	0.12	53.85
Walc	2.62	41.99	freetime	0.07	31.48
Dalc	2.39	15.68	sex	-0.02	16.90
goout	1.96	46.51	Fedu	-0.62	34.84
school	1.62	11.08	traveltime	-1.07	30.00
famrel	1.51	41.17	Pstatus	-1.42	7.53

Figure 3. Variable importance measures of Students' performance dataset

```
school       age          famsize       Medu            Mjob        guardian     failures
GP:241   Min.   :15.0   GT3:199   Min.   :0.000   at_home : 42   father: 68   Min.   :0.0000
MS: 35   1st Qu.:16.0   LE3: 77   1st Qu.:2.000   health  : 24   mother:184   1st Qu.:0.0000
         Median :17.0             Median :3.000   other   :101   other : 24   Median :0.0000
         Mean   :16.7             Mean   :2.764   services: 64                Mean   :0.3152
         3rd Qu.:18.0             3rd Qu.:4.000   teacher : 45                3rd Qu.:0.0000
         Max.   :22.0             Max.   :4.000                               Max.   :3.0000
schoolsup higher    internet      famrel          goout           Dalc            Walc
no :244   no : 14   no : 47   Min.   :1.000   Min.   :1.000   Min.   :1.000   Min.   :1.000
yes: 32   yes:262   yes:229   1st Qu.:4.000   1st Qu.:2.000   1st Qu.:1.000   1st Qu.:1.000
                              Median :4.000   Median :3.000   Median :1.000   Median :2.000
                              Mean   :3.982   Mean   :3.065   Mean   :1.511   Mean   :2.286
                              3rd Qu.:5.000   3rd Qu.:4.000   3rd Qu.:2.000   3rd Qu.:3.000
                              Max.   :5.000   Max.   :5.000   Max.   :5.000   Max.   :5.000
    health         absences            G1              G2              G3
Min.   :1.000   Min.   : 0.000   Min.   : 4.00   Min.   : 0.00   Min.   : 0.00
1st Qu.:3.000   1st Qu.: 0.000   1st Qu.: 8.00   1st Qu.: 9.00   1st Qu.: 9.00
Median :4.000   Median : 4.000   Median :11.00   Median :11.00   Median :11.00
Mean   :3.638   Mean   : 5.663   Mean   :11.13   Mean   :10.96   Mean   :10.74
3rd Qu.:5.000   3rd Qu.: 8.000   3rd Qu.:14.00   3rd Qu.:13.00   3rd Qu.:14.00
Max.   :5.000   Max.   :75.000   Max.   :19.00   Max.   :19.00   Max.   :19.00
```

Figure 4. Basic statistical summary

The Kurtosis for the numerical variables of the dataset is given in Table 1. This is useful for comparing all numerical variables at once. A larger value means sharper peaks and flatter tails. The pairwise correlation between each numeric variable is plotted in figure 5. Positive correlations are displayed in blue and negative

correlations in red colour. The colour intensity and the size of the circle are proportional to the correlation coefficients.

Table 1: Kurtosis for a numerical variable

Variable	Kurtosis	Variable	Kurtosis
age	0.1502606	Walc	-0.7807410
Medu	-1.1092547	health	-0.9449312
failures	5.3149634	absences	23.6967637
famrel	0.8816100	G1	-0.7856114
goout	-0.8037374	G2	0.9035215
Dalc	3.8838185	G3	0.7163464

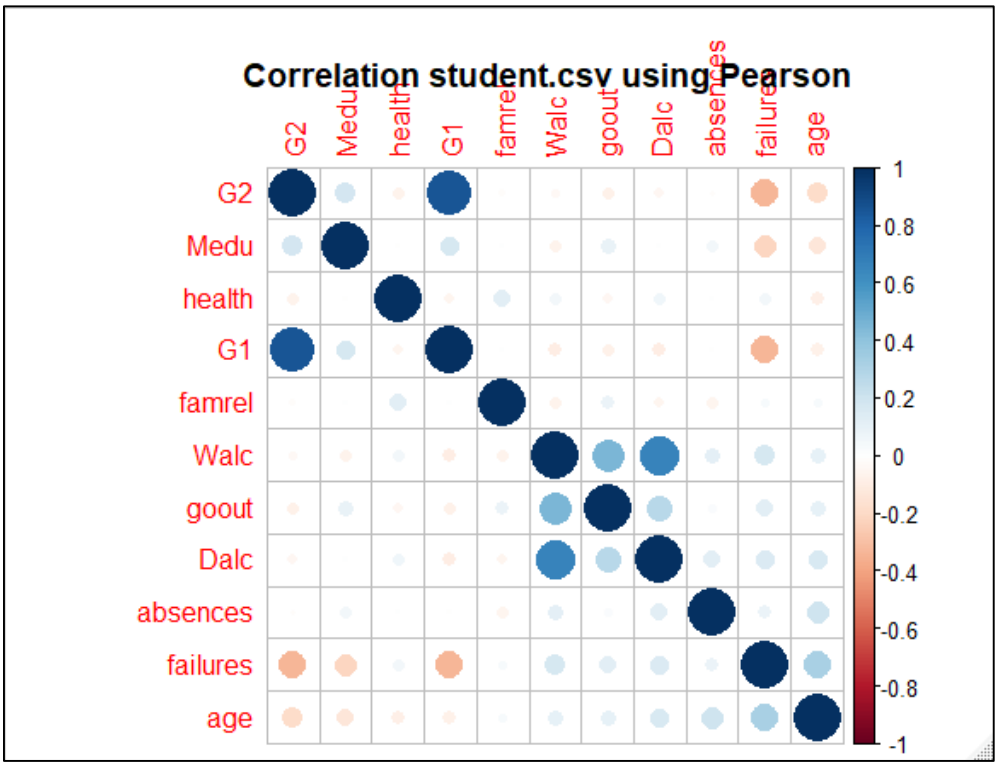

Figure 5. Correlation Plot

Random Forest Modelling :

RF is a resourceful machine-learning method proficient in performing regression, classification, dimension reduction, and other machine-learning tasks (Leo, 2001).

It is a type of ensemble learning method, where a group of weak models combines to form a powerful model. R and Rattle are used to analyse model structure, number of trees in the forest, and importance measures of variables for partitioning the dataset. The package "*random forest"* is used for the present investigation.

The reported investigation depicts the optimum random forest architecture achieved by tuning the number of trees of the RF model (Kamath & Kamat, 2016). The training dataset is used for parameter adjustment and validation set to control the process. RF builds many decision trees using a random subset of data and variables (Andy and Mathew, 2011). Figure 6 shows an error plot that represents the error rate progressively for the number of trees built. This helps in deciding the optimum number of trees to build while building the RF model. It has decided to continue modelling with 200 trees in the forest with 4 partitioning variables (Kamath et al, 2016). The textual representation of the corresponding model is given in figure 7. Here 276 observations are used to build the model.

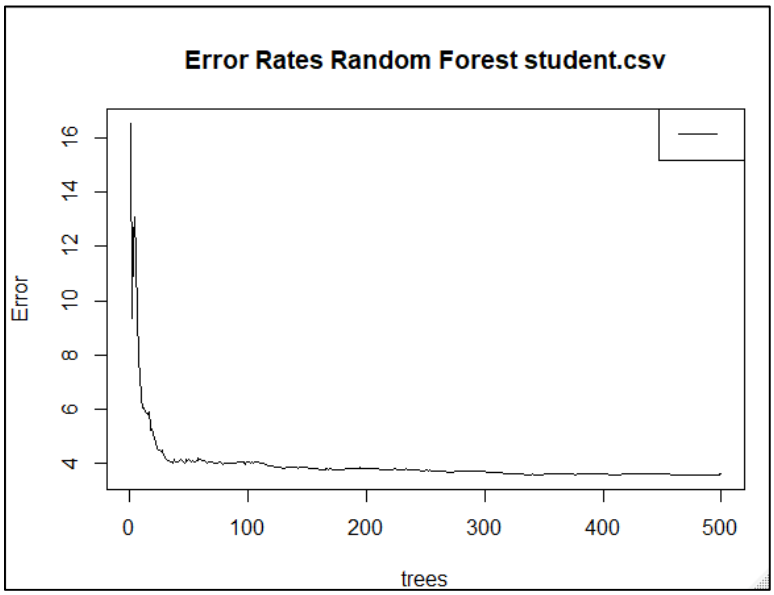

Figure 6. The error rate for the number of trees built

```
Summary of the Random Forest Model
==================================

Number of observations used to build the model: 276
Missing value imputation is active.

Call:
 randomForest(formula = G3 ~ .,
              data = crs$dataset[crs$train, c(crs$input, crs$target)],
              ntree = 200, mtry = 4, importance = TRUE, replace = FALSE, na.action = randomForest::na.roughfix)

               Type of random forest: regression
                     Number of trees: 200
No. of variables tried at each split: 4

          Mean of squared residuals: 3.797412
                    % Var explained: 80.62
```

Figure 7. Random forest model for Students' performance prediction

The performance of the model is evaluated regarding predicted versus actual values of the test dataset is shown in figure 8. The value of the Pseudo R-squared is 0.8852 which is near 1 indicating the model better predicts the target. Thus derived RF model predicted students' performance i.e. G3 for the test dataset with less error.

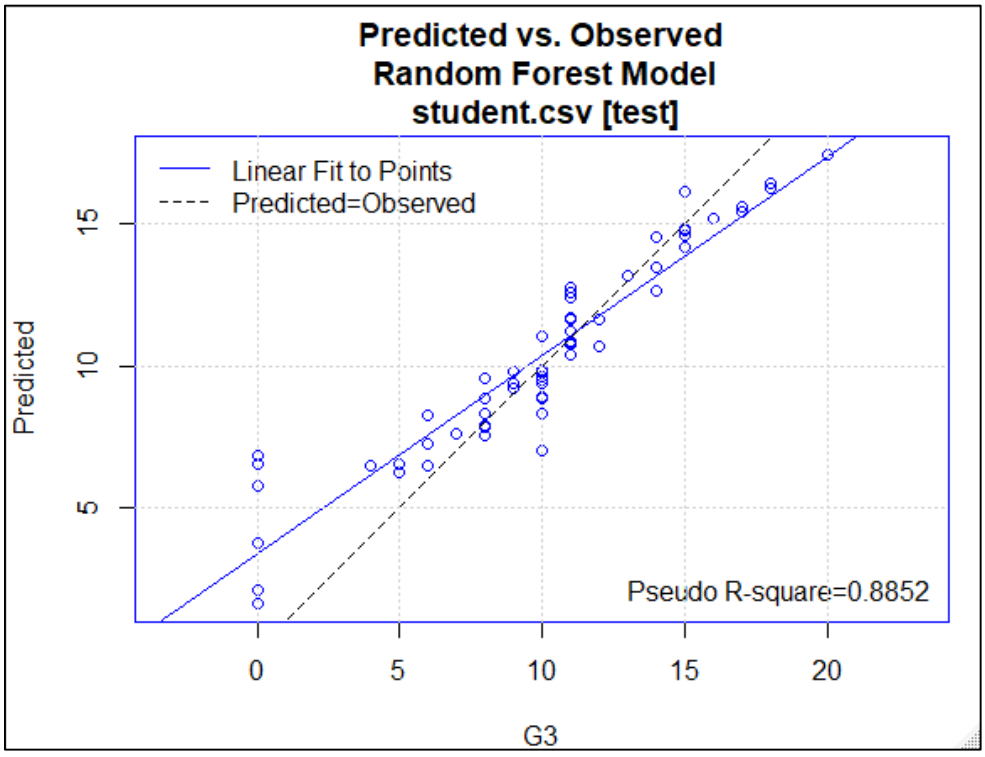

Figure 8. RF model performance

Conclusion :

Educational Data Mining helps in providing stakeholders with deep insights into the learning process as a value-added to the learner environment. In this context, this chapter illustrated RF modelling for the prediction of students' performance. The model is designed by tuning the number of trees in the forest thus training the model on students' performance dataset. The performance of the model is evaluated regarding predicted versus actual values. The study concluded the aptness of RF modelling for the prediction of students' performance. Early prediction helps in taking various measures for improving students' performance.

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Appendix: Student Performance Data Set retrieved from UCI Machine Learning Repository

sex	age	address	famsize	Pstatu	Medu	Fedu	Mjob	Fjob	reason	guardian	travelt	studyt	failure	schoolsup	famsup
F	18	U	GT3	A	4	4	at_home	teacher	course	mother	2	2	0	yes	no
F	17	U	GT3	T	1	1	at_home	other	course	father	1	2	0	no	yes
F	15	U	LE3	T	1	1	at_home	other	other	mother	1	2	3	yes	no
F	15	U	GT3	T	4	2	health	services	home	mother	1	3	0	no	yes
F	16	U	GT3	T	3	3	other	other	home	father	1	2	0	no	yes
M	16	U	LE3	T	4	3	services	other	reputatic	mother	1	2	0	no	yes
M	16	U	LE3	T	2	2	other	other	home	mother	1	2	0	no	no
F	17	U	GT3	A	4	4	other	teacher	home	mother	2	2	0	yes	yes
M	15	U	LE3	A	3	2	services	other	home	mother	1	2	0	no	yes
M	15	U	GT3	T	3	4	other	other	home	mother	1	2	0	no	yes
F	15	U	GT3	T	4	4	teacher	health	reputatic	mother	1	2	0	no	yes
F	15	U	GT3	T	2	1	services	other	reputatic	father	3	3	0	no	yes
M	15	U	LE3	T	4	4	health	services	course	father	1	1	0	no	yes
M	15	U	GT3	T	4	3	teacher	other	course	mother	2	2	0	no	yes
M	15	U	GT3	A	2	2	other	other	home	other	1	3	0	no	yes
F	16	U	GT3	T	4	4	health	other	home	mother	1	1	0	no	yes
F	16	U	GT3	T	4	4	services	services	reputatic	mother	1	3	0	no	yes
F	16	U	GT3	T	3	3	other	other	reputatic	mother	3	2	0	yes	yes
M	17	U	GT3	T	3	2	services	services	course	mother	1	1	3	no	yes
M	16	U	LE3	T	4	3	health	other	home	father	1	1	0	no	no
M	15	U	GT3	T	4	3	teacher	other	reputatic	mother	1	2	0	no	no
M	15	U	GT3	T	4	4	health	health	other	father	1	1	0	no	yes
M	16	U	LE3	T	4	2	teacher	other	course	mother	1	2	0	no	no
M	16	U	LE3	T	2	2	other	other	reputatic	mother	2	2	0	no	yes
F	15	R	GT3	T	2	4	services	health	course	mother	1	3	0	yes	yes
F	16	U	GT3	T	2	2	services	services	home	mother	1	1	2	no	yes
M	15	U	GT3	T	2	2	other	other	home	mother	1	1	0	no	yes
M	15	U	GT3	T	4	2	health	services	other	mother	1	1	0	no	no
M	16	U	LE3	A	3	4	services	other	home	mother	1	2	0	yes	yes
M	16	U	GT3	T	4	4	teacher	teacher	home	mother	1	2	0	no	yes
M	15	U	GT3	T	4	4	health	services	home	mother	1	2	0	no	yes
M	15	U	GT3	T	4	4	services	services	reputatic	mother	2	2	0	no	yes
M	15	R	GT3	T	4	3	teacher	at_home	course	mother	1	2	0	no	yes
M	15	U	LE3	T	3	3	other	other	course	mother	1	2	0	no	no
M	16	U	GT3	T	3	2	other	other	home	mother	1	1	0	no	yes
F	15	U	GT3	T	2	3	other	other	other	father	2	1	0	no	yes

DESIGN AND DEVELOPMENT OF NATURAL LANGUAGE PROCESSING (NLP) INTERFACE TO ADDRESS QUERIES OF COMPUTER LAB TECHNICIAN AT CSIBER – A CASE STUDY

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ABSTRACT : In many educational institutes' labs, LAN contains different software installed on different machines and also different hardware such as printers, scanners, etc. connected to specific machines, which poses a problem for locating machines where rarely used software are installed. The challenge continuously increases as new software's installed on different machines in a network and as the size of the network increases beyond control. Further, the technician is required to install newly acquired software on virtually every machine. In the current research, the authors have designed and implemented natural language queries and parsers for addressing the queries of a computer lab technician. The information about the machine, hardware, and software information is stored in a persistent Relational Database Management System (RDBMS) which is dynamic and is instantly updated as the new hardware is connected to LAN or new software is installed. The end user instead of querying the database directly will use the natural language, termed Hardware Query Language (HQL), and Software Query Language (SOQL) designed by the author, which is interfaced with RDBMS using prolog. To implement HQL and SOQL, a finite set of symbols, words, and language rules are defined, which constitute HQL and SOQL grammar

Keywords **:** Context Free Grammar, Deterministic Finite Automata, Parser, Parse Tree, Query Language, Tokens

1. Introduction :

In this digital era, it is virtually impossible to find even a single business premise that does not host a local area network in place. Knowledge of all software installed and all hardware connected to the LAN is extremely essential to a lab technician. Because in many occasions, any minor error in LAN requires the lab technician to check virtually all computers connected to LAN manually which is extremely time-consuming and a lengthy process.

In many educational institutes' labs, LAN contains different software installed on different machines and also different hardware such as printers, scanners, etc. connected to specific machines, which poses a problem for locating machines where rarely used software are installed. The challenge continuously increases as

new software is installed on different machines in a network and as the size of the network increases beyond control. Further, the technician is required to install newly acquired software on virtually every machine.

Also during the practical exam phase, the lab technician has to visit virtually every machine in the network to check whether the required software is installed on them or not. The time for the entire process is directly proportional to the size of the network. A lot of time can be saved if the whole process is automated and centralized.

Current research aims to design and develop an interface for LAN which accepts the queries about hardware and software installed in LAN in natural language (NL) which is parsed using three different parsers, text parser, DFA parser, and NLP parser designed and developed by the author. The text and DFA parsers work by mapping natural language queries to the corresponding SQL queries and instantly provide a piece of the required information to an end user by retrieving the relevant data from the underlying database **management system. On the other hand, the NLP parser interfaces with the knowledge base for retrieving the desired information.**

2. Literature Review :

There are very few papers on the design and development of NLP parsers documented in the literature. The researchers provide how to manage and control the network by analyzing the collected information (Naik 2015). Controlling is the task of taking specific actions against individual network and system components. Network monitoring is important to find network trends, and network bottlenecks and locate network problems quickly. The research paper by Wei Wang et. Al. introduces the current situation and process of natural language processing (NLP) and the effect of natural language processing in search engines (Yue 2012, Cooling1994, Alam 2011). In terms of concepts and classifications, the traditional search engine has many deficiencies that can not completely satisfy the requirements of users. The key technology of intelligent search engines and the development trend of the combination of natural language processing and search engine technology in the future are discussed. This research paper explains the evolution of the network from early radio and telephone to current devices such as mobile phones and laptops. Accessing the global network has become the most essential and indispensable part of our lifestyle. Wireless communication is an ever-developing field, and the future holds many possibilities in this area (Andersson et.al. 2016, Parikh et.al. 2016). One expectation for the future in this field is that the devices can be developed to support communication with higher data rates and more security. Research in this area suggests that a dominant means of supporting such communication capabilities will be through the use of Wireless LANs. As the

deployment of Wireless LAN increases well around the globe, it is increasingly important for us to understand different technologies and select the most appropriate one (Gillick et.al. 2016, Collobert et.al. 2011). Also, this paper provides a detailed study of the available wireless LAN technologies and the concerned issues. This is followed by a discussion on evaluating and suggesting a feasible standard for the future (Zamani et.al 2016, Chandramouli et.al. 2017).

3. Case study on design and development of Natural Language Processing (NLP) Interface to Address Queries of Computer Lab Technician at CSIBER

3.1 Problem Definition :

Chhatrapati Shahu Institute of Business Education and Research Kolhapur, popularly known as CSIBER, was established in 1976. CSIBER is one of the few institutes in Maharashtra catering to the needs of Quality Higher Education in Southern Maharashtra and part of North Karnataka by providing professional education, training, and skill development to the youths of the country. Due to the continuous changes in computer technologies and owing to the emergence of new cutting-edge technologies, the computer lab is subject to constant up gradation to address the new emerging requirements in the field. Hence at any point in time, various reports related to the machine configurations, software installed on various machines in the network, bandwidth/internet speed monitoring to locate any anomalies in the pattern, and IP conflicts are desirable at frequent intervals. To facilitate this the head of the institution is looking for a tool that can address one or more of these issues.

3.2 Problem Analysis :

The following alternative solutions exist for addressing the issues posed by the institution:

i. Designing query language for retrieving hardware and software information of LAN.

ii. Designing expert system for retrieving hardware and software information of LAN

3.3 Research Methodology :

Identifying the working of LAN, information on installed software and connected hardware in LAN, and study of Natural Language Processing is a very crucial component of the NLP Interface design.

The research methodology used for the comprehensive designing and developing NLP Interface is as follows.

❖ **Data Collection Method :**

A. Primary Data:

Primary data shall be collected from Lab technicians, network experts, and professors by using structured interviews and questionnaires.

B. Secondary Data :

Secondary data should be collected by the following means,

- Published literature
- Earlier research studies on NLP and Networking.
- Books, magazines, and journals.
- Internet etc.

❖ A theoretical model based on three-tier architecture for executing queries entered by the user in natural language against the data stored in a database after mapping NLP queries to Prolog queries.

Design and implementation of an algorithm for parsing natural language sentences into an NLP parser.

❖ **Tools and techniques employed for the implantation of the model :**

- Visual Basic Runtime Environment
- JDK 1.5 and Java Runtime Environment
- MySQL /MS Access for storing LAN information about software and hardware configuration.
- SWI- Prolog.

3.4 Model for Hardware Query Language :

To assist human-machine interaction, a query language is designed for enabling the quick location of desired hardware and software in a local area network without involvement in the technicalities of information retrieval. For achieving this a set of alphabets, a set of tokens, and a context-free grammar is designed which is parsed using different types of parsers such as text parser, Natural Language Parser (NLP), Deterministic Finite Automata (DFA) parser and the comparative analysis of these parsers is carried out. The query language so developed is referred

to as "***Hardware Query Language***" (HQL) and ***Software Query Language*** (SoQL). HQL/SoQL is designed for organizations that render the end user free from the intricacies involved in SQL syntax for filtering, joins, etc., employing the following different approaches.

- ✓ developing a parse tree and using a text parser for parsing the query.
- ✓ developing a grammar for human interface to the database which involves the execution of human-like queries for information retrieval from the database based on multiple objectives. The queries are parsed using finite state automata. The state table and the state graphs will be developed for different queries.
- ✓ defining the grammar for human-like queries using Natural Language Processing (NLP).

After studying the operational and technical feasibility of the problem, the following three alternatives were found for implementing HQL/SoQL.

3.5 Application Framework :

The application framework designed for issuing hardware and software-related queries and obtaining results on different device types is depicted in Figure 3.1. The startup script retrieves the LAN configuration information and hardware and software information from the LAN and stores the data in a database. The queries entered by an end user are parsed using different parsers designed and implemented for the purpose and the queries which are successfully parsed are further evaluated by pulling out the relevant information from the persistent database and displaying the results on thick and thin clients. In the current system, only the thick client is targeted and the work for interfacing with a thin client is still in progress.

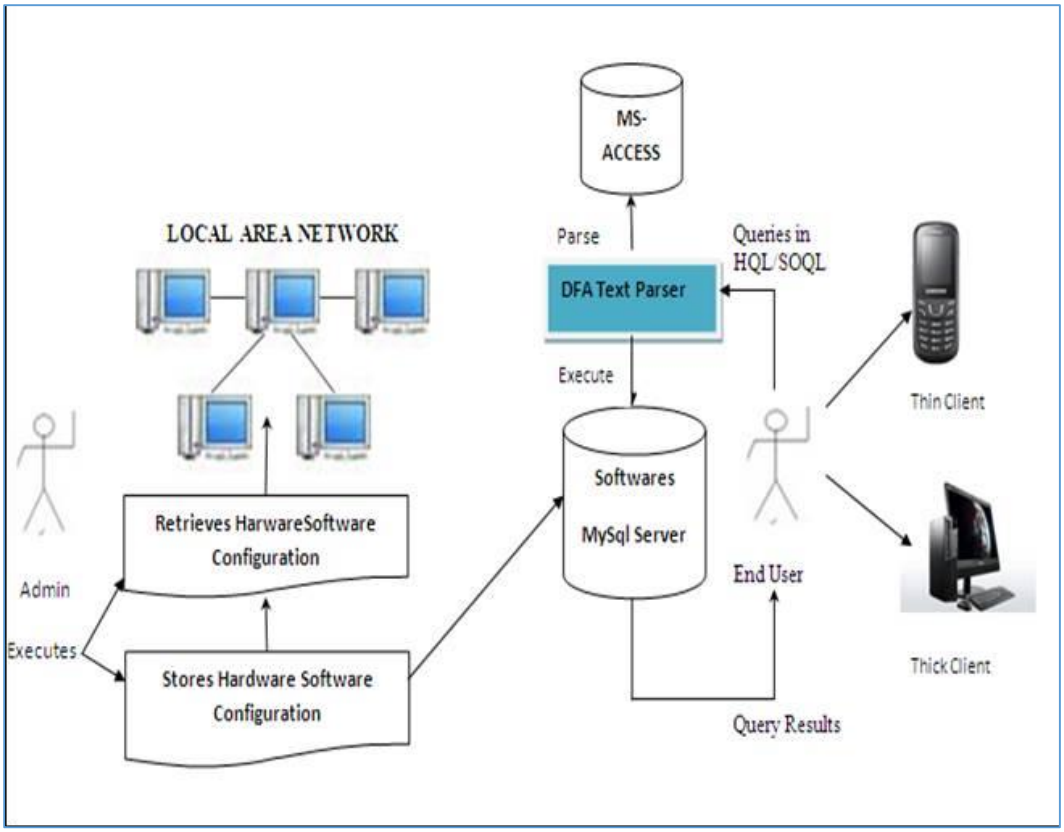

Table 1 depicts the relative comparison between the different approaches used for developing a parser for HQL/SoQL.

Table 1. Relative Comparison Between Different Approaches for the Development of Parser for HQL/SoQL

Parser	Adaptability to changes in the query language	Query optimization
Text parser	Poor	Poor
Finite state automata	Moderate	Poor
Natural language processing	Excellent	Excellent

The sample state graph for parsing natural language sentences is depicted in Fig 1.

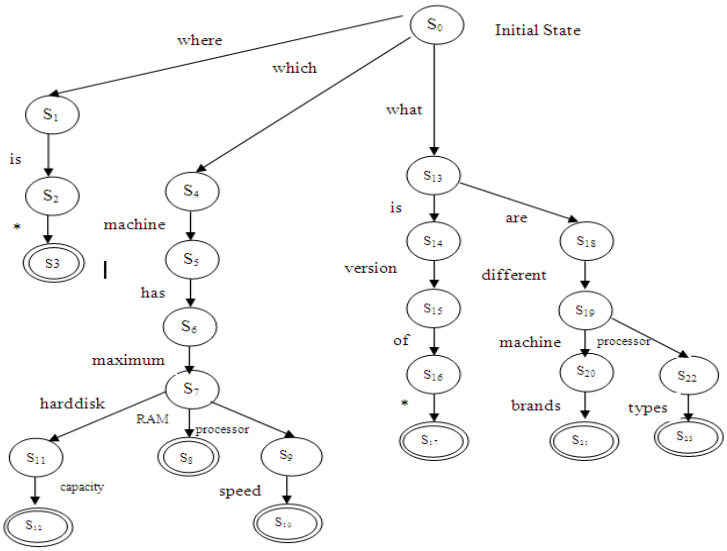

Fig. 1 State Graph for HQL/SOQL Query

3.6 Parse Tree for Querying the Hardware and Software Information of a Local Area Network.

Which machine has maximum {ram | hard disk | processor}

{ram? ' ': hard disk? Capacity: Speed}?

In the above, the sixth token depends on the fifth token, if the fifth token is "ram", then the sixth token is null.

If the fifth token is “hard disk" then the sixth token is "capacity", otherwise the sixth token is "speed". The condition expression is used in the sixth token.

The following notations are used

{a|b|…} → One clause from the group of clauses separated by | must be selected.

[..] → The clause specified is optional

The above semantics generates the following queries.

The corresponding sample NLP parse tree is depicted in Fig 2.

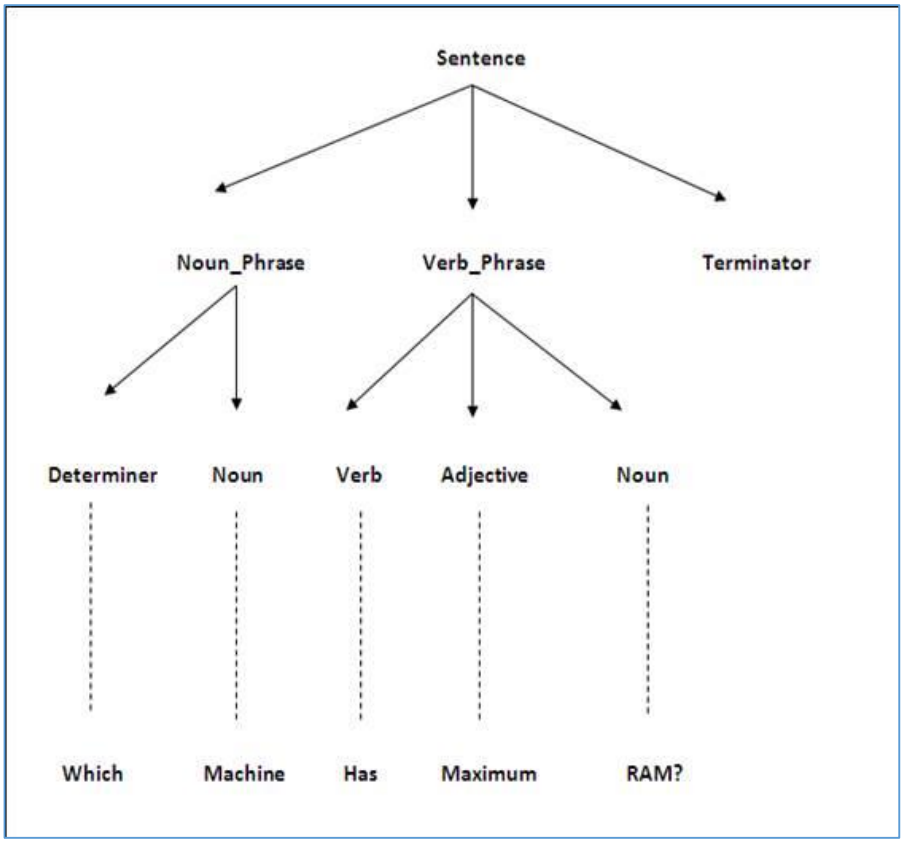

Fig 2. NLP Parse Tree

The natural language queries which result fromthe above state graph are listed below along with the corresponding prolog queries:

Natural Language Queries :

1. Where is *? (* → Software Name)
2. Which machine has maximum RAM?
3. Which machine has maximum hard disk capacity?
4. Which machine has the maximum processor speed?
5. What is a different OS?
6. What is the version of *? (* → Software Name)
7. Which machine has JDK version 1.6?
8. What are different machine brands?

