亞洲大學
ASIA UNIVERSITY

Final Project Report

Advanced Computer Programming

Student Result Dashboard

Group : 1

Instructor : DINH-TRUNG VU

2025-06

Chapter 1 Introduction

1.1 Group Introduction

1) **Group Project Repository**: https://github.com/113710077/Group-1
2) **Group members**:
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   3. Marlen Rakymov - 111021139

1.2 Overview

The Student Result Dashboard is an interactive and automated system designed to facilitate the management and analysis of student academic performance data. It allows users, such as teachers and academic administrators, to upload student marks through CSV files or input them manually via a form. Once the data is submitted, the application utilizes Python’s powerful data processing and visualization libraries—primarily Pandas and Matplotlib—to compute essential academic metrics. These include total and average marks, pass/fail classification based on defined thresholds, and identification of top-performing students. The results are then presented visually using dynamic charts and tables, making it easier to interpret student performance data at both individual and class levels.

What sets this project apart is its incorporation of machine learning components through the Scikit-learn library. Specifically, the dashboard includes features for grade prediction using classification models and student clustering using the KMeans algorithm. These features enable predictive analytics and segmentation of students into performance-based categories such as high, average, and low performers. This capability introduces a forward-thinking approach to educational analytics, helping educators make informed decisions and provide targeted academic support.

1.3 Project Objectives

The primary goal of this project was to create a user-friendly, web-based system that automates the analysis and visualization of student results. It combines several key programming concepts, including file I/O, data manipulation, chart generation, web development with Flask, and introductory machine learning. Beyond fulfilling academic requirements, the project was designed with scalability and real-world applicability in mind, showcasing our ability to integrate diverse programming skills into a cohesive and functional application.

Chapter 2 System Design and Implementation

2.1 Input Handling

The dashboard provides two main options for inputting student data. The first option allows users to upload a CSV file containing student information, with each record comprising fields such as ID, Name, and marks in subjects like Math, Science, and English. Alternatively, users can manually input data through an HTML form. This flexibility ensures that both small-scale and large-scale data can be easily accommodated by the system.

2.2 Data Analysis Using Pandas

Once the data is collected, it is processed using the Pandas library. Key operations include computing the total and average marks for each student, determining their pass or fail status based on a 35% threshold, and calculating class-level statistics such as subject-wise averages. The application also identifies the top five students by average score and pinpoints the single highest scorer. These features allow teachers to gain immediate insights into academic performance without having to analyze raw data manually.

2.3 Visualization Using Matplotlib

To make the analysis more intuitive and visually appealing, the application employs Matplotlib for chart generation. Three types of visualizations are created dynamically:

- A **bar chart** displaying individual scores across subjects,
- A **pie chart** showing the proportion of students who passed versus those who failed, and
- A **line graph** illustrating the class-wide average for each subject.

These visual tools help users grasp key trends and distributions at a glance, enhancing the overall utility of the dashboard.

2.4 Web Interface with Flask

The entire application is built on the Flask framework, which serves as the backbone for the web interface. Users interact with the system through a browser, where they can upload CSV files or enter data manually, and receive immediate feedback in the form of tables and charts. Flash messages guide users throughout their interaction, offering real-time notifications for errors or successful operations. The interface is styled using Bootstrap to ensure clarity, responsiveness, and ease of navigation.

Chapter 3: Advanced Features with Machine Learning

3.1 Grade Prediction

The system includes a module for predicting student grades using a Decision Tree Classifier. By training the model on historical data, the system learns to map numerical scores to categorical grades (e.g., A, B, C, D, F). When new data is input, the model can predict grades based on learned patterns, giving educators an additional layer of insight into academic trends and future performance.

3.2 Student Clustering with KMeans

Another innovative feature is the use of the KMeans clustering algorithm to group students based on their academic performance. This unsupervised learning method segments students into categories such as high performers, average performers, and low performers. These clusters can help educators identify which students need more attention and which are excelling, enabling personalized academic strategies.

During development, several challenges were encountered, including handling missing or incorrectly formatted data, dealing with dynamic chart rendering in Flask, and integrating machine learning into a real-time web interface. Debugging template errors and managing stateful interactions between the server and client also required a solid understanding of Flask's request-response cycle.

From a learning perspective, the project significantly deepened our understanding of Python's core and advanced features. It strengthened our skills in data analysis, web development, and machine learning. More importantly, it demonstrated how different technologies and libraries can be brought together to solve a practical, real-world problem in a user-centric way.

