# Major Project

# (23ONMCR-753)

# of the programme

# Master of Computer Applications

## Batch - Jul 2023

## Fourth Semester

## CENTRE FOR DISTANCE & ONLINE EDUCATION

## CHANDIGARH UNIVERSITY

Submitted By: **Jeevan Kumar**
Enrollment No: **O23MCA110357**

# SYNOPSIS

## 1. Title of the Project

Student Performance Predictor using Machine Learning

## 2. Objective

To build a web-based intelligent system that predicts whether a student will pass or fail based on academic parameters like attendance, study hours, assignment scores, and previous marks using a logistic regression machine learning model.

## 3. Resources Required

Hardware:

- Intel i3 or above processor
- Minimum 4GB RAM
- Internet connectivity

Software & Tools:

- VS Code (IDE)
- Node.js (Backend)
- React.js (Frontend)
- Python (ML microservice)
- Express.js (Server)
- MongoDB (Database)
- Joblib, Pandas, Scikit-learn (ML Libraries)

# Table Of Contents

# Title

# STUDENT PERFORMANCE PREDICTOR USING MACHINE LEARNING

**Major Project Report Submitted in partial fulfillment of the requirement for the award of the degree of MASTER OF COMPUTER APPLICATIONS (MCA)**

Submitted By: **Jeevan Kumar**
Enrollment No: **O23MCA110357**

Centre for Distance and Online Education
**Chandigarh University**
May 2025

# Certificate

This is to certify that the project entitled **"Student Performance Predictor using Machine Learning"** is a bona fide work carried out by **Jeevan Kumar** (Enrollment No: **O23MCA110357**) in partial fulfillment for the award of the degree of **Master of Computer Applications**.

This project work is original and has not been submitted elsewhere for any other degree or diploma.

# Declaration

I hereby declare that the project report entitled **“Student Performance Predictor using Machine Learning”** submitted to **Chandigarh University** is a record of original work done by me. This project has not been submitted anywhere else for the award of any degree or diploma.

# Acknowledgement

I am expressing my sincere gratitude to **Chandigarh University** for providing the opportunity to undertake this project. I also thank my friends and the online developer community for their support and guidance during the development process.

# Abstract

This project outlines the development of a web-based application that predicts student performance using machine learning. By analyzing key input parameters such as attendance, study hours, assignment scores, and previous marks, the system predicts whether a student is likely to pass or fail.

The model is built using **Logistic Regression** and integrated with a **Node.js and React** application, using a **Python microservice** for predictions. The aim is to help institutions proactively identify students at risk.

# Introduction

Educational institutions face the challenge of improving student outcomes. Predictive analytics through machine learning helps forecast academic performance. This project provides a solution that allows teachers to use student data to predict outcomes and intervene early if necessary.

# SDLC of the project

Software Development Life Cycle (SDLC) model followed:

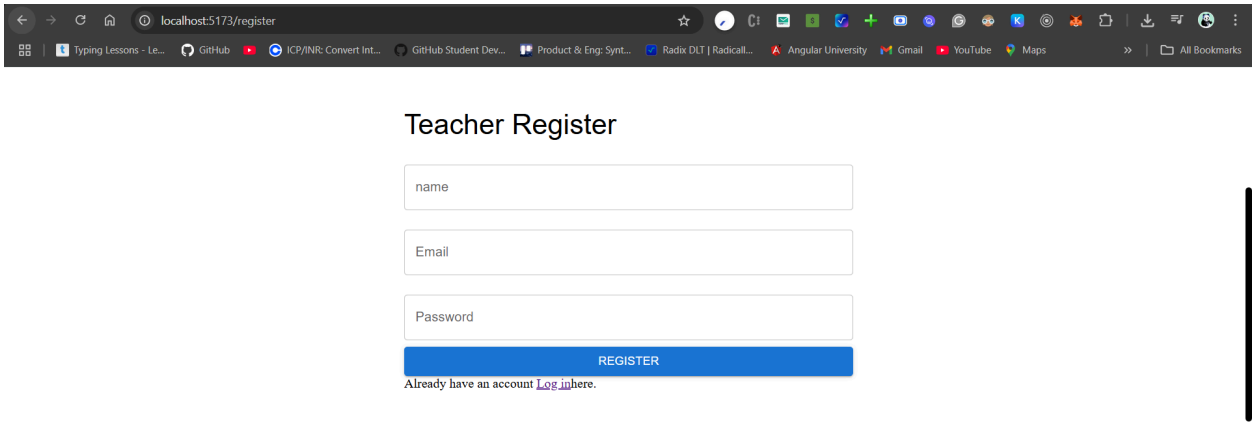
- Requirement Analysis
- System Design
- Implementation
- Testing
- Deployment
- Maintenance