9. What is the brand of *? (* → Machine Name)
10. What are different processor types?
11. What is the processor type of *? (* → Software Name)
12. List all software installed on *? (* → Machine Name)
13. Which machine has Windows OS?
14. Which machine has Linux OS?
15. List the IP address of the machines
16. What is the IP address of *? (* → Machine Name)
17. What is the monitor size of *? (* → Machine Name)
18. What is the resolution of *? (* → Machine Name)

Prolog Queries :

1. version_of_software (<softwarename>,<versionno>,<machinename>)
2. machine_by_vendor(<machinename>,<vendorname>)
3. software _on_machine (<machinename>,<softwarename>)
4. processor_of_machine(<machinename>,<processortype>)
5. os_on_machine(<machinename>,<osname>)
6. ip_of_machine(<machinename>,<ipaddress>)
7. machine_attribute(<machinename>,<attributename>,<attributevalue>)

The mapping of the prolog query

Sr.No.	Natural Language Query	Equivalent Prolog Query
1	Where is *? (* → Software Name) Example: Where is Python?	Software_on_machine(X,python)
2	What is the version of *? (* → Software Name) Example: What is a version of JDK?	version_of_software (JDK, X, Y)
3	Which machine has JDK version 1.6?	version_of_software (jdk,1.6, Y)

4	What are different machine brands?	machine_by_vendor(X,Y)
5	What is the brand of *? (* → Machine Name) Example: What is the brand of DELL5?	machine_by_vendor(dell5,Y)
6	What are different processor types?	processor_of_machine(X,Y)
7	List all software installed on *? (* → Machine Name) Example: List all software installed on DELL5	software _on_machine (dell5,X)
8	Which machine has Windows OS?	os_on_machine(X,windows)
9	Which machine has Linux OS?	os_on_machine(X,Linux)
10	List the IP address of the machines	ip_of_machine(X,Y)
11	What is the IP address of *? (* → Machine Name) Example: What is the IP address of DELL5?	ip_of_machine(dell5,Y)
12	What is the monitor size of *? (* → Machine Name) Example: What is the monitor size of DELL5?	machine_attribute(dell5,monitor size,X)
13	What is the resolution of *? (* → Machine Name) Example: What is the resolution of DELL5?	machine_attribute(dell5,resolution,X)

The structure of the operating system shell for querying software information using the SWI prolog interface to Java is shown in Figure 2.

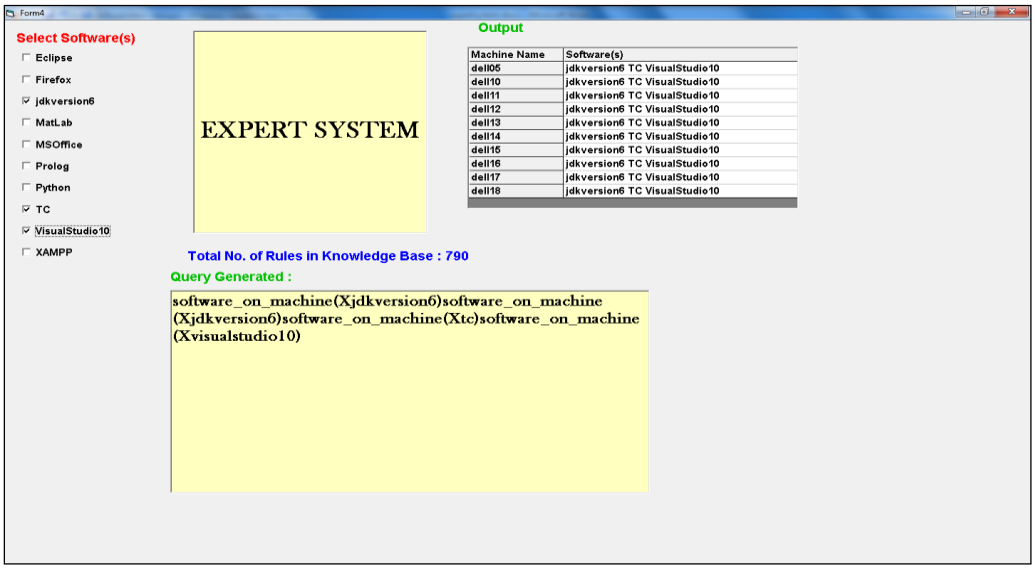

Figure 2. Expert System shell for Querying Software Information

4. Conclusion and Scope for Future Work :

In the current work, authors have designed and implemented a DFA parser for querying the hardware and software configuration information stored in a centralized MySQL database. The end user instead of querying the database directly will use the natural language, termed Hardware Query Language (HQL), and Software Query Language (SOQL) designed by the authors, which is interfaced with RDBMS using DFA parser implemented by the authors. To implement HQL/SOQL, a finite set of symbols, words and language rules are defined which together constitute HQL/SOQL grammar. A Deterministic Finite Automata (DFA) parser is developed for parsing HQL/SOQL tokens. The state table and state diagrams are developed for different tokens of HQL/SOQL identified by us. State information is stored in a persistent database management system as a measure of improving efficiency and extensibility. The parser is tested for a few HQL/SOQL queries and the language is easily extensible for incorporating more queries in the knowledge database. Implemented employing Visual Basic in the presentation tier, Java in the middle tier, and MS Access in the data tier.

It is proposed to design and implement an expert system for querying the software information stored in the knowledgebase and implement an NLP parser for parsing sentences entered by the user in a natural language as it is very flexible and quickly adapts to the changes in a query language.

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OVERVIEW OF ROUTING ISSUES AND CHALLENGES IN MANET

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ABSTRACT : The phrase "Mobile Ad Hoc Network" (MANET) refers to a group of two or more wirelessly capable devices, nodes, or terminals that can connect with one another without the assistance of a centralized administrator. In this type of network, wireless nodeswhich can dynamically build a network to exchange information without using any pre-existing infrastructure. We discuss in this paper the distinctive characteristics MANET including network configuration may change at any time, there is no direction or limit the movement, and so needed a new optional path Agreement (Routing). This paper is present different issues and challenges occur in MANET.

Keywords **:** MANET, Centralized administrator, challenges, issues, routing

Introduction :

Wireless networks, one of the various types of data communication networks, use wireless links to connect devices and share information and it's an autonomous system in which mobile hosts connected by wireless links are free to be dynamically and sometimes act as routers at the same time as shown in Fig. 1 (Zhang & Shi 2018).

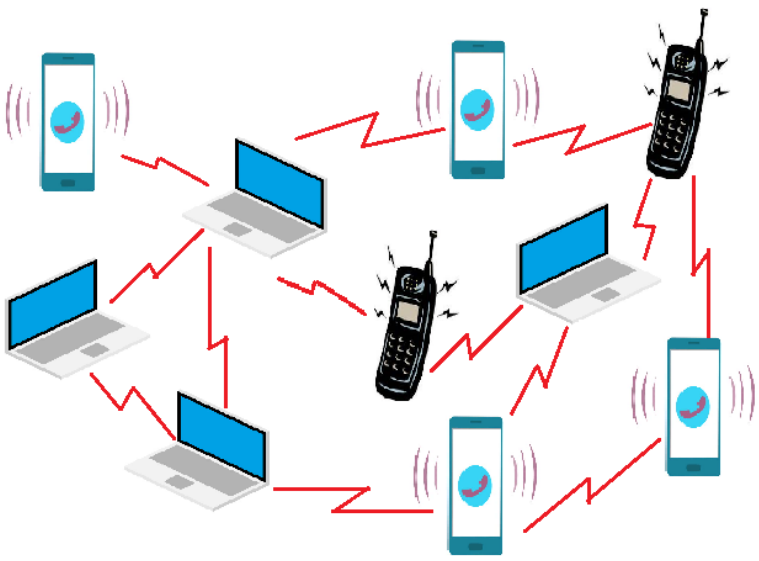

Fig. 1.MANET Architecture

Wireless network technology avoids the expensive process of establishing cables for the data communication between devices within different networks locations (Zalte &Ghorpade2018). Radio networks and Wi-Fi local networks are two types of wireless networks. There are two types of wireless networks: those with infrastructure and those without. In the former, data communications are established and maintained using access points or routers. (Zalte & Ghorpade2017)

Before installing a MANET, the routing and privacy concerns should be carefully identified. In MANET, the routing protocols are crucial in maintaining reliable communication between nodes (Habib et al. 2013). Packet transmission from one network to another is known as routing. The MANET routing protocols must be able to adapt to the shifting topology of the network. The Quality of Service (QoS) characteristics like as throughput, packet loss, and delay demonstrate the requirement for a reliable routing protocol with minimal overhead in controlling MANET.

Issues and Challenges with MANETs :

The following is a summary of the main open challenges for MANETs as shown in Fig. 2:

a. Autonomous: There isn't a centralized administrative authority to oversee the functioning of various mobile nodes.

b. Dynamic topology- Nodes could be dynamically joined in any way and are mobile. The network's linkages fluctuate in time and depend on how close one node is to another.

e. Restricted resources: The battery power, memory and bandwidth are significantly constrained

f. Scalability: In a broad sense, scalability refers to a network's ability to provide an adequate level of service despite the existence of several nodes.

g. Security- Mobility means higher security concerns, including peer-to-peer network design or a shared wireless medium that is available to both hostile attackers and authorized network users Considerations should be given to eavesdropping, spoofing, and denial-of-service attacks.

h. A self-healing, infrastructure-free MANET must reorient itself to encircle any node that moves outside of its coverage area.

i. Deprived Data Transmission Quality: This is a fundamental issue with wireless communication that is brought on by a variety of error sources that degrade the received signal.

j. Network Set - up: Because the entire MANET infrastructure is dynamic, the variable links are dynamically connected and disconnected (Mishra 2012).

k. Difficult to Update Information: Updating information about dynamic links between nodes in MANETs is a significant problem for topology maintenance (Ghosh et al. 2011)

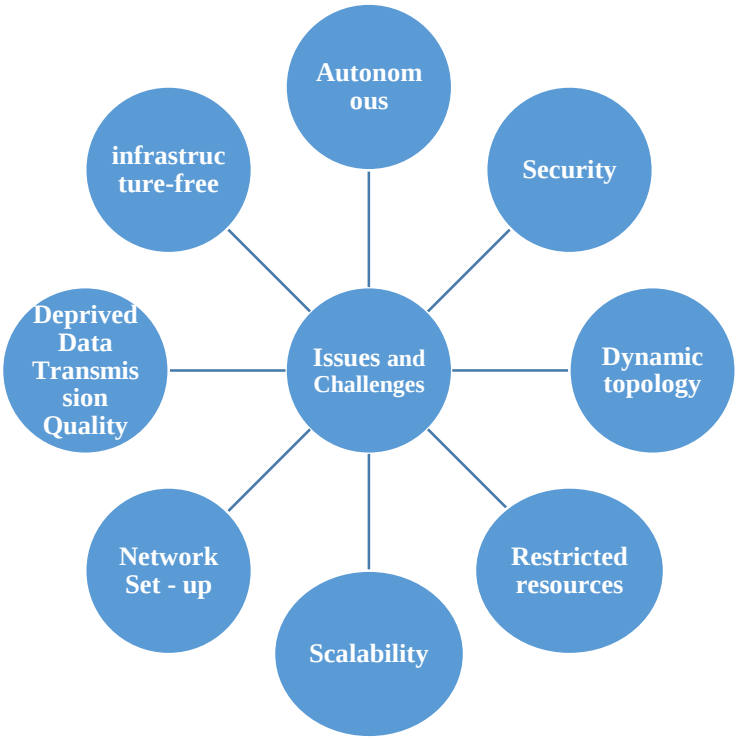

Fig. 2.Issues and Challenges in MANET

Performance Metrics :

There are different performances metrics parameters are used to calculate performance of different routing protocols in MANET.

PDR-(Packet Delivery Ratio) : PDR compared the total amount of packets supplied by the source node with the number of packets successfully received by the destination node (DestinationNi) (SourceNi).One of the Qos metrics is PDR. It shows how effective a routing protocol is.

$$PDR = \frac{\sum_{i=0}^{N} \text{DestinationNi}}{\sum_{i=0}^{N} \text{SourceNi}}$$

Throughput :

Throughput is calculated by dividing the total number of successfully delivered packets seen at the destination device over a given period of time by the length of the period.

Throughput= Amount of the packet sent /Amount of data sending time.

Packet Loss :

The total number of packets sent through the network proportionately to time is what determines the percentage of lost packets. Network overload, packet distortion, faults in storage devices, and loss of the receiver's transmission (i.e., buffer overload) are a few of the factors that contribute to packet loss on the network. Equation can be used to determine packet loss.

Packet Loss= Amount of packet sent−Amount
of the packet received /total of packet sent.

Delay :

Delay is the amount of time it takes for a packet to get from its source to its destination after passing through a number of nodes.

Delay=packet receiving time−packet sending time /total package received.

Energy Consumption :

The starting value I of energy at every node is subtracted from the residual energy R and the result is then multiplied by the total number of nodes to calculate the energy consumption at each node (N).

Energy Consumption=I-N/R

Performance Issues in Routing Protocols :

Routing protocols, that are proactive waste bandwidth. This is because even when there is no data flow, control messages are transmitted. Among the drawbacks are the nodes' excessive data retention for route maintenance and the sluggish reorganization following a failure in a specific link? A proactive routing protocol is the OLSR. Because of this, OLSR has a larger network overhead than other reactive protocols like AODV or DSR. Moreover, because there is no requirement to create a new route whenever one is required, the routing latency does not rise with the number of routes in use. Thus, the route discovery delay is decreased (Demers & Kant 2006).

One of them is that when looking for routes, it has a high latency. The potential for network clogging when flooding is excessive is the other drawback (Zahary & Ayesh 2007).

When it comes to the throughput and packet end-to-end delay performance parameters employed in this study, OLSR surpasses AODV, TORA, and DSR. When used in networks with low mobility and heavy load, it also performs better than all the other protocols in terms of packet delivery ratio. The network overhead performance of OLSR is the worst. As a result, it is appropriate for networks with high capacity. Low capacity networks cannot employ OLSR due to the heavy routing traffic required to find and maintain routes.

DSR works better in smaller networks in both high- and low-speed scenarios than AODV and TORA. For AODV, the opposite is true. With network expansion, it outperforms DSR. Conclusions about TORA's throughput under heavy network stress cannot be made because there was no data available for comparison (Kishore & Nand). In the network with a lot of traffic, TORA had a high delay, and mobility had no impact on it.

It is surpassed by TORA. However, we notice that as the number of sources rises, AODV's performance does too. In AODV, the end-to-end delay is decreased by the hop-by-hop initiation.

One of DSR's key benefits is that it is a reactive (on-demand) protocol, which means that even when the link is not in use; it does not constantly overwhelm the network with routing updates. Only when a route is required is it chosen. Finding routes to every node in the network is not necessary. Additionally, routing cost is decreased by using the cached data in the intermediary nodes. The drawback is that unsuccessful paths are not fixed locally. The nodes' cached information could cause reconstruction to produce inconsistent paths. Compared to table-driven protocols, there is a significant increase in setup delay. For static and low-mobility networks, DSR is a good fit. High mobility lowers its effectiveness.

Therefore, proactive protocols keep track of the network's accessible pathways' route discovery even if those paths aren't being used right now. The fundamental disadvantage of these methods is that if the topology changes frequently, maintaining unused links may take up a significant portion of the throughput (Trung et al. 2007).

Conclusion :

We also discover several areas throughout the survey that can be investigated further in the future, such as some elements of intrusion detection techniques can be enhanced further. We'll strive to go more deeply into this field of study.

In this paper, we discussed about several common problems and difficulties in mobile ad hoc networks, most of which are brought on by the latter's mobility, dynamic topology, open media, and battery-life limitations. These weaknesses have necessitated the development of strong security measures to guard the mobile ad hoc network from a variety of security threats.

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DESIGN AND DEVELOPMENT OF AN ONLINE GENERIC ELECTIVE SELECTION SYSTEM (STUDENT MODULE)

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ABSTRACT : The New Education Policy (NEP) introduced by the Ministry of Human Resource Development (MHRD) offers a teaching pedagogy to develop a leaner-centric approach in the current education delivery system. The implementation of the Choice Based Credit System (CBCS) relies on inter-disciplinary, intra-disciplinary, and skill-oriented approaches tuned to the aptitude, interest, and learning needs of a student, thereby increasing their involvement and productivity in the whole academic curriculum. Another salient feature of CBCS is credit transfer. The effective implementation of the CBCS system provides a platform for each student to learn based on his/her needs and interest. CBCS provides a cafeteria approach for students for selecting the courses of their choice which are categorized into different categories namely, core courses, Discipline Specific Elective (DSE) Courses, Generic Electives (GE), Ability Enhancement Courses (AEC), Ability Enhancement Compulsory Courses (AECC), and Skill Enhancement Courses. GE is offered at the institute level. The current research focuses onthe design and development of an Online Generic Elective Selection System for a hypothetical institute with an emphasis on student modules. With due consideration to no. and type of end users, the manual process is both cumbersome and error-prone. To address these issues a user-friendly web-based system is developed to address the needs of all users at different levels. The student module is completely implemented and deployed on the web hosting platform which enables the student to perform different pre-registration activities, register with the system, and select the subject of his/her choice. The system is integrated with the mailing system to send mail to the student on successful registration and GE selection.

Keywords **:** Ability Enhancement Courses**,** Access Control Matrix**,** Ability Enhancement Courses**,** Ability Enhancement Compulsory Course**,** Generic Elective**,** New Education Policy.

1.1 Introduction :

A Generic Elective (GE) is an interdisciplinary course under the Choice Based Credit System (CBCS) (UGC guidelines on adoption of Choice Based Credit System 2023, Minimum course curriculum for undergraduate courses under choice Based Credit System 2023, UGC News 2015, Aithal et.al. 2016). This course is offered to all the students of the institute to allow them a chance at availing of a comprehensive education. An elective course is generally chosen from adifferent department, to seek exposure to other disciplines/subjects and at the same time helps preserve the interest of the student in other disciplines. The Generic Elective bears an equal credit as compared to any of the core papers. A core course offered in a discipline/subject may be treated as an elective by another discipline/subject. As per academic guidelines each student has to compulsorily opt for one GE subject offered by other departments in each semester of their program. The institute offers GE Selection based on a First-Come-First-Serve basis. Due to the constraints on subject experts, each department is free to decide its cut-off policy in terms of no. of batches subject to the batch size of 60. Since such a system should be accessible to all the student stakeholders of the institute from anywhere at any time, the current research focuses on the design and development of a web-based scalable highly concurrent system operable by end users in different roles clearly defining access control for each role. The research is in progress and the student module is elaborated at length in the current paper.

1.2 Scope of the System and Constraints :

- The proposed system incorporates the following functionalities:
  - ✓ The system is operable by end users of diverse roles and responsibilities.
  - ✓ The system is flexible enough to incorporate the new roles on a need basis.
- In the current system, the following roles are identified:
  1. Admin
  2. Director
  3. G.E. Coordinator
  4. Class Coordinator
  5. Student

The following access control matrix depicts the access permissions for different roles:

Table 1. Access Control Matrix for Users in Different Roles

Task	Admin	Director	G.E. Co-ordinator	Class Co-ordinator	Student
Manage Departments	Y	N	N	N	N
Manage Programme	Y	N	N	N	N
Manage Courses	Y	N	N	N	N
Registration and Login	Y	Y	Y	Y	Y
Update Profile	Y	Y	Y	Y	Y
GE subject selection	N	N	N	N	Y
Download the GE registration/selection receipt	N	N	N	N	Y
View the Current Status of GE Selection	Y	Y	Y	Y	Y
View Registration Reports	Y	Y	N	Y	N
View Class-wise GE selection Reports	Y	Y	N	Y	N
View Subject-wise GE selection Reports	Y	Y	Y	N	N

- The system maintains a logical relationship between the following entities:
    - The program, Year, Semester, G.E. Subjects
    - Student Registration, G.E. Selection
- The system avoids duplication of the registration process.

- The system avoids duplication of the GE selection process.
- The system keeps track of the live count of students for each GE subject at the time of the GE selection process
- The allocation process of specific GE subjects automatically stops, when the student count reaches maximum capacity.
- The system operates for both mobile and Desktop/Laptop
- The system takes care of the following tasks as depicted in Table 2.

Table 2. Tasks Performed by Online Generic Elective Selection System @CSIBER

Task	Description
Transaction control	The atomic transactions in different logical transactions should be committed or rolled back as a single unit.
Concurrency Control	A proper locking mechanism should be in place to avoid data inconsistency.
Role-based authentication	The task should be accessible and should be performed only by the person who is authorized to do so.
Time-triggered menu options.	The menu options should dynamically appear and persist for a specified period.

The system generates the requisite informative reports for Director, GE coordinator, and Class coordinator. The list of reports along with the roles permitted to access it is shown below:

- GE coordinator Registration Report (Director)
- Class coordinator Registration Report (Director)
- Student Registration Report (Director, Class coordinator)
- Program-wise GE Allocation Report (Director, Class coordinator)
- Program-wise GE Non-Allocation Report (Director, Class coordinator)
- Subject-wise GE Allocation Report (Director, GE coordinator)

- Subject-wise GE Non-Allocation Report (Director, GE coordinator)

1.3 System Objectives :

- To develop Online System for GE selection.
- To maintain transparency in the GE selection process.
- To reduce human intervention in the process.

1.4 Relevance to Professional or Academic Field :

Generic Elective (GE) gives exposure to a new discipline/subject and prepares to look for interdisciplinary research

2. Current State of Research :

There is exhaustive work and a plethora of research papers on the analytical study and the implications of CBCS on higher education system. An exhaustive analytical study has been performed on the CBCS system focusing on its objective to eliminate rote learning and memorization leading to an innovative education system (Saharish 2009, Kelkar et.al. 2014, Biswas 2018, Saha 2021). Although CBCS sounds elegant on paper there are several obstacles to its practical implementation of CBCS. The problems and prospects of implementing CBCS at the UG level are highlighted by Tanmoy Saha (Saha 2021). More attention and discussion are required for the problems and prospects of CBCS to fulfill its objectives. To cater to the needs of ease in course selection, the current paper provides guidelines for the design and implementation of a generic web-based system for course selection which is generic and can be applied to any course category.

3. System Design and Implementation :

3.1Model Design :

The different modules employed in the project are listed below:

- Department Master
- Program Master Module
- Student Master Module
- Registration Module
- User Authentication Module
- Class coordinator

- GE coordinator
- Generic Electives Module
- Generic Allocation Module

The dependencies existing between different modules are shown in Fig. 1.

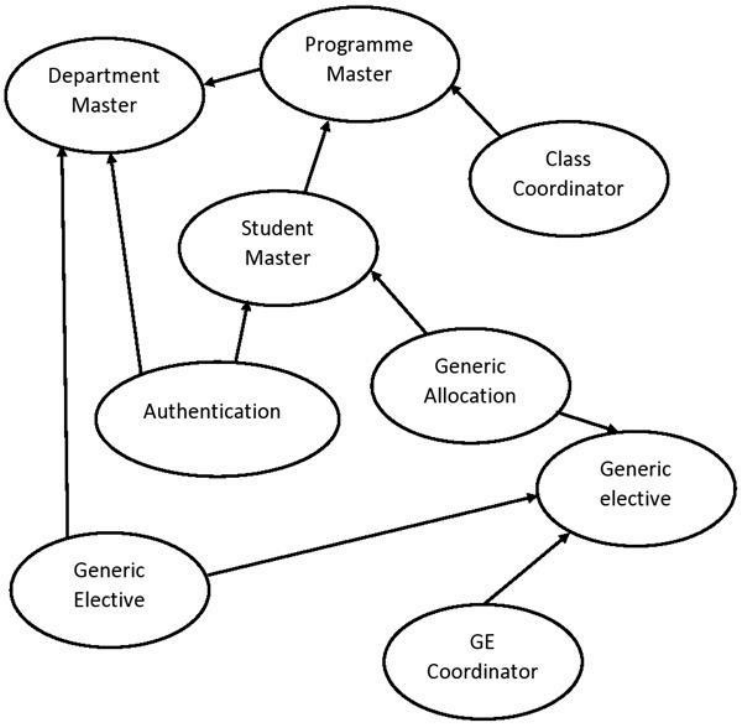


Fig. 1. Dependency Between Different Modules of Application

3.2 Application Architecture :

The prototype model given above will be implemented in PHP with MySQL as the backend. The multi-tier application architecture employed is shown in Fig. 2(a) & 2(b)

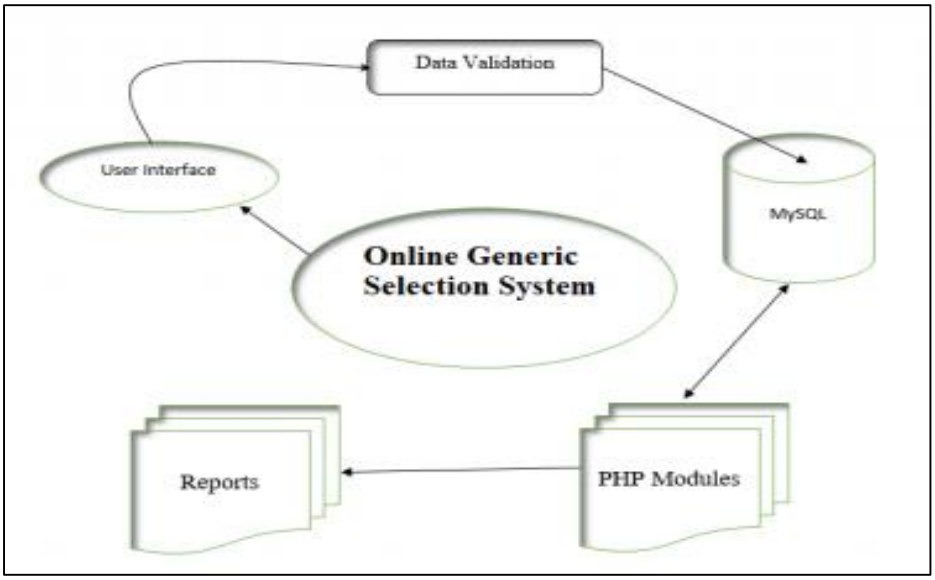


Fig. 2(a) Multi-Tier Application Architecture.

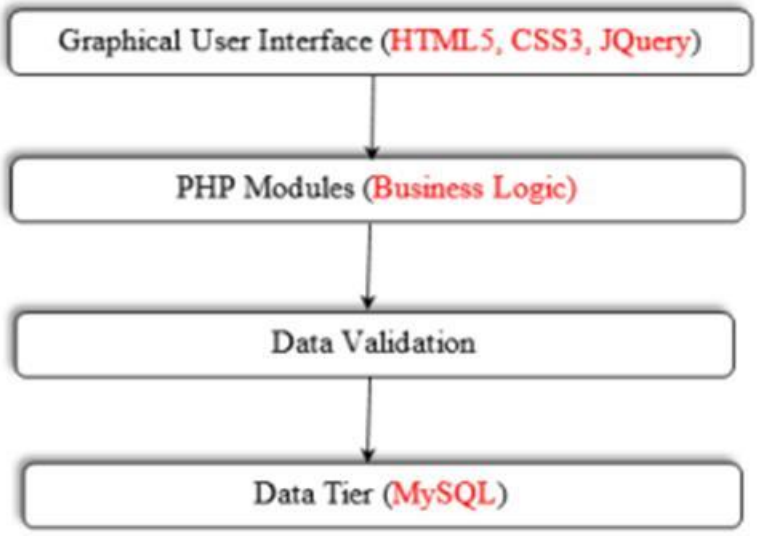


Fig. 2(b) Multi-Layered Application Architecture.

3.3 System Workflow Diagram :

A typical workflow in the system is depicted in Fig. 3.

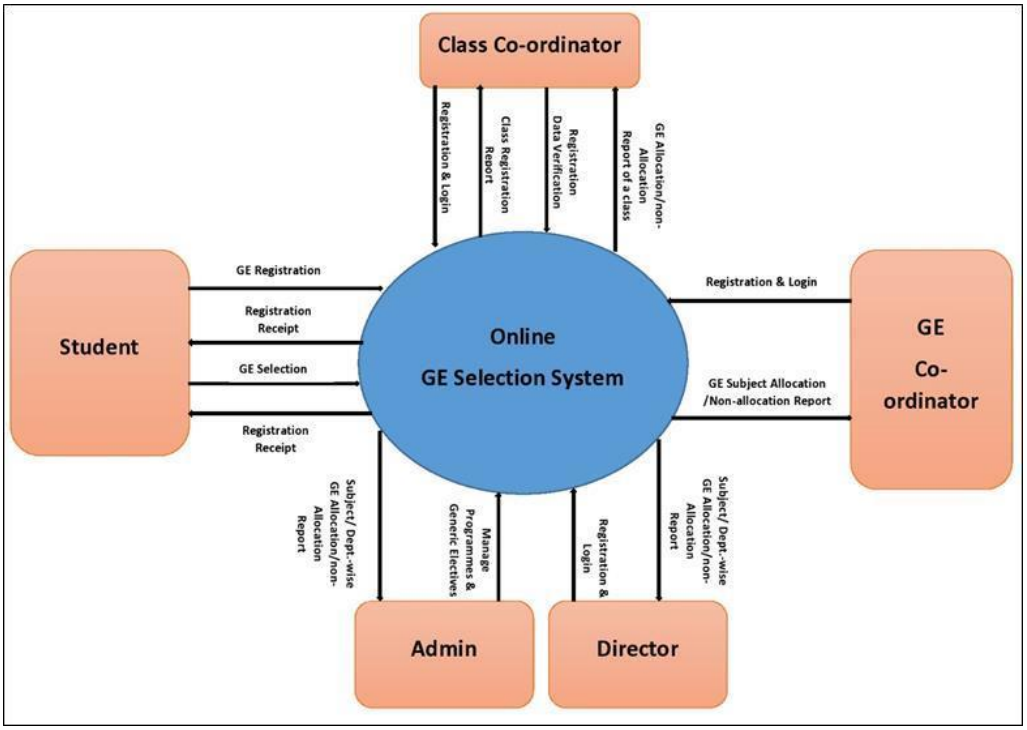


Fig. 3. System Workflow

A typical workflow in a system is depicted below:

- Class Coordinator Registration.
- GE Coordinator Registration.
- Director Registration.
- Student Registration.
- Generate a list of Registered Students for the Class Coordinator
- Download GE Registration Receipt.
- Student Registration verification by Class Coordinator.
- GE Selection.
- Download GE Subject Selection Receipt.
- Generate a list of students opting for GE subject for the GE coordinator

3.4 Tools and Techniques Employed :

- The proposed system is implemented cost-effectively by employing an open-source technology using PHP and MySQL
- XAMPP stack is utilized for the execution of the Apache server hosting the web app and MySQL server hosting the database.
- The system is hosted on an internet server so that students can go through the registration and selection process from anywhere.
- Advanced web technology employed in the system development include
  - ✓ AJAX for improving application performance
  - ✓ JQuery for improving User Interface and User Experience.
- The project employs bootstrap technology to handle devices of disparate display sizes.

3.5 Setting Up of Operational Environment :

For the smooth working of the system, the following prerequisites are to b met.

- Popup blockers must be disabled.
- Browser history must be cleared.
- The home page of a web portal contains the PDF of GE subjects and brief information about the GE subject. The students are advised to pre-read the material and go through the contents before the selection of the GE subject.