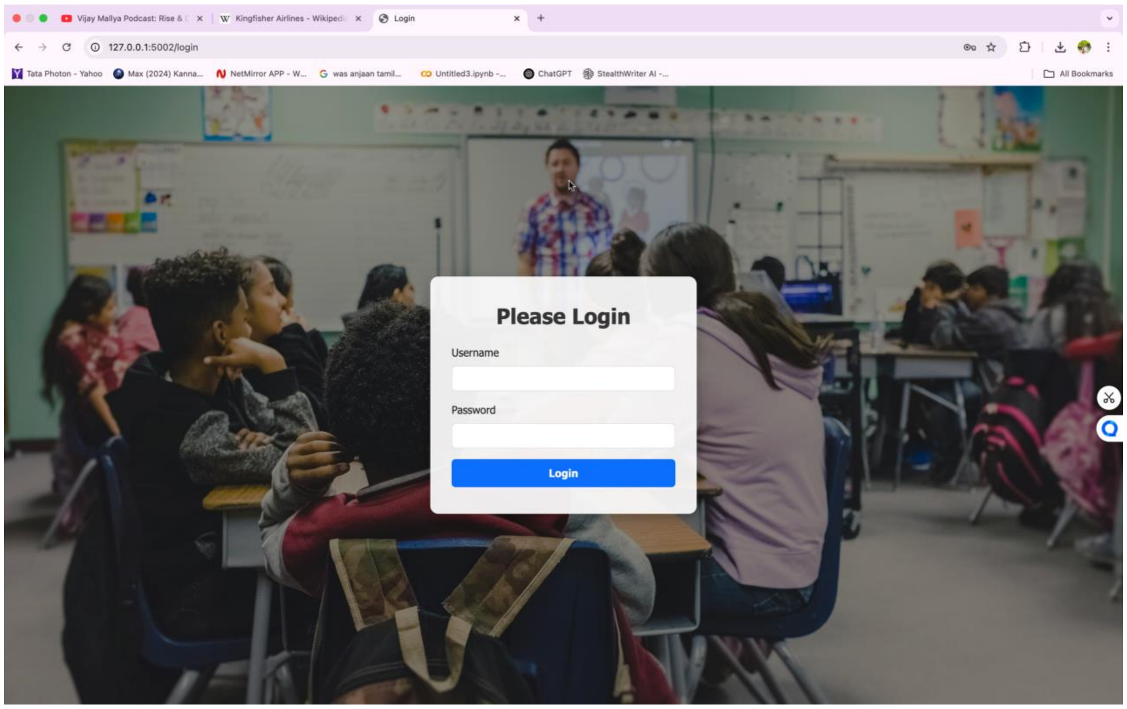
Chapter 5: Conclusion and Future Work

The Student Result Dashboard is a robust and extendable application that successfully achieves its core objectives. It provides a seamless way for educators to analyze student performance, backed by visual aids and predictive intelligence. The project showcases the integration of multiple technical skills and offers valuable insights into the power of combining data science with web development.

