System for Modelling Academic Performance of Students based on Learning Behavior

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Abstract: Students Performance in Academics is main interest not only for the students but also for institutions. Prediction of student performance in academics will not only help students to analyse themselves better but also help institutions to help them. University campuses are becoming more digitalized and most of the learning and assessment is online, it is becoming evident that we leverage the digital technologies for improving the learning outcomes and improve academic performance of students. The purpose of our work is to predict students' performance based on their learning behaviour pattern and analyses the correlation between them. In this project, we predicted student performance using machine learning algorithms.

Keywords: Behaviour Pattern, Machine Learning, Student Performance, Algorithms.

I. INTRODUCTION

The goal of any educational institution is offering the best educational experience and knowledge to the students. Identifying the students who need extra support and taking the appropriate actions to enhance their performance plays an important role in achieving that goal. In this project, we propose to implement behavior classification-based-performance prediction framework based on online learning behavior. Many machine learning techniques, such as decision trees, artificial neural networks, matrix ion, collaborative filters and probabilistic graphical models, have been applied to develop prediction algorithms. Most of this work ignores the temporal/sequential effect that students improve their knowledge over time and treats the prediction as a one-time task.

The academic performance of students can be affected by various factors such as study duration, study patterns, time, assessment marks, learning subject, language known by the student, attendance. Considering these factors, we are going to build a model that dynamically predicts the academic performance of students. A student dataset is taken in and sub datasets are generated like assessment only, learning time, time plus marks. Then classification algorithms such as Decision Tree, Random Forest (RF), Logistic Regression can be used to classify the student performance. To compare and evaluate the prediction models, precision, recall, F-measure, kappa value, area under ROC curve is measured.

1. Machine Learning

Machine learning[6] is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.

II.OBJECTIVES

- To analyze the performance of the student.
- To predict student performance.
- To build a standard model which can followed to get good results.
- To know factors affecting student performance.

III.PROBLEM STATEMENT

Student Performance prediction will help institution to help them to get better in necessary areas and helps students to analyse themselves. So, Student performance prediction is a technique which can be helpful for students as well as institutions.

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IV.METHODOLOGY

- To get a solution to predict the performance of students, we are going to train a model that predicts the performance of students.
- To train the model, we collected dataset from Kaggle.
- After collecting the data from the surveys
    - Data pre-processing
    - Data cleaning
    - Data selection processes takes place.
- In the data selection, features engineering takes place.
- Some features are selected that impacts the performance of students.
- Then next comes the process of data mining
- Data mining refers to digging into or mining the data in different ways to identify patterns and get more insights into them.
- It involves analyzing the discovered patterns to see how they can be used effectively.
- Data mining includes Data classification.
- Classification in data mining is a common technique that separates data points into different classes.
- So, based on the data we collected, we are going to divide the students into different classes here.
- We can divide the students into different classes using many classifiers such as Logistic regression, Linear regression, Decision trees, Random Forest etc.,
- Then results will be evaluated.
- It completes the training of our model.
- In this survey, as we know the actual capacity/behavior of students, this can be considered as supervised learning. Then we have our trained model.
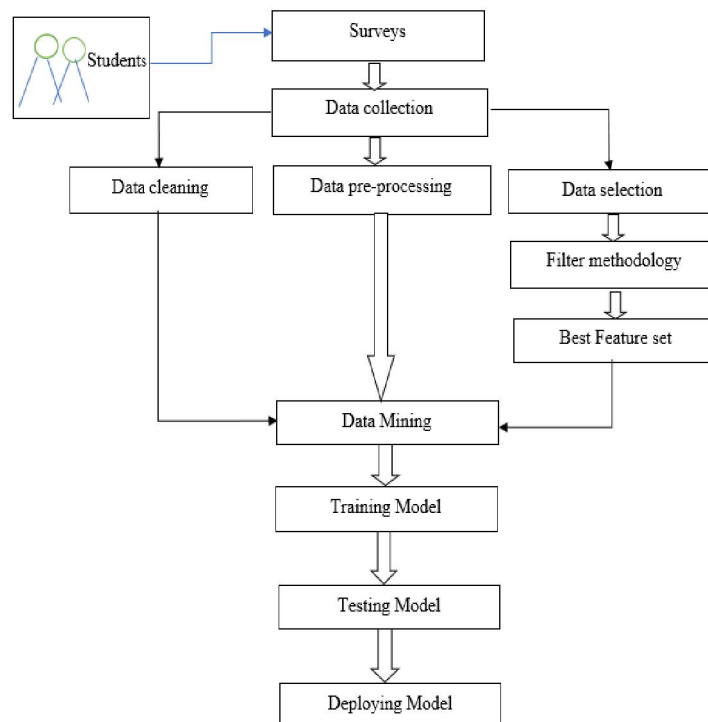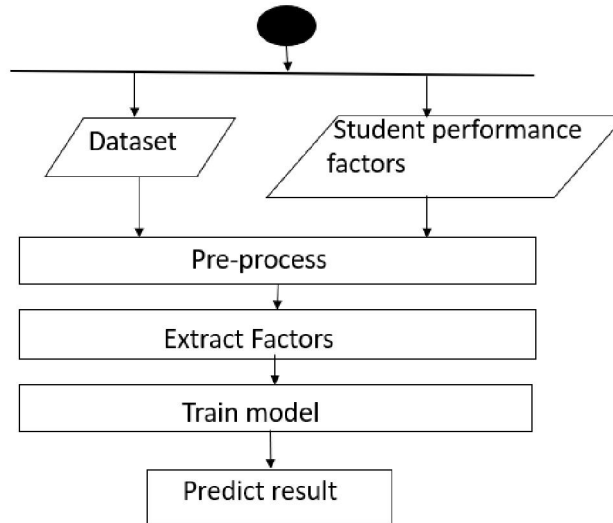