3.6 System Testing :

The system was tested

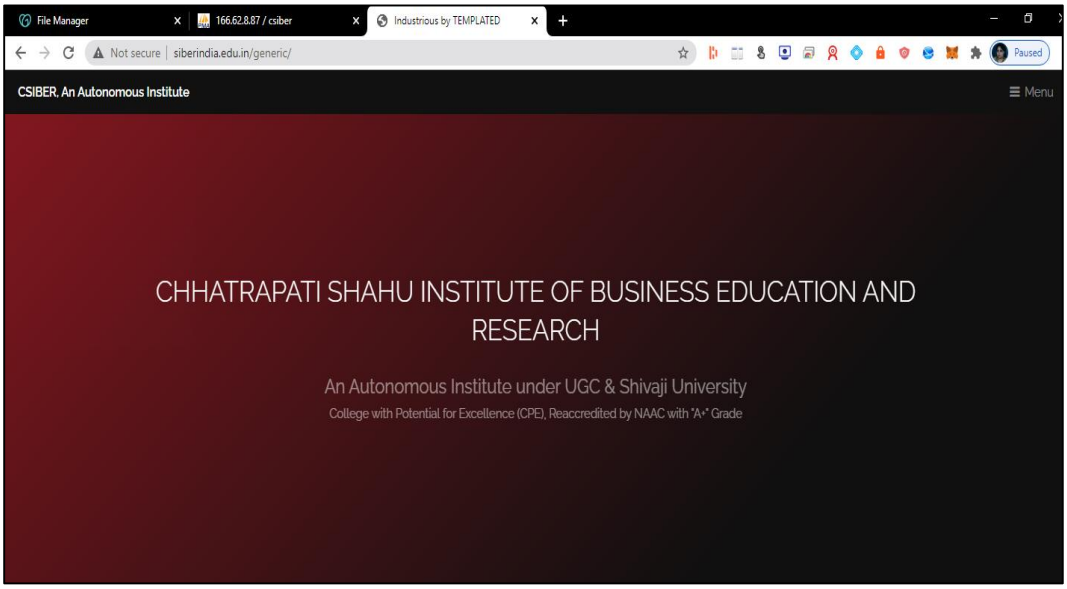
- ✓ For different browsers, Mozilla and Chrome in particular, due to their highest market share.
- ✓ For different display sizes.
- ✓ For Concurrency
- ✓ The allocation process of specific GE subjects should stop, when the student count reaches maximum capacity
- ✓ A proper validation mechanism should be in place to reduce runtime errors if any.

4. Experimental Results and Discussions :

The current section presents the student module in detail. The system is currently online and can be viewed by entering the following URL in the address bar of a browser:

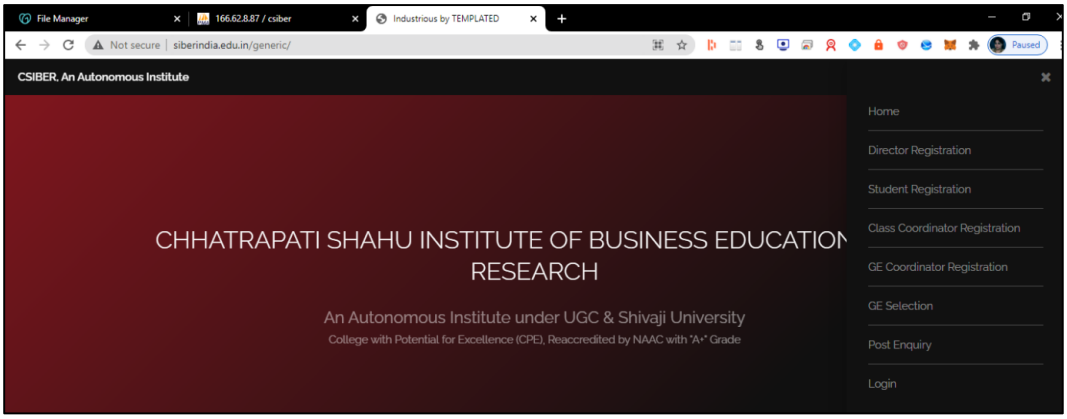
http://www.siberindia.edu.in/generic/

The following home page is displayed:



GE Web Portal Menu Structure :

Fig. 4 depicts the main menu structure of the GE web portal.



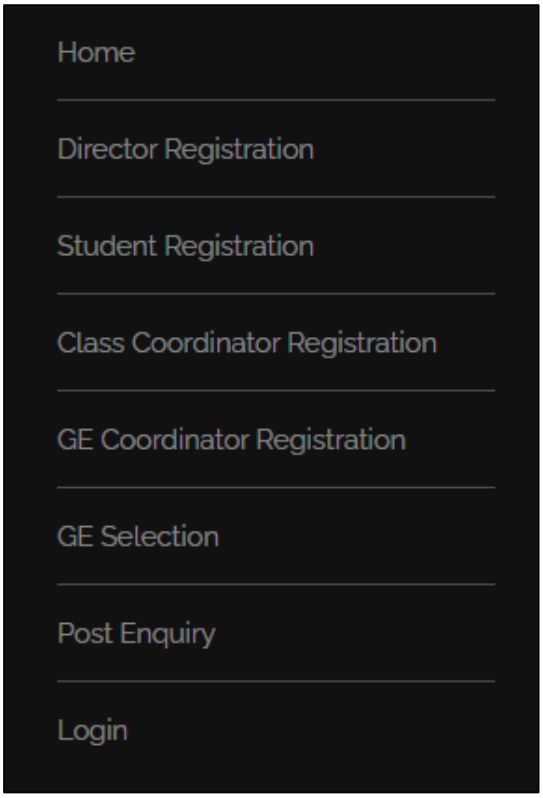


Fig. 4 Main Menu Structure

Role Name – student

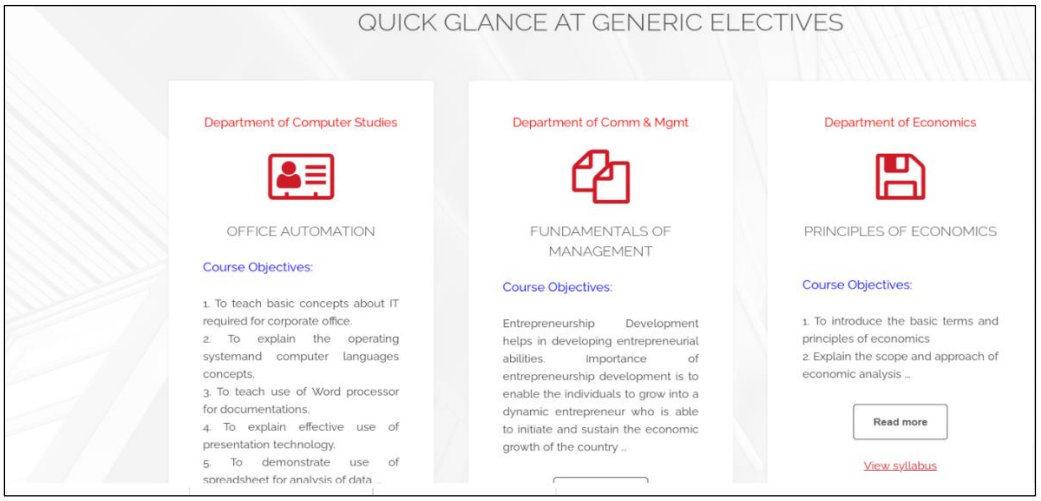
The different tasks permissible to the user in the '***student'*** role are listed below:

- Student Registration
- Authentication
- Edit Profile
- Change Password
- Download registration Receipt
- GE subject selection
- View the current status of GE selection
- Download GE Allocation Receipt

Student Module :
Pre-registration Procedure :

To get information about GE electives offered by different departments in the current year and semester, display the web portal home page and scroll down to the section shown in Fig. 5.

Fig. 5. Quick Glance at Generic Electives



The 5 different departments are listed along with their course objectives.

For viewing the course content, click on the '***View syllabus'*** link. The syllabus is displayed in PDF format as shown in Fig. 6 which can be downloaded or printed by the student.

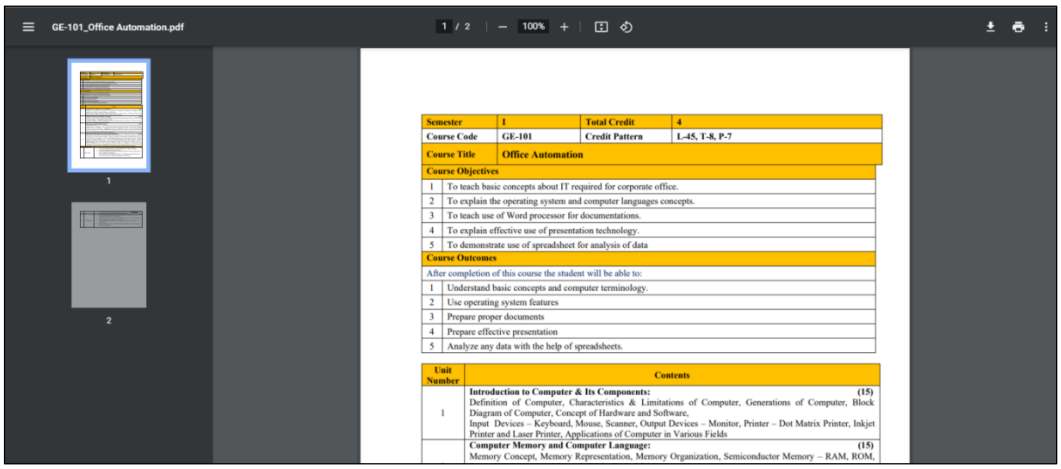
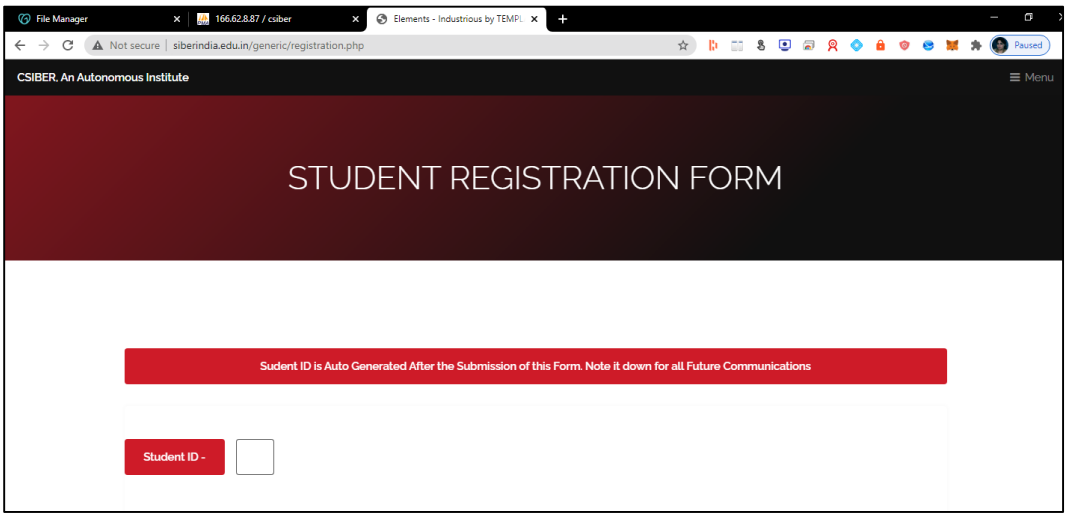


Fig 6. Viewing GE Syllabus

Task: Student Registration

Select the '***Student Registration***' option from the main menu. The student registration form is displayed as shown below:



All the fields are required. Enter the details and select the program name from the dropdown list. On entering the above details click on the '***Submit Form'*** button. On successful submission of the form, the unique student ID is auto-generated. Note it down for all future communications.

Fig. 7 shows a sample student registration:

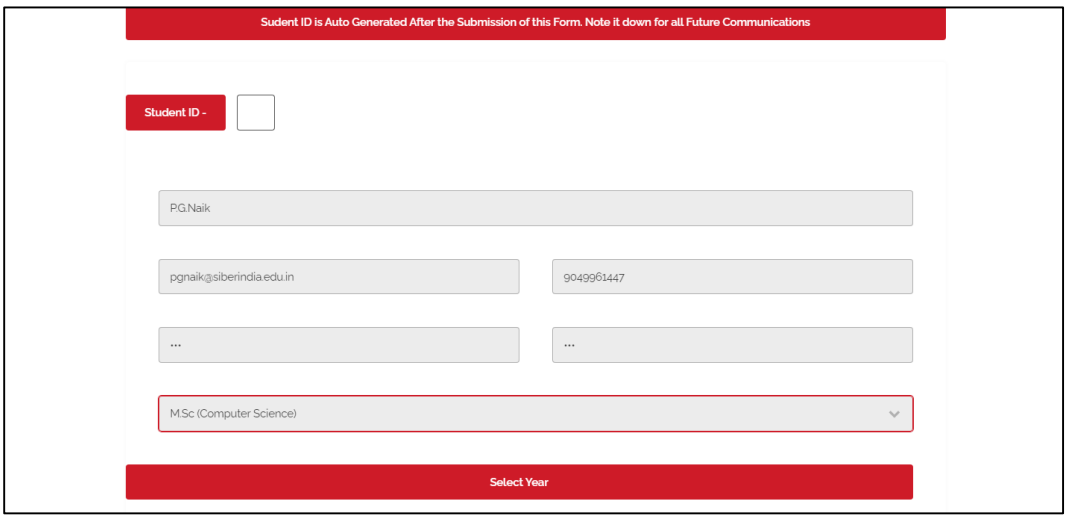
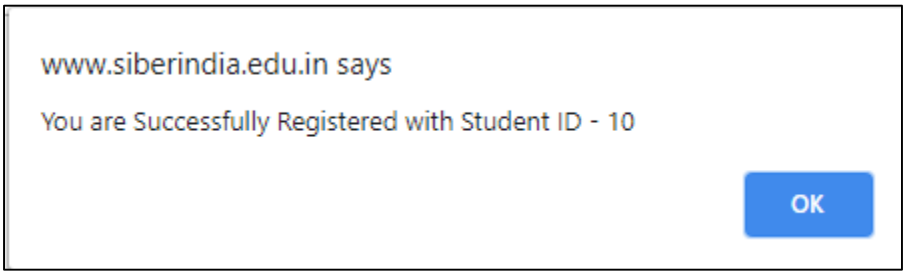


Fig 7. Sample Student Registration

On successful registration, the message box is generated which displays the student id generated by the system.



On clicking the 'OK' button, the home page is displayed.

Validation Routines :

The different validation routines employed in the implementation are listed below:

Rule 1: All the fields displayed on the student registration form are required fields.

If any of the fields are left blank, the error message '***Please fill out this field*** is displayed

Rule 2 : Password and confirm password fields should match.

If the password and confirm password fields do not match, then the error message '***Passwords do not match***' is displayed.

Rule 3 : If the program name and roll no already exist in the database, then the error message, '***You are Already Registered with Student ID …***' is displayed.

Rule 4 : Email Validation

The email ID entered should be in a proper format containing '@' and '.' Characters. If an invalid email ID is entered by the user, then the following error message is displayed:

Rule 5 : Mobile Validation

The mobile no entered by the user should contain 10 digits. If invalid mobile is entered by the user, then the error message '***Please match the requested format***' is displayed.

Rule 6 : Duplicate Email Validation

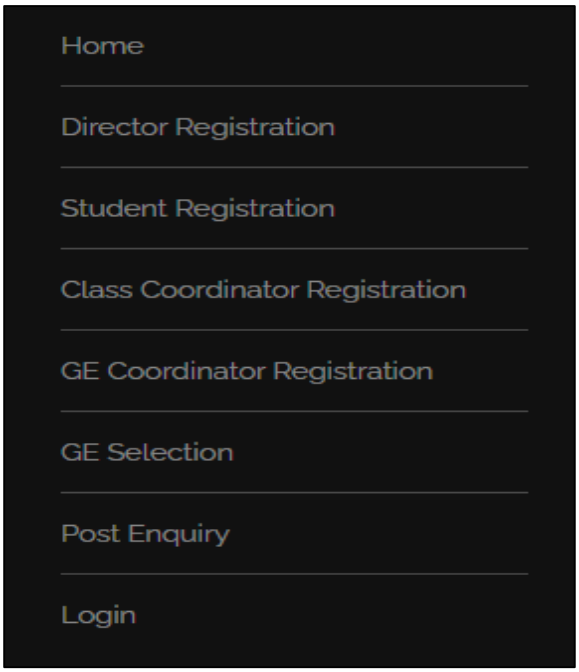
Since the email ID of the student is used as a username for authentication with the system, it should be unique and duplicates are not allowed. If the student enters the

email ID which already exists in the database, the error message '***Email already taken'*** is displayed.

On clicking the '***OK'*** button, the student registration form is displayed and the data entered by the user earlier are preserved.

Task : Student Login

Only after successful registration, the student will be able to login into the system using the password entered by the student during the registration process. The web portal main menu is shown below:



For authentication, select the '***Login***' option from the main menu. The login dialog is displayed as shown in Fig. 8.

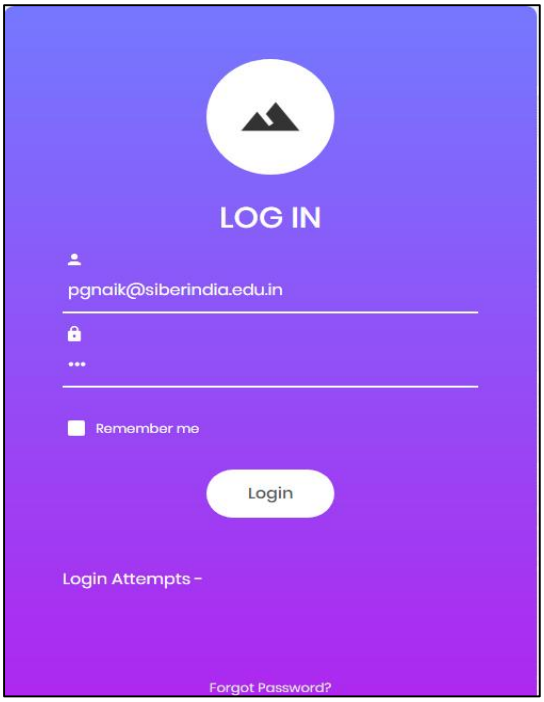


Fig. 8. Student Authentication Form.

On successful authentication, the student dashboard is displayed as shown in Fig 9.

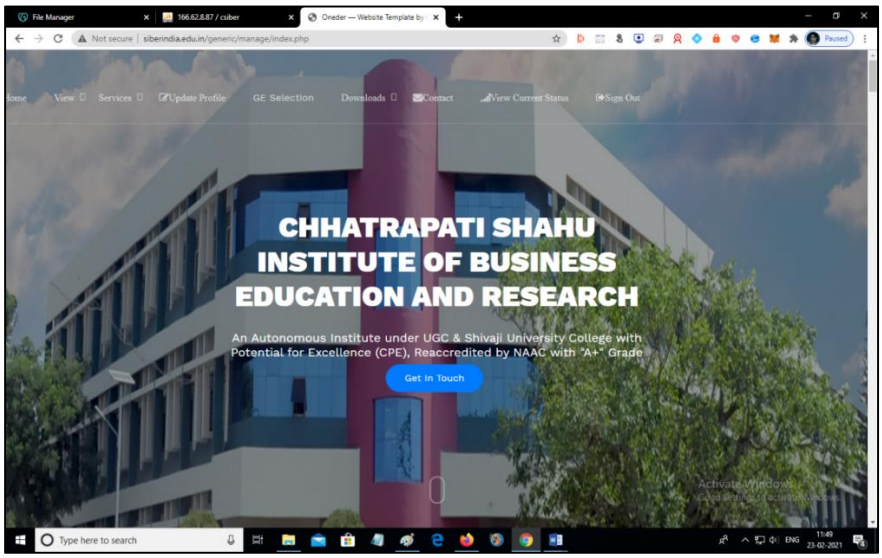


Fig. 9. Student Dashboard

Menu Structure for Authenticated Student :

The menu structure for the authenticated student is shown below:

Home

View

- View GE Allocation

Services

- Change Password
- Password Recovery

Update Profile

GE Selection

Downloads

- Download Registration Receipt
- Download GE Allocation Receipt

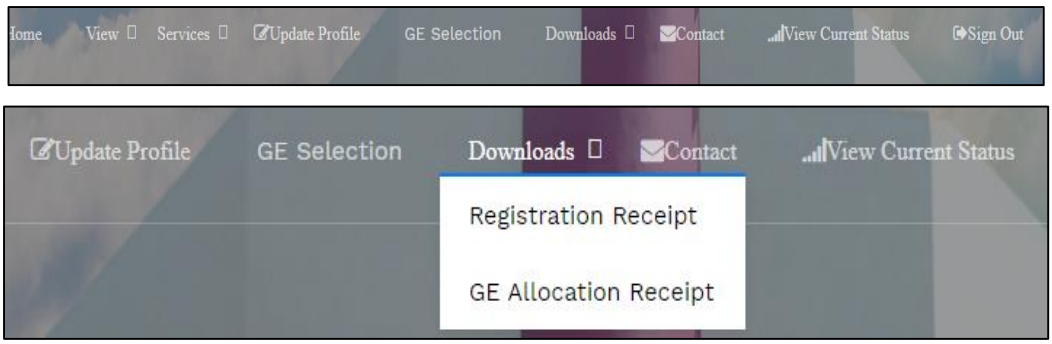
Contact

View Current Status

Sign Out

Task: Downloading Registration Receipt

On successful registration, the student can download the registration receipt.



For downloading the registration receipt, select ***Downloads → Registration Receipt*** from the main menu of the student dashboard.

The student registration receipt is generated which contains the date and time of registration along with other details as shown in Fig. 10.

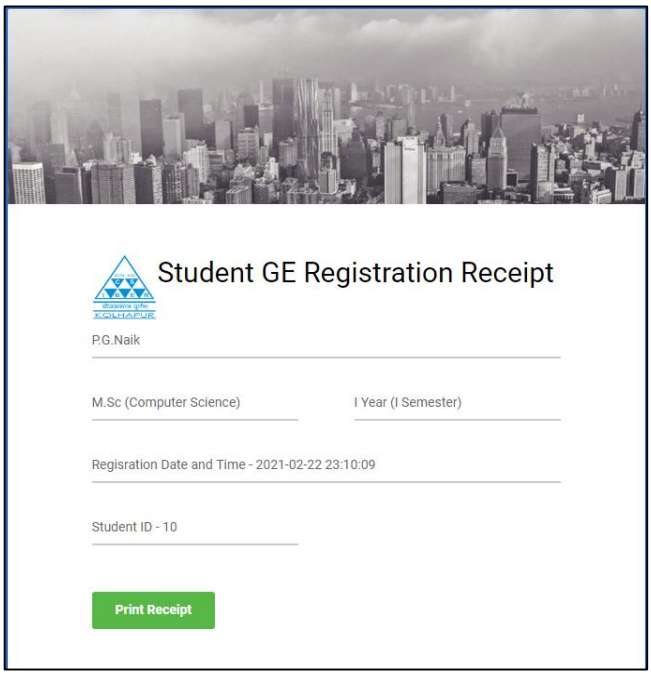
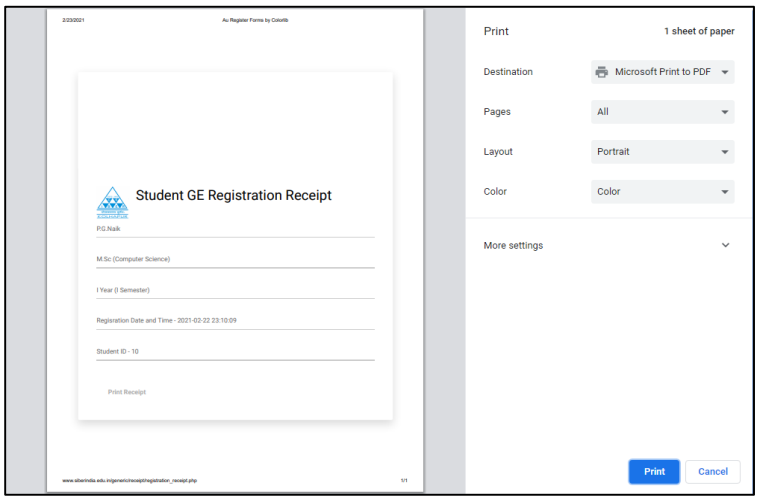


Fig. 10. Downloading GE Registration Receipt

To print the receipt or download the receipt, click on the '***Print Receipt'*** button. The print dialog is displayed as shown below:

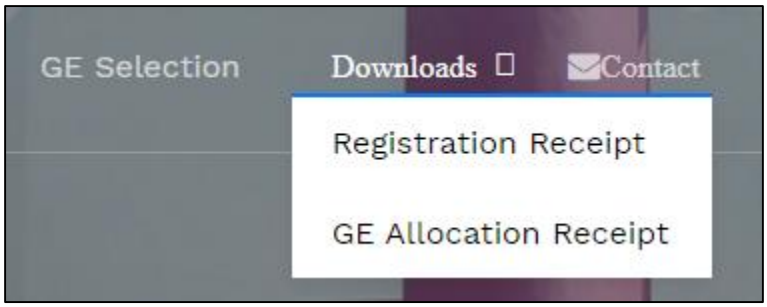


For downloading the receipt in PDF format, in the '***Destination***' dropdown list, select the '***Microsoft Print to PDF'*** option and click on the '***Print'*** button.

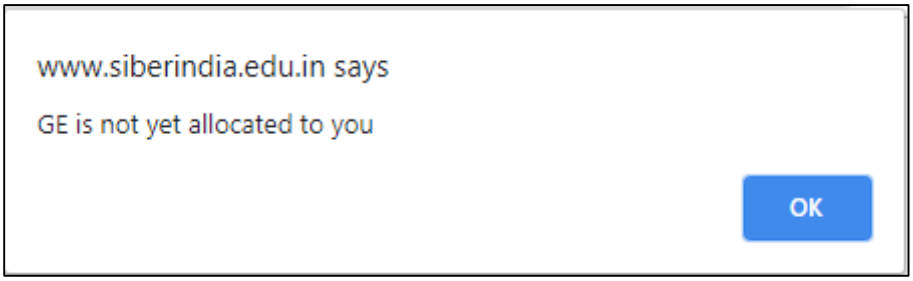
Enter the meaningful name for the file and select the location where you want to save the file and click on the '***Save'*** button.

Click on the SIBER logo to return to the student dashboard.

The '***Downloads'*** menu also contains an option for downloading '***GE Allocation Receipt'*** which is not currently available to the student and becomes available only after selecting the GE subject.



To test, select the menu option ***Downloads → GE Allocation Receipt.*** The message '***GE is not yet allocated to you*** is displayed as shown below:

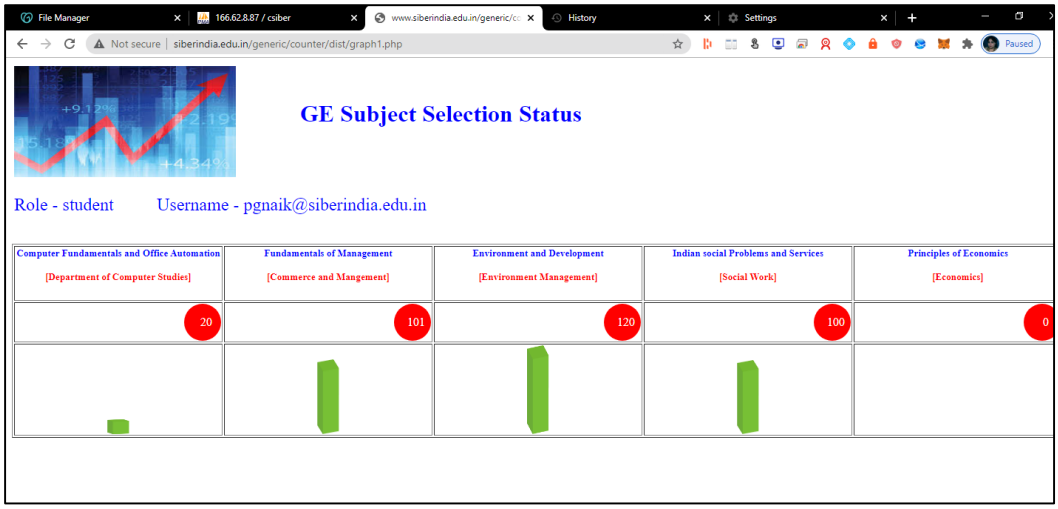


Click on the '***OK***' button to return to the student dashboard.

Task : Viewing Current GE Selection Status

After the GE selection process commences, the student can check the availability of the GE subject. Currently, the quota for each subject is fixed at 120.

To view the current GE selection status, select the '***View Current Status'*** menu option from the main menu. The following page is displayed which reveals the current count of GE subject selection in a graphical format.



Click on the image to return to the student dashboard.

Task : GE Selection

There are two interfaces for GE selection:

- Desktop interface from student dashboard.
- Mobile interface from web portal home page.

With both selections, the student needs to authenticate himself with the system using the username and password. The username is the Email ID of the student and the password is selected by the user at the time of the registration process.

The workflow in both interfaces differs slightly:

For selecting the GE subject from the desktop interface, the steps arelisted below:

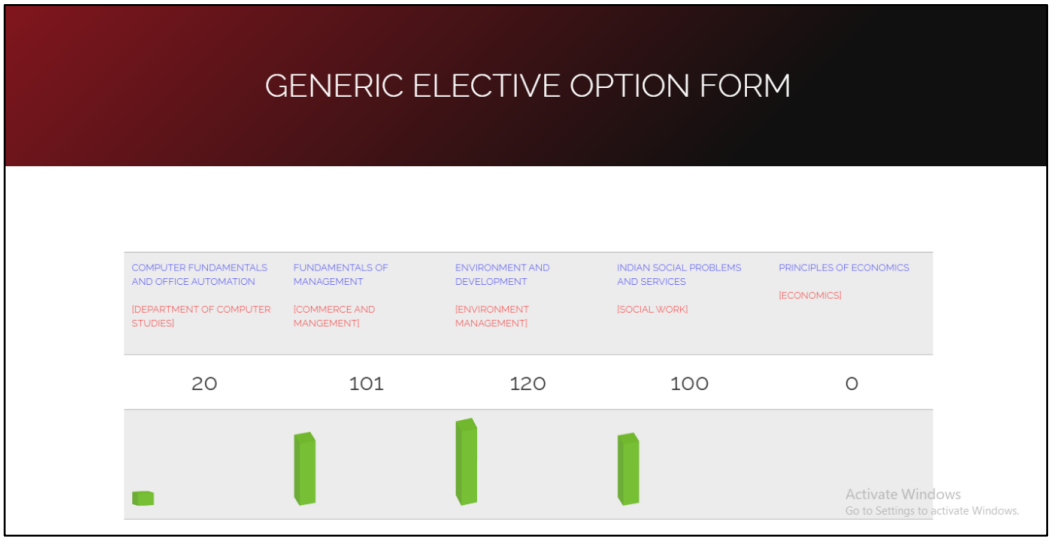
- Select the '***Login'*** option from the main menu of the web portal.
- On successful login, the student dashboard is displayed.
- Select the '***GE Selection'*** option from the main menu.
- The GE selection page is displayed.

For selecting the GE subject from the mobile interface, the steps arelisted below:

- Select the '***GE Selection'*** option from the main menu of the web portal.
- On successful login, the GE selection page is displayed. (The student dashboard is not displayed).

For using the desktop interface, select the 'GE Selection option from the main menu.

