

Student-Teacher App using Machine Learning

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Abstract

In today's world, educational institutions have a task to provide the best education to their students and then to classify them on their basis of understanding they could be divided upon their learning and understanding ability. As the evolution of teaching happens, the whole world has entered the era of digital education. There have been quite a lot of improvements in the educational domain and the pandemic as well has affected the perspective towards the education sector. This has made us realize that a revamp is needed in this sector with the help of digitalization of data for the present and future aspects of students' learning and performance. The revamp due to COVID-19 has given us some time to analyze how effective the education can be. It has to be in such a format that all the actors in this domain (Student and Teacher) must be aware of their daily activity and no one must be left behind due to no proper analysis of the basic block of education. So, this project of Student-Teacher App using machine learning, includes features such as discussions, notifications on projects and assignments, attendance, and marks. Results reveal that the proposed application will produce improved performance.

Keywords : Decision Tree Classifier, Random Forest Classifier, Flutter, Text to speech, Predictive Analysis, Adaptive Learning, Machine Learning, Application Development.

1.Introduction

In today's era of digital education, eLearning has completely revolutionized the way in which learning is provided to the students and the evaluation process has also been digitalized. Technology today has been developed so much that it has improved the livelihood including education. It has also proved to enhance the engagement of students in their learning and understanding. The recent advancement of the smartphone capability could be taken as an advantage by engaging with the learning process, since the student group is significantly involved in smartphone now-a-days. The enhancements in technology have improved the

utilization of devices by educators and researchers for teaching and learning. This has enabled for a more engaging and interactive experience better than the traditional learning by the use of smartphones. It enables the students to engage on a more personal level in their activities by the use of their smartphones. Additionally, e-learning allows students to focus on activities of learning and to work on assignments that could be evaluated by teachers who can then provide the result of the assignment over this digital medium. In addition, e-learning devices helps the learning and understanding of the students' by making it more interactive based learning exposure with the help of processes that affect the cognitive and affective learning. Also, the smartphone devices enhance students to look upon their progress, performance and get an understanding of their scope of improvement in an interactive and effective process. The learning carried home with a thorough understanding of analysis where the student is been lacking and where there is a scope of improvement. Also, parents at their convenience can assess their child in the form of notifications, and details regarding marks and attendance can be notified.

The COVID-19 pandemic has revamped the current scenario of eLearning and the evaluation process of the student activities so a need for change has become evident in this domain. The teacher's communication with the app has improved from previous years but can be improved even better. This application aims to provide a bridge between students and teachers and increase communication between them. Teachers can send notifications of assessments, and an analysis of the predictive model in the form of a graph will also be provided to evaluate the grades and attendance. A discussion forum to analyze the scope of improvement has also been included in this application. The evaluation in turn has turned out to be effective and has enhanced the ability to improve for future related activities like placements and exams. This project includes features like Notifications with Text-to-Speech, Discussion Forum, Notes, Marks, Attendance, and predictive analysis with the help of Machine learning as well as the visualization using graphs.

2. Related Works

There is quite a rich and meaningful base of research and it's not very often taken into consideration, and that doesn't lead to any change in policies that could affect the teaching nature or methodologies. Much more research has been done in the area of educational data mining where a model similar to the predictive model which has been used in this project, has

already been developed which is used for the prediction of students' grades on the basis of several characteristics such as previous years' GPA and other related factors. Thus it is extremely difficult to predict at high accuracy.

The research paper named ML Based Application for the Evaluation of Student-Teacher Specific Instructional Tools and Style by FedorDuzhin and Anders Gustafsson, published by MDPI Publications (2018) used the methodologies Adaptive Learning, Symbolic Regression and Quasi based Experiments for the Prediction unto 70% of the variation in students score. In this project, teamwork was given more importance than individual work. Similarly, the research paper named Communication Channel Between Teachers and Students in Chemistry Education: WhatsApp by Nuray ZAN, published by David Publications (2019) focused on using WhatsApp application to create a group and communicate with students for discussions, also for strengthening the communication and encouraging information sharing among students. But the limitation of this project was the lack of Adaptive Learning and Predictive Analysis methodologies.

