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Student Result Prediction Before Attempting Exams Using Machine Learning Algorithm

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Abstract In present scenario, students results are creating drastic problems if they are not as expected. Many parents are upset, and some students are even losing their lives as they feel that they could not face their parents with such results. Faculty usually guess the results based on performance of student which helps in predicting student result and inform parents. However, there is no proper mechanism for communicating this as both faculty and parents have their own busy schedule. Hence, this student result prediction before attempting exams using machine learning algorithm is a well-trained system with the training set adapted by faculty in guessing the student failure. This is usually predicted by the system by attendance and internal assessment of the student. Then, a suitable mechanism is adapted for intimating this to students, parents, faculty, mentors, heads of department. This will help in taking extra care before exams instead of becoming aggressive after exams. The algorithm used for this prediction is Naïve Bayes algorithm. Then, the accuracy is being tested on existing dataset of students.

Keywords Student result prediction · Machine learning algorithm · Naïve Bayes algorithm

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1   Introduction

Though the present examination system is criticized for years but still taking exams and result analysis has become a routine. The parents are bothered about their wards attempting exams and further worried if the results are not as expected. Earlier in schools and colleges, many parents were attending parents meetings organized by educational institution and used to enquire about their child's performance. However, nowadays the parents are busy with their job and business, and hence, they are unable to attend meeting organized by schools and colleges. But they are upset after viewing the result of their children. Many children are also worried to show their results to their parents and few have lost their lives for this silly reason. Many parents are comparing the grades with the classmates which are hurting the student's feelings. However, if the results are expected prior to writing the exam, they can take extra care on their ward and motivate him to excel in education.

The student many times fails due to his over expectation that he will pass basing on some assumptions. However, many times these assumptions go wrong. Hence, if the student is informed about the probability of failure, then he may work hard and try to pass the exam. Similarly, the parents and faculty would have taken more concern before the child attempts the exam. Sometimes if extra care is required for a child to pass in some subject that can be provided by taking it into concern. Some system is needed replacing the manual system which is paper based, slow and inefficient and facing difficulty in report generation, eradicating improvement in student academic performance.

2   Literature Review

Rumsey in his paper of innovative approach discussed the approach of teaching under-graduate students about an application [1]. Bloomfield discussed approach for evolution of a perfect exam grading system [2]. Shahiri depicted a system for predicting performance of the students using data mining techniques [3]. Ibrahim has discussed about predicting academic performance by using ANN and other techniques [4]. Sujatha has proposed and encrypted question paper distribution system in exam cell [5]. Transformations in undergraduate and engineering education need to be done for bringing reformations in creating good graduates [6, 7]. However, predicting if a student will pass or fail is still needed to be worked out. Farrell discussed about the reforms required in transforming education and role of teaching to support these transformations [8]. Karimisetty have proposed a system of developing mobile application for examcell for effective communication to parents [9].

3   Student Result Prediction Before Attempting Exams Using Machine Learning Algorithm

Student result prediction before attempting exams using machine learning algorithm aims to predict that the student will pass/fail in the examination before the student writes the exam. Results prediction is based on some conditions like attendance, assignments and internal marks.

The objectives of this student result prediction are

- To uphold entire student, attendance and marks database.
- Predict, if a student will pass or fail based on Naïve Bayes algorithm.
- SMS/Notify predicted results to students and parents.
- Keep up the expectation of parents on the institute.
- Inform student about his calibre.

3.1   Naïve Bayes Algorithm

Naïve algorithm is used for the result prediction which is used to measure the performance of the student during that year. Student academics will be improved with the help of result prediction as prior care can be taken by parents and faculty for avoiding failure. This is Bayes theorem-based classification technique which is easy to develop and can be used on huge datasets. This classifier is based on assumption that one feature of a class is not related to existence of any other feature [6].