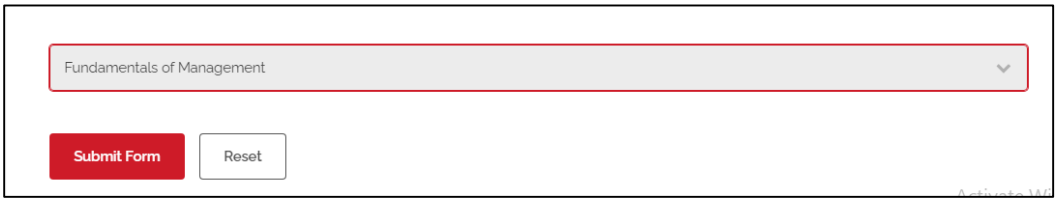
The following page is displayed:



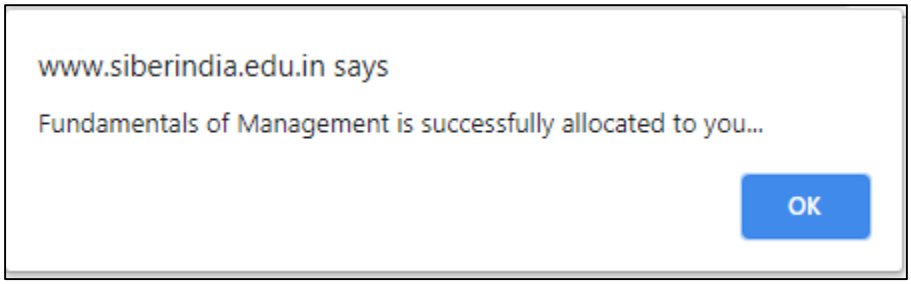
Enter the student id generated during student registration and click on the '***View Details*** button.

Verify the details displayed.

On confirming the displayed information, select the generic elective from the drop-down list and click on the '***Submit Form'*** button. In the current example '***Fundamentals of Management'*** is selected.

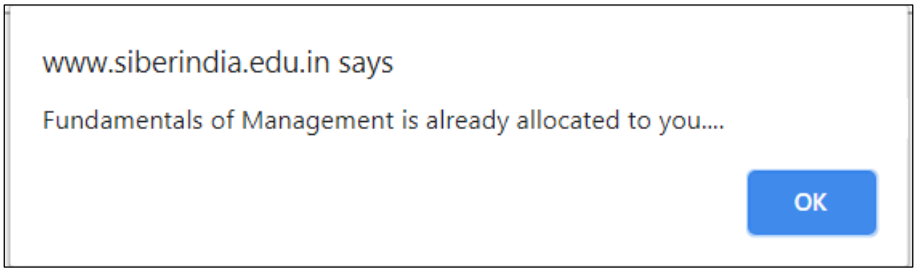


On successful allocation of the subject, the message '***Fundamentals of Management is successfully allocated to you…'*** is displayed.



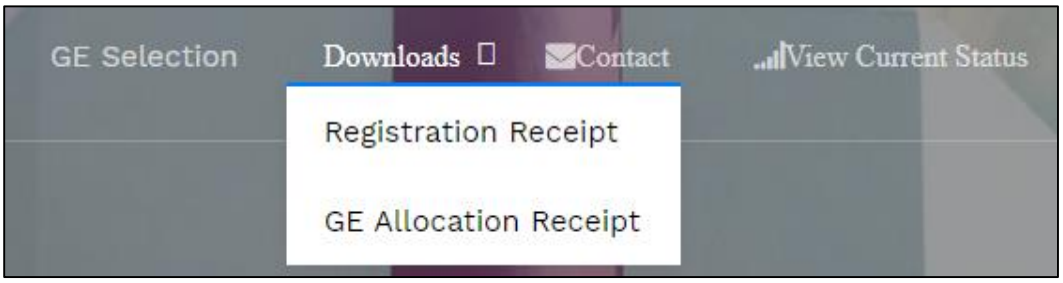
Click on the 'OK' button to return to the student dashboard.

The GE subject once selected by the user cannot be changed. If the student with the id equal to 10, tries to select another GE subject, the error message '***Fundamentals of Management is already allocated to you…***' is displayed as shown below:



Task : Downloading GE Selection Receipt

For downloading the GE selection receipt, select ***Downloads → GE Allocation Receipt*** from the main menu of the student dashboard.



The GE allocation receipt is generated as shown in Fig 11. For downloading the GE allocation receipt, select ***Downloads → Registration Receipt*** from the main menu of the student dashboard.The GE allocation receipt is generated which contains the date and time of GE allocation along with other details as shown in Fig. 11.

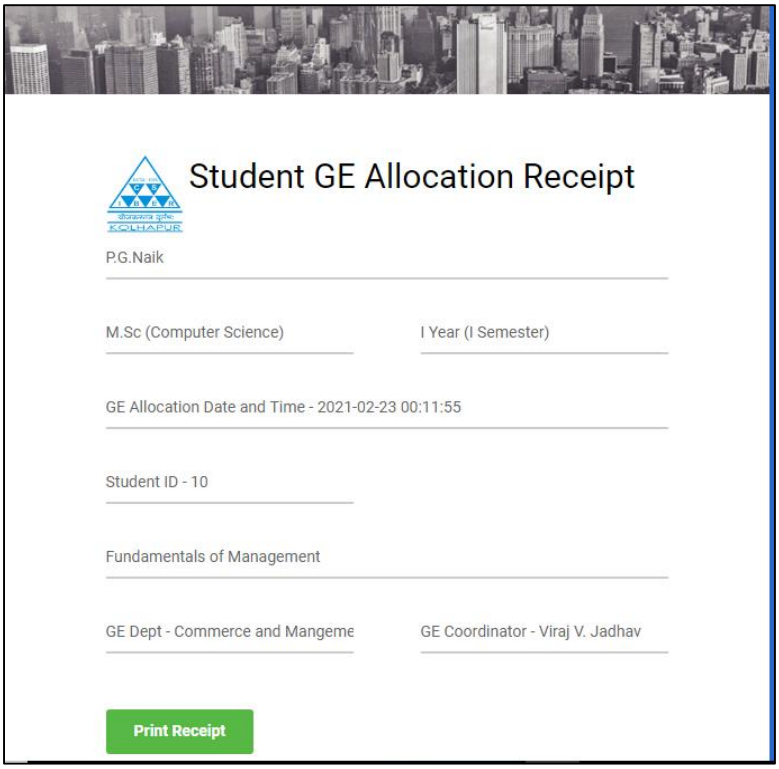
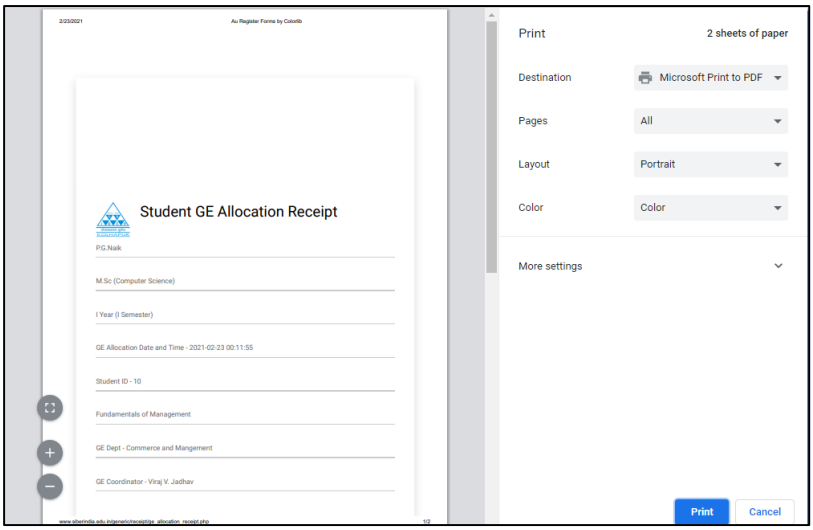


Fig. 11. Downloading GE Allocation Receipt.

To print the receipt or download the receipt, click on the '***Print Receipt'*** button. The print dialog is displayed as shown below:

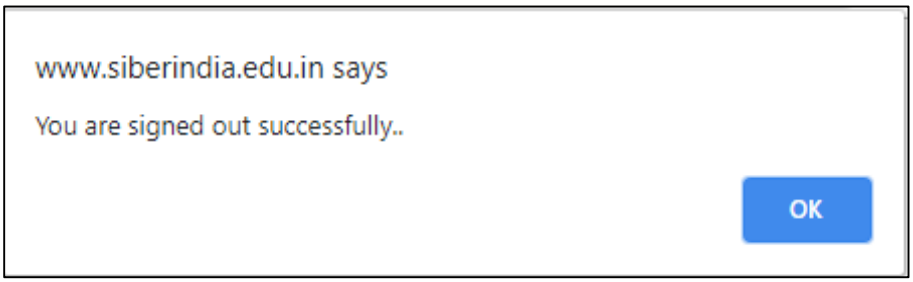


Click on the SIBER logo to return to the dashboard.

Task : Signout

For logging out of the system, select the 'Sign Out' option from the main menu.

On successfully logging out of the system, the message '***You are signed out successfully'*** is displayed.



5. Conclusion and Scope for Future Work :

The current research focuses onthe design and development of the Online Generic Elective Selection System@CSIBER with an emphasis on student modules. With due consideration to no. and type of end users, the manual process is both cumbersome and error-prone. To address these issues a user-friendly web-based system is developed to address the needs of all users at different levels. The different end-user requirements are identified and incorporated into the system to offer controlled access to the system depending on the role in which the user is placed. This also assists in preventing inducing any inconsistencies in the system at the operational level. The student module is completely implemented and deployed on the web hosting platform which enables the student to perform different pre-registration activities, register with the system, and select the subject of his/her choice. The system is integrated with the mailing system to send mail to the student on successful registration and GE selection.

Our future work focuses on integrating the system with WhatsApp to automate the process of creating WhatsApp groups of students with the corresponding GE coordinator as group admin to enable all future communications.

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ANDROID CITY BUS APPLICATION FOR KOLHAPUR MUNICIPAL TRANSPORT

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ABSTRACT : This android application is used to find the bus information from one place to another. Users need to give the details of the source and destination. Accordingly, it will display the details of the bus which is going on that route. It is a time-saving application for the user. Users can easily get information related to the bus on a particular route. In this way, a user will be free of confusion about the buses. It will also be very helpful for those people who are new to the city. In this, there is an admin module in which he/she can update various city bus paths along with their timing to the system database. Also, the admin can update the ticket price and maintains the schedules. It also encourages more passengers to make the most of their city bus system.

Keywords : android application, mobile application, bus service, local bus app, local industry

Introduction :

The public Transportation system is an important part of every city in India (In India that too on Maharashtra 60% of people prefer the bus service as our mode of transportation). In, India the public transportation system includes buses, trains, metros, subways, etc. in Maharashtra buses are an integral part of this public transport system.

As many metro cities have strong connectivity of local buses. This is the digital era and many people use smartphones for information access & digital transaction. In India, almost 60% population used android based smartphones. As android smartphones are popular among people many metro city's bus transportation system has already developed their android applications for the convenience of customers

Here we proposed an android city bus application for the local bus transport system in Kolhapur municipal corporation area, Maharashtra. As stated above many metro cities have their bus system application but Kolhapur is a tier 2 city and doesn't have any such application for customers. In Kolhapur, many people like to travel by bus daily to reduce fuel consumption, pollution & heavy traffic.

As per the 2018 statistics of Kolhapur city with a current population of 8,47,450, almost 45% of the population uses Kolhapur Municipal Transport (KMT) buses. This indicates that buses form one of the vital assets for the people of Kolhapur. The situation happens to be more or less the same in other cities like Bangalore or Mumbai. However, the frequency of the buses is not at par to suffice the thirst of the commuters. Buses are overcrowded. Many times, they are delayed due to substandard traffic conditions. So, there is a strong need of having a fool proof system to take care of such issues.

KMC Transport Department was established on 1st April 1962. The bus service was started under this department to provide economical, timely, and reliable travel facilities to the citizens of Kolhapur. The transport department provides city bus service in Kolhapur city, nearby suburban areas, and the rural area within 20 km of city limits. KMT is the main public transport provider in the Kolhapur metropolitan area.78540 passengers daily travel by KMT Bus. Nearly 129 buses have around 130 schedules providing around 1950 trips per day for the passengers. There are 129 buses with the transport department as on March 2022 and 62 buses are on the road for daily service. These buses traveling on different routes are controlled by 5 transport control centres in the city. The central transport control centre is at Ch. Shivaji Maharaj square. There are pass issuing centres at Maharana Pratap Chowk, Gangavesh, and Shri Shahu Maidan, and are open all weekdays from 8.00 morning to 8.00 at night. In this region, many buses are available for various routes, yet no appropriate information about their timing is available. Especially in a pandemic staff strength, I reduced and one-to-one contact is also restricted there is a problem for customers to get timely information about bus timing, bus routes, frequency, etc. Here we proposed a system that will be an android bus application for Kolhapur Bus city transport.

Literature Survey :

Research on public transportation has usually focused on the effectiveness of transport. But this information available is also a critical issue. This bus availability and accessibility data is real-time and can change at any time depending on the situation. There may be the possibility of a bus cancellation or time change due to some traffic situation or problem with the bus.

Author Ingle D proposed a framework and analysed the implemented bus tracking system (Ingle, D.2015). The feature of this system is, it doesn't require any internet or GPS. The system is SMS based and when the user sent an SMS to a Toll-Free number then he will get details about the bus.

With the help, of android mobile location reminders can be manipulated. In any android, one can Google maps API and set bus timetables and location-based reminders accordingly. Here authors (Battin, P. et al 2016) proposed a prediction system for bus arrival based on bus customers' participatory sensing. The main

concern with local travellers or passenger is the waiting time for local buses, which discourages them to use the local transport system. Here proposed system depends upon the efforts of participating customers.

Here proposed system (Fong, S.L. et al.2019) describes the scenario in the Malaysia bus system where a smart bus application has features like- bus live location using GPS, an alert passenger on mobile when the bus is approaching a bus stop, display fare and the number of stops based on user location, use QR code for ticket payment.

(Jain, S., et al 2019) and (Hafiizh Nur et al.2020) also proposed a school or college bus tracking system with the help of google map API, and GPS tracking, which will ensure the security of students on the bus.

With the help of the android application, passengers can access real-time bus data. A few of the following applications, we have studied before developing one.

Android-based Application	**Year**	**Facilities/Features**
1) RedBus (Intercity bus ticketing service)	2016	a) Booking history. b) Push notifications. c) 24/7 Customer care and support. d) Find buses and route information. e) Select boarding and drop-off points.
2) PMPML (Pune city bus guide)	2016	a) Citizen selects only grievance and the department is auto-selected by the system. b) Option to put photographs for respective grievances. c) Citizen gets SMS and email alerts. d) Citizens can provide feedback on offered services.
3) Delhi Bus Route	2016	a) In this app no internet connection is needed. b) Complete description of Delhi Transport Route Details. c) Get multiple bus routes from source to destination. d) Also we can find the route by the bus number. e) Get metro routes from source to destination with time and fare.

4) MyBMTC (Bangalore Metropolitan Transport Corporation App)	2019	a) Locate buses on the route. b) Locate buses near stops c) Buses arriving at the bus stand and airport d) Show buses on Map e) Trip planner
5) Best Pravas (Mumbai city bus transport app)	2019	a) Real Time ETA (Expected Time of Arrival) of routes. b) Tracks buses by routes. c) Static Timetable for each route. d) Lost and Found functionality. e) Provide feedback to improve our services. f) City guide. g) Quick Tips for understanding the mobile app.

1. Need for KMT Bus Application

Kolhapur is a tourist center and needs to be a model city to provide standard local public transport service facilities. This will improve the inflow of tourists and also give a good image of our state and city. It is observed that the number of vehicles approximately increased almost 25 times to 12,50,000 in 2021 from around 50,000 in 2000. Learning from the examples of other cities where traffic congestion has been a major factor.

In Kolhapur, Municipal Corporation runs its public bus transport system, which is called KMT (Kolhapur Municipal Transport). Many people use this service for local commutes as they have multiple route options. KMC is planning to provide state of art infrastructure that would attract local citizens to adopt public transport as the first choice of travel. These days prices of fuels are increasing tremendously and even pollution is increasing. It's always ideal to use the public transport system which will reduce pollution, and traffic congestion and saves fuel. As there is an increase in digitalization and every other person carries a smartphone these days. Every customer gets information on tip of their finger. Especially after the COVID-19 pandemic use of the online system and contactless information is increased largely. We visited KMC and come to know that there is no dedicated mobile app for KMT service. These days customers like to know bus details, times, and routes on mobile. Here we propose this application which will be designed to give all information about KMT (Kolhapur Municipal Transport) buses.

This city bus app will provide a schedule of buses, the distance between bus stops, and route maps, and even commuters can rise their concern online with the help of

this application. This app will be a major step toward the automation of city bus services and technology-based solutions to commuters' problems.

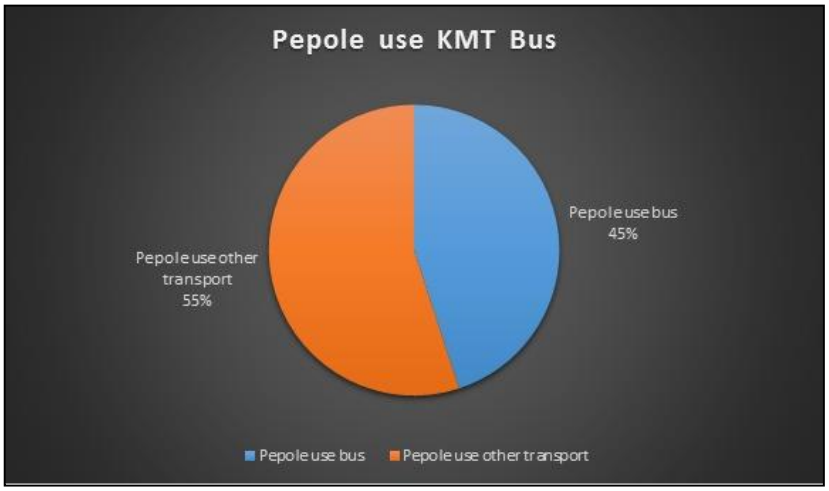

Figure 1 shows the number of people who use the bus service. Almost 45% of the people use public transport. People use this public bus transport system out of them almost 60% of people use android mobile phones This is the basic reason here we proposed an android-based Kolhapur city bus application.

2. Proposed System

In this paper, we proposed Android Mobile Application for the Kolhapur region city bus Transport system which is known as KMT (Kolhapur Municipal Transport). The following Figure 42 shows the overall architecture of the system.

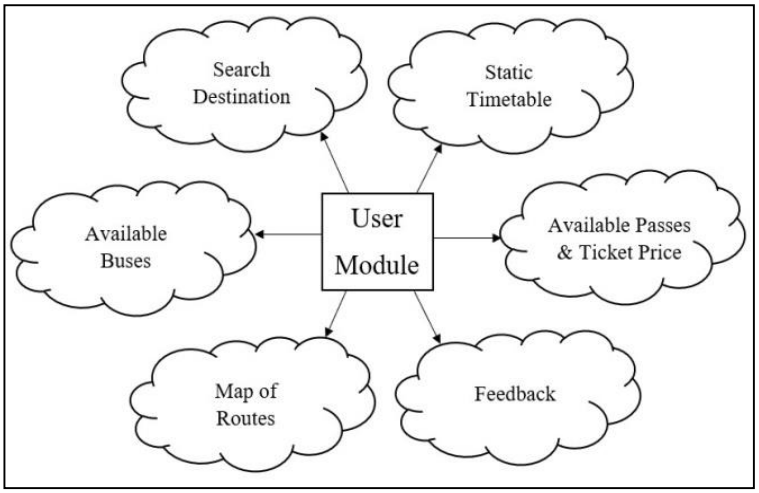

Fig. 2 General System Architecture

This System consists of two modules:

2.1 User module :

The following figure shows details of the User module details

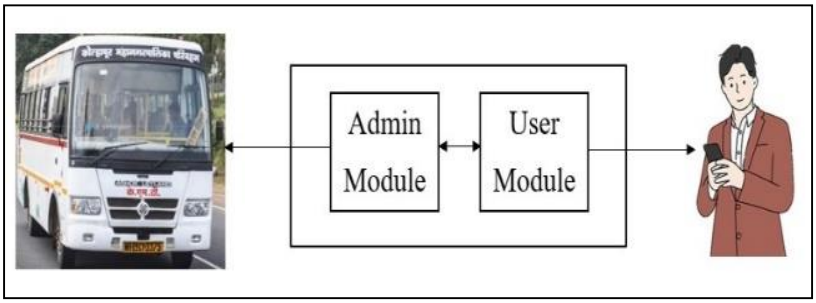

Fig.3. Details of user Module

With the help of this module, users can perform various tasks/actions. Users can register for this application and can search for a destination point. Here users are even able to check the availability and schedules of buses. Commuters will be able to access the bus route map. This system provides feedback about service from the user. With the help of this feed, it will be easy to improve the transport system over the years.

4.2 Admin Module :

With the help of this module, users can perform different tasks/actions. Admin can add/correct the bus route. Admin will be able to change ticket prices and bus details. Admin will maintain the schedule of the bus. In the future admin will be able to add driver and conductor details and will be able to accept payments online.

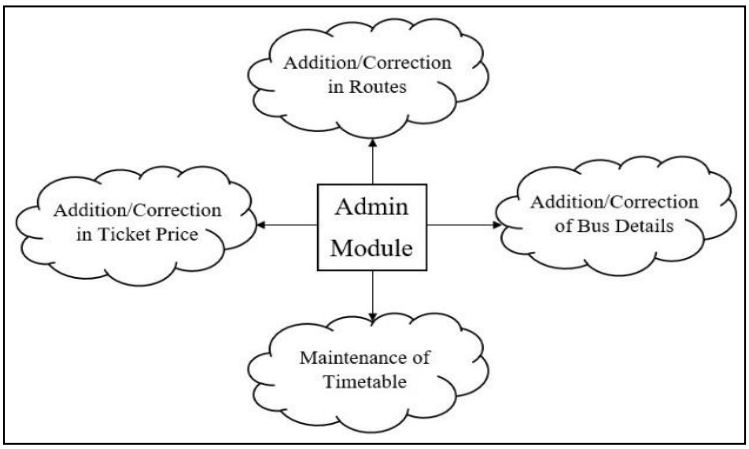

Fig. 4. Details of Admin Module

The following figure shows some of the implementation screenshots

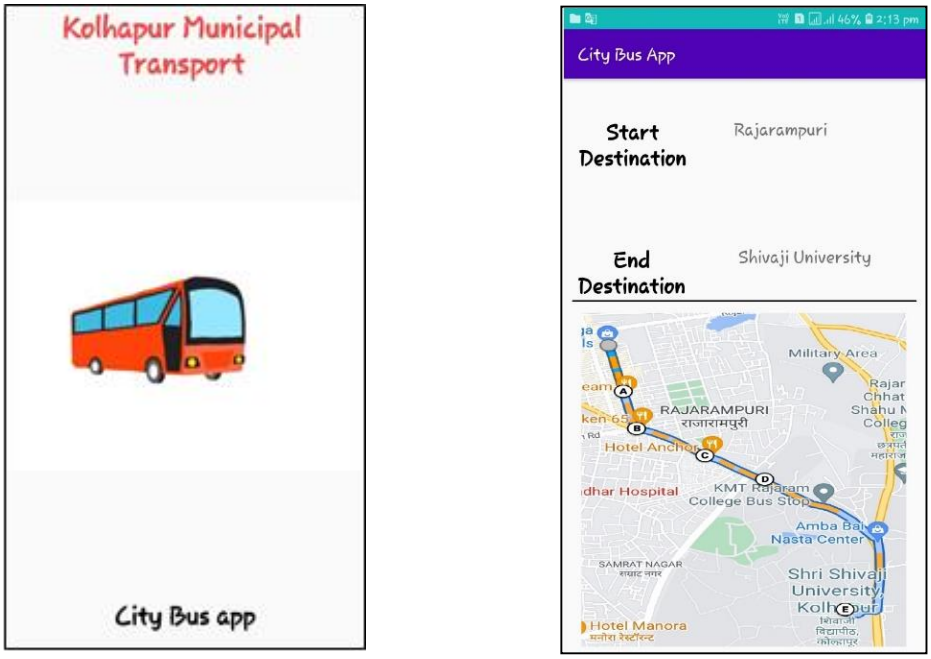

Fig. 5. Implementation Screenshots

Conclusion :

It can be observed that mobile applications are very important in every field of human endeavor. We presented the design and implementation of a mobile application called City Bus Application for Kolhapur & Transport, with which mobile users can get available bus information they need anytime and anywhere. Users can get location-based information. Admin can manage the schedules of buses.

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CLASSIFICATION AND DETECTION OF BRAIN TUMOR USING MACHINE LEARNING

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ABSTRACT : Many consider brain tumours one of the most prevalent forms of cancer as one of the world's most severe diseases. Brain tumours kill thousands of individuals annually worldwide because of the tumour cells' accelerated proliferation. To save the lives of thousands of individuals worldwide, an accurate and quick examination of brain tumours and automatic detection of these tumours are necessary. Cancer may develop in some situations due to the expansion of aberrant brain cells, a condition recognized medically as a brain tumour. Magnetic resonance imaging, or MRI scans, is the preferred technique for detecting brain tumours. The information required to pinpoint the aberrant tissue growth that is taking place in the brain is obtained from MRI scans. A very effective strategy to identify brain tumours is using machine learning.

Keywords : Brain Tumour, Decision Tree Classifier, Logistic Regression, Random Forest

Introduction :

A system for detecting brain tumours can determine whether or not the subject's brain contains a tumour based on a picture of the brain. Medical facilities will use the technique to identify a patient's brain. The system will examine the image and decide whether or not the patient's brain contains a tumour. The human brain serves as the body's primary control centre. Memory, eyesight, hearing, knowledge, personality, and the ability to solve problems, among other things, are all under its influence (Charbuty & Abdulazeez 2021). The stagnation of cell growth in the brain is the primary contributor to the development of brain tumours. Several different health organizations have named brain tumours the second most prominent disease responsible for the deaths of many people worldwide. If a brain tumour can be detected in its early stages, there is a greater chance that it can be effectively treated medically. Utilization of Magnetic Resonance Technology When compared to images produced by computed tomography, imaging images have been

acknowledged as possessing a higher level of detail and more consistency (Keerthana et al. 2021).

When diagnosing brain tumours, medical imaging is one of the most valuable tools that doctors have at their disposal. The ability to automate this procedure using a technology that has a high degree of precision could be beneficial. However, due to concerns regarding legal obligations, such a tool cannot substitute for the knowledgeable opinions of experienced medical professionals (Al-Ayyoub et al. 2012).

The rate of growth of brain tumours can be classified as either slow or aggressive. In contrast, a malignant tumour (one that proliferates) will spread from its original site to other locations in the body. In contrast, a benign tumour (one that grows slowly) will not infiltrate the tissues around it. The World Health Organization assigns grades from I to IV to each type of brain tumour. Tumours of grades I and II are believed to have a modest rate of growth, but tumours of grades III and IV are considered more aggressive and have a worse prognosis (Amin et al. 2020).

Certain tumours have the potential to affect the structures in the brain that are located nearby. Therefore, for doctors to successfully perform any surgical technique or therapeutic intervention involving the brain, they need to identify the region or area in the brain affected precisely. The method of separating tumours in the brain by isolating better and healthier tissues of damaged areas is referred to as the segmentation of brain tumours. Consequently, brain segmentation is the most challenging process involved in diagnostic procedures. Many exclusionary strategies rely on edge-based data that is not exclusive to the field of brain tumours because they are not specialized in this area (Younis et al. 2022).

The availability of several methods for the extraction of features and categorization from MRI scans helps detect malignancies in the brain for treatment. Utilizing an image classification technique that uses convolutional neural networks would help make highly accurate predictions regarding the early-stage detection of cancers (Shirwaikar et al. 2021).

Objectives :

The objectives are as follows:

- ✓ Identify the infected image using images provided by MRI Scan
- ✓ Identify the machine learning algorithm which provides the most accurate results
- ✓ Compare the results generated using multiple machine-learning algorithms

Algorithms Used :

a) **Logistic Regression :** Logistic Regression is a technique utilized by statisticians and researchers to analyze and classify binary and proportional response data sets. Logistic regression is one of the most important statistical and data mining techniques. The ability of LR to naturally generate probabilities and extend to situations involving several classes is among the most significant benefits of this method. One more advantage is that most of the techniques utilized in LR model analysis adhere to the same fundamentals as those utilized in linear regression (Maalouf 2011). Logistic regression is a method for modeling the probability of a discrete outcome given an input variable. The input variable is the key ingredient in this process. The most frequent type of logistic regression models a binary outcome, which refers to something that can only take on one of two possible values, such as true or false, yes or no, etc. When there are more than two possible discrete outcomes to a scenario, multinomial logistic regression can be used to model the situation (Rajesh 2021).

b) **Decision Tree :** Roots, branches, and leaves are the components that make up a typical tree. In the case of a Decision Tree, the same structure is followed. It has a root node, branches, and leaf nodes within its network. The testing of an attribute occurs on every internal node, the test result appears on the branch, and the class label appears on the leaf node as a direct consequence. A root node is the parent of every other node in a tree, and as its name suggests, it is the node at the very top of the tree (Patel et al. 2018).Classifiers based on decision trees are widely considered to be among the most well-known approaches for classifying and representing data in classifiers. Researchers specializing in areas as diverse as machine learning, pattern recognition, and statistics have all given thought to extend a decision tree using data already at hand (Kharade et al. 2021). The decision tree is the most common method for classifying and forecasting data. Learning by decision tree is an example of a standard inductive technique based on instances. It focuses on classification rules displayed in decision trees and is inferred from a collection of disordered and irregular instances. It does this in a top-down, recursive manner, comparing the attributes of internal nodes of the decision tree with one another. It then evaluates the downstream branches based on the various qualities of the node. Finally, it concludes from the decision tree's leaf nodes (Dai et al. 2016).

a) **Random Forest :** To accomplish this, it is necessary to aggregate the basic classifiers to produce an aggregated classifier with a more excellent resolution than the individual classifiers. One form of ensemble learning method that has been considered more than other types of ensemble learning

methods due to its simple structure, ease of understanding, and higher efficiency than other comparable methods is known as random forest. The data in question will almost always affect the capacity and effectiveness of the traditional procedures. The ability to be independent of the data domain and the power to adapt to the conditions of the problem space are two of the hardest aspects of the various types of classifiers (Savargiv et al. 2021)

Project Prerequisites :

Python version 3.6 and anaconda need to be pre-installed on your machine to participate in this project. For this project, the Jupyter notebook has been used. But you are free to make use of everything you like.

The following are the necessary components for this project:

a) Numpy – pip install NumPy

b) Tensorflow – pip install TensorFlow

c) Keras – pip install keras

The code and dataset for the brain tumor detection experiment are yours. This dataset already has a train, test, and prediction section separated for it. The photos that will be used as a training dataset are located under the train folder of the project. The photographs that will be used as a test dataset are located in the test folder, which may be found on your computer. Then, as a last step, we predict the outcome by using an image from our dataset of predictions (Patil et al. 2022).