Furthermore, the research paper named Parent-Teacher Communication Effects using Digital Tools in Middle and Elementary Classes by NaTeal Bosch, Stephanie Bosch, Kylie Cline, Sarah Hochhalter, Aleksandra Rieland, Emily Takekawa, and Tanya Walther, published by SOPHIA Publications (2017) used different applications like Facebook, Remind App, Seesaw App, and Google forms which were survey focused on the effects of three different digital communication tools in middle and elementary classrooms. In this project, all the data collected was survey-based and no proper evaluation in digital format was done to predict future outcomes. The research paper named A Review of Related Literature on Mobile Learning by Mazhar Shamsi Ansari and Dr. Santosh Kumar Behera, published by IJETA (2018) focused on the concept of E-learning and Mobile learning, as well as their characteristics but the limitation, included the lack of any database and the lack of interaction between teachers and students.

The research paper named Mobile Application Tools for Students in Secondary Education by Zoe Karabatzai, AgathiStathopoulou, Alexandra Economou, published by IJIM 2018 used the methodologies of mobile technology, secondary education, high order thinking skills, special education for Mobile Learning Applications to promote higher order thinking skills. Although this project lacked the use of databases.

The research paper named Context-aware mobile learning application development by Bimal Aklesh Kumar, Bibhya Sharma, published by Springer Nature Publications 2019 used the

methodologies of mobile learning and extraction of information for the development of application. In this project, there was no interaction between teacher and student and also no adaptive learning approach on the attendance of students was found. Concluding with the research paper named Students' Performance Prediction using ML Algorithms. by Hussein Altabrawee Osama Abdul Jaleel Ali, Samir Qaisar Ajmi, published by JUBES (2019) used the methodologies Decision Trees, Naive Bayes Theorem, Automated Neural Networks, and Logistic Regression which showed using the Decision tree model whether the student was Good or Weak in that subject. In this project, no interaction between teacher and student was observed.

3. Methodologies

The project has been divided into the following modules

1. Adaptive Learning
2. Predictive Analysis
3. Text To Speech

3.1 Adaptive Learning

Adaptive Learning otherwise called as Adaptive Teaching which is an educational teaching mechanism or rather method which uses computer algorithms such as machine learning to amplify the interaction of the teachers and the students in a better way. The Learning Resources are customized according to the students' point of view and is unique for each and every student so that every student focuses more effectively. Many learning organizations have been using this adaptive learning approach to modify the students' needs and provide a better learning approach along with the provision of desired resources depending on the student himself/herself since every student is not the same and the difference also occurs based on age groups, so, for better results, the adaptive learning technique could be Instrumental in the future.

The Adaptive Learning method also facilitates the students by analyzing each and every student individually and then providing the resources according to their needs. Also, the adaptive learning technique provides better approaches and ways of solving their problems.

3.2 Predictive Analysis

Student Predictive Analysis deals with the student's data of previous marks or grades and displays the data in a graphical format. The analysis will be provided to the student and then he/she can determine where he/she has to work hard in the upcoming exams, one more criterion under consideration will be attendance which will determine how many classes he has missed and the benchmark number where he/she can be detained.

The algorithm suitable for this scenario is the Decision Tree classification algorithm:

Steps for the implementation of this ML module are:

- a) Defining the problem
- b) Preparing the data for analysis
- c) Evaluating the problem
- d) Improving the assessment
- e) Presenting the scenario

Decision Tree is used due to its predictive power, also because of its classification and regression power.

3.3 Text To Speech

Text-to-speech synthesis -TTS - is a machine learning module that allows the conversion of a text input to a sound output automatically. The synthesizer engine of the text-to-speech (TTS) is an advanced technology that lets devices such as smartphones and computers speak to us. The TTS module takes input in the form of text and then there is a computer algorithm which is called the TTS engine which is used for the analysis of the same text, pre-processing of it, and then the speech synthesis by using some algorithms. The TTS engine generates output in the form of sound data. The text-to-speech (TTS) engine works by the help of 2 processes. The first process is the analysis of text, where the text which is given as an input is represented as an intermediate form of information, and the second process is the production of waveforms in the form of speech, where this information leads to the production of output.

4. Results and Discussions

This is the result from the machine learning Project there are 6 graphs provided which shows the relationship between the features present in the data set like age, sex, subject 1 marks, subject 2 marks etc. As it can be seen in the first graph the colors orange and blue represent the eligibility of a student to sit in the placements respectively. the graph shows the eligibility of students to sit in the placements according to their age groups. As it can be seen, the age group 20 which has around 60% students eligible for placements and 55% not eligible for placements and can be seen similarly for other age groups also.

In the second graph the 0 in the X-axis represents female and 1 represents male students and their respective percentage of eligibility can be seen in the Y-axis. Similarly the 3rd graph represents the eligibility in placements according to their marks in Subject 1. Similarly the 4th and 5th graphs represent respectively the eligibility in placements according to their marks in Subject 2 and Subject 3.