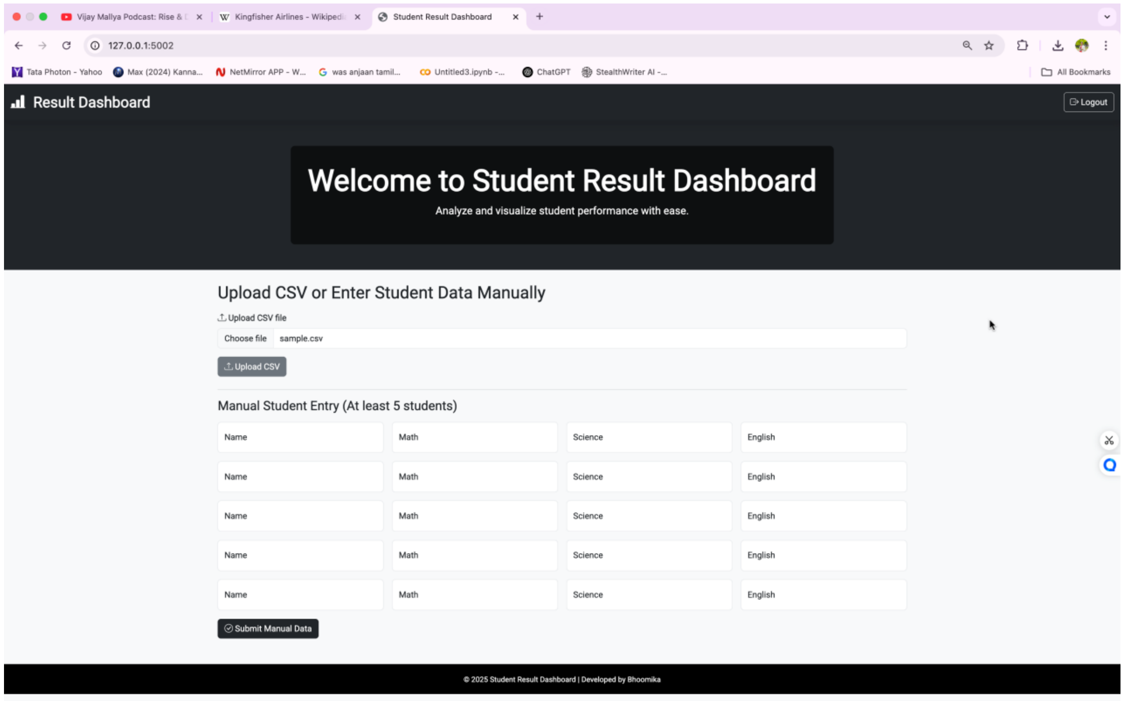
In the future, the system could be enhanced by adding features such as time-series tracking of academic performance, integration with student databases or LMS systems, and user authentication for secure data access. The machine learning models could also be expanded to include more advanced algorithms and broader datasets for greater accuracy and utility.

Chapter 6 : Results

Login page



a. Uploading a CSV


127.0.0.1:5002
Result Dashboard
Logout
Welcome to Student Result Dashboard
Analyze and visualize student performance with ease.
Upload CSV or Enter Student Data Manually
Upload CSV file
Choose file sample.csv
Upload CSV
Manual Student Entry (At least 5 students)
Name
Math
Science
English
Submit Manual Data
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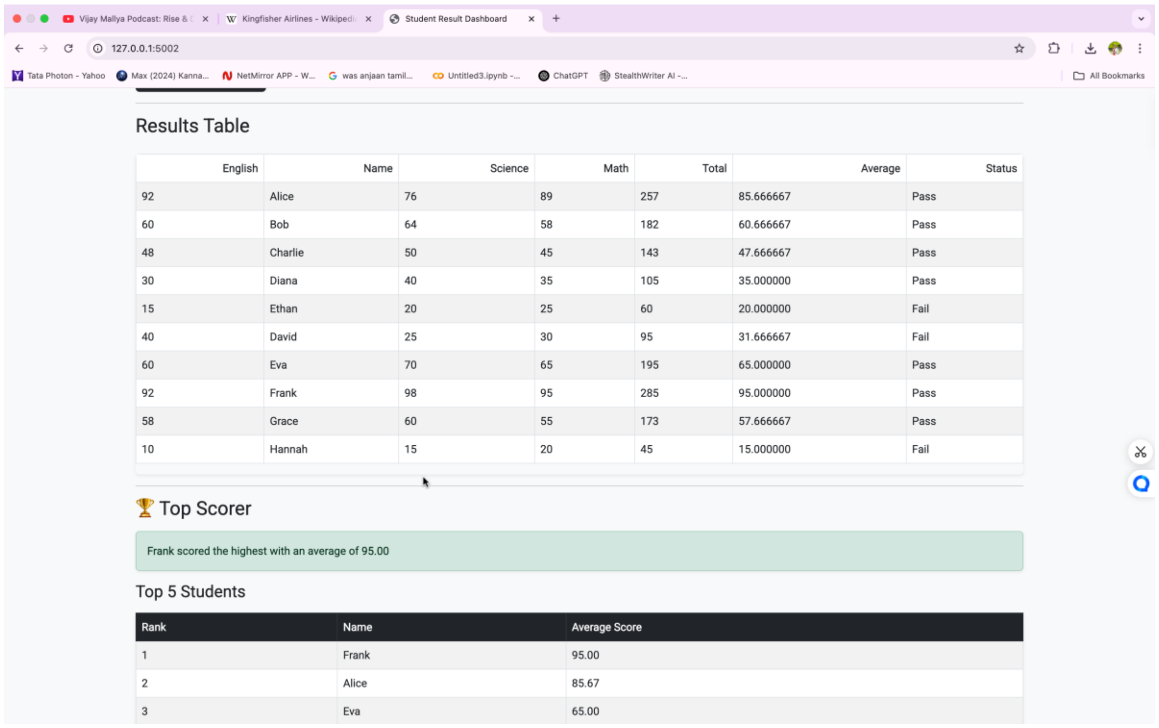