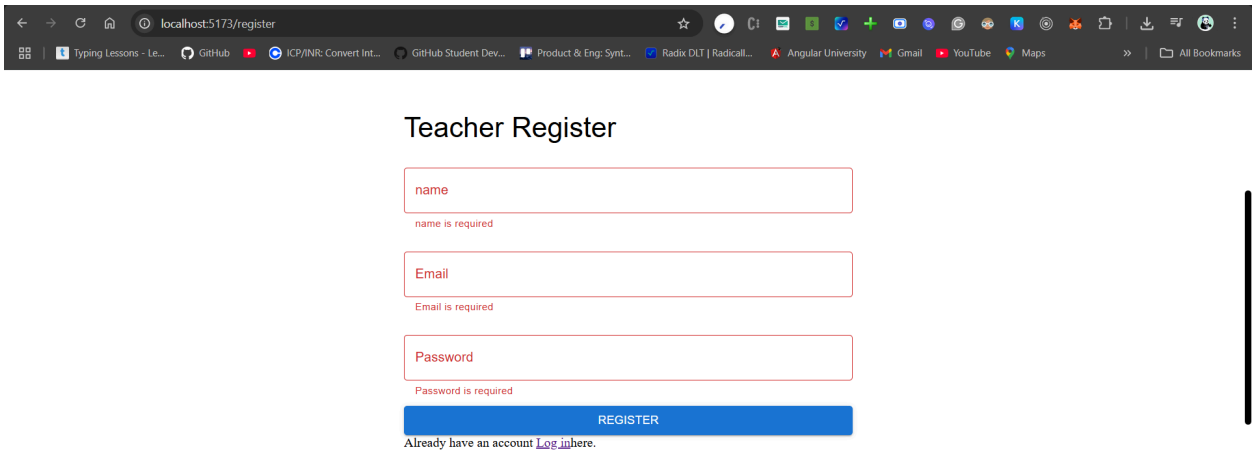
# Design

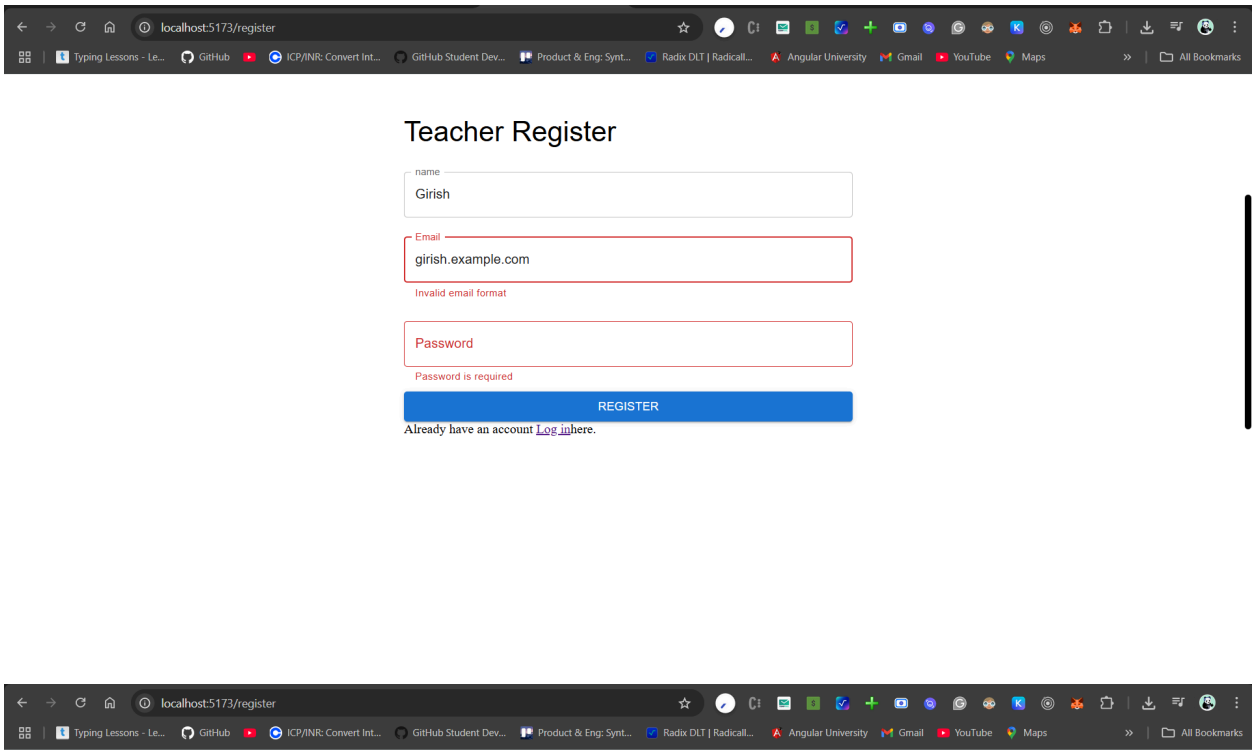
**System Architecture Includes:**

- Frontend: React.js
- Backend: Node.js
- ML Microservice: Python (Logistic Regression)
- Database: MongoDB
- Communication: Node.js `child_process` to call Python script