Bayes' theorem is mathematically represented by Eq. (1) where m and n are events

$$P(m|n) = (P(n|m) \times P(m))/P(n) \tag{1}$$

Here first, the probability of *m* is calculated when *n* is true. *P(m)* is the probability of occurrence of m before event *n* occurs. *P(n|m)* is the probability of occurrence of *n*. The probability is calculated as shown in Eq. (2)

$$P(m|n) = P(n_1|m) \times P(n_2|m) \times \ldots P(n_i|m) \times P(m) \tag{2}$$

3.2   Student Result Prediction Using Naïve Bayes Algorithm

The student dataset is considered with attendance and internal assessment with failures. The student dataset is taken from exam cell of educational institutions. Initially, the system needs to be trained with dataset that predicts if a student passed or failed based on existing training set which is the dataset of students who have taken exam and result announced. Once the system is trained, the test set can be applied to predict

Fig. 1 Student result prediction using Naïve Bayes
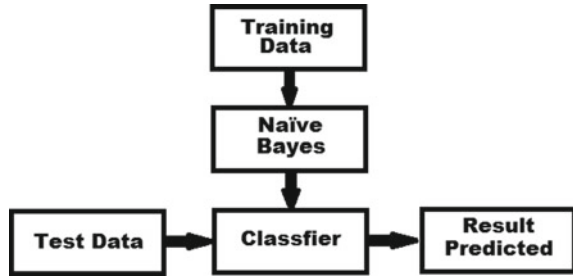
if a student will pass or fail. The process is depicted in Fig. 1. The classifier is used to classify the trained data into specific classes and uses this when test data is given for prediction.

4 Results and Discussion

For predicting the student failure, the student database is set by which the faculty comes to assumption and informs parents that there is a probability that the student may fail. The sample dataset regarding guessing if the students pass/fail is tabulated as in Table 1. The fields used in the table are SNo indicating the serial number. Rno is used to indicate the registered number that is the unique identification number alloted to student in the university. For representing student name, name is used. Att and Asg are the attendance percentage and assignment marks of the student. Mid1 and Mid2 are the total of internal assessment tests conducted by the college at two periodical intervals. SF indicates the number of subjects in which the student failed and Res is the result of the student predicted manually.

The predicted result can be used to inform parent over SMS or app/email notifications. Parent can take extra care and counsel student and give him confidence to attempt the exam properly. The result is informed prior to writing exam to the parent,

Table 1 Sample student dataset

SNo	Rno	Name	Att	Asg	Mid1	Mid2	SF	Res
0	16U41A0501	Riya	80	25	165	170	0	Pass
1	16U41A0502	John	45	15	90	80	4	Fail
2	16U41A0503	Peter	90	28	175	Ab	0	Pass
3	16U41A0504	Bobby	69	23	147	158	0	Pass
4	16U41A0505	Robin	35	10	54	75	5	Fail
5	16U41A0506	Diya	75	19	154	162	0	Pass
6	16U41A0507	Karan	82	20	70	66	5	Fail
7	16U41A0509	Razia	96	22	140	133	1	Pass

the parent or student will not get upset by the exam failure. Extra care can be taken by all the persons related to student.

There are three modules in the proposed system. First, the student can login with his account and check his performance and also run the result prediction module. He can collect suggestions from concerned faculty and try to work smart to pass the exam. He will get an idea on which he has to concentrate more. He can also get the percentile of the class and can analyse the status of his grade in the class.

Second, module is related to parents informing the status of their ward. Here, parent can come to know the status of student and will try to mentor them in proper direction. Third module is related to faculty where concerned subject handling faculty can verify the students with below average performance and try to take extra care. This increases pass percentage of faculty which is considered to be important in many institutions. The student also will show gratitude towards faculty as his issue is resolved before viewing bad results.

5 Conclusion

The student result prediction system can generate the output as whether the student will pass or fail in the examination, so that the students academics can be improved by extra care taken by student themselves, parents and concerned faculty. This system can be used by all the colleges who autonomously take exams in their colleges for improving the students' career. The proposed system is developed, and mobile applications are shared to parents, students and faculty. The test results have proved that the results are accurate and lie as motivation to develop such applications useful for society and education. In this competitive environment, students are not only worried about failure, but their concern is about the grades which they obtain. The future scope can be extended to expect the grade that will be obtained by the student based on past performance.

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