Results Table

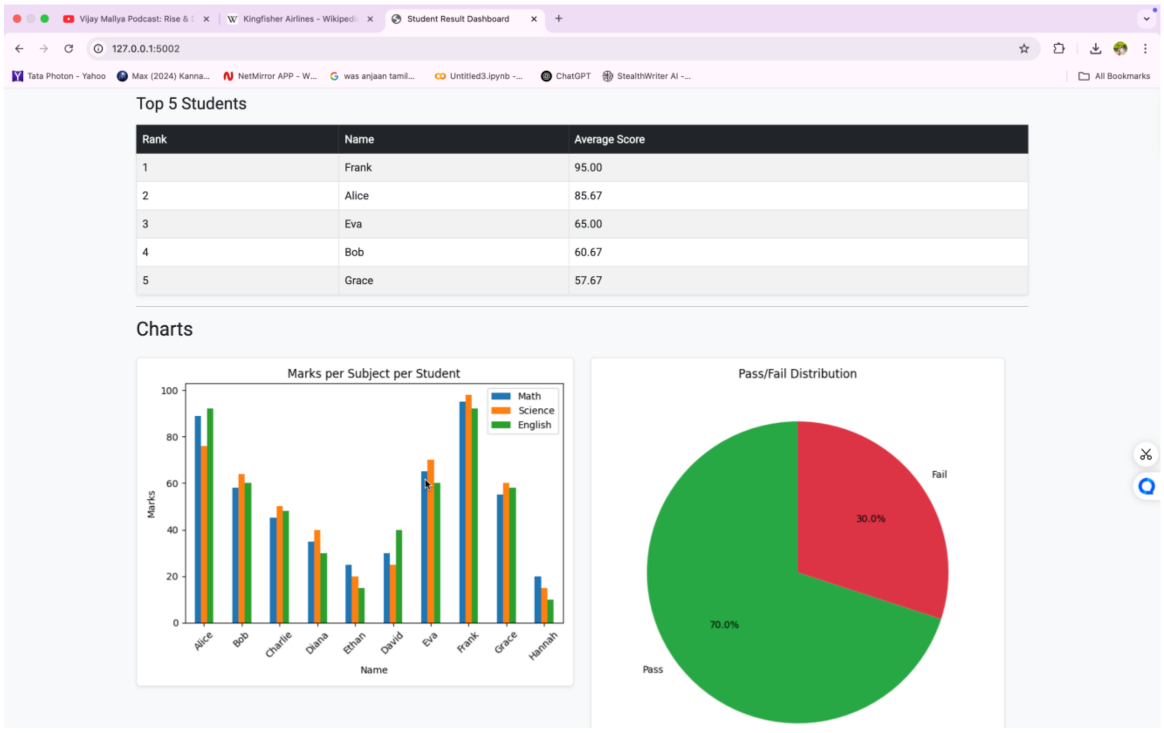
English	Name	Science	Math	Total	Average	Status
92	Alice	76	89	257	85.666667	Pass
60	Bob	64	58	182	60.666667	Pass
48	Charlie	50	45	143	47.666667	Pass
30	Diana	40	35	105	35.000000	Pass
15	Ethan	20	25	60	20.000000	Fail
40	David	25	30	95	31.666667	Fail
60	Eva	70	65	195	65.000000	Pass
92	Frank	98	95	285	95.000000	Pass
58	Grace	60	55	173	57.666667	Pass
10	Hannah	15	20	45	15.000000	Fail