# Registration View-

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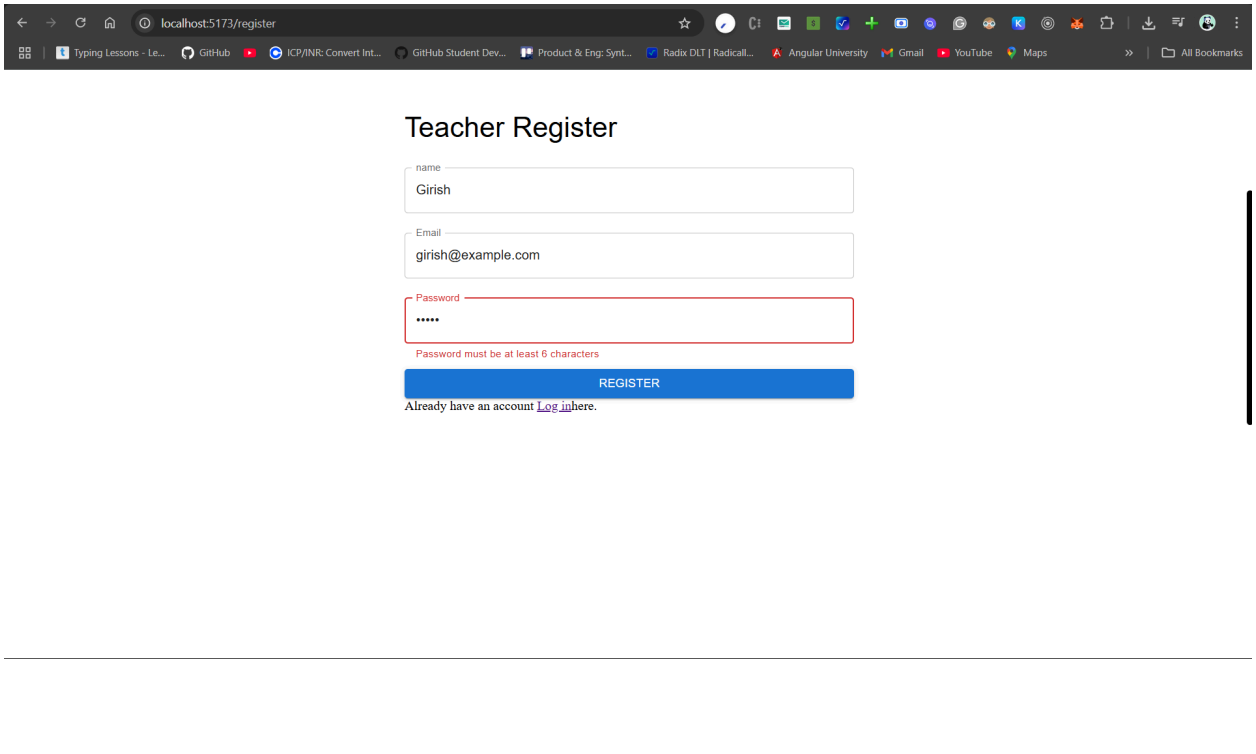
REGISTER
Already have an account Log inhere.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All Bookmarks
Teacher Register
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Email
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Password
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Password must be at least 6 characters
REGISTER
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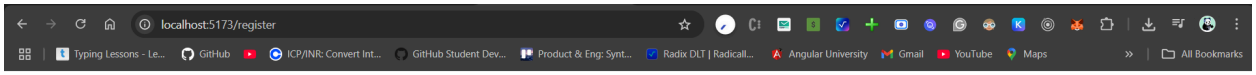


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Girish

Email
girish@example.com

Password
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SUBMITTING...

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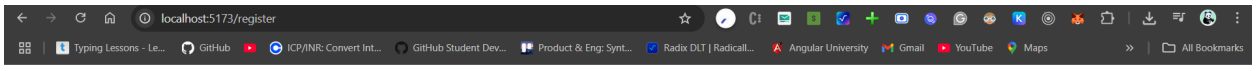


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Girish

Email
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Password
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REGISTER

