A Student Performance Prediction and Course Recommendation System: A Survey

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Abstract— Degree Students often face numerous problems completing their degree programs. There is a need to automatically detect student’s performance before he/she gets the final results in hand. So that the students could improve his/her study time and performance This system predicts the final grades of students in class and recommends elective subjects to be taken for good performance in future exams. The Student will get the overall view in brief what will be his/her future grade and even what elective subjects he/she should take so that the performance is improved.

Keywords— Student performance prediction, Ensemble predictors, course recommendation, collaborative filtering.

I. INTRODUCTION

Higher education is the most essential investment to build the future of students. The fees of degree courses have skyrocketed from last few years making it difficult for middle class low income families to pay the fees. Despite paying the fees students do not perform good in exams which will result in low grades even a year gap because of the subject they have failed. These facts motivate to design a Student Performance and Prediction System and in addition Recommend Elective Courses to students for better outcome as Students often tend to make mistake and gets confused while choosing elective subjects.

As Students proceed to higher classes, the amount of fees needed to pay for admissions increases. The aim is to make education courses inexpensive which will save students from school dropouts and save the wasted money on paying the exam fees again and again several times.

Moreover the student would come to know in which particular subject he lacks knowledge, so that he could focus more on that particular subjects for better grades. Machine learning has done a great advancement for prediction that could not be possible with other technologies.

A. Role of Collaborative Filtering in Grade Prediction:

Collaborative filtering play a crucial and important concept in grade prediction. It takes in Input the choices from users and based on those choices recommends to other users. It is observed that people who choose the items before often tend to choose the same items again and again.

The rest of this paper covers the following aspects: The Literature overview is described in section II, Methodology in Section III and Conclusion in Section IV.

II. LITERATURE REVIEW

In previous work Jie Xu, et al. [2] they used the machine learning approach. It will predict the student performance. These performance is based on the previous academic record of the student. So it is very helpful for predicting the future grade of the student. In this paper they basically uses the two key features. The first feature is data driven approach. The second feature is bi-layered structure. The second feature is data driven approach. With the help of first feature we can calculate the student performance based on the previous marks. With the help of second feature we can easily build the classifier.

The Algorithm proceeds by using 2 layers. The first is the base prediction layer and second is the Ensemble Prediction Layer.

The Massive Open Online Courses (MOOC) has enormously huge data sets which is handled using Big Data methods and techniques. This System is proposed by Yifan Hou, et al. [5]. The System also improved the accuracy of recommending the courses to students.

Christopher G. Brinton, et al. [1] proposed a system to check the correctness of an answer clicked by the students in Massive Open Online Courses (MOOC) using the CFA prediction algorithm. Matrix Factorization is used to learn the training instances and KNN (K Nearest Neighbour) Algorithm is used to predict the correctness. The Pearson correlation coefficient is calculated. The features are classified accurately using Support Vector Machines (SVM).

Carlos Mrquez-Vera, et al. [3] implemented a using Educational Data Mining (EDM) to guess the Students who have failed in exams are dropout from colleges.

Yannick Meier, et al. [4] implemented a system, to predict grades using the Data Mining Approach for Students studying in particular course or any classroom program. This Method could also be applied for Massive Open Online Courses. The System Predicts the Students who are weak in particular courses so that proper precautions could be taken before hand and the results or grades could be improved.

Jie Xuet, et al.[7] In this paper they propose the thematic methodology. It will provide the sequence of recommendation. It have the forward search backward induction algorithm. These algorithm gives the optimal solution of the given data. It will also help to improve the overall GPA of the student. Multi armed bandits tools is the second tool used in this system.
CemTekin, et al. [6] introduced a system using Hedged Bandits method to train the online ensemble predictors and offline base predictor which will help to predict the future performance of the system.

This approach yields performance assurances with respect to the optimal local prediction strategy, and is also able to adapt its predictions in a data-driven manner. They demonstrate the performance of Hedged Bandits in the context of medical informatics and show that it outperforms frequent online and offline ensemble learning methods.

Man-Ching Yuen, et al. [8] proposed a system for Task recommendation of Tasks performed by workers. Proper work or task is assigned to proper and appropriate worker so that the company gets a higher profit. Matrix factorization is the technique used for recommending appropriate tasks in crowd sourcing systems.

Task recommendation can support workers to find their right tasks quicker as well as help requesters to receive good quality output faster. However, previously proposed classification based task recommendation approach only considers worker performance history, but does not explore worker task searching history.

Ya-huei Wang, et al. [9] in this paper they proposed the adaptive learning. In this paper they can analyze the student performance using the n number of data mining techniques. There are three different levels of content vocabulary. It will also use the artificial neural network. This network is essential for improving the performance.

Ruslan Salakhutdinov, et al. [10] In this paper they handled the large dataset. They can easily handle the data. In this paper they introduced the probability matrix factorization. With the help of these linearly scale the n number of observations. Here all operations are performed automatically. For further improvement they have extended the PMF model to adaptive prior model parameters.

![Prediction Methods](image)

**III. PROPOSED SYSTEM**

Real World data is frequently imperfect and missing in certain behaviours or trends and is liable to contain many errors in that data. This should be resolved so that the data becomes error free. Data pre-processing is a process of resolving various kind of issues and making the data perfect for further development. Data cleaning includes filling in missing values, identify or eliminate outliers and determine inconsistencies. In data cleaning phase it will detect the noisy data from all rest of data.

Data prediction: Base prediction is constructed and trained using static features like GPA & SAT and is done offline. Ensemble prediction is done online that takes the output from the base predictors and the present dynamic features.

The algorithm proposed consists of 2 essential layers that is the first layer is an Ensemble Predictor Layer and the Second layer is the Base Predictor Layer.

In the First layer, the students past school grades such as the the Grade Point Average (GPA) and the Scholastic Aptitude Test (SAT) is taken as input. These Marks are trained offline.

Course Recommendation: Collaborative filtering is a practice of building automatic predictors (filtering) about the interest of a user by gathering likings or choices from many other users and using it to recommend other users.

The following Techniques are used to construct this System:

- **B.** Pearson algorithm & I to I search is used in collaborative filtering Pearson Algorithm find the similarity between students & I to I search finds the similarity between elective courses.
- **C.** Hybrid Recommendation is the combination of student similarity and course similarity.
- **D.** Majority voting: Course with the high rank are chosen and recommended to the students.
A method is studied and a new system is proposed for predicting the students’ performance or actually predict the probable grades in Degree Programs and in addition to this recommending elective Subjects that should be taken by that particular student to yield maximum grade than the student selecting the subject by himself as being a student he/she often gets confused in choosing proper elective Subject. This System is a success key for students which uses Collaborative filtering for predicting the appropriate subjects to students. Collaborative filtering play a crucial and important concept in grade prediction. It takes in Input the choices from users and based on those choices recommends to other users. It is observed that people who choose the items before often tend to choose the same items again and again. This filtering Method composes of two main algorithms. The first is the Pearson Algorithm and Second is the I to I.

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REFERENCES