Fig 4.1 Flowchart

V.SYSTEM ARCHITECTURE

Fig 5.1 Block Diagram

Level 0: -

Fig 5.2 Data Flow Diagram

This data flow diagram explains about factors affecting student performance are selected using correlation. Here we are passing data of students as input system will predict the performance of students by using correlation between factors.
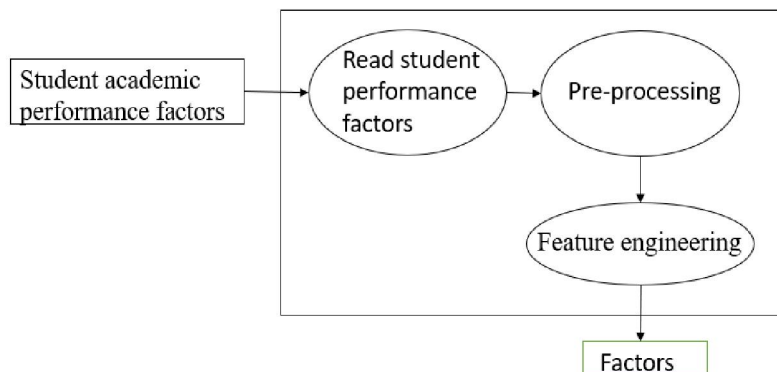
Level 1: -

Fig 5.3 Data Flow Diagram

Describes the first step of the project, we are passing student performance factors system will read factors and pre-process and extract the required features using feature engineering and outputs the factors that effects the student academic performance.
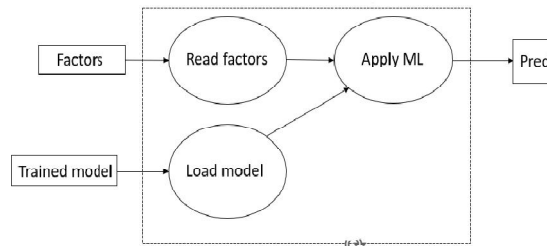
Level 2: -

Fig 5.4 Data Flow Diagram

Here the extracted factors from level 1 and trained model as input. System will read factors and load the model and predict student academic performance using Machine Learning.