Steps for identification of infected image :

```
import numpy as np
import tensorflow as tf

from keras.preprocessing.image import ImageDataGenerator
```

The dataset on brain tumours includes two folders labelled "NO" and "YES," comprising 122 and 175 photos, respectively. Import the folders that contain the images into the working directory that is currently active. The paths for each shot are by utilizing the imutils package, and we save them in a list referred to as image paths.

```
from imutils import paths
import matplotlib.pyplot as plt
import argparse
import os
import cv2

path = "brain_tumor_dataset"
image_paths = list(paths.list_images(path))
```

After this, each of the paths has been verified to extract the directory name (in this example, either "NO" or "YES" which serves as the label), and we resize the image to have a dimension of 224 by 224 pixels. Images of brain tumours can be converted into pixel information using the read () function found in the cv2 library.

```
images = []
labels = []
for image_path in image_paths:
    label = image_path.split(os.path.sep)[-2]
    image = cv2.imread(image_path)
    image = cv2.resize(image, (224, 224))
    images.append(image)
    labels.append(label)
```

Let's plot an image using the matplotlib module.

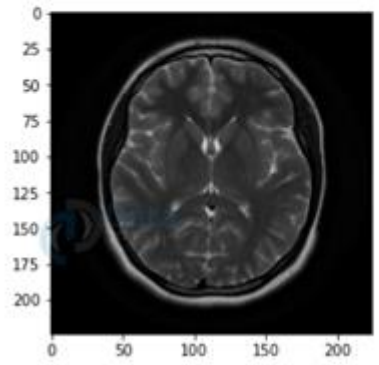
```
def plot_image(image):
    plt.imshow(image)
plot_image(images[0])
```

```
images=[]
labels=[]
for image_path in image_paths:
    label=image_path.split(os.path.sep)[-2]
    image=cv2.imread(image_path)
    image=cv2.resize(image,(224,224))

    images.append(image)
    labels.append(label)
```

```
def plot_image(image):
    plt.imshow(image)

plot_image(images[0])
```



As can be seen, the image and the label that corresponds to it have been saved in separate lists. However, the titles are strings, and machines cannot understand them in any way. Therefore, One-hot encoding should be applied to the titles. Additionally, it is needed to standardize the photographs and transform our lists into NumPy arrays to divide our dataset.

```
from sklearn.preprocessing import LabelBinarizer
from tensorflow.keras.utils import to_categorical
import numpy as np

images = np.array(images) / 255.0
labels = np.array(labels)

label_binarizer = LabelBinarizer()
labels = label_binarizer.fit_transform(labels)
labels = to_categorical(labels)
```

Convolutional Neural Networks, or CNNs for short, is a type of deep neural network frequently employed to interpret visual data. Image classification, detection, and image segmentation are successful applications for these kinds of networks (Kharade et al. 2022). Two primary components make up a CNN:

- A layer of convolutional processing that is responsible for feature extraction.

- ❖ At the very end, there is a fully connected layer that uses the output of the convolutional layers to predict the image's category.

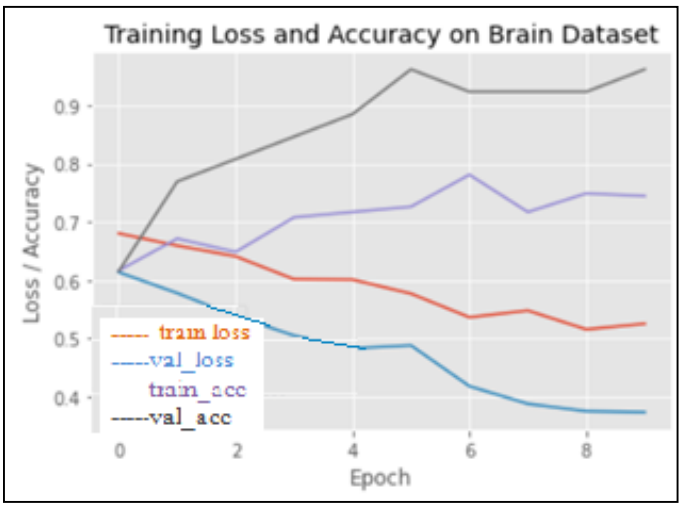
ImageDataGenerator is a tool that can be used for augmenting data that TensorFlow provides. In situations where the amount of input data is very limited, data augmentation can be a valuable tool. Therefore, to expand the size of the dataset, we employ a variety of transformations (Kharade et al. 2020).

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
train_generator = ImageDataGenerator(fill_mode= 'nearest', rotation_range= 15)
```

```
batch_size = 8
train_steps = len(train_X) // batch_size
validation_steps = len(test_X) // batch_size
epochs = 10
```

```
N=epochs
plt.style.use("ggplot")
plt.figure()
plt.plot(no.arange(0,N), history.history["loss"], label="train_loss")
plt.plot(no.arange(0,N), history.history["val_loss"], label="val_loss")
plt.plot(no.arange(0,N), history.history["accuracy"], label="train_acc")
plt.plot(no.arange(0,N), history.history["Val_accuracy"], label="val_acc")

plt.title("Training loss and Accuracy on Brain Dataset")
plt.xlabel("Epoch")
plt.ylabel("Loss/Accuracy")
plt.legent(loc="lower left")
plt.savefig("plt.jpg")
```



Conclusion :

In classifying brain cancers using machine learning, we developed a binary classifier to identify brain tumors in MRI scan pictures. Here we constructed a classifier through the use of transfer learning. As a result, an accuracy of 98% as well as visualize the overall performance of our model. The comparative accuracy in the percentage of various algorithms used;

Name of the algorithm	**Accuracy**
Logistic Regression	98%
Decision Tree Classifier	92%
Random Forest Classifier	97%

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DETERMINING THE ATTENTIVENESS OF STUDENTS IN THE ONLINE MODE OF LEARNING USING MACHINE LEARNING

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ABSTRACT : Today online education plays a significant contribution to the teaching learning pedagogy. This new-normal education methodology helps learners to grasp knowledge as per their interest, abilities, time, and their own pace. Association Rule Mining is a rule-based machine learning method used for discovering interesting relations between variables in large datasets. This data mining technique helps to discover the co-occurrences between the two variables in the datasets. Researchers used algorithms to decide the attentiveness of students based on specific factors like their facial expressions, body posture, eye, and head pose. This paper identifies and analyses the students' attentiveness in the online learning mode. The association rule mining technique has been implemented to decide the prominent factors that impact students' attentiveness in online education.

Keywords **:** Data Mining, Apriori algorithm, Association Rule Mining, Online Education

Introduction :

The online mode of learning is the modern mode of learning for students, teachers, or any other learners. This mode of learning evolved during the covid pandemic and within no time researchers discovered the pros and cons of this mode of learning (Shefali et al. 2021). On the bright side of this mode of learning, we can say that we got the flexibility to learn anytime and anywhere on our devices like mobile phones, laptops, etc. But when it comes to using an internet connection for accessing the learning material, the difficulties may vary depending upon the availability of the network in the specific area. The digital divide is the major problem in the success of online education (Shivangi 2020). Accessing educational material became a lot easier for students with the online learning method whereas on the contrary it was slightly challenging for the teachers to deliver their knowledge and teaching methods were affected. So, to overcome these limitations this research was carried out to examine the student's nature in online learning based on some crucial factors to get an efficient result.

The online learning mode has surely improved the soft skills of students and encouraged them to learn more new things and make use of time just by sitting in

one place. In the beginning, teachers were dubious about their way of teaching but gradually over time they got quite comfortable with their teaching methods. Teaching in online mode is very different from teaching in physical mode. In the actual classroom, teachers used to know whether the students are getting the point or not just by looking at their faces and expressions but in the online learning model, it became a little difficult because students were behind those black screens of computers from where they weren't visible. So, this thing became challenging for the teachers while they were teaching in the online mode (Rimba et al. 2020). That's why this research was carried out to study the factors where we can decide about students' attentiveness and to use them for the effective learning of the students and effective teaching too (Raskova & Afif 2020).

This paper presents a machine-learning approach using Association Rule Mining for analysis and prediction of students' attentiveness in online education (Thabet & Amor 2014). The data has been collected from the students through Google Forms. Students gave their honest opinion regarding the topics which were written in the google form. The total number of responses collected through google Forms from students for this research is 205. So based on the answers collected from students we have analysed the results and come to certain conclusions. Among many factors, the prime factors which were considered are:

1. Knowing if students feel sleepy in the online mode of learning.
2. Teachers conduct surprise tests in between the lectures.
3. Students share their computer screens to clear their doubts.
4. Random question-and-answer sessions between students and teachers to make the lecture more interactive.
5. Whether students are comfortable keeping their cameras on throughout the lecture.
6. The preferable online learning method among these 3 methods:
    i. Teachers show the blackboard using the camera.
    ii. Teaching through ppts.
    iii. Teachers using a virtual whiteboard
7. The duration of the lecture – whether students prefer a 30-minute lecture, 60-minute lecture, or 45-minute lecture.

So, based on these factors the research was carried out. The collected data were classified as per the rules of association mining and were converted into numerical data.

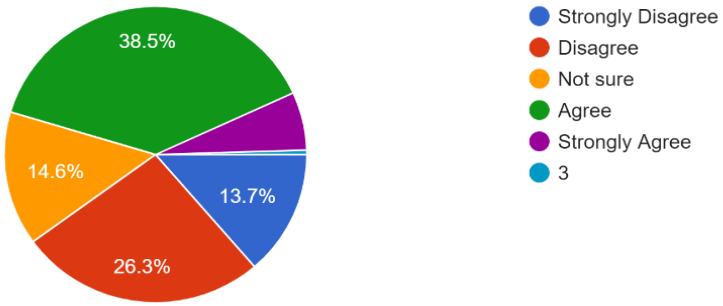

Fig 1. Online Learning preference

The following is the conversion of data to numerical data:

1. The sleepiness factor was decided as- 2 (if students have said yes), 1(if students have said sometimes), 3(if students have said no)

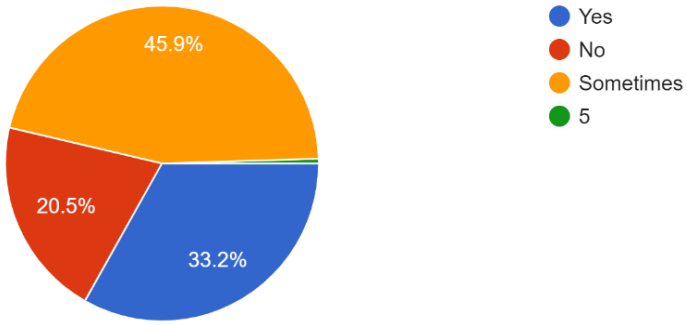

Fig 2. Online Lectures make Sleepy

2. For the conduction of surprise test in the online class- 1 (if students have said yes), 0(if students have said no)
3. Screen sharing done by students- 1(if students have said yes), 0 (if students have said no)
4. Student's preference to the random questions asked by the teacher in the online class- 1 (if students have said yes), 0(if students have said no)

5. Students comfort in keeping their camera on throughout the online class- 2(if students have said yes), 1(if students have said sometimes), 0 if students have said no)

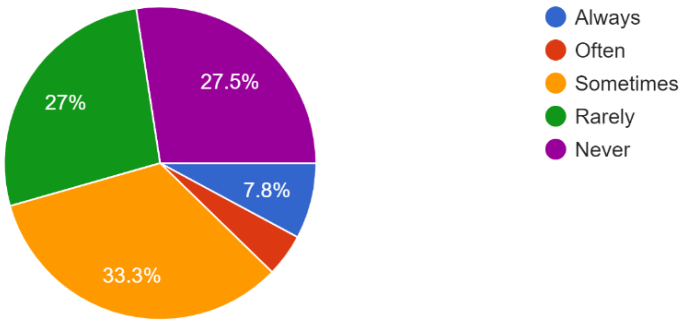

Fig 3. Students feel comfort to keep the camera on during the online lecture

6. Students preferred online learning method- 2(if students have said yes to PPTs), 1(if students have said yes to virtual whiteboard), 0(if students have said yes to blackboard)

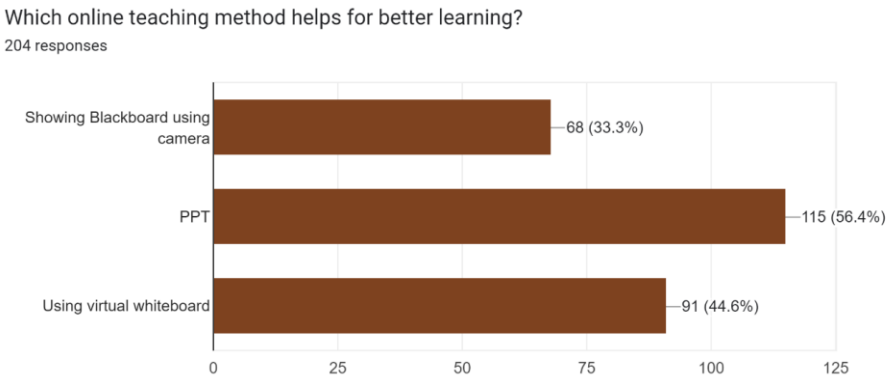

Fig 4. Online Teaching Methods

Result and discussion :

To study the attentiveness of students in online learning mode we have used the data gathered from Google forms and used association mining on it and discovered the result.In this research, the experiments were performed by using the data collected from 205 students through google forms. Google form is survey administrative software that allows us to collect information through some

questions. Many useful and appropriate questions were asked to the students and based on which we collected the information. Then the collected data was processed as per the requirement. First, the questions were segregated as per the necessity, and then the inputs and expected outputs were declared. The data were categorized and transformed into numerical data which proved to be useful in the algorithm.

Table1. Parameters used to identify students' attentiveness

Factors	**Values**		
	2	1	0
sleepiness factor	Yes	Sometimes	No
surprise test	Yes	Sometimes	No
Screen sharing	Yes	Sometimes	No
Chat box use	Yes	Sometimes	No
Unmute themself	Yes	Sometimes	No
Random Questions	Yes	Sometimes	No
Use Device Camera	Yes	Sometimes	No
Learning method	PPT	Virtual Whiteboard Sharing	Blackboard Sharing

The way the values were distributed proved to be effective and useful while analysing the results. Apriori algorithm is implemented on data by importing necessary libraries in python language. The Apriori algorithm was used throughout the process. We imported NumPy, pandas, and matplotlib libraries in python. Then it was checked if the data has any null values. It had no null values so it was good to go ahead. In the apriori algorithm we decided the minimum support, minimum confidence and minimum lift, minimum length and maximum length to be considered.

- Minimum support = 0.003
- Minimum confidence = 0.373
- Minimum lift = 0.2
- Minimum length = 2
- Maximum length = 6

Based on these values, the dataset is trained using the apriori algorithm and then the results were calculated.

Table 1 summarizes the parameters considered and their respective values. During experimentation at least 70% confidence and lift value 1 is considered for developing the model. The relation is said to be positive only if the value of lift is

1 or greater than 1. Keeping these points as our criteria we got the relations that will help to find the attentiveness of the students in the online lectures.

1) Students sometimes feel sleepy in the lecture if the lectures are not interactive.

   (Confidence is 99% for sometimes, 90% for yes, and 82.5% for no)

2) Students do not prefer the conduction of surprise tests in the middle of the lecture.

   (Confidence is 99.4% for yes and 91.4% for no)

3) Less number of students prefer screen sharing in the lecture to clear their doubts. (confidence is 81.3% for yes and 89.3% for no)

4) Random Q&A is preferred by fewer students in the online learning mode. (confidence is 82.8% for yes and 99.3% for no)

From the above criteria we can state the following:

1) If students feel sleepy and don't prefer surprise tests, they are less attentive.

2) If any student dislikes the conduction of surprise tests and screen sharing then he/she is less attentive.

3) If students feel sleepy and don't share the screen in the lecture then they seem less attentive.

4) If students are not okay with screen sharing and don't respond to Q&A sessions in class then they are less attentive.

5) If students feel sleepy, don't prefer surprise tests, don't share their screen, and don't even respond to random Q&A they are less attentive

As can be seen from the rules discovered that they are few conditions through which we can analyse the result. Based on these rules we can decide if he/she is attentive or not in the online lectures.

Conclusion :

In this paper, we have focused on finding the attentiveness of students in online lectures. Statistical tools are used for data normalization and pre-processing. The Apriori algorithm is implemented to discover the results based on the confidence, support, and lift values. If the lift is >=1 then it was considered a positive relationship which is the relationship that will work. And the values of lift which were <1 were ignored as they prove to be negative relationships. The criteria for the confidence was set to 70% and based on this we achieved conclusions that are

helpful concerning the results. This paper depicts the implementation of association rule mining to identify the student's attentiveness in online education. The outcome of this research further helps to implement supervised machine-learning techniques to develop personalized e-learning systems to improve students' interest in online education.

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RECOMMENDATION SYSTEM FOR CROP VARIETIES BASED ON MACHINE LEARNING

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ABSTRACT : This study provides a recommendation for the crop that would be most suitable depending on input characteristics such as the amount of nitrogen (N), phosphorus (P), and potassium (K) in the soil, as well as the humidity, temperature, and rainfall levels. This project predicts the accuracy of the future production of eleven different crops such as rice, maize, chickpea, kidney beans, pigeon peas, moth beans, mung-bean, lentil, pomegranate, banana, mango, grapes, watermelon, muskmelon, apple, orange, papaya, coconut, cotton, jute, and coffee crops using various supervised machine learning approaches in India and recommends the most suitable crop. This dataset includes a variety of factors, such as temperature, humidity, soil PH, nitrogen (N), phosphorous (P), and potassium (K), as well as rainfall. The machine above learning system utilized various techniques, including Decision Trees, Naive Bayes(NB), Logistic Regression, Random Forest (RF), and K closest neighbor.

Keywords **:** Crop Prediction, Logistic Regression**,** Machine Learning, Random Forest

Introduction :

The agricultural sector is the back bone upon which India's overall economic expansion is built. Products of agriculture are necessary for the continued existence of people. Climate changes, lack of enthusiasm among farmers, short age of employees, globalization, industrialization, or movement of farmers from village to city are some factors causing this backbone to become compromised in today's society. On the other hand, an increase in the pace of production of crops is necessary to satisfy the significantly higher level of demand that is the direct result of an increase in the world's population (Van Klompenburg et.al, 2020). The majority of the time, the farmers does not have a good understanding of the kinds of plants that they should be cultivating on their farms. This results in a great deal

of confusion and reduces the amount work that can be accomplished. Because of this, one of our primary goals is to determine the kind of crop that would give us the highest possible return on our investment. We have compiled a dataset by extending India's existing rainfall, climate, and fertilizer data. This has allowed us to understand the country better (Katkar, S. V. et.al 2020) . This will provide us with a more accurate picture of crop production patterns when considering the various environmental and geographical elements. With the help of this dataset, we can develop a machine-learning model that would allow us to determine which crop would be most successful in cultivating in a given location. The agricultural sector may experience a sea change due to the application of machine learning. It will become possible to assist farmers in determining the necessary quantities of raw materials and other resources considerably sooner than they otherwise would have been able to do it on their own by correctly anticipating the crop that would be grown. This would eliminate the issue of nutrient deficit in fields, which occurs when the wrong crops are planted (Kharade, K. G et.al 2019) . This is a concern since it can significantly reduce the efficiency of output in a compounding way. India is still falling behind in the race to discover technological solutions for agriculture, even though farming is the major means of subsistence for around half of the country's population. To propel India's agricultural sector to even higher heights, it is urgently necessary to encourage the development of a greater number of scientific solutions. The fundamental purpose of the model is to supply farmers with an optimal prescription for cultivating crops by taking into account aspects such as soil composition, environmental conditions such as temperature, humidity, and rainfall, and the influence of geography (M. Kalimuthu et.al.2020).

Design and Methodology :

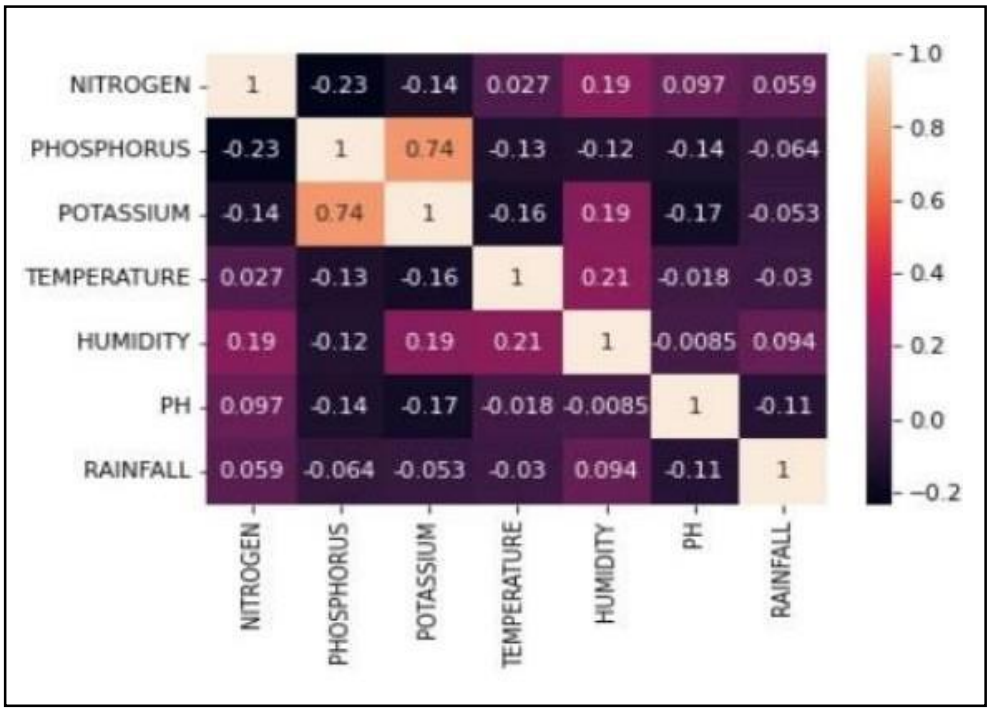
The primary objective of the study is to determine, with the use of a model that uses machine learning, the type of crop that is best suited to be cultivated so that it can then be planted. Consequently, the finding scan potentially be of tremendous use to those engaged in agricultural pursuits (Kharade,K.G.et.al 2021). We used a dataset from Kaggle that included 2200 values for 22different types of crops. On this dataset, we have implemented machine learning algorithmic approaches. The dataset is utilized for training the model following the real values, after which the model's precision is evaluated using the dataset. Because our farmers do not use technology and analysis at the moment, there is a possibility that they could make a mistake in their choice of crops for cultivation, which would result in a decrease in their income (Mahendra N et.al 2020).Therefore, we have also incorporated a graphical user interface to make it as easy and appealing as possible, even for users who are using the facility for the first time and have never used any app or facility of this kind before. Python's PY basic GUI package was utilized to create the graphical user interface (GUI). Instead of making assumptions about any of the

components, our research aims to take into account the ground truth that accurately reflects the actual requirements. Because most of our customers are farmers with limited education, we have worked to make the platform more intuitive and user-friendly. This method establishes the framework for further review, which will take place after the addition of secondary elements that will impact determining the crop cultivated on a specific field in a particular location (Mendagudli, M. G et.al 2021).

Research Approach :

We have implemented machine learning algorithms on this dataset by using scikit-learn as our tool of choice. The training of the model is done in such a way that it can learn from the data that is provided to it and then apply the same patterns and knowledge to get the best possible outcomes for any input that is provided. After testing, the model is put into action using a graphical user interface (GUI), providing a clearer view of the machine learning findings and a more aesthetically pleasing appearance (Naikwadi, B. H2021)

Fig.1 : Various Parameters considered during the suggestion



```
df.head()
```

	NITROGEN	PHOSPHORUS	POTASSIUM	TEMPERATURE	HUMIDITY	PH	RAINFALL	CROP
0	90	42	43	20.879744	82.002744	6.502985	202.935536	rice
1	85	58	41	21.770462	80.319644	7.038096	226.655537	rice
2	60	55	44	23.004459	82.320763	7.840207	263.964248	rice
3	74	35	40	26.491096	80.158363	6.980401	242.864034	rice
4	78	42	42	20.130175	81.604873	7.628473	262.717340	rice

Fig.2 : Crop Recommendation Dataset

The machine learning model has the dataset fed into it. After that, the data is separated into training and testing sets, and then put through training and testing with three distinct algorithms. After selecting the optimal algorithm, the model is subsequently brought to its conclusion. This model is currently carrying out its function by accepting a variety of criteria as input and generating the crop yield that is ideal for the situation (Suruliandi, A 2021)

Crop Prediction using Machine Learning :

Artificial intelligence (AI), known as machine learning, is an application of AI that allows computer systems to autonomously learn and improve from their experiences without being specifically programmed by the system's creator. Learning is a process that begins with observations or data, such as examples, direct experience, or instruction, to search for patterns in the data and improve future decision-making based on the criteria that are provided (Patil, B. P2020).The primary objective of machine learning is to provide a means by which computers can acquire knowledge on their own and modify their behavior to enhance the program's precision and utility without requiring any human aid or direction. Writing programs for a computer traditionally involves automating the processes that need to be carried out on the data being entered to produce the artifacts that will be output. In almost all cases, they follow a sequential, systematic, and logical pattern (Swami, A 2019).A traditional program is created in a programming language according to a particular specification. It possesses features such as the following: We know or control the program's inputs. We can specify how the program will achieve its goal. We can map out what decisions the program will make and under what conditions it will make them. We can be confident that the program will achieve its goal since we know both the inputs and the expected outputs (Patil, S 2022).

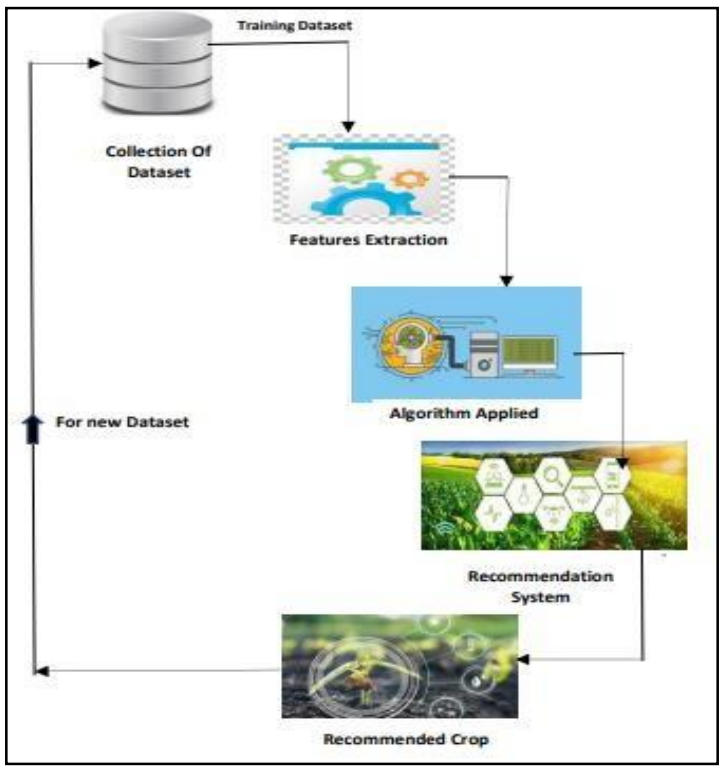
Types of Machine Learning :

Machinelearningtechniquescanbebroadlycategorizedintothefollowingtypes:

a) **Supervised Learning :** The "training set" is a collection of feature-label pairings necessary for supervised learning. The system uses this training set to generate a generalized model of the relationship between the collection of descriptive features and the target features in the form of a program that has a set of rules. This model is then used to make predictions about new data. The goal is to use the program developed as an output to forecast the label for an input set of features that have not been seen before and do not have a label to predict the outcome for some fresh data (Chourasiya, N.L et al. 2019).

b) **Unsupervised Learning :** The training set for unsupervised learning is a dataset of descriptive features that do not have any labels attached to it. Unsupervised learning is a type of machine learning in which the algorithms are given free rein to uncover interesting patterns in the data. Currently, the objective is to develop a model capable of discovering some latent structure inside the dataset, such as natural clusters or relationships (Katkar, S.V et al.2021).

Fig.3 : Flowchart of the recommended system



Integration of Machine Learning Algorithms :

This section explains the platform and the primary modules and libraries used to implement the programming of the algorithm for crop prediction through machine learning. This section aims to achieve noticeable accuracy in the exploitation of land and crop cultivation. To divide our dataset into two sets according to our requirements, we import train-test-split from sci-kit-learn (Prathima, Ch et al.2022). The first set is used for training the model, and the seconds is used to test the workings of and the accuracy of the trained model. This allows us to select the best algorithm that is available. On the training data, we use a variety of supervised learning algorithms, and then we get results on the testing data for all the applied techniques. After that, the method that yields the best result chosen in the model.

- **Logistic Regression :** It is an example of a linear modeling technique that employs a logistic function in constructing the model. It identifies the relationship trends in the given dataset and then classifies the data into distinct categories. It is simple to install, highly effective during training, and can categorize unfamiliar data records in a concise time. However, it assumes that there is a linear relationship between the dependent variables and those that are independent. This can be a limitation in the performance of the modeling some circumstances (Pandith, V et al.2020).

- **Random Forest Classifier :** The random forest algorithm is one of the most well-known supervised learning methods and is also one of the most extensively employed. Instead of working with the entirety of the data as a single subset, it in corporate several decision trees tailored to specific data subsets. This significantly increases the accuracy of the model's predictions since it takes the average of the forecasts made by all of the trees and bases the final output on the projections that received the most votes from most of the trees. Because of this, it can give findings with a high level of accuracy in a relatively short amount of time, making ideal for even the most extensive and diverse datasets (Kharade, S. K et al.2019).

```
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import confusion_matrix
RF = RandomForestClassifier(n_estimators=60, random_state=0)
RF.fit(X_train,Y_train)
```

- **Decision Tree :** The supervised machine learning technique, the decision tree, can be applied to problems involving classification and regression. Still, it is most often utilized to resolve classification issues. It is a classifier in the form of a tree, with internal nodes representing the features of a dataset, branches representing the decision rules, and each leaf node representing the conclusion of the classification. The Decision Node and the Leaf Node are the two different types of nodes found in a Decision tree. Leaf nodes are the output of those decisions and do not contain any additional branches, whereas Decision nodes are used to make any decision and have many branches. Leaf nodes can be found in a decision tree (K. Vengatesan et al.2021).

```
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import classification_report, confusion_matrix
DecisionTree = DecisionTreeClassifier(criterion="entropy",random_state=2,max_depth=5)
DecisionTree.fit(X_train,Y_train)
```

- **Naive Bayes :** The Naive Bayes algorithm is a supervised learning technique to resolve classification issues. This algorithm is based on the Bayes theorem. Its primary application is in text classification, which often involves the utilization of a large-scale training dataset. The Naive Bayes Classifier is one of the classification algorithms that are both straightforward and very effective. It contributes to constructing rapid machine learning models capable of making predictions promptly. It is a probabilistic classifier, which means it makes its predictions based on the likelihood that an object will be present (Nageswara Rao et al 2021).

```
from sklearn.naive_bayes import GaussianNB
NaiveBayes = GaussianNB()
NaiveBayes.fit(X_train,Y_train)
predicted_values = NaiveBayes.predict(X_test)
x = metrics.accuracy_score(Y_test, predicted_values)
```

- **K-Nearest Neighbor (KNN) :** One of the most straightforward machine learning algorithms, K-Nearest Neighbor, uses the Supervised Learning approach to data analysis and can be used for regression and classification. Still, the vast majority of the time, it is used for classification issues. It is also known as a lazy learner algorithm since it does not instantly learn from the training set. Instead, it stores the dataset, and when it is time to classify the data, it takes some action on the dataset (Katkar, S. V et al.2020).