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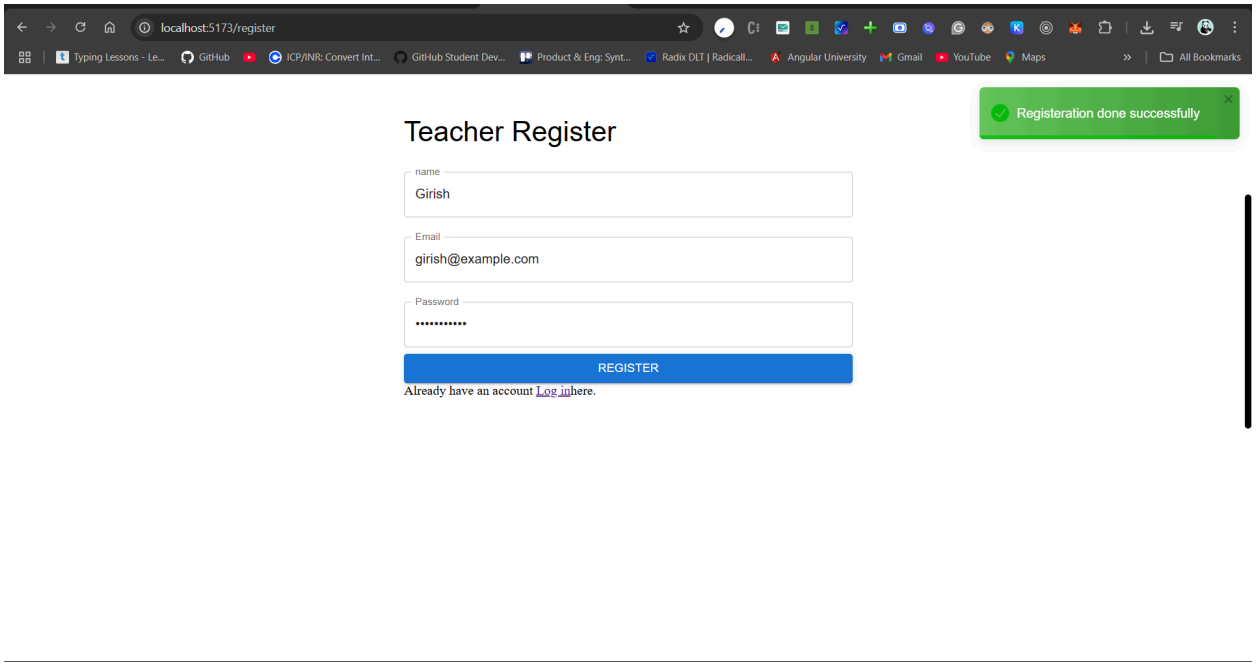
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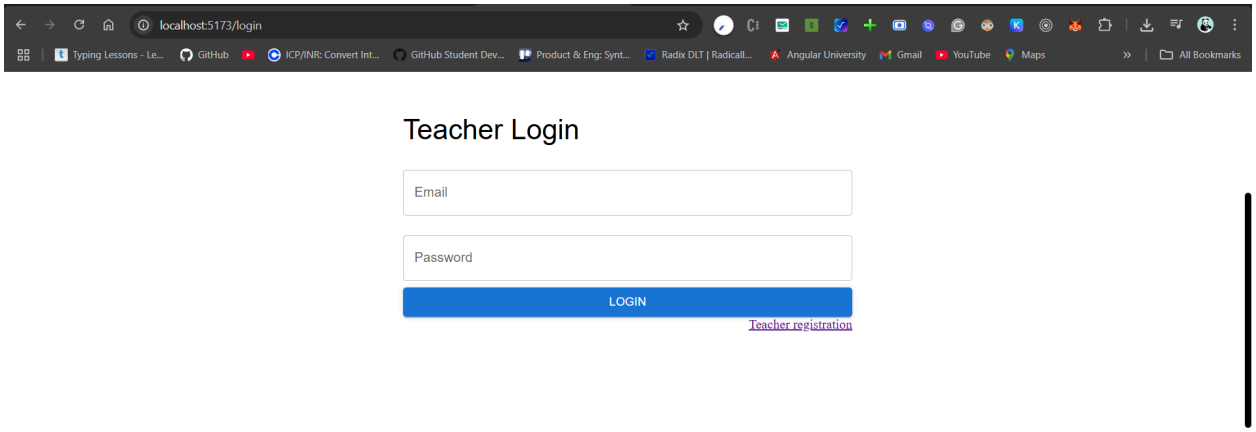
YouTube
Maps
All Bookmarks
Registeration done successfully
Teacher Register
name
Girish
Email
girish@example.com
Password
REGISTER
Already have an account Log inhere.