🏆 Top Scorer

Frank scored the highest with an average of 95.00

Top 5 Students

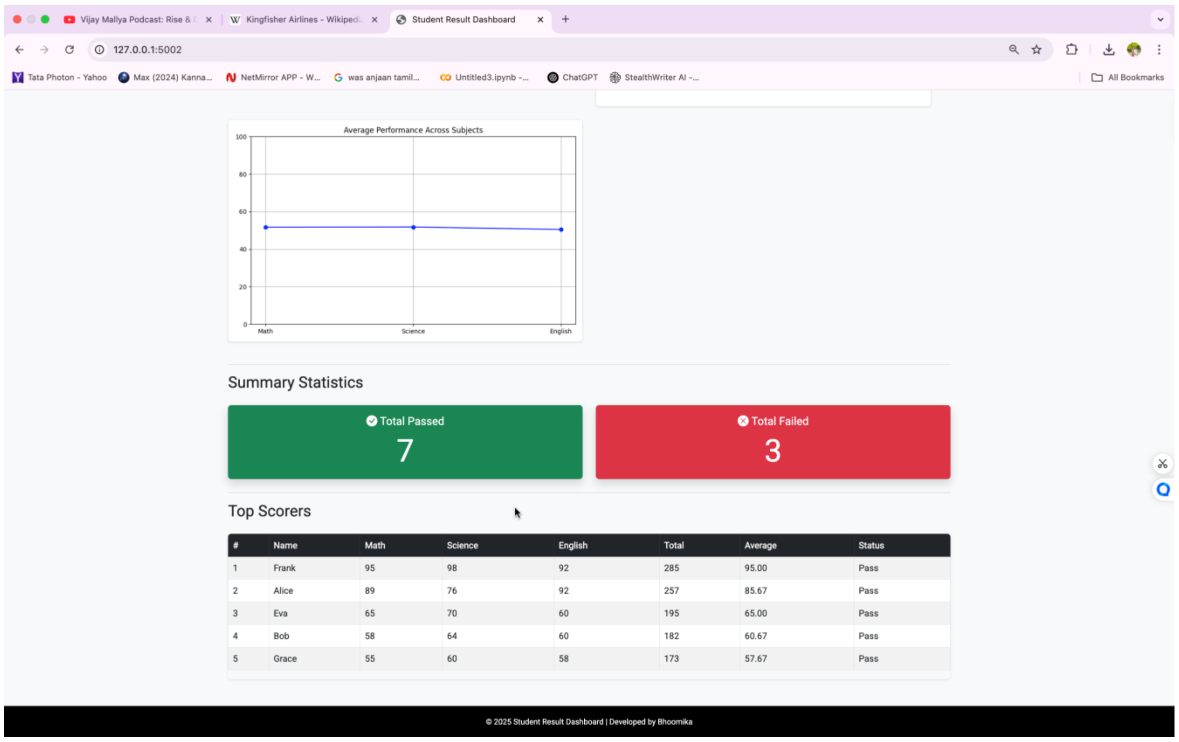
Rank	Name	Average Score
1	Frank	95.00
2	Alice	85.67
3	Eva	65.00



Top 5 Students

Rank	Name	Average Score
1	Frank	95.00
2	Alice	85.67
3	Eva	65.00
4	Bob	60.67
5	Grace	57.67

Charts



Summary Statistics

Total Passed
7

Total Failed
3

Top Scorers

#	Name	Math	Science	English	Total	Average	Status
1	Frank	95	98	92	285	95.00	Pass
2	Alice	89	76	92	257	85.67	Pass
3	Eva	65	70	60	195	65.00	Pass
4	Bob	58	64	60	182	60.67	Pass
5	Grace	55	60	58	173	57.67	Pass