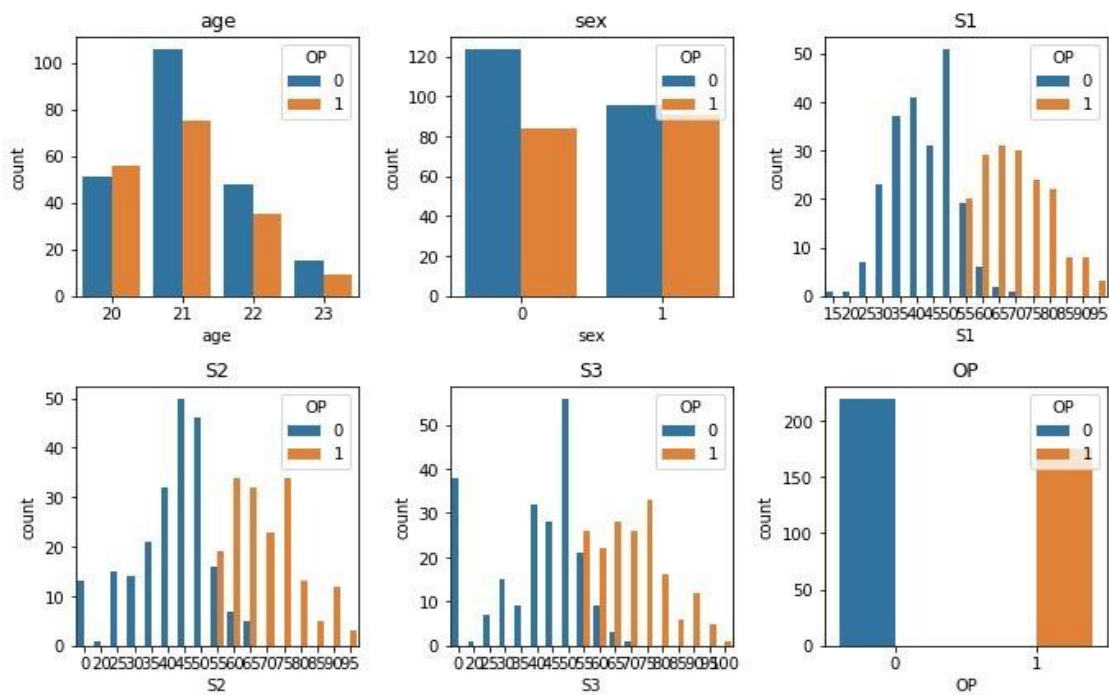


Fig 4.1 Results of proposed System

The below table shows the importance of features according to the attributes present in the data set. The attributes include grade one marks, grade 2 marks, grade 3 marks, age and sex.

importance	
feature	
S1	0.304
S3	0.275
S2	0.242
age	0.170
OP	0.009

Table 4.1. Importance of Feature Values

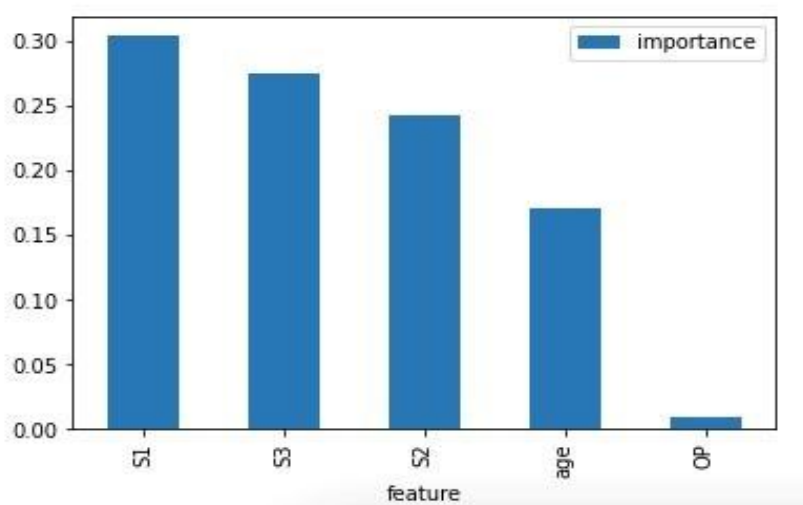


Fig 4.2 Feature Values

The importance of the features has been represented in the form of the bar chart above. The table below represents the header of this project's data set.