# Login View-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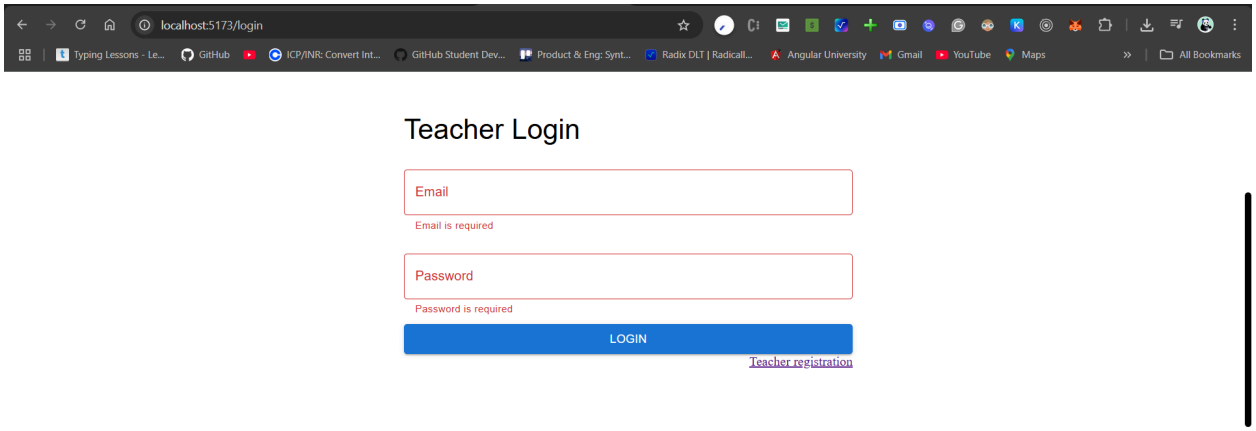
Teacher registration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Email
Email is required
Password
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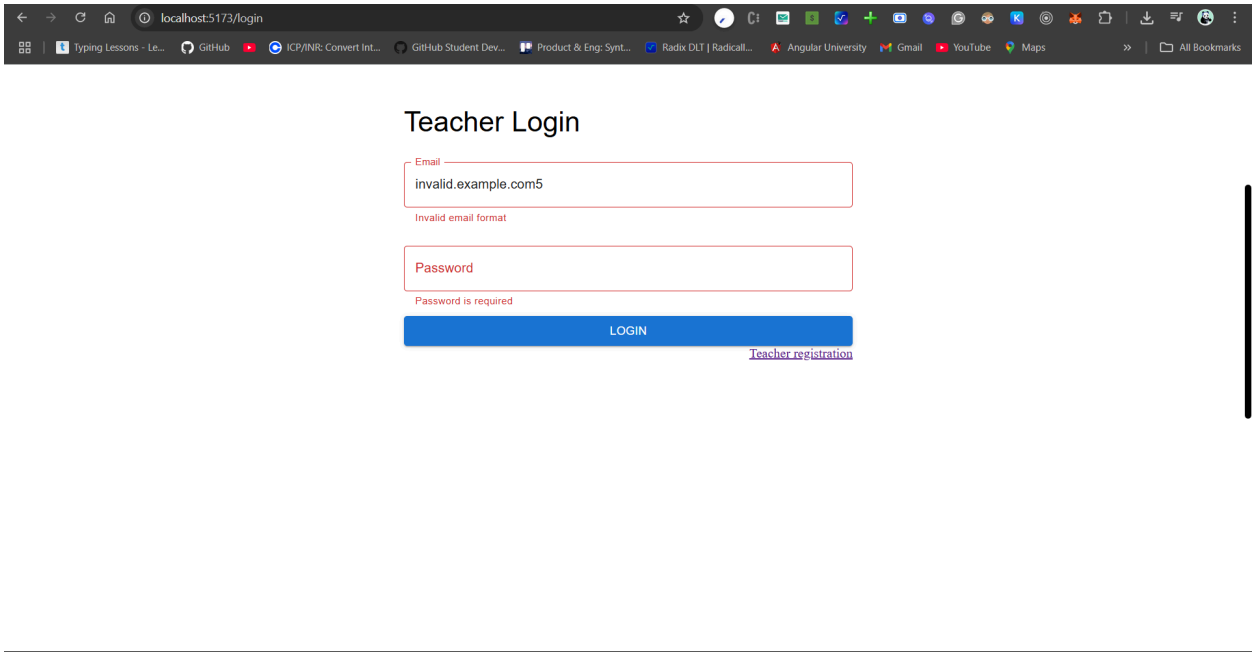
LOGIN
Teacher registration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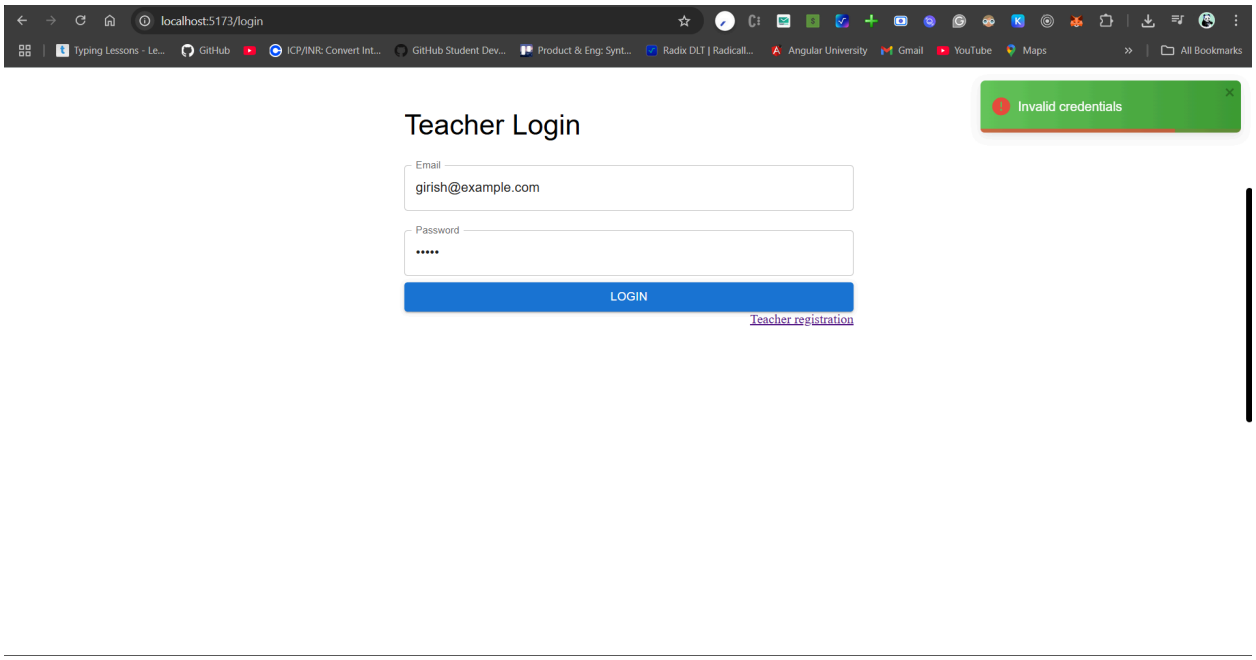
Password is required
LOGIN
Teacher registration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Password
