

# Project Title: "Student Performance Analysis and Visualization"

## Objective

Create a Python program to analyze and visualize student performance data using concepts learned in the course, including file handling, data structures, functions, loops, NumPy, and Pandas.

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## Project Tasks

### 1. Data Collection and Storage

- Simulate or gather a CSV file with student performance data, including:
  - Student Name, Student ID
  - Subject, Score, Attendance Percentage
  - Assignment Completion (Yes/No)

### 2. Basic Data Handling

- Use **File Handling** to:
  - Read the CSV file.
  - Write modified or updated data back to a new CSV file.

### 3. Data Analysis and Manipulation

- **Pandas and DataFrames:**
  - Analyze average, minimum, and maximum scores per student.
  - Identify students with attendance < 75% or missing assignments.
- **Boolean Indexing:**
  - Filter students failing a specific subject.
- **Data Type Conversion:**
  - Convert **Score** to integer if stored as a string.

### 4. Visualization

- Use **Matplotlib** or **Pandas Visualization** to:
  - Plot a bar chart of average scores by subject.
  - Display a pie chart of attendance percentage categories (e.g., <50%, 50-75%, >75%).
  - Create a line graph showing performance trends over time for a selected student.

### 5. Applying Functions and Logic

- Implement **Functions** for:
  - Calculating aggregate scores for each student.
  - Determining grade (A/B/C/Fail) based on scoring criteria.
  - Generating student performance reports in a user-friendly format.

## 6. Advanced Features (Optional for Bonus Marks)

- **Decorators:**
  - Add a log to monitor when a particular function is executed.
- **Exception Handling:**
  - Handle file-not-found errors, invalid input errors, or division by zero errors.
- **Regular Expressions (RegEx):**
  - Validate student IDs (e.g., IDs must follow a specific pattern like **STU-12345**).

## 7. Interactive Console Input/Output

- Allow the user to:
  - Add a new student's data via console inputs.
  - Search for a student by name or ID.
  - Update a student's score or attendance.