Understanding Student Engagement Through Academic Performance and Background Factors

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*Abstract*—This project showcases that how a simple behavioral/engagement factor can influence a student’s academic performance. Also, how a student’s background and facilities can influence in engagement and academic performance as well. Implementing Logistic Regression, the prediction has been made in this project whether a student has completed test preparation course or not based on background, activity and academic performance.

Keywords—Machine Learning, Logistic Regression, Student Performance, Student Engagement.

# Introduction

This Project implements Logistic Regression to predict a student’s engagement by analyzing academic performance along with background and activity. Here the objective was to predict whether a student has completed test preparation course or not based on some factors such as gender, group, parental level education, math score, writing score etc. Besides predicting test preparation course, it also shows how different machine learning models along with Logistic Regression perform on the dataset and most importantly which one provides the best and balanced performance. Finally comparison between the performance of different models on this dataset is visualized followed by different approaches such as class imbalance handling, cross validation etc.

1. Literature Review

|  |  |  |
| --- | --- | --- |
| Reference | Title | Summary |
| [1] | Student Performance Prediction Using Machine Learning Algorithms | This study implements Logistic Regression and SVM to predict student academic performance, emphasizing teacher performance and student motivation as key predictors. |
| [2] | A model for predicting academic performance on standardised tests for lagging regions based on machine learning and Shapley additive explanations | This study implements Logistic Regression and other algorithms to predict performance on the Saber 11 exam, identifying socioeconomic and demographic factors as key influencers. |
| [3] | Machine Learning-Driven Student Performance Prediction for Enhancing Tiered Instruction | This study uses logistic regression and SVM to predict student performance, integrating engagement data to support tiered teaching strategies. |
| [4] | Research on Student Performance Prediction Based on Random Forest Algorithm | This paper employs random forest and logistic regression to predict student performance, emphasizing behavioral factors like library usage and grades. |
| [5] | Predicting Academic Success of College Students Using Machine Learning Techniques | Using the CRISP-DM methodology, this study applies logistic regression and XGBoost to predict academic success based on academic and socioeconomic factors. |

# Methodology

## Dataset Analysis

The dataset for this project named Student Performance is a particularly a smaller dataset consisting of 1000 rows and 8 columns.

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*a**b* 

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1. Table Type Styles

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