```
from sklearn.neighbors import KNeighborsClassifier
K_nearest=KNeighborsClassifier(n_neighbors=3)
K_nearest.fit(X_train,Y_train)
predicted_values = K_nearest.predict(X_test)
x = metrics.accuracy_score(Y_test, predicted_values)
```

Working Mechanism of the System :

Jupyter notebook was utilized in the process of the model's creation. Importing the necessary libraries, which consisted of pandas, matplotlib, seaborn, and SK learn, was the first thing we did because we believed that doing so was required to carry out an accurate dataset analysis that was provided. A data frame was developed to read the CSV file and perform operations on it. After that, we checked to see whether there was any association between the parameters by plotting them on a heat map. The dataset was divided into test and train data to complete the data-splitting process. After that, we trained the model via linear regression and used the testing data to validate the model's correctness. The same was carried out with Decision trees, Naivebayes, logistic regression, Random Forest Regressor, and K closest neighbor. The Naive Bayes Classifier, which achieved an accuracy rate of one hundred percent, was chosen to create the prediction model that produced the best overall results. After that, we loaded the model developed in the application into the graphical user interface we had made with the simple GUI module in Python. The application that was developed successfully makes accurate forecasts for 22 different crops.

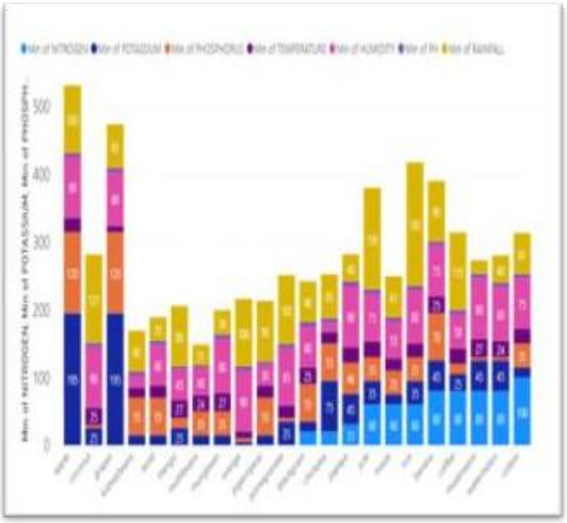


Fig.4 : The minimum range of input parameters of crop

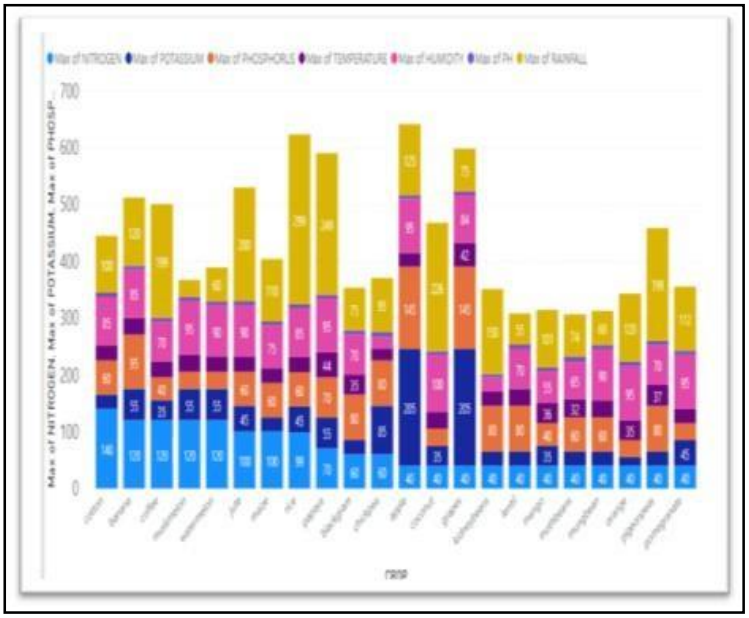
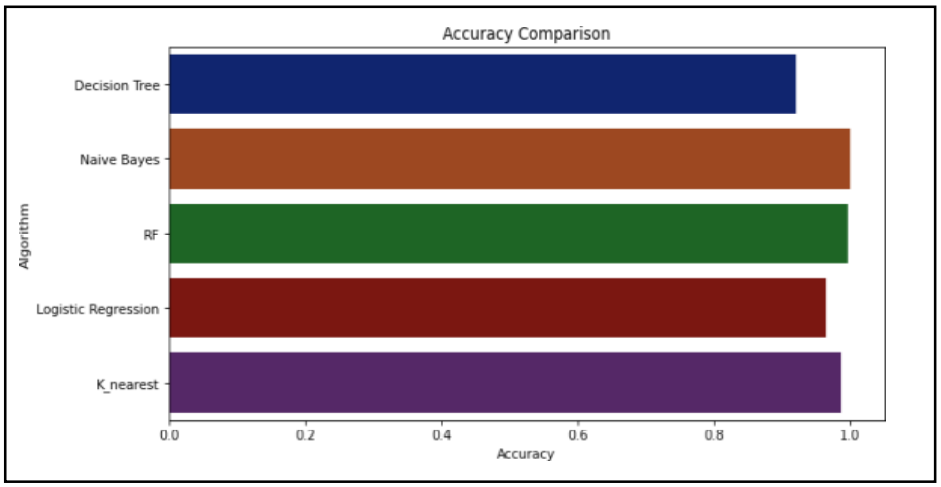


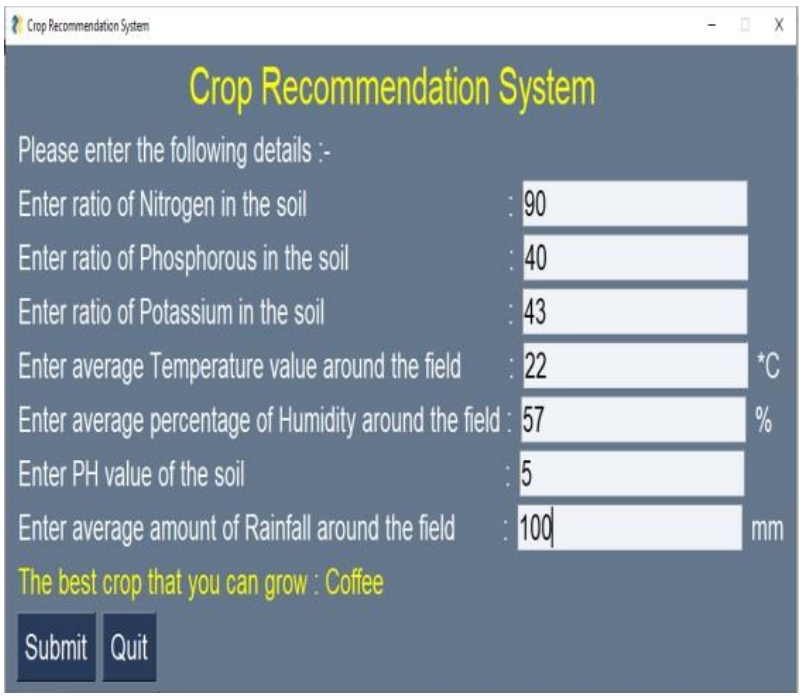
Fig.5 : The maximum Range of input

parameters of crop Table1: Accuracy chart algorithm wise

Sr.No	Name of Algorithm	Accuracy
1.	Decision Tree	0.9204
2.	Naïve Bayes	1.0000
3.	Random Forest	0.9945
4.	Logistic Regression	0.9636
5.	K_nearest neighbor	0.9863

Fig.6 : GUI of Accuracy Comparisons of Crop Recommendation System





Conclusion :

Our farmers are falling further and further behind in their methods because they are not currently incorporating technology into their farming operations. As a result, we come up with this to urge farmers to utilize the most recent technologies rather than continuing to rely on traditional practices. It takes a lot of knowledge and insight into many different things to grow a crop successfully. Some of these

things include the location's temperature, the soil's pH, and the soil's contents. As a result, it would make sense for the farmer to adopt newer technologies as they would make his life easier. Implementing an algorithm for machine learning, such as Decision Tree, Naive Bayes, Linear Regression, Random Forest, or k-Nearest Neighbors. We predicted that the naive Bayes algorithm would have an accuracy of one hundred percent when predicting the right crop to grow, and we also predicted that if the farmer adopted this technology, it would not only make his life easier, but it would also help him make decisions that do not exploit the environment.

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DESIGNING OF AI-BASED TEACHING-LEARNING MODEL FOR REVITALIZING EDUCATION

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ABSTRACT : Artificial Intelligence (AI) is used widely throughout society, and people are becoming increasingly interested in it. As a result, the importance of artificial intelligence education is rapidly becoming a hot topic in the world of education. The purpose of this exploratory review was to gather information from the existing body of research by throwing light on the developing phenomena of conceptualizing the impact that artificial intelligence will have on the educational system. In the following exploratory review, analysis and synthesis of the procedures, techniques, applications, and instruments of artificial intelligence in education are presented. In the realm of education, artificial intelligence is utilized for a variety of purposes, including teaching, learning, and grading students. Researchers from a variety of institutions are working on a wide variety of educational software applications. The research that is proposed suggests using an AI-based model in which students learn programming concepts by creating concept maps and their conceptual understanding is evaluated by conducting tests to which our AI-based model delivers responses. Depending on the responses, the student will be able to determine whether or not he or she has correctly acquired that topic, or whether or not they need to upgrade their understanding.

Keywords **:** AI, Concept Map, Chatbot, Education, Programming Language

Introduction : Education is the process by which individuals focus on learning new ideas, attempting to acquire new knowledge, and attempting to put previously obtained knowledge into real-world applications. Education makes it easier to acquire new competencies, values, and behaviours. Many different approaches can be taken while instructing pupils. Some of these approaches involve the student taking an active role in the learning process, such as through participating in a group discussion, leading a debate, or presenting a tale. Students can educate themselves independently with the use of books or even through online courses with the assistance of the internet, or they can receive their education under the direction of a teacher [Algabri, H. K etl, 2021]. The Indian educational system needs to come to terms with the fact that not all students have the same learning capacity. As a result of this, it is necessary to employ a variety of instructional strategies when educating different types of students. Because it is physically impossible for a teacher to pay attention to each of their students, educational institutions are being forced to adopt and implement a variety of cutting-edge technologies, such as

artificial intelligence and chatbots, that can act as a helping hand to both students and teachers [Novak, J. D. 1998]. Understanding a topic domain, such as science, is dependent on knowing a set of relations among the important concepts that are contained inside that subject domain, as has been proven by research and learning theory. Students are unable to comprehend an idea until they can teach it to another person or explain it to another person. The simulation of human intelligence processes by computer systems is what we mean when we talk about artificial intelligence [Algabri, H. K etl 2021B]. Processes in pedagogy include teaching, learning, reasoning, and self-correction. Pedagogy deals with education. The entire process of the education business was revolutionized by AI. Increasingly, educational institutions are employing a wide variety of intelligent systems to revolutionize the education field. These intelligent systems are assisting students in improving their learning and achieving their educational goals. In the realm of education, artificial intelligence (AI) is utilized to carry out education operations such as teaching, learning, and evaluating students in a variety of various methods. Researchers from a variety of institutions are working on a wide variety of educational software applications [Blair, K.P. 2007]. Learning how to program a computer is an involved and difficult process. After becoming proficient in programming, students may wish to pursue a variety of careers, including those in the fields of website development, junior software development, data science, and data analysis, amongst others. It is not possible to hold their hands throughout the entirety of the journey [Kharade, K. G. etl 2019]. Instead, as a teacher, your objective should be to guide them toward reaching a level of programming independence that is comfortable for them. When pupils reach that point, they are responsible for independently developing applications. Despite having access to competent instruction, a variety of reference materials, and online programming courses for learning programming languages, students were most likely to withdraw from the class due to the course's abstract programming principles and difficult structure [Chen, L etl 2020]. It was normal for them to be unable to independently construct an application, even though they had devoted significantly more time to studying the syntax of programming languages. One of the efficient ways to learn and also teach concepts about the relationship between those concepts is to draw a concept map. Drawing idea maps allow students to teach by building networks of entities and the relationships between them. Students can use tools known as concept maps to help them make and understand links between different topics. Students can use concept maps to better understand the gaps in their understanding and the structure of their knowledge [Kharade, S. K. etl 2020]. Concept maps can also assist educators in accurately diagnosing student learning difficulties and identifying the factors that contribute to ineffective instructional practices. The absence of the student's knowledge structure might be inferred from the fact that they have trouble forming concept maps. The fact that the concept map

is only partially complete suggests that there is a need for additional information regarding their reserves. In addition, if the level of the concept maps is unclear, this is an indication that the kids do not have a comprehensive comprehension of the concepts [Jagadeesh Kengam 2020].

Our investigation is predicated on the hypothesis that students are unable to comprehend a topic unless they can teach that concept to another person or explain it to another person. Students can teach programming concepts to the Teaching Agent by feeding it concept maps, and then students can test the Teaching Agent's understanding by asking it questions [Kharade, K. G etl 2021]. This model that we suggested is a unique form of a pedagogical agent called a Teaching Agent. To generate answers based on what was taught, Teaching Agent employs many techniques from the field of artificial intelligence. Depending on the response, students can discern if they have correctly mastered that concept or whether they need to revise their understanding of their agents, which in turn allows them to revise their knowledge [Kim, W. 2021]. Learning how to program computers is a difficult subject, and determining how much we've retained is even more difficult. Students were unable to properly construct applications by making use of programming features even though teachers provided effective training and online programming courses were available for students to master various programming languages. A concept map is a teaching aid that is used by various teachers to teach any programming idea by establishing relationships between the various concepts being taught. A concept map helps students identify gaps in their grasp of knowledge and the structure of knowledge, and it also assists teachers in determining where students are having difficulty learning new material[Chougale, N. P. etl 2021].

Learning through Artificial Intelligence :

The gap can be filled by artificial intelligence using crowd-sourced tuition from professionals and peers who are farther along in their studies. Students can spare themselves the humiliation and guilt associated with asking for excessive assistance in front of their other classmates without compromising their academic performance or overall accomplishments.

Helpful feedback can be provided to students and teachers by using AI-driven applications. Not only can AI assist teachers and students in developing courses that are specifically tailored to their requirements, but it can also provide feedback to both parties regarding the overall effectiveness of the course.

[Neha, Kandula 2020]. Machines driven by AI have the potential to personalize the educational curriculum. The use of AI techniques can make it possible for those with visual or auditory impairments to participate in global classrooms. Students who are unable to attend classes due to an illness may also benefit from this

[Zawacki-Richter etl 2019]. Intelligent tutoring systems, often known as ITS, are capable of imitating the experience of receiving human instruction one-on-one. They can make decisions regarding the learning path of an individual student and the content to select, provide cognitive scaffolding and support, and engage the student in dialogue based on learner models, algorithms, and neural networks [Nageswara Rao etl 2021].

Incorporated into robots, artificial intelligence, or computers and supporting equipment enables the production of robots that improve the learning experience of the student, beginning with the most fundamental component of education, early childhood education. One of the most significant movements in the field of education is the drive toward individualization [Patitsas, E. etl 2019]. Students now have access to individualized learning programs thanks to the utilization of AI, which is based on the specific experiences and preferences that are individual to each student. AI can adjust to the level of knowledge, speed of learning, and desired goals of each student to ensure that they get the most out of their education [Seo, K. etl 2021]. The capacity of artificial intelligence makes it possible to automate even the most menial of duties, such as administrative labour, grading papers, analysing learning patterns, responding to general questions, and more. A number of the pupils have questions or concerns outside of their classroom [Patil, B. P. 2020]. It may be to prepare for tests or offer assistance with homework; it would be difficult to identify professors who have sufficient time for all of these objectives.

Objectives :

Objectives of the research are;

- ✓ To design and develop a graphical user interface that helps students to draw concept maps and teach programming concepts to the AI system.
- ✓ Design and development of a tool to extract knowledge from concept map and preserve it in an AI system.
- ✓ Design and development of an AI-based feedback mechanism in form of a Quiz based on concepts learned by the AI system.

Methodology :

Many different students have found that learning through teaching is one of the most successful learning methods available to them. As a result of our research, we proposed an AI-based model in which students would teach one another object-oriented programming concepts by sketching concept maps, and then students would take a quiz in which an AI system would give answers based on the concepts they had learned and taught one another, as well as on the quiz answers themselves. Students can evaluate whether or not they need to review what they have previously

instructed to enhance their understanding. The proposed approach can be depicted in the following fig 1.

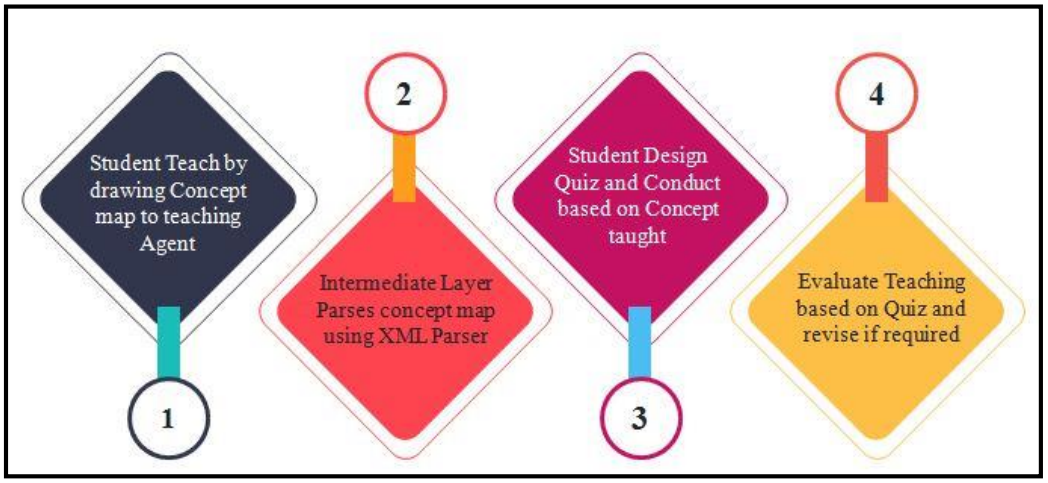

Fig. 1: AI-based teaching-learning approach in four stages

Following steps involved in the application of the proposed model

a) **Teaching** : During this stage of the process, students draw concept maps to instruct an AI-based teaching agent in object-oriented concepts. It is hoped that as AI educational solutions continue to evolve, this technology will assist address significant gaps in learning and teaching, allowing schools and instructors to do more than they ever have before. AI can promote efficiency, and personalization, and streamline administrative processes, freeing up time for teachers to impart understanding and flexibility, two distinctively human characteristics that computers would struggle to replicate.

b) **Parsing :** The student's grasp of the concept is deposited when the concept map they drew is processed by an XML parser. The term "parsing" is utilized frequently in both the field of "data quality" as well as the field of "computing" in general. It can entail anything from merely "splitting apart data" to full Natural Language Parsing (NLP), which employs complex artificial intelligence to enable computers to 'understand' human language. NLP is an acronym for Natural Language Parsing.

c) **Conduct Quiz :** Students will administer a test based on the concept, and the teaching assistant will provide answers based on the notion that the students have learned. When asked to reply to a variety of hypothetical situations, students will have the opportunity to draw on their prior

knowledge of ethical principles during this section. The scenarios include information systems that make use of an artificial intelligence application.

d) **Evaluation and feedback mechanism :** Students will administer a test based on the concept, and the teaching assistant will provide answers based on the notion that the students have learned. When asked to reply to a variety of hypothetical situations, students will have the opportunity to draw on their prior knowledge of ethical principles during this section. Initiating a never-ending cycle of progress and serving as evidence of learning is what assessment does. In the context of higher education, assessment and feedback are considered to be significant issues deserving of attention since they have an impact on a diverse range of stakeholders.

Conclusion :

Students will administer a test based on the concept, and the teaching assistant will provide answers based on the notion that the students have learned. When asked to reply to a variety of hypothetical situations, students will have the opportunity to draw on their prior knowledge of ethical principles during this section. Initiating a never-ending cycle of progress and serving as evidence of learning is what assessment does. Because it affects a diverse range of stakeholders, the assessment and feedback processes are taken into consideration to be among the most significant factors of focus in the higher education environment. Artificial intelligence (AI) systems provide useful assistance for online teaching and learning in several ways, including the customization of lessons for individual students, the automation of regular work for instructors, and the provision of power for adaptive tests. The use of AI in education will close the disparities. Everyone will have the chance to advance their education in areas that are more relevant to their interests as a result of this opportunity. Because we know that traditional education does not meet the needs of all students, the incorporation of AI into educational practices makes conventional modes of instruction appear to be somewhat dated. This realization is sweeping around the globe, which helps to explain the meteoric expansion of online educational opportunities.

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ARTIFICIAL INTELLIGENCE ENHANCED PERSONALIZED EDUCATION GAMIFICATION: A SYSTEMATIC OVERVIEW

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ABSTRACT : In this paper, the authors examined research articles to perform a systematic study of gamification in education and its impact. The review study has explored AI and machine learning strategies and their potential use in the personalization of educational gamification, adaptive learning, and hyper-personalized learning experience. Furthermore, the identified key game elements , previous conceptual and methodological approaches of gamification in education research.

Keywords **:** Gamified learning, personalized; educational gamification, Artificial Intelligence

I. Introduction :

“Gamification," since 2003, when the term was first coined to the current date, has gained immense popularity and prominence in various important industries like education, marketing, sales, healthcare, pharmaceuticals, finance, etc...

Basically, gamification is a strategic attempt to add game mechanisms into systems, services, organizations, and activities, giving similar experiences of playing games in order to motivate and increase user engagement.

Personalization has emerged as an alternative to improve gamification effectiveness. In the referred studies by Allan Jay (2022), Luiz Rodrigues et.al, Bilgin, Enes. (2020), it is seen that user profiles are explored to tailor the game design so as to improve user experience and user engagement, in turn, increases the productivity of the system. The personalization process exploits the user's demographic, geographical, and contextual information (goals set, activities completed, timelines, task complexities, etc..) to automate adaptive gamification. And with technological advancement, Artificial Intelligence (AI) and Machine Learning (ML) recommendation systems can make it easy to implement personalization in gamification.

Empathy Mapping in Gamification, in articles by Bilgin, Enes. (2020), Dave Gray (2017) have discussed the emotional experience that the game provides to the user with good game designs that empathizes user. Empathy Mapping is a trend in

gamification that tries to answer the questions of understanding their user; what do they feel?, What do they do?, What do they see ? , What do they say? , What do they think, designing and implementing the game to provide the user the emotional experience, which is the core driver in its success of it, and that is what curls up the gamification promotions

It is a very immersive technology that has been tilting the landscape since the advent of gamification, and years down it has been a fixture in corporate training learning and training, marketing, and fitness industries, but now it is creeping into fields like civil, political organization where people before where more scepticalabout it, reported by Arun Nagarajah (2021) and Growth Engineering (2021). One key industry where gamification is being actively discovered is education, gamification has deeper roads within this sector mainly for its potential to motivate students and productive learning experience.

As Known to us that games stimulate motivation and engagement, including game mechanics in learning is an appealing proposal to motivate learners. Gamification in education refers to the integration of game key elements and user experiences in the design of learning processes. Cilem Ozturk and Ozgen Korkmaz (2019) their study aimed to analyse the effect and significance of educational games on students academic performance and cooperative learning skills using an experimental research approach with Anova statistical analyses.

II. Literature Review :

An exhaustive review of research articles and case studies done by various researchers in the context of Gamification, Teaching and Learning Pedagogy, personalization has been carried out in this study and further classified them into four sections a) Key Game Element b) Personalised Gamification c) Personalized Gamification in Educational context d) Artificial Intelligence Integration in Educational Gamification.

A) Key Game Element :

There are many descriptions and classifications of game elements; some of the common gamification elements are points, scoring, leader boardsM.B. Armstrong and R.N. Landers (2018), RNLanders et.al (2015)**,** K. Seaborn and D.I. Fels (2015), progress bars, ranks, rewards, or incentives; most of these often appear in the implementation of gamification, F.F.-H. Nah et.al (2014). In addition to these, story or narratives is also part of gamification, M.B. Armstrong and R.N. Landers (2017).

A review of research and scholarly articles on educational and learning gamification it is observed the gamification elements can be categorized into five types progressive achievement, social interaction, immersion experience, non-

digital elements, and others, while the most common elements are points, challenges, badges and leader board.

Coppens An (2018) has mentioned in his blog some common gamification design principles that include goals and challenges, personalization, rapid feedback, visible feedback, freedom of choice, freedom to fail, and social engagement . A review study of educational and learning gamification by J. Majuri (2018.) found that gamification elements may be divided into five different types, including progressive achievement, social interaction, immersion experience, non-digital elements, and others, while the most common elements are points, challenges, badges, and leaderboard.

B) Personalized Gamification :

An important aspect proposed by D. Liu, R. Santhanam, and J. Webster (2017), is

incorporating user empathy to enhance user experience with progressive user engagement is personalizing the system. W. Oliveiraet. al (2020),S. Hallifax et.al. (2019), J. Koivisto and J. Hamari, (2019) in their review articles have identified common practices to adapt the gamification design and the realization of personalization, specifically game elements, its feature to the user's characteristics and behavioral profile. In the review study by S. Hallifax et.al. (2019), it was seen that the most predominant information used in the personalization of gamification are users and personality types, and same were identified by G. F. Tondello (2016), L. E. Nacke et.al (2014), R. R. McCrae and O. P. John (1992). In recent case studies by M. Denden (2017) and A. Toda (2019) it has been found that other user characteristics, such as gaming habits, age, and gender, also influence their inclination, as well as the relationship between user demographics (i.e., age and gender) and user types advocate the influence of those aspects.

C) Personalized Gamification in Educational context :

In studies done by M. Sailer and L. Homer (2019), G. F. Tondello et.al (2016), L. E. Nackeet.al (2014), D. Liu et.al (2017) and S. Deterding (2015)specifically,in the context of educational systems, a prominent factor that has relevance for gamification effectiveness is the application context (e.g., geographic location, learning task), L. Rodrigues et.al (2019) and Hallifax Stuart et.al. (2019)have recommended considering learning activity as one of the aspect of customizing gamified systems. This is related to the recommendation that gamified designs should match the task and, given that tasks of educational systems are almost every learning activity, personalizing the gamified designs to these activities should be accomplished.

D) Artificial Intelligence Integration in Educational Gamification :

Involvement of artificial intelligence has increased multifold in every sector, from marketing, finance, and e-commerce to education, that is because artificial intelligence systems can adapt to individual student learning and grasping abilities to give hyper-personalized learning experience it also converts the traditional classroom learning experience into a competitive multi-player gaming and learning platform.

Shamini Koravuna et.al (2020) and W. Oliveira et.al (2020) have explored the need to integrate artificial intelligence and machine learning modules into games, also the use of intelligent agents and including human behaviour simulation in games according to styles and skills acquired in games by intelligent agents.Research articles exploring in context of AI and educational gamification have proposed various methods in the implementation of game elements and assessment and evaluation, Tadayon et.al examined the capability of the hidden Markov model for student performance assessment after educational game usage. Hallifax Stuart et.al (2019) have used deep learning techniques to find, the usage of the value and policy networks to generate different random games for self-play. J. Koivisto and J. Hamari, (2019) have developed intelligent bots that simulated human behaviour using multilayer perceptron's; the usage of the genetic algorithms for the search of the effective strategy organization without total check of all possible alternatives.

Peng et.al (2019) present an emerging teaching method enabled by a smart learning environment as a form of personalized adaptive learning Shamini Koravuna et.al(2020) have clearly convinced the concept of a personalized adaptive learning framework and the same can contribute to future pedagogical studies and practices. S. Deterding (2015) propose to use the recognition of facial expressions in real-time mode for motivation, experience, and performance improvement in the game with the help of the SVM algorithm. Machine learning algorithms for embedding adaptive content, taking into account the current behaviour of the player and the skills he has acquired. S.S. Jamsandekar et.al (2020) proposed a model based on a data-driven approach to enable personalized learning with adjusted learning paths for each learner based on the pace of learning and knowledge level with four adaptive learning models such as content model, learner model, adaption model, and interface model are explored. The learner model utilizes data mining and deep learning techniques to do the user modelling process based on the learner's features. The adaption model is based on learner engagement through the user interface. Based on the learner's acquired knowledge, the course content organization and learning sequence of course content use an ensemble approach of graph theory and neural networks.

III Overview and Discussion :

Personalization and gamification-based learning are used as independent educational strategies, in recent times a positive trend of ensemble or blending other learning experiences with game-based learning. In the current review, it is accessed that in recent years integration of artificial intelligence in education and AI-led gamification as much attention. AI based gamification has led to better user engagement and encourages them to be continuous learners; it also converts the conventional classroom experience into a competitive multi-player gaming and learning platform.

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IMPACT OF ARTIFICIAL INTELLIGENCEON EDUCATIONAL RECOMMENDATIONS

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ABSTRACT : Global adoption of online tools in education is transforming the teaching and learning process. The evaluation showed users' acceptance of extracted information about their educational interests, automatically generated from social networks and enriched to find implicit claims. Several educational resources are distributed in different repositories that address various subjects and educational goals. The constant and ever-increasing use of social networks allows the identification of additional information about profiles, interests, preferences, styles, and behaviour from spontaneous interaction. To generate personalized recommendations, it is essential to identify information that will help to define a user profile and assist in determining an individual's interests. It is based on the relevance of an algorithm for analysing predictions. Technology-enhanced learning (TEL) aims to design, develop and test socio-technical innovations that will support and enhance the learning practices of individuals and organizations.

Keywords : Artificial intelligence, recommender system, pedagogy, algorithms

I. Introduction :

In the world of information density and product overload, a recommendation engine provides an efficient way for companies to provide consumers with personalized information and solutions. A recommendation system is one trend that suggests products and services and leads users. Recommendation systems are quickly becoming the primary way for users to expose to the whole digital world through the lens of their experiences, behaviours, preferences, and interests(Katkar S.V et al., n.d.) On the Internet, where the number of choices is overwhelming, there is a need to filter, prioritize and efficiently deliver relevant information to alleviate the problem of information overload, which has created a potential problem for many Internet users. Prediction techniques in recommendation systems serve as a compass for research and practice in recommendation systems. In the world of information density and product overload, a recommendation engine provides an efficient way for companies to provide consumers with personalized information and solutions. Recommender systems solve this problem by searching through a large volume of dynamically

generated information to provide users with customized content and services(Mendagudli, M. G. et al., n.d.). The users can minimize the cost of choosing the most suitable product in the context of internet shopping. The technology suggests the most appropriate content for its users and matches their preferences. It uses different sources of information to provide users with predictions and recommendations of items. Digital businesses need to improve their performance through the implementation of recommender systems. Collaborative Filtering algorithms play a vital role in the request, although they are often used along with other filtering techniques like content-based, knowledge-based or social. Evaluation of the predictions and recommendations has evolved since the origins of recommender systems. (Algabri, H. K 2021)

II. Framework of Recommendation System :

One of the crucial components behind a product recommendation engine is the recommender function, which considers specific information about the user and predicts the rating that the user might assign to a product. The ability to predict user ratings, even before the user has provided one, makes recommender systems a powerful tool. Although most of the big giants use machine learning and Artificial intelligence models to build their recommendation systems, more straightforward approaches are also possible. Driven by an orchestration layer, the recommendation engine can intelligently select which filters and algorithms to apply in any given situation for a specific customer.

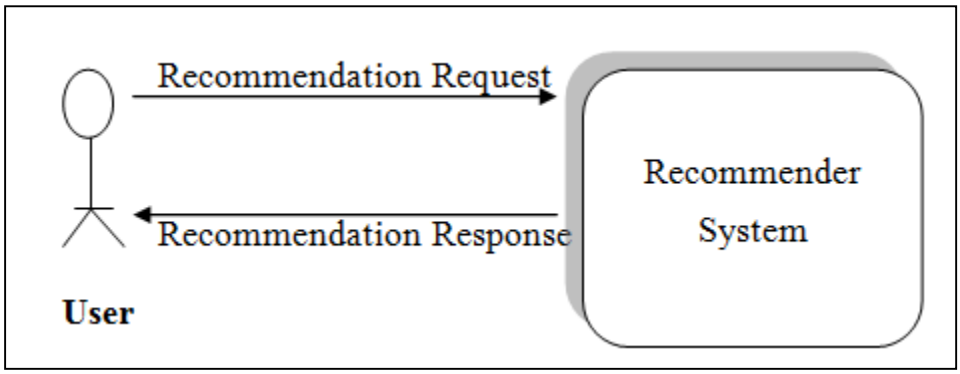


Fig.1 : Interaction with Recommender System

Computational tools are increasingly present in information access, both by conducting formal classes supported by technologies or in daily people's life searching for non-formal educational content.(Varnika and Kulvinder Singh, 2020)Many educational resources are distributed in different repositories that address a wide range of content and subjects that can supply information to individuals or groups on the Web.

III. Scope of Recommender Systems in Education :

Teachers have reported that they wish to receive recommendations for resources or people based on their preferences, and goals and search topics or suggestions for resources other teachers found interesting and useful. Recommender systems are guides that can help teachers find solutions to their documented needs in a context where teachers are responsible for their professional development. It includes academic choices, learning activities, learning resources, and training. It follows content-based, collaborative, or hybrid approaches for implementation. It has different formats like desktop-based, web-based or mobile-based, etc.

In the online learning ecosystem, we envision a scenario wherein the educational platform should guarantee that a set of learning principles are met for all the learners, to a certain degree, when generating recommendations according to the learner's interests. Therefore, the ideal recommender system would predict individual interests based on collected data and analysis. Characterizing and counteracting potential pitfalls of data-driven educational interventions is receiving increasing attention from the research community. The recommendation systems can be used to support main areas in education, what approaches, techniques, or algorithms recommender systems use, and how they address different issues in the academic world. Moreover, this work has also helped detect some research gaps and key areas where the further investigation should be performed, like the introduction of data mining and artificial intelligence in recommender system algorithms to improve the personalization of academic choices.

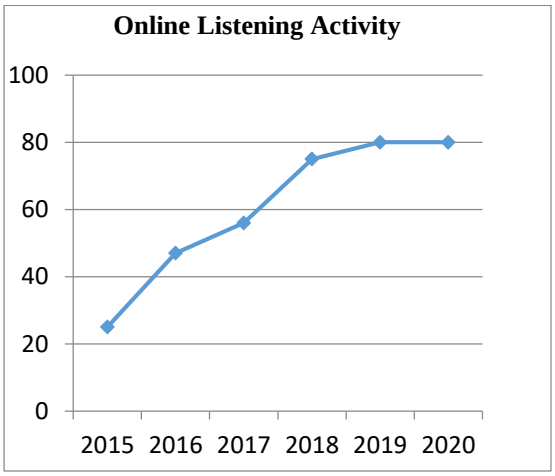
Developing a recommender system using a genetic algorithm (Mirko Marras et al., 2021)often has problems and open questions that must be evaluated so software engineers know where to focus research efforts. The use of genetic algorithms in recommender systems identifies research opportunities for software engineering research. Recommended learning opportunities, according to the platform principles, context, and pedagogy. Various issues are related to recommender systems that use AI, (Deschênes, M. 2020) and also reviews the improvements made to these systems through the use of such AI approaches as fuzzy techniques, transfer learning, genetic algorithms, evolutionary algorithms, neural networks and deep learning, and active learning. Artificial intelligence (AI), particularly computational intelligence and machine learning methods and algorithms, has been naturally applied in developing recommender systems to improve prediction accuracy and solve data scarcity and cold start problems.

It has been a new era for recommender systems, creating advanced insights into the relationships between users and items, presenting more complex data representations, and discovering comprehensive knowledge in demographical, textural, virtual, and contextual data. These continuing advances in AI, data

analytics, and big data present a great opportunity for recommender systems to embrace the impressive achievements of AI. Various AI techniques have recently been applied to recommender systems, helping to enhance the user experience and increase user satisfaction with a self-determined approach. The recommended approach is based on learning object repositories, linked data, and video repositories (Blaschke, L.M. ,2017).

IV. Pedagogical Changes in Education :

A study published by eSchool News indicates that by 2021, the application of AI in education and learning will be increased by 47.5%. Students, learners, school leaders, and curriculum designers are the main stakeholders of the education system. The impact of this technology will be felt from the lowest education levels through higher learning institutions. This will create adaptive learning techniques with customized tools for improving the learning experiences. With more inventions, there will be a wider range of courses available online, and with the help of AI, students will be learning from wherever they are. Technology brings drastic transitions by facilitating the learning of any course from anywhere, globally, and at any time. It provides personalized learning to the trainers (Patil, B. P,2020). It also helps to generate smart content. It helps with grading, tutoring, analytics, etc. It supports formal and non-formal education. Artificial Intelligence can make connections across these different data points to provide predictions of future outcomes to enable course corrections in near-real-time and to derive insights that will allow all stakeholders to make more informed decisionsthat constitute its power and its promise. None of these challenges can be met with data alone. We can show a percentage increase in online listening and reading activities. Once you refer to a source, the system recommends relevant reading and listening resources. (Katkar, S. V.et.al 2020)



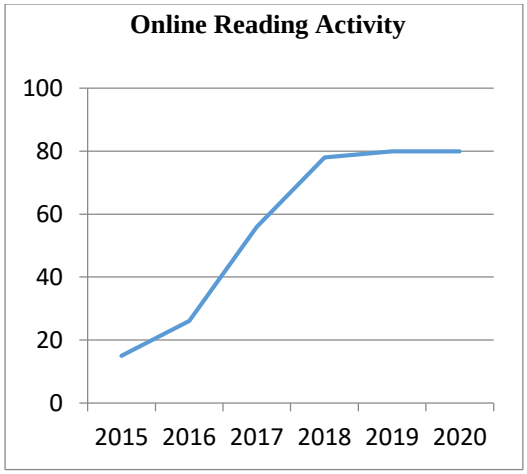


Fig.2 : Measurement of year-wise progress Use of Educational tools

Earlier, for the teaching-learning process, a teacher-centred approach was followed. A teacher decided all the details. There was less scope for students' suggestions. But today, the picture has changed. So, student-cantered pedagogy is followed. System provides guidelines based on recommendations. (Rivera, A.C.1970)

Comparison of Change in pedagogy has been explained with the help of a pseudo code,

Teacher-centered pedagogy