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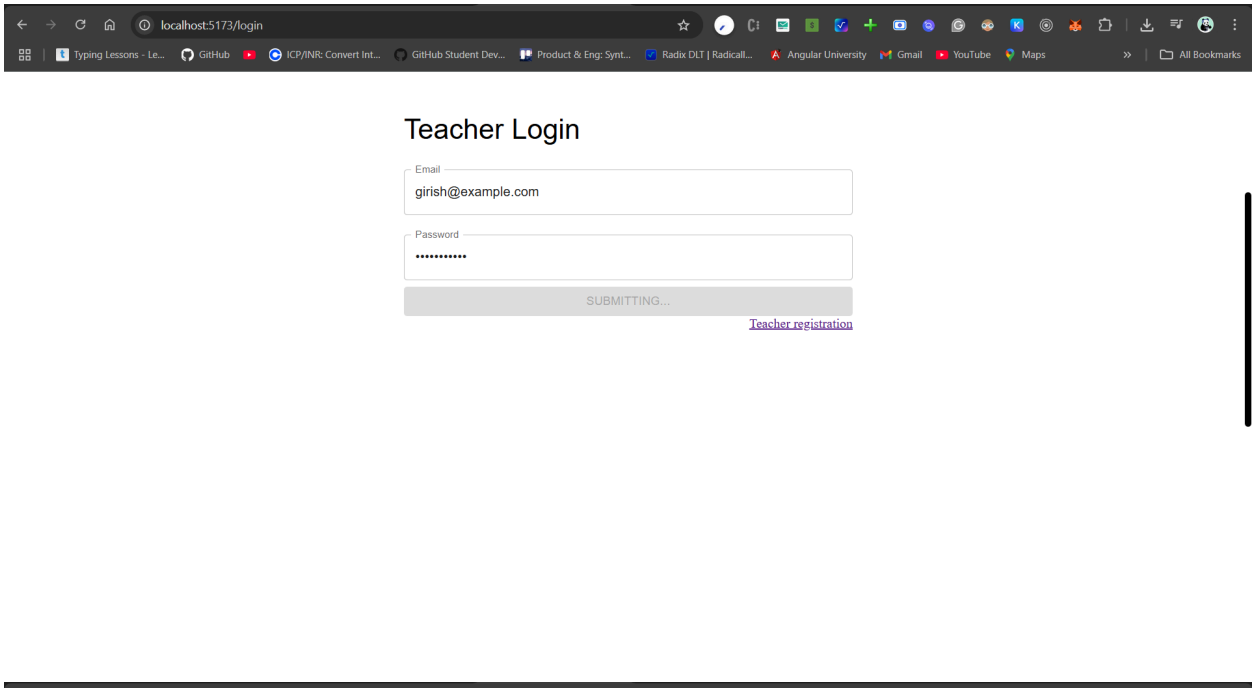
LOGIN
Teacher registration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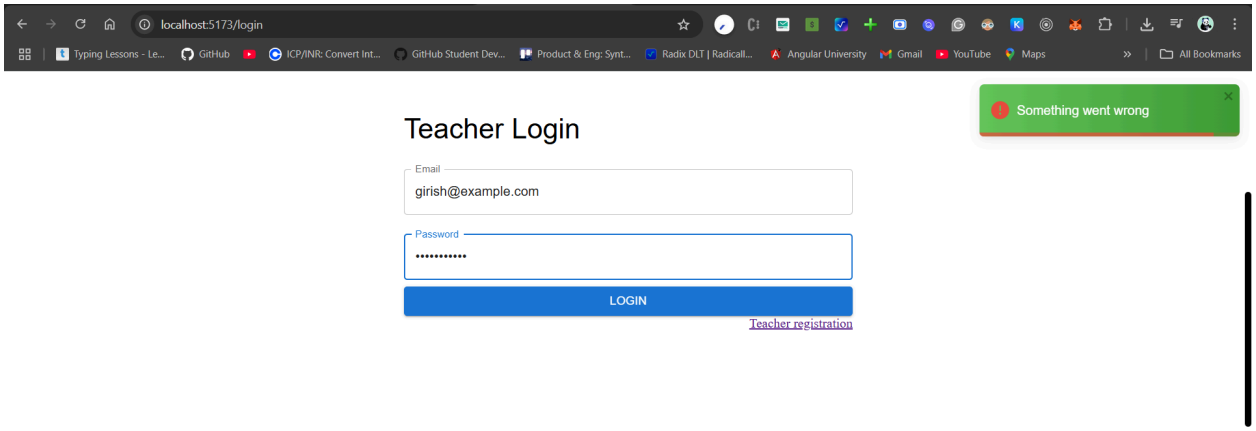
SUBMITTING...
Teacher registration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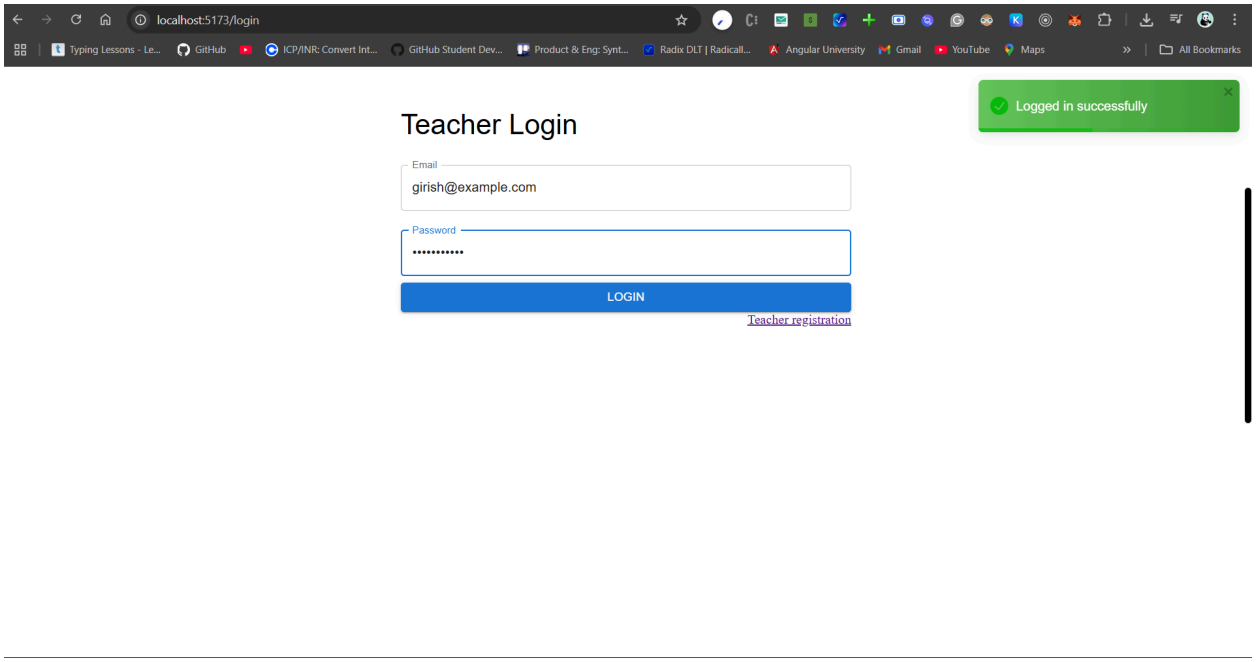
Teacher registration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Logged in successfully
Teacher Login
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Password
LOGIN
Teacher registration

