AI-Based Student Performance Analysis and Recommendations

Group 2 — SWE485 Project Report

Group Members

- Abdulaziz Mohammed Alduraibi — ID: 444102549
- Sultan Saeed Alqahtani — ID: 444100168

Instructor: Dr. Bader Alshemaimri
Course: SWE485 — Selected Topics in Software Engineering

1. Introduction

This project applies Machine Learning techniques to analyze student performance and generate data-driven recommendations to help improve academic success. By studying patterns among students' grades and background information, the system can identify the factors that influence academic outcomes.

2. Dataset Description

The dataset used in this project is the *Students Performance in Exams* dataset, which contains 1,000 student records.
It includes:

- Math, Reading, and Writing exam scores
- Simple demographic features

The dataset enables prediction and clustering based on student performance levels.

Dataset Source:
https://www.kaggle.com/datasets/spscientist/students-performance-in-exams

3. Methodology

The project was completed across **four main phases**:

Phase 1 — Data Exploration

- Cleaning data
- Understanding score distribution
- Identifying performance differences across subjects

Phase 2 — Supervised Learning

- Building predictive models to classify student performance

- Comparing models using performance metrics

Phase 3 — Unsupervised Learning

- Applying K-Means clustering
- Grouping students into High, Medium, and Low performance categories

Phase 4 — Generative AI Recommendations

- Generating performance improvement suggestions for each cluster
- Providing personalized academic guidance

4. Results

- Machine Learning models successfully learned patterns from the dataset
- Students could be grouped into performance levels
- AI recommendations helped identify strategies for improvement such as:
    - Increasing study time
    - Reducing absences
    - Improving focus on weak subjects

5. Conclusion

This project demonstrates the value of using Machine Learning to support education. By predicting performance and generating smart recommendations, students and educators can take better actions to improve learning outcomes.