```
START
    Assign roll no
      Discuss topics
      Evaluation
END
```

Student-centered pedagogy

```
START
        Create or Update Profile
Select level
        If level = beginner
                Then
                Recommend beginner activities
        Else
                Recommend advance activities
        END
```

Artificial intelligence has a higher impact on pedagogy. According to most experts, the presence of teachers is irreplaceable; there will be many changes to a teacher's role and technology for teaching and learning.

For recommendations, the collaborative filtering approach is more relevant. Current research facilitates recommendations for the education field and specializes in foreign language learning (Albatayneh, N. A.2018)

Based on a learner's skill set and interest, by referring collaborative algorithm, requests will be made for language improvement.

V. Value Addition in Technology for Recommendations :

As the recommendation tasks are getting more diverse and the recommending models are growing more complicated, it is increasingly challenging to develop a proper recommendation system that can adapt well to a new recommendation task. In this tutorial, we focus on how automated machine-learning techniques can benefit the design and usage of recommendation systems (Pereira, C.K. et al. 2018). Then, we elaborate more on three important topics under such a scope, i.e., feature engineering, hyper parameter optimization/neural architecture search, and algorithm selection. Present recommendation schemes such as content-grounded filtering and collaborative filtering practice dissimilar databases to create references. Content-based filtering can recommend a new item but requests more data on customer preference to include the finest match. Like, collaborative filtering wants a huge dataset with lively customers who valued a product before to create precise predictions. (Chougale, N.P. et al. 2021) Collaborative filtering mimics user-to-user recommendations. Content-based filtering creates recommendations built on customer favourites for product types. The interpretability discussion of the recommendation algorithm is generally the selectionprocess after the algorithm evaluation (Bauman, K.et.al 2018) With the high demands of users, the research of recommendation reasons has received more and more attention in industry and academia. Since information retrieval is a pivotal activity in the educational system, the deployment of recommender systems has attracted increased interest. (Prathima, Ch.2022)

Conclusion :

Artificial intelligence provides many ways for effectiveness in the education field. The use of the online mechanism is increasing consistently. It also helps to alleviate the problem of information overload, a very common phenomenon with information retrieval systems and enables users to access details and services that are not readily available to users on the system. Various algorithms are responsible for the performance of the recommender systems.AI recommender systems help academic achievement and improve learners' engagement in learning tasks and recommend details for achieving learners' goals.

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TECHNOLOGY-ENHANCED LEARNING (TEL) FOR THE JAPANESE LANGUAGE : AN ONLINE COLLABORATIVE APPROACH

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ABSTRACT : This paper presents an online collaborative approach called Technology Enhanced Learning (TEL) that uses a multimedia-rich and engaging approach to teaching Japanese in English-speaking countries. TEL can be an effective language-learning method for adult learners who want to "pick up" curricular information in curricular areas without going through years of expensive training. Through a series of active learning sessions and self-study, the approach allows learners to interact in creating online content on topics including kanji writing practice, hiragana and katakana development, grammatical points, cultural information associated with Japan, and much more. The learners develop their knowledge by reading pre-written articles in the Japanese language, discussing them with peers in a message board format, and then translating them into English for uploading. The Learning progresses as the learners interact with one another. The paper presents a step-by-step learning process to demonstrate how TEL can be implemented in university courses.

Keywords **:** Technology Enhanced Learning (TEL), Japanese, Language Acquisition, Online Collaborative Approach, University Classroom

I. Introduction :

Since the Internet boom, Web 2.0 and online collaborative activities have become integral to many people's lives. Millions of online users worldwide are connected through various websites, and users can create content at the same place where it is viewed or used since their works are located on their personal computers or websites. This has made new Web 2.0-based language learning possible.(Algabri H. K et al., 2021)This is a boon for those who want to learn Japanese because Japanese is one of the most difficult languages to learn. The development of websites, blogs, and videos allows learners worldwide to connect and interact on various topics, including the Japanese language.(Katkar S.V et al., n.d.) As the number of online resources for learning Japanese increases daily, there is a need to develop a Technology Enhanced Learning approach that uses these resources. This paper presents an online collaborative approach called Technology Enhanced

Learning (TEL) that uses a multimedia-rich and engaging approach to teaching Japanese in English-speaking countries(Algabri, H. K. et al., 2021).

The paper presents a step-by-step language learning process that shows how TEL can be implemented in courses that use Web 2.0 technology intending to promote Japanese language communication through active Learning, which aims to facilitate immersion into the Japanese language by interacting with the learners, thereby avoiding passive and audio based methods of communication.(Mendagudli, M. G. et al., n.d.)

II. History of Language Learning :

It has been 1965 since the first call for a change in language teaching. Since then, numerous books have been published to advise students on studying a foreign language. Since then, computers have become increasingly easier to use and an important part of people's lives. People can communicate with each other by using computers, emails, phones, and many more.(Spolsky, B. 2010)

In the early 1960s, language learning mainly consisted of rote Learning, which trained students with skills to "vocally reproduce" words, phrases, and sentences within a text. The belief was that by repetition of these words and phrases, a student would eventually understand what they said themselves. Although this method was largely successful, it did not involve translational ability because all the Learning involved memorization. If the student could not "vocally reproduce" language and translate it, they would be hard-pushed to communicate in a foreign language. A student was required to listen only and repeat after the teacher without any questioning, thus limiting their ability to learn. The teacher would tell what the students had done in class and how well they had done. The students were expected to listen and repeat what they were told. Although this system was effective, it did not allow students to learn actively. (Patil, B. P et al., n.d.)

That all changed in the second half of the twentieth century when audio and new technologies were applied in language teaching. Audio devices were developed to allow the student to listen and repeat after a tape recorder or teacher who recorded their pronunciation. The tapes helped students with their pronunciation but did not allow them to understand the language they were learning.(Manoban, A. 2021)

The use of computers in language learning started to become more prominent in the middle of the twentieth century. Spolsky & Young (2008) offer a detailed history of how computers were used in language learning. They focused on developing a computer-assisted language learning (CALL) system and its use. In 1977, Rod Ellis proposed an approach that uses computers and multimedia technology to teach languages to solve many problems related to traditional methods. One of the problems of conventional methods is that the students are expected to focus on a

new language for several hours every day, and their ability to learn the target language decreases as their interest in the recent language decreases. Ellis (2008) claimed that by using computers, students could be motivated to speak the languages they were learning more and improve their knowledge because they had an opportunity to use them. Ellis (2008) also suggested that learners were empowered by using computers and forced to work when communicating with others. Another problem with traditional methods was that students would only speak English when learning languages. Ellis (2008) proposed a system in which learners must communicate using English and their learning language. Using the computer, students would be forced to learn a new language by interacting with each other and translating their sources from English. The learners would have an opportunity to interact with speakers of other languages because they could use the computer while they learned.(Ellis, R.)

III. Implementation framework for Web 2.0-based TEL : A Collaborative Approach :

This section presents a technology-enhanced Learning (TEL) framework based on the collaborative approach. In TEL, unlike traditional teaching, learners are regarded as active and competent participants in constructing their knowledge and sharing it with others. TEL can be an effective means to enhance access for learners in many fields of practical and theoretical knowledge. Likewise, in Japanese language education, which has been traditionally teacher-cantered and class-based, information technology has been limited because of the dominance of print-based media such as textbooks and workbooks.(ZubaProkopetz, R.2021).This paper discusses the potential of Web 2.0 (W2.0) and the collaborative approach for effective TEL in Japanese language education by taking a research project as an example. We call this framework TEL based on the collaborative process. The characteristics of the framework are: (1) it is based on a paradigm shift in how educators think about Learning and teaching; (2) it is W2.0-based; (3) it involves learner participation with social networking tools; and (4) it is based on a cooperative rather than a competitive model of learning within a unique community of learners who share a common interest and goals related to the target language. In our project, learners develop and share dynamic multimedia e-portfolios to demonstrate their language ability and competence. (Sacha Kiffer 2021)

IV. Details of The Tel Framework :

The Web 2.0-based learning environment consists of five hierarchical levels: The TEL framework was tested with a project on developing knowledge on oral fluency of beginner learners of the Japanese language based on their own experience. A total of 32 beginners students participated in the project, among whom 40% (n =

12) were female and 60% (n = 20) male, with a mean age of 21.3 years (SD=1.7).(Lam, R. 2020) It is shown graphically as follows,

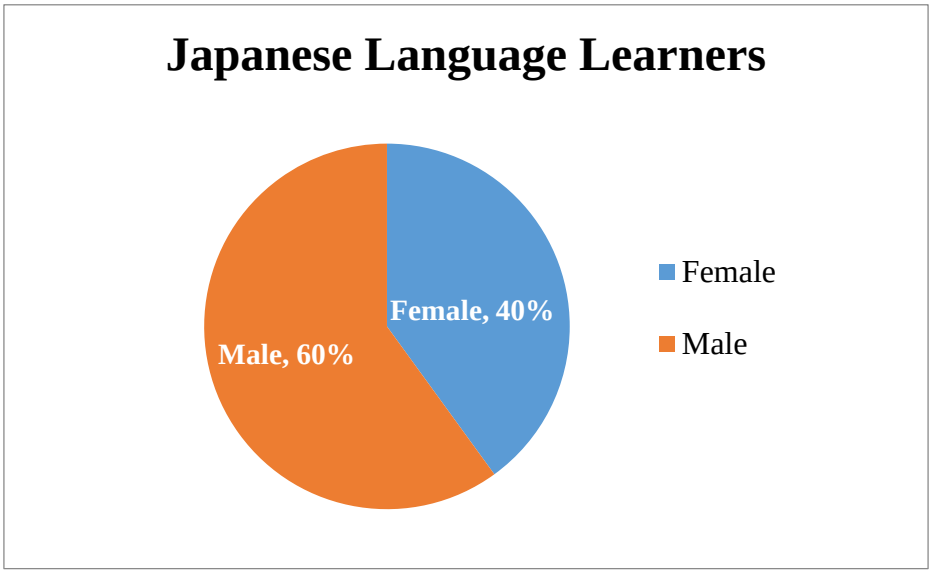


Fig. 1: Participation of learners during the project

They came from various backgrounds, such as universities, preparatory schools, internships, and summer camps. The learners visited the project website and registered as members. Members can operate at any of the levels within this framework. They can also become co-creator, authors, editors, or publishers for the materials of their choice in the collaborative environment. The learner could also comment on, rate, and like others' work to share their knowledge openly. (Naikwadi, B.H. et al. 2021) Learners were encouraged to share what they know and what they intend to learn to help each other learn more efficiently in a socially networked way. As described below, we discuss how such a level-based and W2.0-based collaborative approach can be implemented in Japanese language education. (Sulistyo, T. et al. 2020)

Another learning opportunity for learners is to share their experience with the target language by producing and sharing e-portfolios. These e-portfolios are dynamic media tools in the form of digital photos, videos, blogs, wikis, or web pages that can be accessed from any location and at any time. According to Takahashi (2008), dynamic multimedia portfolios include static ones, such as digital photos and videos, blogs, and active media, such as web pages. (Soodeh Babaee2020). These dynamic media are for tracking and sharing learners' progress. Learners can develop their e-portfolio with interests or topics concerning the target language learning. The content of their e-portfolios may be diverse such as learning materials, blog entries, academic papers, movie reviews, and personal reflections.

Learners can also create a friends list of learners who share common interests and projects they have worked on together. This collaborative approach is flexible and allows learners to achieve more than they could in a single project or individually.(TuomiIlkka, 2018)

V. Collaborative TEL Framework : Features

As described above, the collaborative TEL framework includes several key features and elements: As we consider the collaborative approach, learners must have a common goal and mission. In our development reported in this paper, learners are encouraged to form or join like-minded people with similar interests. The mutual goal of each group is discussed and agreed upon. Then each group selects one or more topics they would like to learn to achieve their common goal.(Language Learning Centre Annual Report2017) These topics can be diverse, including social skills, effective communication skills, cultural insights on a specific region or country in Japan, oral fluency or even pronunciation, etc., depending on their specific purposes as learners. The topics the learners use may be more specific or of general interest to some learners than others. For example, the target learner's mother tongue is English, but she would like to learn about Japanese culture to become closer to her Japanese boyfriend. (Chougale, N. P., et.al 2021).Japan's common theme was "cultural insights on a certain region or country". Thus the group selected three topics related to this theme: "Japanese history and culture", "Japanese food", and "Japanese traditional arts." Each group defines a person as a team leader (TL) responsible for gathering relevant information and resources that might be useful for their group project. TLs develop their plan and schedule of action based on their group's agreed-upon common goal and mission(Margaret J. Marshall,2017) This can be, for example, a plan for a collaborative e-portfolio or planning for a photo and video exhibition. Each group member can freely design and create his/her multimedia e-portfolio and upload it at their own pace. The content of the e-portfolios may be diverse such as learning materials, blog entries, academic papers, movie reviews, and personal reflections. Learners are encouraged to share what they know and what they intend to learn to help each other learn more efficiently in a socially networked way. As learners complete their projects, they can participate in the group project by commenting on others' work or giving ratings of one's work to share openly.(Mathew Montebello,2016)

A. Pseudo code for TEL : The workflow of TEL can be illustrated by using pseudo-code as follows;

START

Form or join a Japanese group

Select common interest in the Japanese language

Select team leader

The team leader selects a plan and schedule

Discuss common interest

Share language knowledge

Complete the project

Participate in other projects

Provide ratings

END

Discussion scenarios are mentioned in the following tables: As mentioned earlier, learners select common interests and do discussions based on the specific topic. e.g., If common interests are Japanese Culture or Japanese Food, language discussion will result in relevant vocabulary, books, or website links. (Ahmet Erdost Yastibasa,et.al 2015)

Table 1 : Learning through Common Interest

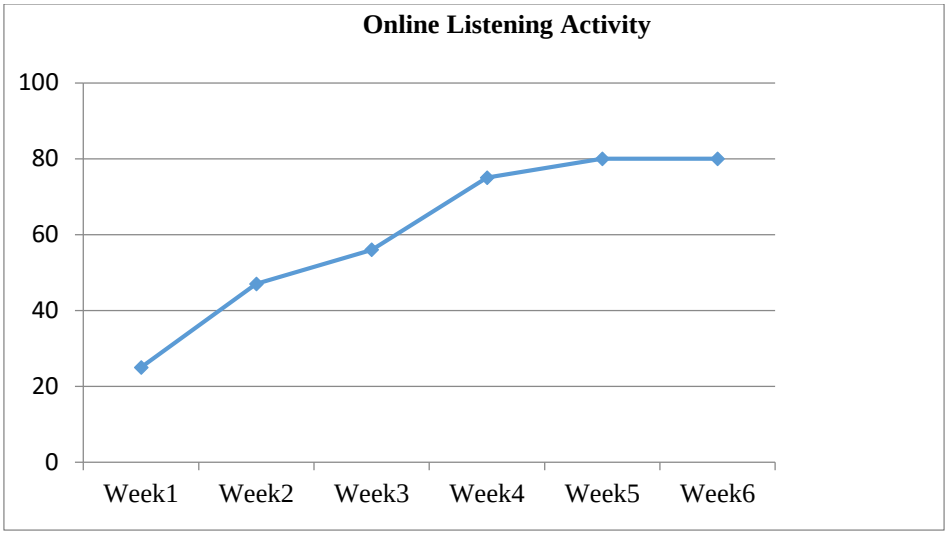
Common Interest	**Vocabulary**	**Website Links**	**Books**
Japanese Culture(Bunka 文化)	Shakai,iubi, Wabi	https://www.japanvisitor.com	Daido Moriyama Ikigai,Marigoto Japanese
Japanese Food (Shokumotsu 食物)	Taberu,asagohan,bangohan	https://www.tofugu.com	Kuniko's Recipes Futomaki Sushi Roles
Japanese Traditional Arts(Dentō geijutsu伝統芸術)	Shodo , Ikebana Ukiyo , Shikki	https://theculturetrip.com	Ikebana Masters Book on Ikebana

Japanese Movies (Eiga 映画)	Engi,kamera, sutori,sakka	https://www.skdesu.com	Yotstusnba,Kodomo to Yomu Nihonno Mukashi Banashi

VI. Summary and Conclusion :

As described above, the W2.0-based collaborative approach is a new concept yet has some applications in many areas. One of the uses of this framework is to teach foreign language learners more effective interaction skills. Not only can this be effective in helping learners integrate into the host culture, but it can also give them an effective way to learn languages through social interaction and peer evaluation. This collaborative approach is essential for learners who are not used to communicating with their peers or others and may have difficulty establishing good social relationships in their host country or region. (C. K. Ang,et.al 2015)

In the collaborative language education project, learners were encouraged to share what they know and intend to learn to help each other learn more efficiently in a socially networked way. As described above, we discuss how such a level-based and W2.0-based collaborative approach can be implemented in Japanese language education. (Liviana Ferrari,et.al 2012) This study used the collaboratively-supported Japanese teaching model to improve level 2 learners' oral communication skills. In the pilot program, we invited learners to join the online discussion boards and test surveys used as a part of our collaborative approach. To examine the usefulness of this approach, learners completed a pre-test and post-test on their listening and speaking skills (Farhang Jaryani,2011). After that, they participated in the online discussions and completed another survey after six weeks. Results showed that all students improved their listening comprehension scores, while three students' speaking scores increased significantly. Furthermore, students' post-test survey results showed that the collaborative approach was highly effective; the students were happy to participate in the collaborative teaching method and actively participated in the discussions. (Patricia Wet.al 2009).We find evidence that the learners were improved by learning with each other.



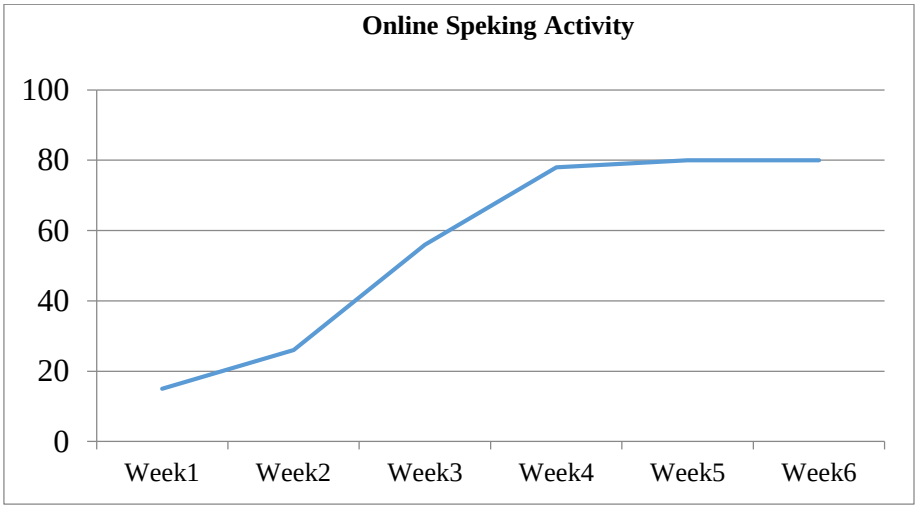


Fig.2 : Improved Online Listening and Speaking Activities

The W2.0-based collaborative approach introduced here is a new concept with some applications in many areas. This is mainly because W2.0 is best suited for problem-based Learning and network-supported interaction among peers (users of online platforms), promoting topic understanding, peer evaluation, and interdisciplinary discussion. The above approach is quite flexible and can be applied to various educational activities.

In sum, the collaborative approach introduced in this paper is an innovative approach to improving listening and speaking skills and a new model to integrate technology education into teaching. The key point here is that learners are encouraged to interact with each other, share their knowledge and ideas, discuss

problems, communicate daily, and help each other improve their language abilities by providing feedback. The most important thing is integrating technology into the teaching process to practice speaking and listening effectively whenever they need help from others.

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EXPLORATORY ANALYSIS AND VISUALIZATION OF GLOBAL TEMPERATURE CHANGE

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ABSTRACT : Exploration and Visualization techniques is a key measure for analysing and presenting climate data. Representing research results to decision-makers and to the broader audience in an easily-understandable way is of growing importance. This paper examines global historical surface temperature anomalies data (1880-2022) and combined Land-Surface Air and Sea-Surface Water Temperature Anomalies data (1950-1980) datasets to analyse and visualize the global temperature change. The study employs advanced visualization techniques such as spiral projections on polar coordinates system and heat maps to generate an informative and visually appealing representation of associated data

***Keywords* :** *Visualization, Temperature change, Exploration, Global climate change, matplotlib.*

I. Introduction :

The advent of increasing computing power and advanced observation techniques, such as satellite operations, contribute to the growth of climate-related data (Nocke et al., 2008).

However, the question arises: whether these observations and quantitative analysis of it are only helpful to the climatology experts for forecasts and predictions or can be effectively engaged *beyond the awareness of the general public*? One way is to create visualizations that depict climate change as an *essential* topic, i.e., to create a sense of issue salience (Nicholson-Cole, 2004; O'Neill et al. 2013). Climate change communication is an interesting and contemporary issue, and it is widely acknowledged that public communication about causes, impacts, and action alternatives is essential in addressing the challenges of the changing climate.

Data exploration and Visualization tools and techniques are concerned with data representation that aims to improve our understanding as well as analysis of the complex or massive amount of information and dissemination of information to broaderaudiences or decision-makers (Bishop et al., 2013). Visualization focuses

on tools and techniques in which data analysis and data science theories and methods can be explored in the process of 'making data visible in real-time to provide an accessible way to see and understand trends, and patterns in the data

Visual presentations can employ either static, dynamic, or interactive formats as well as various types of representations and visual encodings, which can affect grasp the attention and working memory of users differently on different users

Although Visualization tools are being widely used formats in the scientific domain, such representations are influenced by a domain expert and give less consideration to broader audiences increasingly involved in climate adaptation practices but less accustomed to the traditional ways of representing climate data

The global mean temperature is continually rising and the Integrated Pollution Prevention and Control (IPCC) has jagged out that the upsurge should be limited to 1.5 °C above pre-industrial levels (ipcc-special-report-on-global-warming-of-15-degc) to limit the mitigation of the harmful effects of climate change. This goal was set in theParisAgreement (Agrawal et al., 2016) that was adopted by almost every country in the world in 2015.

According to surveys conducted by the Pew Research Centre, about 70% of people globally believe that climate change is a major concern to their country but yet the publicmust understand the magnitude of this problem. One way to inform the public about climate change is by creating informative and aesthetically appealing visualizations of the associated data. In this paper, authors have tried to address this issue by employing visualization techniques to show the global temperature change.

II. Literature review :

(Alemu & Dioha, 2020) have studiedthe nature of the temperature trend and significance level in the city of Addis Ababa, Ethiopia by employing Mann-Kendall (MK) trend test and Sen's slope estimate. The scientific community (Ash et al., 2014), (Haase et al., 2000) and (Stephens et al., 2012) has employed standard and traditional visualization techniques to display climate data, including time and bar charts, box plots, line plots, scatter plots, probability distribution functions, regression, and maps)

(Cheng et al., 2022) have examined research articles published up to 2021 to perform co-authorship analysis, co-citation analysis, and keyword co-occurrence analysisto identify the current research status and trends in climate innovation *via*Cite Space visual analysis (Agrawal et al., 2016)have performed exploratory analysis and have built a prediction model based on the obtained observation in temperature change of Indian states.

III. Data Collection and Description :

In the current exploration and visualization, Three datasets are examined

Dataset 1: This is HadCRUT5 dataset provided by the Met Office Hadley Centre. It is a gridded dataset of global historical surface temperature anomalies relative to a 1961–1990 reference period, from 1850 to 2022. HadCRUT.5.0.1.0 data were obtained from http://www.metoffice.gov.uk/hadobs/hadcrut5 on 21 October -2022

Dataset 2: This dataset includes combined Land-Surface Air and Sea-Surface Water Temperature Anomalies [i.e. deviations from the corresponding 1951-1980 means]. GISS Surface Temperature (GISTEMP).

Dataset 3: This data is combined data of global land and ocean temperature anomalies, the data is collected from Global Historical Climatology Network-Monthly (GHCN-M) data set and International Comprehensive Ocean-Atmosphere Data Set (ICOADS),

IV. Exploration and Visualization Techniques

In this article temperature change analysis and visualization are implemented and executed on a Jupyter notebook using Python 3, and libraries are used (matplotlib, seaborn, pandas, etc…)

Comparison of GISS Surface Temperature (GISTEMP) with combined Global land and ocean temperature anomalies (GCAG) over the period between 1800 to 2016 is visualized by a line plot. The plot tracks the change in temperature during the period between 1800 to 2016. Figure 1 shows the line plot for the same.