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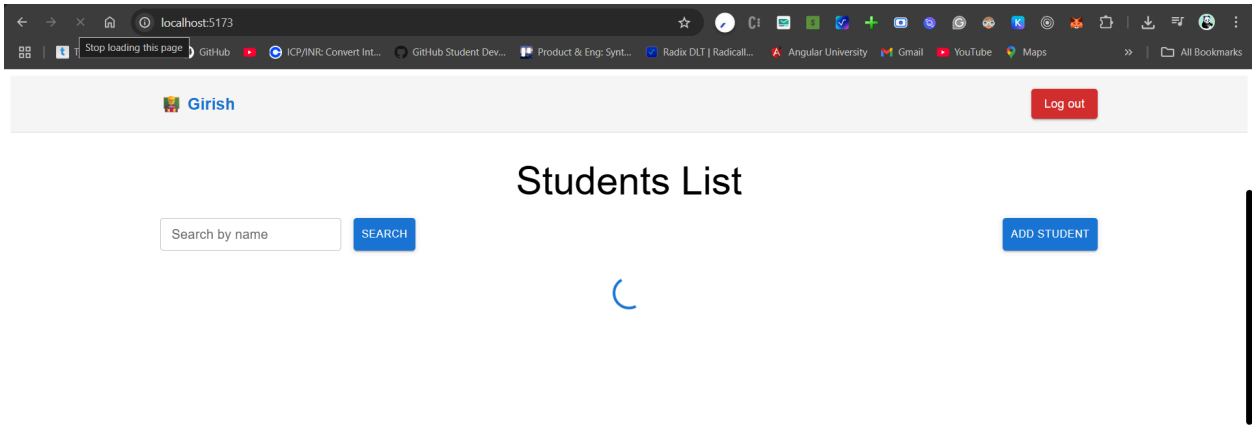