VI.HARDWARE AND SOFTWARE REQUIREMENTS

Software Requirements.
- Windows 10 64bit.
- Python
- Python libraries: Pandas, Numpy, Matplotlib, Seaborn
- Jupyter Notebook

Hardware Requirements.
- RAM - 8 GB
- Hard Disk
- Processor intel i5

VII.RESULTS

Results
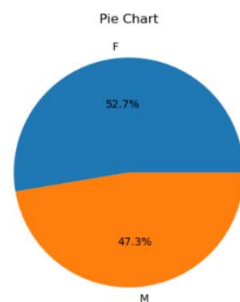
Fig 7.1 pie chart for male vs female students

In our dataset, we got to know that 52.7% are female students and 42.3% are male.
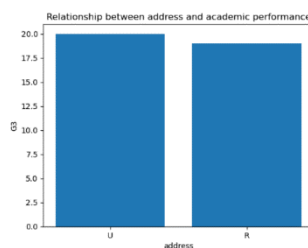

Fig 7.2 Bar chart for address vs academic performance

We found out that urban students have slightly better performance compared to that of rural students.
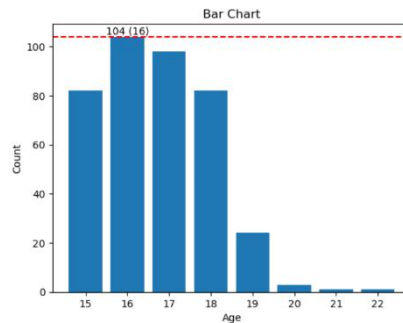

Fig 7.3 Bar chart for Age vs Count

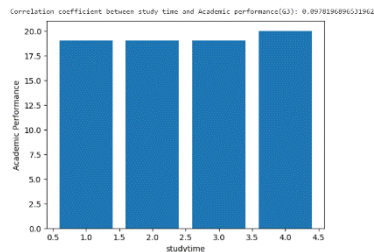We found out that there are more students of 16 years old. They are 104 in number.

Fig 7.4 Bar graph showing study time vs Academic performance

We found out that when the weekly study time is 10 hours or more then they have a great academic performance.
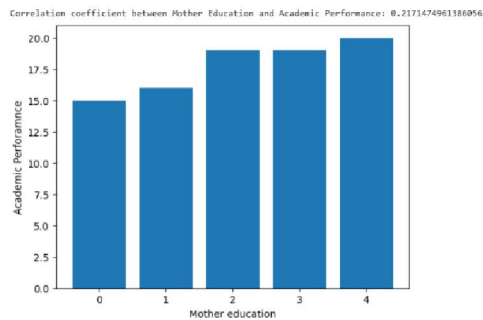

Fig 7.5 Bar graph showing Mother Education vs AcademicPerformance

We found out there's linear positive relationship between Mother's education and Academic performance.
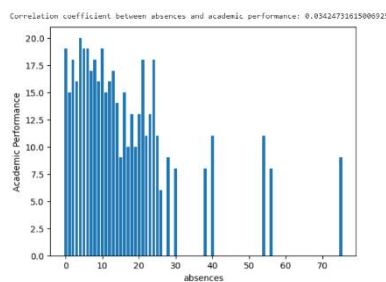

Fig 7.6 Bar graph showing Absences vs Academic performance

When the attendance is very low their academic performance is less compared to those of having less absences.
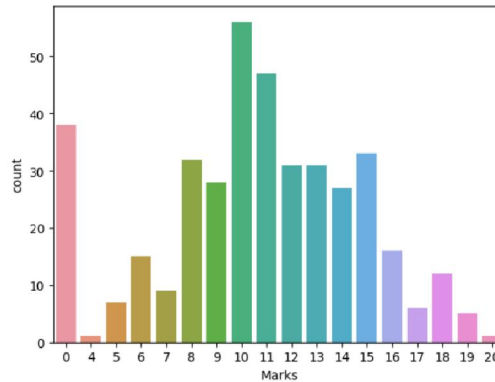

Fig 7.7 Bar graph of Marks and their count

Mode of the student marks is 10. So more than 50 students got 10 marks.

Less than 5 students got 20 marks out of 20.

Nearly 40 students got 0 marks.

VIII.CONCLUSION

- As a solution to predict the academic performance of students, we have decided to train a model that predicts the performance of students.
- We implemented our project in five modules
- In the first module, we predicted factors that have most effect on student performance.
- In the second module, we predicted student performance and where we get student next exam marks.
- In the third module, we did student performance analysis where student performance is visualised and analysed.
- In the fourth module, we plotted student location against their reasons to join the college.
- In the fifth module, we built a standard model that can be followed to get good results.
- We performed unit testing on each one of the modules and unit test cases has been passed.

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