```
import pandas as pd

import matplotlib.pyplot as plot

import seaborn as sns

fn = 'annual_csv.csv'

df = pd.read_csv(fn,sep=',',index_col='Year')

df.plot.line(figsize= (20,12))
```

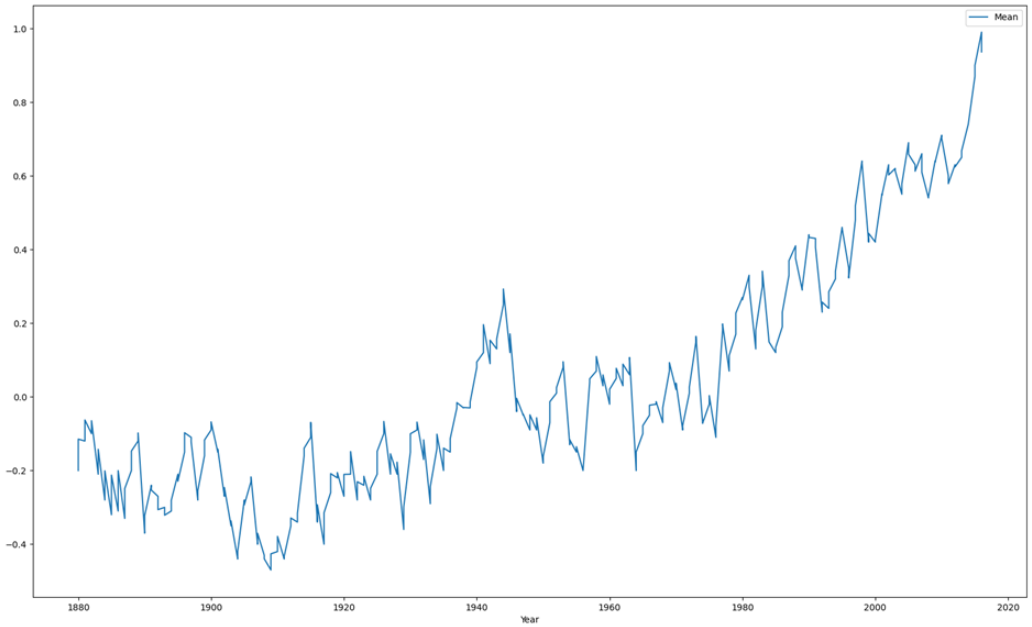

Figure 1 : Line plot of combined dataset 1 and dataset 2 (1800 -2016)

The line plot in figure1 shows a significant change and rise in temperature from the year 2000 onwards. This temperature change is an alarming Global Warming scenario.

The continuous rise in land and ocean surface temperature causing global warming over the *period 1800 to 2016 is visualized by plotting a* heat map, it also visualizes the density of temperature change and the output is shown in figure 2.

```
import seaborn as sns

fn = 'annual_csv.csv'

df = pd.read_csv(fn,sep=',',index_col='Year')

df0= df.drop('Source', axis=1)

df1=df0.sort_index(axis=0, ascending=True)

df1

plot.figure(figsize=(13,10))

ax=sns.heatmap(df1.T, cmap='coolwarm') # df is transposed to look better

ax.set_title('HeatMap of Global Annual Temperature Change ')
```

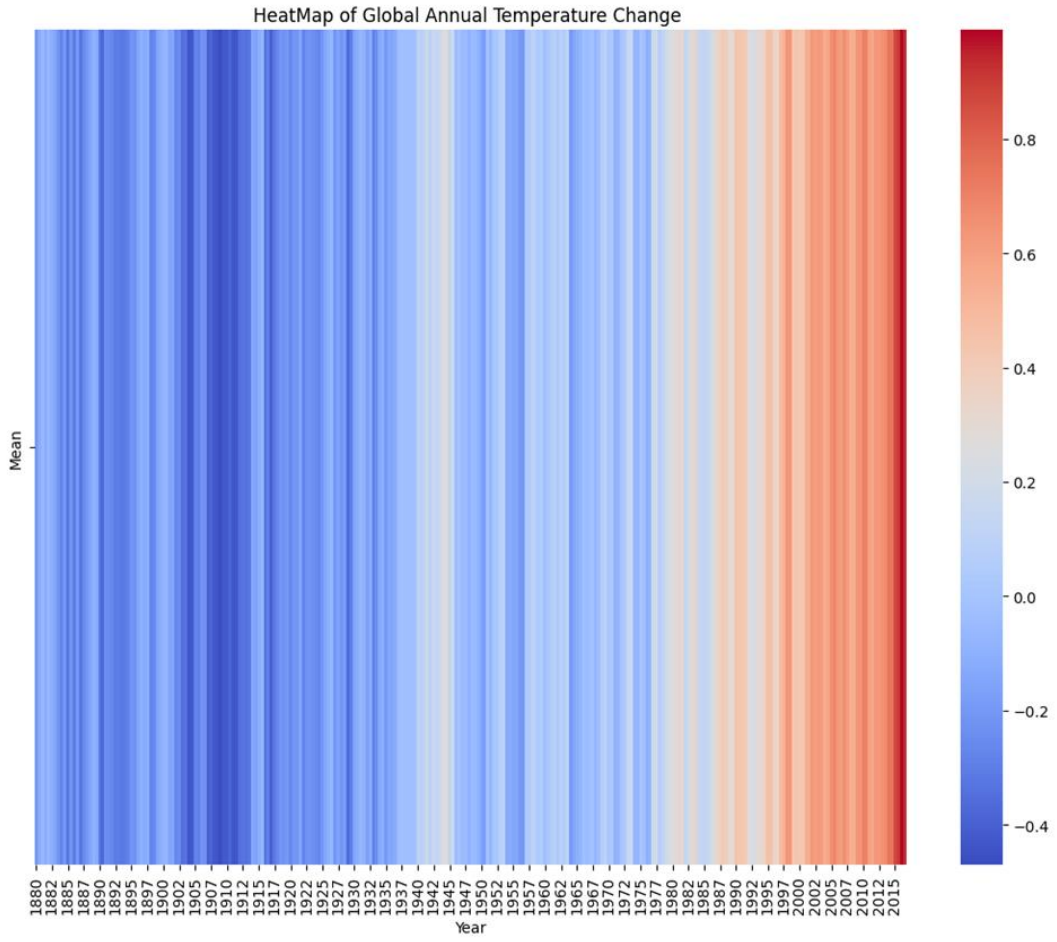

Figure 2 : Heatmap of combined dataset 1 and dataset 2 (1800 -2016)

From the heat map in figure 2 is observed that there is currently global warming. As observed from the figure from the year 1990 onwards the rise in temperature depicted by orange red colour shows climate change which is warmer than the previous years. The average temperature of the Earth's surface has reached its highest, Temperatures have risen at the fastest rate from 2005 onwards.

Another very useful plot in the visualization of data and analysis of time series data is the spiral plot projection using polar coordinates.

In this article, we have employed the spiral plot projection visualization to show the deviations from the average temperature between 1880 and 2022.

This visualization process is carried out in 3 steps

1) transforming the data for polar visualization

2) customizing the aesthetics of the plot

3) stepping through the visualization year-by-year

Transforming the data for polar visualization :

Subsets of the data by year are created and for spiral plotting temperature value for a given month is adjusted to contain no negative values.

import NumPy as np

months=["Jan","Feb","Mar","Apr","May","Jun","Jul","Aug","Sep","Oct","Nov", "Dec"]

fig = plot.figure(figsize=(8,8))

ax1 = plot.subplot(111, projection='polar')

Customizing The Aesthetics Of The Plot: The background colour within the polar plot is set to black, and the colour surrounding the polar plot is grey. Monthly rings with month labels are added to the plot

ax1.axes.get_yaxis().set_ticklabels([])

ax1.axes.get_xaxis().set_ticklabels([])

fig.set_facecolor("#323331")

ax1.grid(False)

ax1.set_title("Global Temperature Change (1880-2022)", color='white', fontsize= 25, ha="center")

ax1.set_ylim(0, 3.25)

ax1.set_facecolor('#000100')

#add months ring

*months_angles= np.linspace((np.pi/2)+(2*np.pi),np.pi/2,13)*

for i,month in enumerate(months):

ax1.text(months_angles[i],3.4,month,color="white",fontsize=15,ha="center")

Stepping through the visualization year-by-year :

To generate 12 equally spaced angle values spanning from 0 to 2*pi so that year by year 12 months data from Jan to Dec can be plotted. Each spiral plots the monthly change in temperature

years = df['Year'].unique()

```
for index, year in enumerate(years):
  #  r=hadcrut.loc[hadcrut["year"]==year,"value"]+1
   r = df[df['Year'] == year]['Value']+1
   theta = np.linspace(0, 2*np.pi, 12)
   # ax1.text(0,0, str(year), color='white', size=30, ha='center')
   ax1.plot(theta,r,c=plot.cm.viridis(index*2))

full_circle_thetas = np.linspace(0, 2*np.pi, 1000)
blue_line_one_radii = [1.0]*1000
red_line_one_radii = [2.5]*1000
red_line_two_radii = [3.0]*1000

ax1.plot(full_circle_thetas, blue_line_one_radii, c='blue')
ax1.plot(full_circle_thetas, red_line_one_radii, c='red')
ax1.plot(full_circle_thetas, red_line_two_radii, c='red')

ax1.text(np.pi/2, 1.0, "0.0 C", color="blue", ha='center', fontdict={'fontsize': 20})
ax1.text(np.pi/2, 2.5, "1.5 C", color="red", ha='center', fontdict={'fontsize': 20})
ax1.text(np.pi/2, 3.0, "2.0 C", color="red", ha='center', fontdict={'fontsize': 20})
```

Figure 3: the global temperature change year by year with a monthly projection shown.

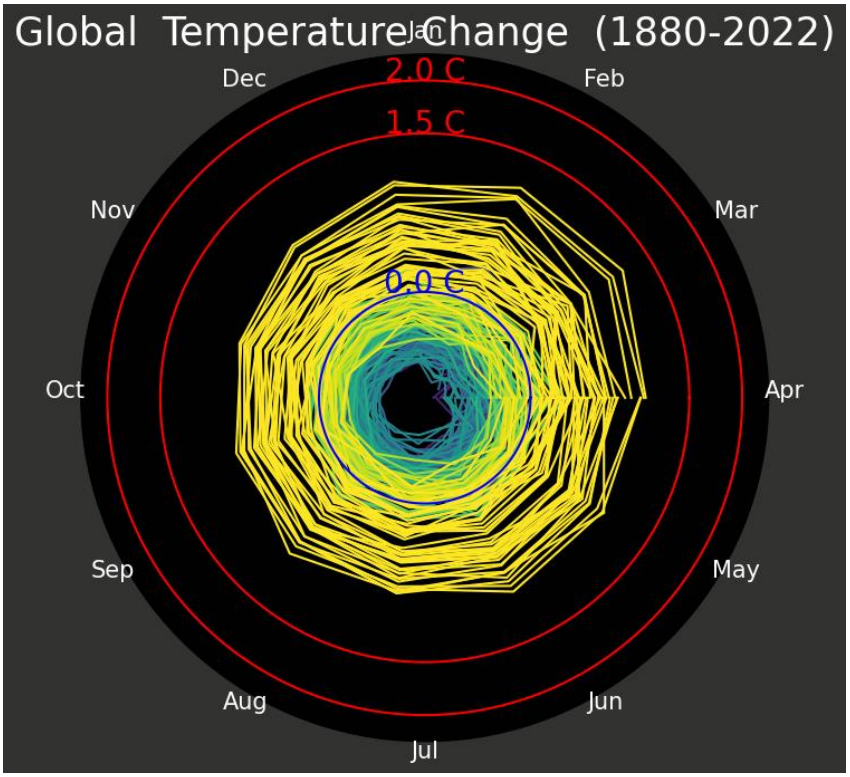

Figure 3 : Year-wise spiral projection of global temperature change (1880 - 2022)

The indicative global warming temperature of 0^{o}C, 1.5^{o}C, and 2.0^{o}C is shown by adding indicative temperature rings.

The 0^{o}C indicative ring comprises blue spirals indicating less temperature change and a cooler climate. Gradually over the years, the green spirals depict a slight increase in temperature change. The yellow spirals between 0^{o}C and 1.5^{o}C depict significant changes in temperature at an alarming rate.

Discussion :

From the current study of global historical surface temperature anomaliesdata (1880-2022) and combined Land-Surface Air and Sea-Surface Water Temperature Anomalies data (1950-1980) it is observed through the line plot, heat map, and spiral projection can be effectively used to visualize the data. The employed visualization plots can be used to communicate with a broader audience the climate change in moreinformative and aesthetically appealing representation styles.

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IMPACT OF COVID-19 PANDEMIC ON ARTIFICIAL INTELLIGENCE-BASED STARTUPS

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ABSTRACT : Artificial Intelligence is the ultimate innovation in technology that will transform every sector of the economy and make tomorrow's world truly different from today's. While AI was first designed to control complex robotics, it has now come a long way and is capable of doing much more than making robots work efficiently or designing cars better; AI will be making our lives easier and a lot more comfortable shortly. When the nationwide lockdown was declared owing to the COVID-19 pandemic, there were severe effects. Organizational layoffs, business disruptions, and other things like that have resulted from this. Artificial Intelligence has been significantly contributing to this pandemic in several ways, including predicting when the epidemic would end, monitoring its spread, and looking into treatments and countermeasures, among other things. The adoption of artificial intelligence in every sector's industries like healthcare, education, communication, transportation, e-commerce, entertainment, etc. has accelerated as a result of COVID-19. AI-based tools and solutions are used rapidly, widely, and in response to the crisis's dynamic character. This has increased the demand for artificial intelligence-based services. This situation has given a lot of commercial boost to Artificial Intelligence-basedstartups. This paper focuses on the positive impact of the COVID-19 pandemic on Artificial based startups.

Keywords : Artificial Intelligence, Covid-19, Start-ups, Technology

Introduction :

India has emerged as one of the most formidable competitors in the global battle for artificial intelligence in recent years. AI start-ups are receiving significant assistance and financing in the form of millions of dollars from the government of India. These AI start-ups in India are focusing their efforts on producing new products and services to boost overall productivity and income in the country's home market(Bhorayal, 2022).Both Artificial Intelligence (AI) and Machine Learning (ML) are examples of technologies that have experienced significant growth over the last three years, in terms of both investment and new product development. They are currently being used in a wide variety of industries, including manufacturing, healthcare, fashion, agriculture, real estate, voice-based applications, and others(LEMAIRE et al., 2018).In India, the year 2016 saw the beginning of the rise of AI startup companies. The field of artificial intelligence

companies is expected to experience remarkable growth over the next two years. The development of artificial intelligence has progressed to the point where it can now take over the management of patient medical records and other pertinent data with relative ease(Kalyanakrishnan et al., 2018). It not only saves the data but also processes it, changes it, and indexes it, making it very easy to access. Various industries, including software development, e-commerce, healthcare, etc. stand to benefit from the advancement of artificial intelligence. The potential of AI-based startups is being realized in the COVID-19 pandemic as well as the post-COVID era(Nageswara Rao et al., 2021). The popularity of utilizing AI in business models has grown along with the technologies like machine learning (ML) and natural language processing (NLP). The need for AI-based start-ups is increasing both globally and in India, driven by different businesses' need to provide better and quicker customer service(Soni et al., 2020). The technology-driven start-ups using various emerging artificial intelligence-based technologies –Computer Vision, DL (Deep Learning), ML (Machine Learning), NLP (Natural Language Processing), and Automation are at the forefront of helping startups with platforms Conversational AI, like automation, speech recognition, and others(Tzachor et al., 2020). The figures show the demand, with AI-based startup funding rising to $3,756.4 million in the post-covid era from $695.4 million before the COVID-19 pandemic (an increase of 540.19%). The activities of AI-based start-ups in the Indian start-up ecosystem are thoroughly examined in this paper("Indian Startups That Are Leading The AI Race," 2021). It evaluates how entrepreneurs focus on important technology to address a variety of issues in various sectors. By examining their investments across various sectors via various Series of fundraising, it also analyses the kind and position of investors' capital allocation to various start-ups. It also emphasizes the funding distribution by funding stage(Howarth, 2021). Entrepreneurs, analyst firms, industry officials, and businesses may all study this paper. They are all using these technologies to expand their firms, progress their careers, and inform their stakeholders about current industry trends. This research will also help stakeholders have a better understanding of the industry's overall market size, potential in key domain areas, industry use of technology, start-up expansion by cities, and other subjects("68 Artificial Intelligence (AI) Companies to Know | Built-In," n.d.).

Additionally, to ascertain the funds obtained from undisclosed sources, this study makes use of several parameters, including corporate location, total funding, funding (Before and after the COVID-19 pandemic), employee size, company funding stage, etc.

The objective of the study is to find the impact of the COVID-19 Pandemic on Artificial Intelligence based Startups:

1) The 10 most AI-based startups
2) Startups receiving high-value funding
3) Location-wise Distribution of Start-ups
4) Top Investment Funds after COVID-19 pandemic

The pandemic has hammered economies all across the world, and even the little enterprises have felt the effects of this. As the number of confirmed cases of COVID-19 continues to rise daily, an increasing number of individuals are staying inside their homes to protect themselves from the virus (Mendagudli et al., 2021). Every sector of society is being compelled to explore different ways to carry out its day-to-day activities, and they have no choice but to do so. And the world of business is not an exception to this rule. The following is a list of the top artificial intelligence (AI) startups in India, that are utilizing technology to assist the nation in making its imprint in the worldwide tech sphere, particularly evolved after COVID-19 (Naikwadi et al., 2021).

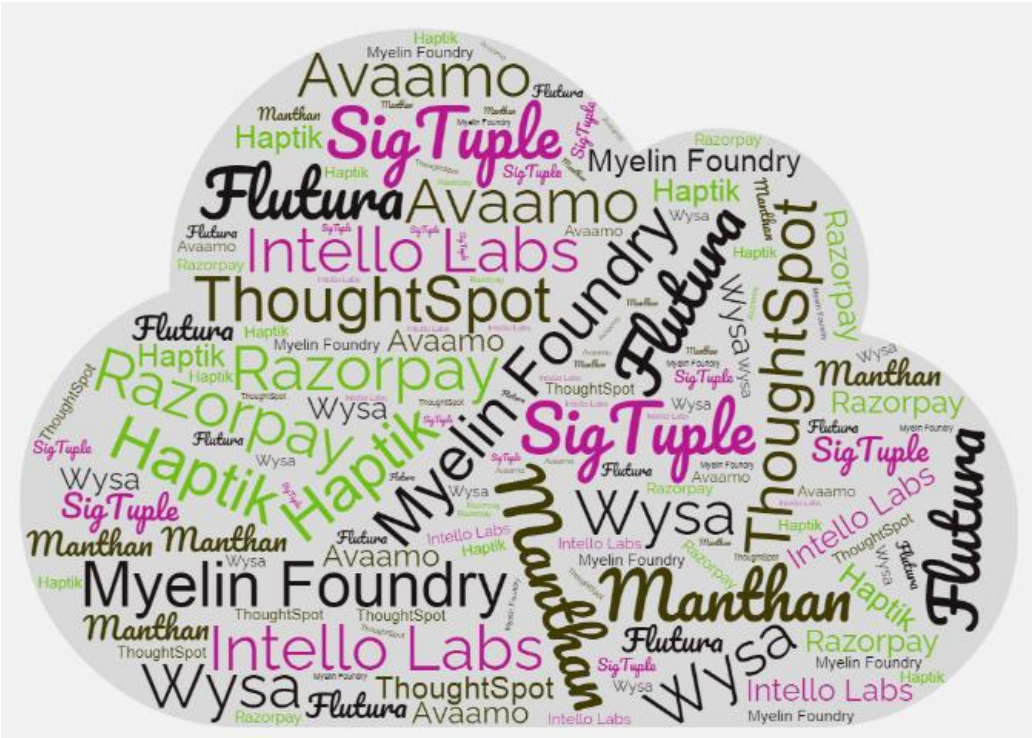

Fig. 1: List of popular startups raised after Covid-19

Methodology :

This paper focuses on existing AI startups in India with different parameters and their analysis using AI techniques. The study further focuses on startups producing AI solutions. Data is collected using different data sources including corporate websites, market reports, white papers, company documents, specialized databases, news feeds, journals, and publications, among others (Patil et al., 2020).

The data and the analysis go through integrity checks. Data redundancy is removed, data inconsistencies are identified and fixed, and the validity of the analysis is confirmed. The data is then processed for tabulations using various formats, weighting, and graphical representations (Hirschfeld et al., 2021).

Results and Discussion:

There are around 3,782 AI-based startups in India. As COVID-19 is over there is a huge increase in AI-based startup funding. The financing and growth rates are as follows:

- ✓ Before the COVID-19 pandemic, funding was $695.4 million.
- ✓ In the post-covid era, funding is $3,756.4 million

That is a huge increase in funding of 540.19% (Palanivelu and Vasanthi, 2020).

Over the COVID-19 pandemic year, funding for supply chain and logistics, customer service, and healthcare has considerably grown. Additionally, start-ups increased their use of areas like Conversational AI, Automation, NLP, and Analytics to build their solutions(Parekh, 2021).

The top 10 most exciting ones are listed below.

Table 1: Top 10 AI-based startups in India (Post COVID-19)

Sr. No.	Name of AI-Based Start-ups	Funding (In Million $)
1	Verse	1810
2	Ola Electric	866
3	Razorpay	817
4	Uniphore	645
5	HighRadius	484
6	Druva	475
7	ElasticRun	461
8	Eightfold	410
9	Gupshup	390
10	BlackBuck	359

The major drivers of the increase in investment for AI-based startups include the significant innovation and disruption in supply chain and logistics, customer services, the healthcare industry, and other industries during this current pandemic (Austria, n.d.).

Table 1: Top 10 AI-based startups with service

Sr. No.	Name of startup	Service Provides
1	Verse	Short video sharing and news app provider
2	Ola Electric	Develop electric scooters
3	Razorpay	Payment processing solutions for businesses
4	Uniphore	AI and cloud-based platforms offering conversational service automation solutions
5	HighRadius	Cloud-based accounts receivable and treasury management solutions for businesses
6	Druva	Cloud data platform offering data backup and protection solutions
7	ElasticRun	Provider of AI-based solutions to manage B2B marketplace platform for rural stores
8	Eightfold	AI-based talent intelligence solutions for enterprises
9	Gupshup	AI and cloud-based chatbot development platform
10	BlackBuck	Web & AI-based marketplace for booking freight transportation

Bangalore-based start-up “VerSe”, received the highest funding of $825M in the Post-COVID-19 era. Six AI-based startups received funding above $300M. Customers' increased demand for AI-based services during the Covid-19 era was a major factor in this expansion of funding(Sharma et al., 2020).

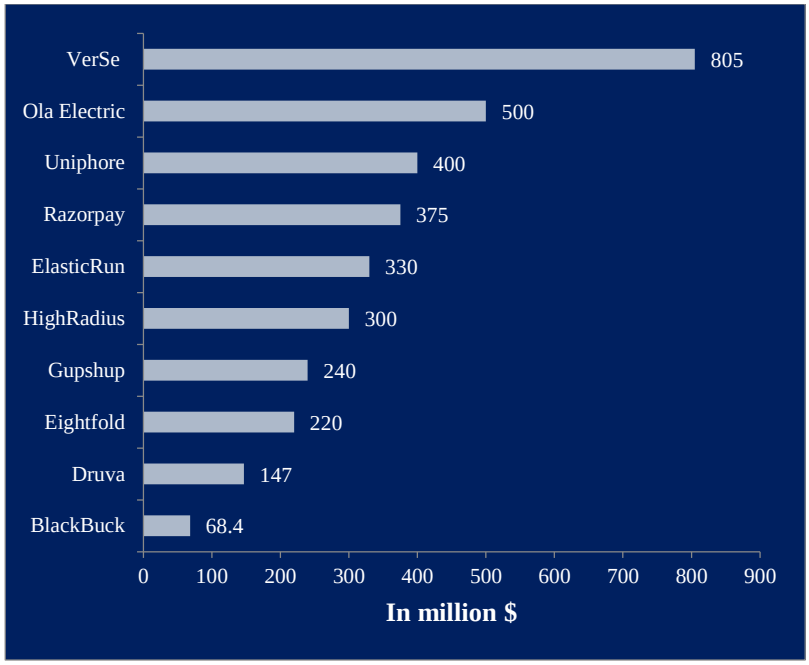

Fig. 2 : Graph showing Top funded AI-based startups in India (Post COVID-19)

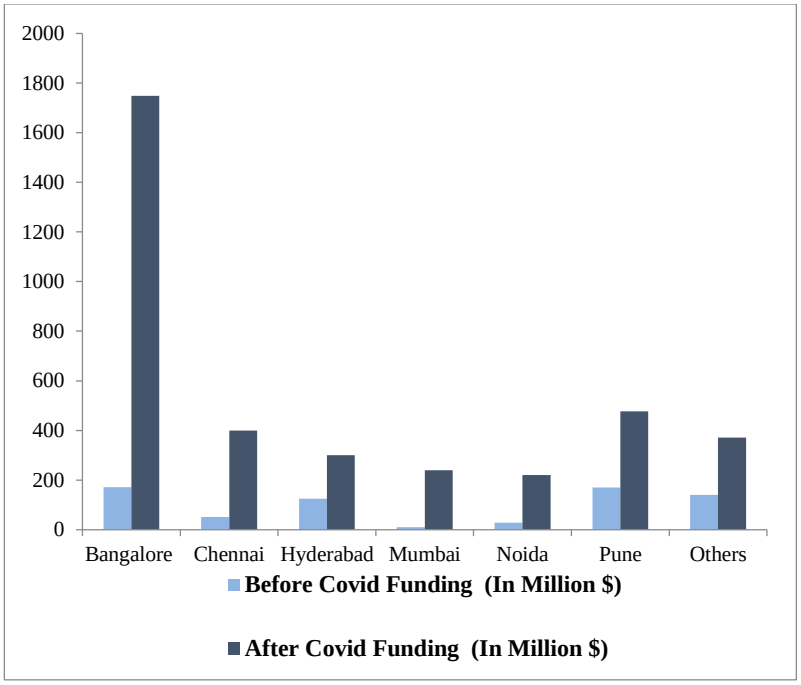

Fig. 3 : Graph showing City (Location) - wise AI-based startup funding

Bangalore-based startups garnered the most funding in the post-covid era. As a result, the overall funding for Bangalore-based start-ups increased steadily by 47% during the pandemic (Dey, 2015).

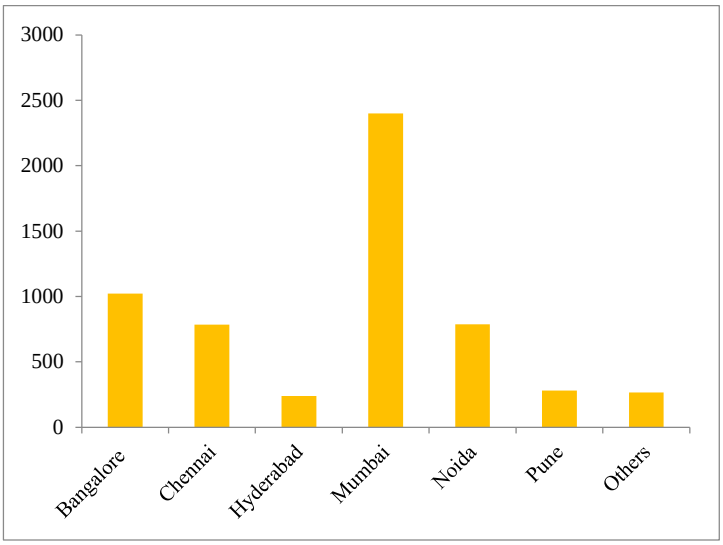

Fig. 4: Graph showing City (Location) – wise increasing funding in %for AI-based startups compared to funding before the COVID-19 pandemic

The overall funding for the AI-based startups in Bangalore is $1748.4 M, or around 47% of the entire funding, which was much higher than the total funding for other allocations.

Table 3 : Top 10 AI-based startups funding (Before COVID-19 and Post COVID-19)

Sr.No.	Name of AI-Based Start-ups	Before COVID-19 Funding (In Million $)	Post COVID-19 Funding (In Million $)
1	Verse	63.4	805
2	Ola Electric	1	500
3	Razorpay	100	375
4	Uniphore	51	400
5	HighRadius	125	300
6	Druva	130	147
7	ElasticRun	40	330
8	Eightfold	28	220
9	Gupshup	10	240
10	BlackBuck	6.98	68.4

The below graph shows a huge positive impact of the COVID-19 Pandemic on Artificial Intelligence based Startups. There is a huge increment in the funding during / post covid pandemic as compared to the pre-covid period. i.e. the increment in percentage is 540.19%.

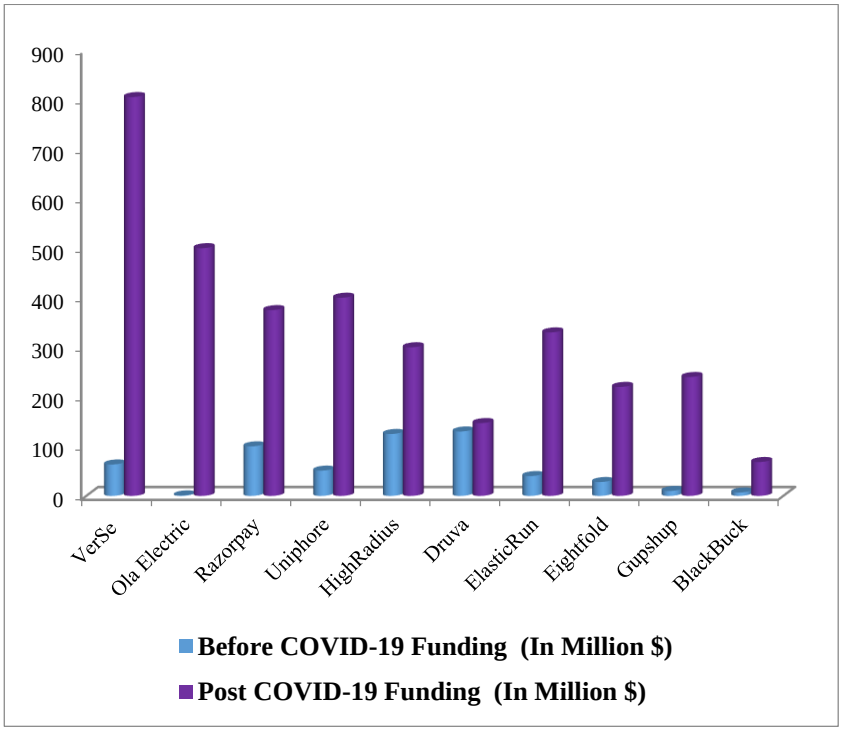

Fig. 5 : Graph showing the impact of the COVID-19 Pandemic on Artificial Intelligence based Startups

Conclusion :

The study findings the positive impact of the COVID-19 pandemic on Artificial Intelligence-based startups in the form of financial terms. The total funding during / post covid period is$3,756.4 million, a growth rate of 540.19%. The study shows AI is most useful in the fight against COVID-19 and related pandemics. That's why there is a positive impact on AI-based startups.

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