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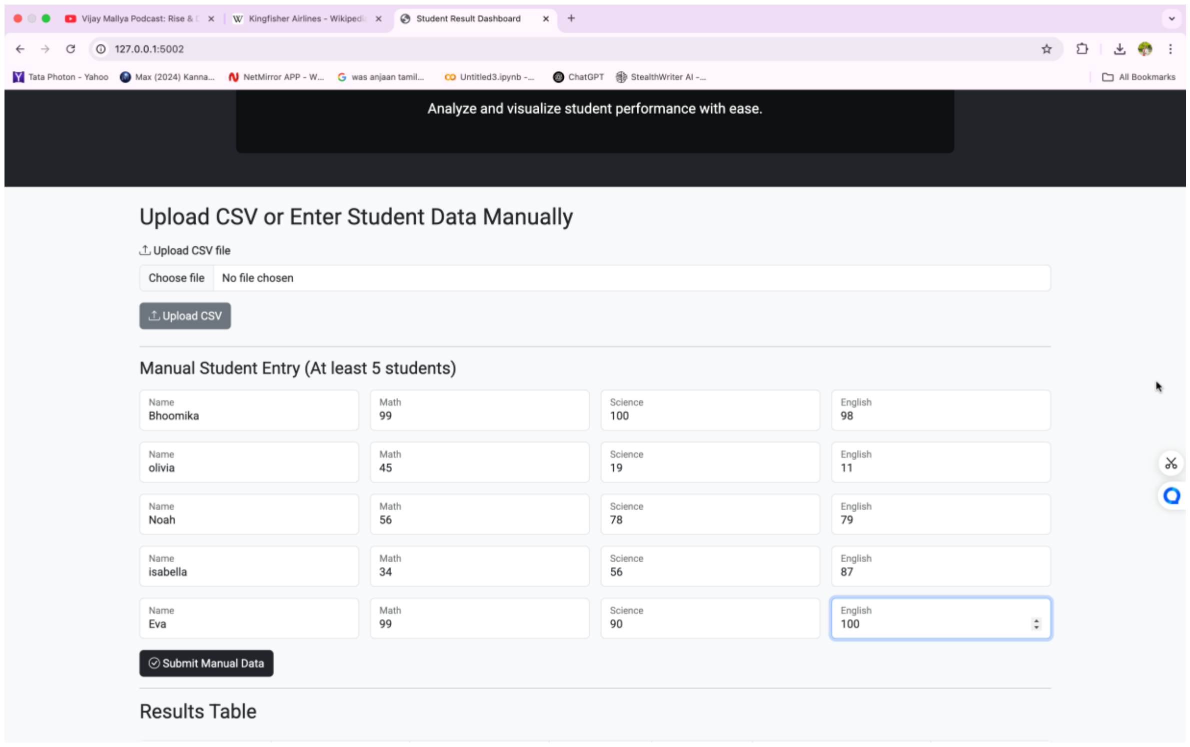
b. Entering data manually



Analyze and visualize student performance with ease.

Upload CSV or Enter Student Data Manually

Upload CSV file

Choose file No file chosen

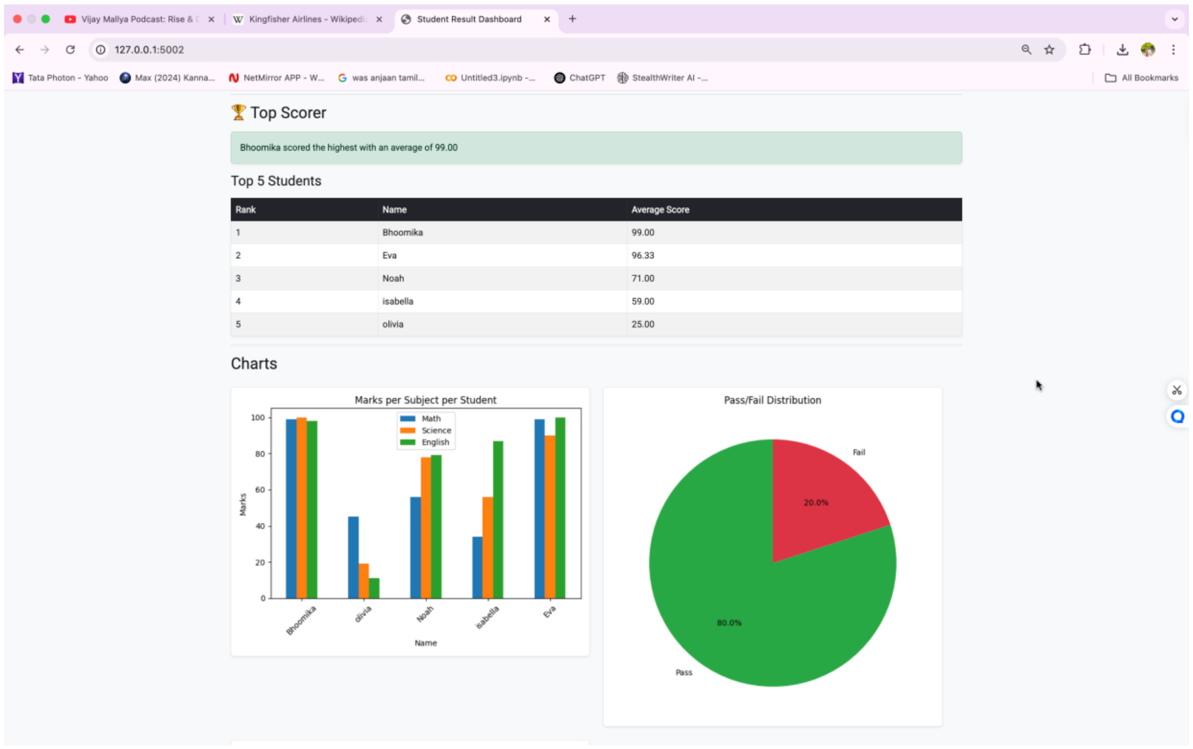
Upload CSV

Manual Student Entry (At least 5 students)

