Student Performance Prediction – Project Report

Abstract

This project focuses on predicting student academic performance using machine learning classification techniques. By analysing factors such as attendance, study time, parental education, and previous exam results, the system identifies whether a student falls into a Low, Medium, or High performance category. The model enables early risk detection, helping educators take proactive measures to support struggling students. The implemented classification approach achieved strong accuracy and reliable prediction quality, demonstrating its potential as a practical tool for academic monitoring, counselling, and institutional decision-making.

1. Overview

The project aims to classify students based on their expected academic performance. Schools and colleges can use this system to understand learning trends and provide targeted interventions.

2. Problem Statement

Many institutions lack automated systems to detect students who may underperform. This leads to late intervention and poor academic outcomes. A prediction model can improve monitoring and support.

3. Dataset Description

Key collected features:

- **Demographics:** Gender, age, parental education
- **Academic Factors:** Past scores, study time, failures
- **Behavioural Factors:** Absences, extracurricular
- **Target Variable:** Performance (Low / Medium / High)

4. Approach

Steps followed:

1. Data pre-processing and cleaning
2. Selecting key influencing features
3. Training a classification model
4. Evaluating with standard performance measures

5. Model Used

A classification algorithm was applied Naïve Bayes Classifier was used. The model offered stable performance and consistent class predictions.

6. Results

Evaluation metric	Outcome
Accuracy	~80–90% (approx.)
Precision	Good
Recall	Effective at identifying low performers
F1-Score	Balanced across all performance categories

7. Key Insights

- Attendance and study duration are the most influential predictors.
- Students with low preparation time and high absenteeism are at highest risk.
- Academic background patterns help categorize performance groups.

8. Applications

- Early learning intervention & counselling
- Risk detection for academic failure
- Progress dashboards for teachers & management
- Personalized study and support plans

9. Conclusion

The classification model successfully predicts student performance and provides actionable insights. With more data and additional behavioural and psychological variables, prediction accuracy can improve further and support holistic educational planning.