	sex	age	G1	G2	G3	su1	op
0	0	21	5	6	6	17	0
1	0	21	5	5	6	16	0
2	0	22	7	8	10	25	0
3	0	22	15	14	15	44	1
4	0	20	14	10	10	34	1
5	1	20	15	15	15	45	1
6	1	20	12	12	11	35	1
7	0	21	6	5	6	17	0
8	1	22	16	18	19	53	1
9	1	22	14	15	15	44	1

The table below show the description of the data set.

	sex	age	G1	G2	G3	su1	op
count	395.000000	395.000000	395.000000	395.000000	395.000000	395.000000	395.000000
mean	0.473418	21.060759	10.929114	10.713924	10.415190	32.058228	0.587342
std	0.499926	0.849816	3.313568	3.761505	4.581443	11.086607	0.492937
min	0.000000	20.000000	3.000000	0.000000	0.000000	4.000000	0.000000
25%	0.000000	20.000000	8.000000	9.000000	8.000000	25.000000	0.000000
50%	0.000000	21.000000	11.000000	11.000000	11.000000	32.000000	1.000000
75%	1.000000	22.000000	13.000000	13.000000	14.000000	40.000000	1.000000
max	1.000000	23.000000	19.000000	19.000000	20.000000	58.000000	1.000000

The screenshots attached below represent the login page and the dashboard page of the mobile application respectively.

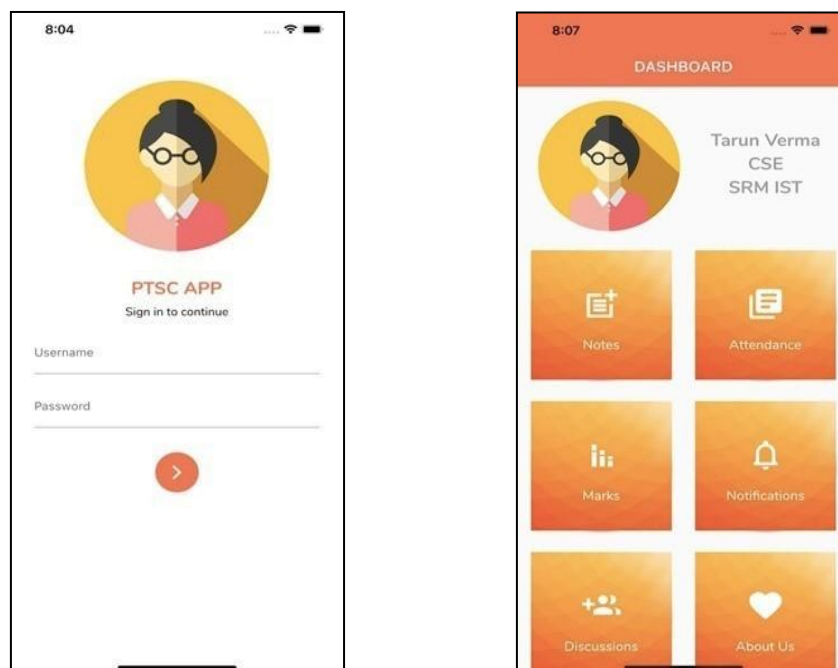


Fig 4.3 GUI of Proposed Work

The table below represents the various machine learning algorithms that have been used for training the model along with their training and testing accuracies.

Table 4.2 . Performance Measures

S. No.	Name of the Algorithm	Training accuracy	Testing accuracy
1	Decision Tree	88 %	58 %
2	Random Forest	85 %	50 %
3	Logistic Regression	57 %	53 %
4	KNN	69 %	52 %
5	Support Vector Machine	56 %	54 %
6	Gaussian Naive Bayes	56 %	54 %

5. Conclusion

The application developed by us is for the educational community. The application consists of the following features in the form of pages

1. Notes
2. Notifications
3. Discussion Forum
4. Attendance
5. Marks/Prediction
6. About Us

The main agenda of the application is to show the academic data of the respective student as well as to extract the same data and use it for the predication of the eligibility for placements using the machine learning algorithm. The outcomes of the machine learning algorithms are illustrative based in the form of graphs for better understanding. The main algorithm used for the prediction in the application is the Decision Tree classifier algorithm. With the continuous improvement in the digital education sector and looking at the current scenarios, this application could be more useful for the students for improved understanding and performance on a real-time basis. The main findings of this application were mainly through the machine learning-based analysis and they have been shown in the results section. This application represents the use of mobile applications for e-learning along with the use of machine learning in the form of predictive analysis and adaptive learning, which is a novelty.

6. References

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