Name	Math	Science	English
Bhoomika	99	100	98
olivia	45	19	11
Noah	56	78	79
isabella	34	56	87
Eva	99	90	100

Submit Manual Data

Results Table



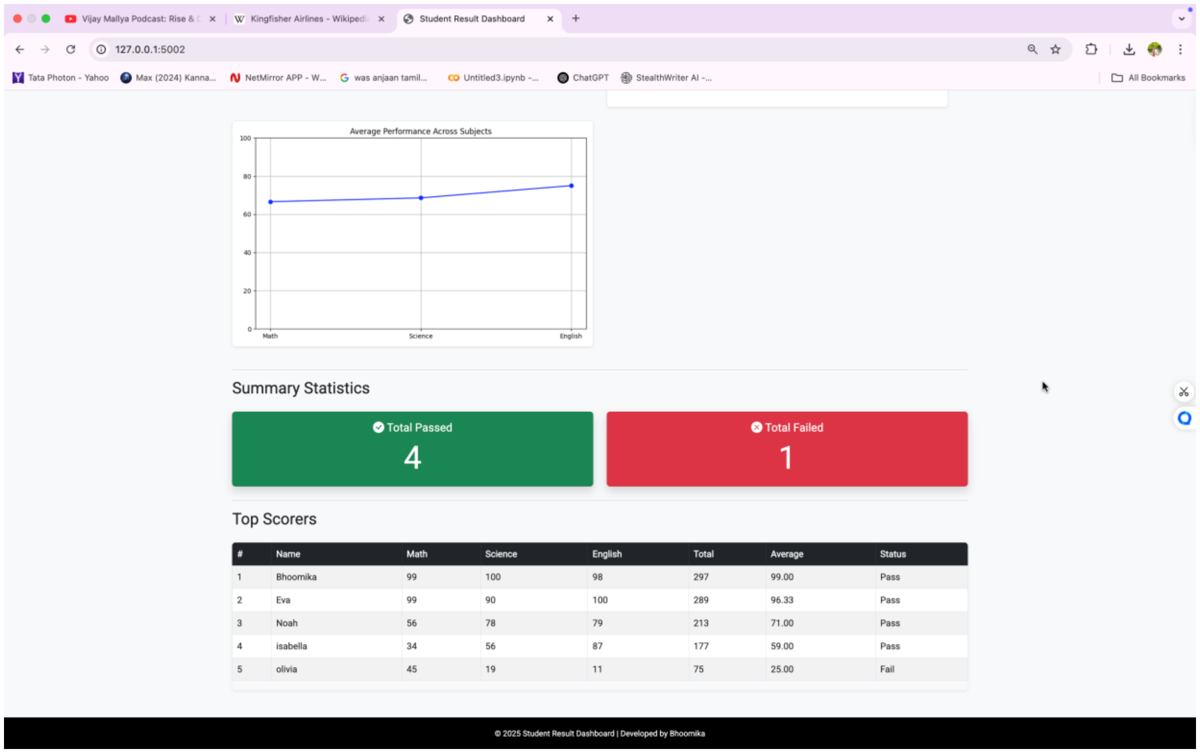
🏆 Top Scorer

Bhoomika scored the highest with an average of 99.00

Top 5 Students

Rank	Name	Average Score
1	Bhoomika	99.00
2	Eva	96.33
3	Noah	71.00
4	isabella	59.00
5	olivia	25.00

Charts



Summary Statistics

Total Passed
4

Total Failed
1

Top Scorers

#	Name	Math	Science	English	Total	Average	Status
1	Bhoomika	99	100	98	297	99.00	Pass
2	Eva	99	90	100	289	96.33	Pass
3	Noah	56	78	79	213	71.00	Pass
4	isabella	34	56	87	177	59.00	Pass
5	olivia	45	19	11	75	25.00	Fail

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