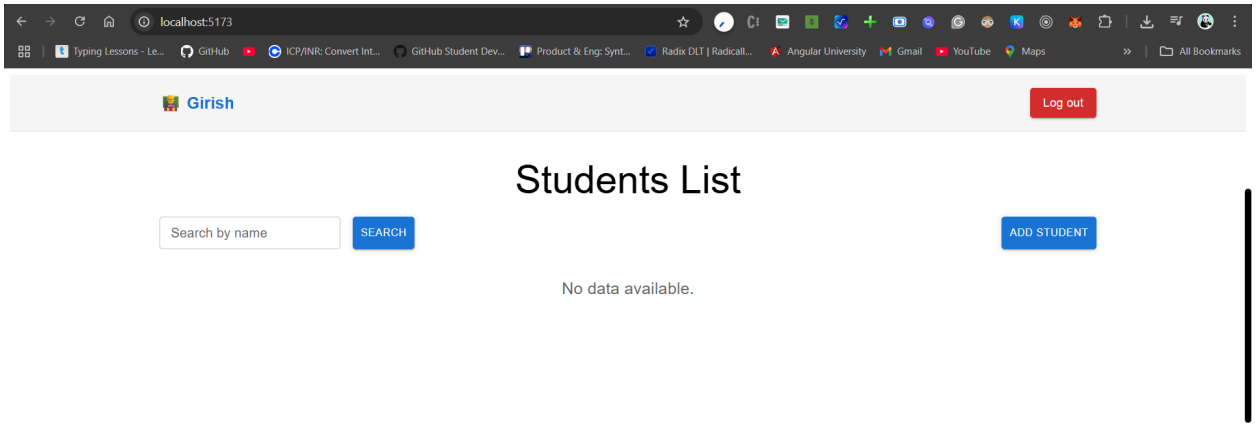

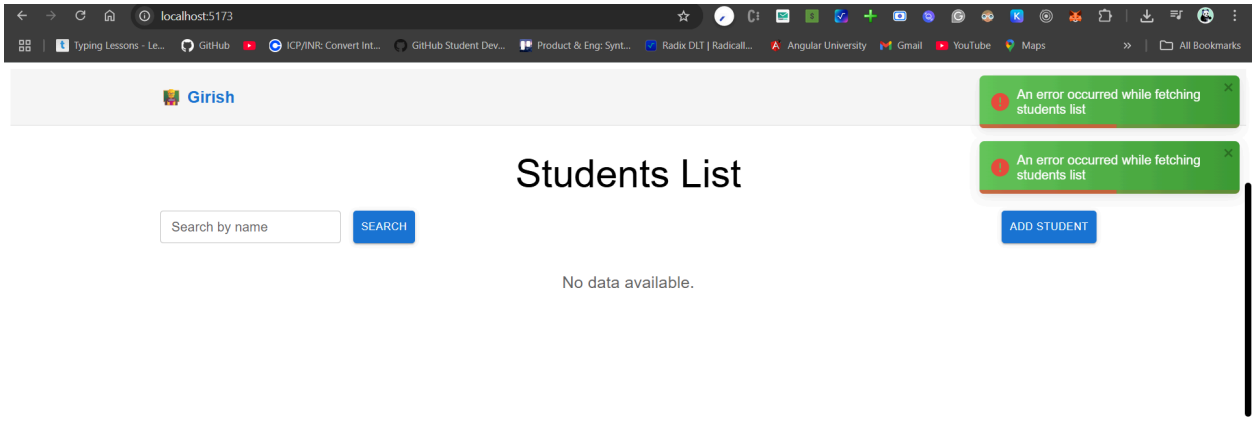
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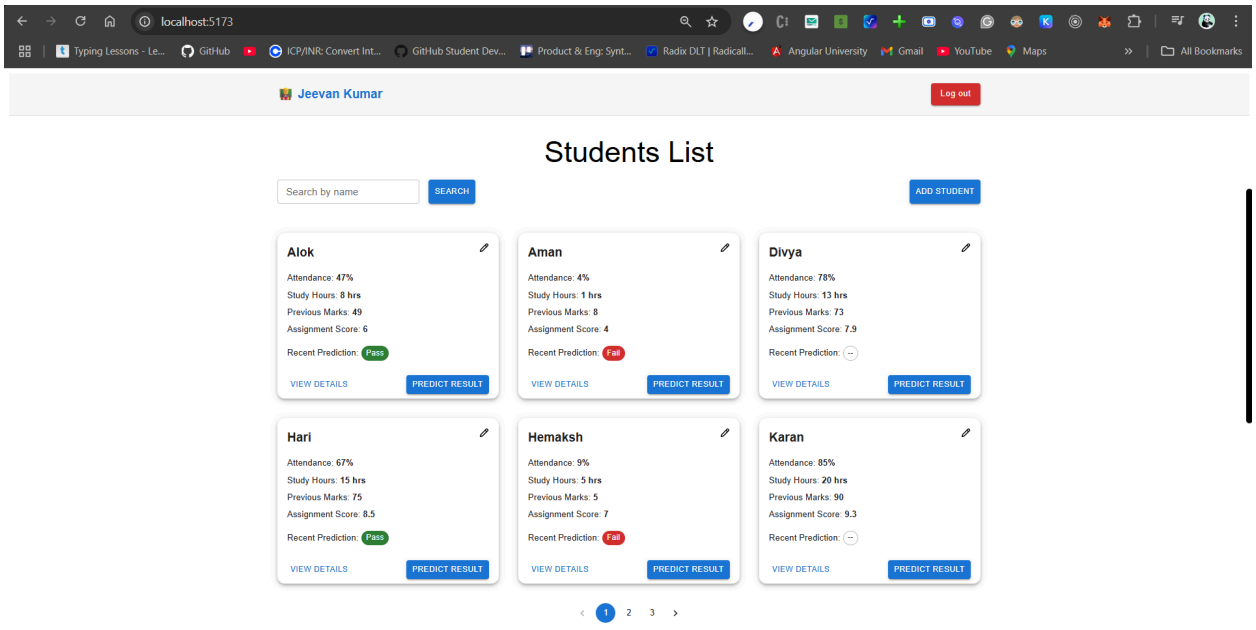
Students List
Search by name
SEARCH
ADD STUDENT
No data available.


localhost:5173
Jeevan Kumar
Log out
Students List
Search by name
SEARCH
ADD STUDENT
Alok
Attendance: 47%
Study Hours: 8 hrs
Previous Marks: 49
Assignment Score: 6
Recent Prediction: Pass
VIEW DETAILS
PREDICT RESULT
Aman
Attendance: 4%
Study Hours: 1 hrs
Previous Marks: 8
Assignment Score: 4
Recent Prediction: Fail
VIEW DETAILS
PREDICT RESULT
Divya
Attendance: 78%
Study Hours: 13 hrs
Previous Marks: 73
Assignment Score: 7.9
Recent Prediction: --
VIEW DETAILS
PREDICT RESULT
Hari
Attendance: 67%
Study Hours: 15 hrs
Previous Marks: 75
Assignment Score: 8.5
Recent Prediction: Pass
VIEW DETAILS
PREDICT RESULT
Hemaksh
Attendance: 9%
Study Hours: 5 hrs
Previous Marks: 5
Assignment Score: 7
Recent Prediction: Fail
VIEW DETAILS
PREDICT RESULT
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Attendance: 85%
Study Hours: 20 hrs
Previous Marks: 90
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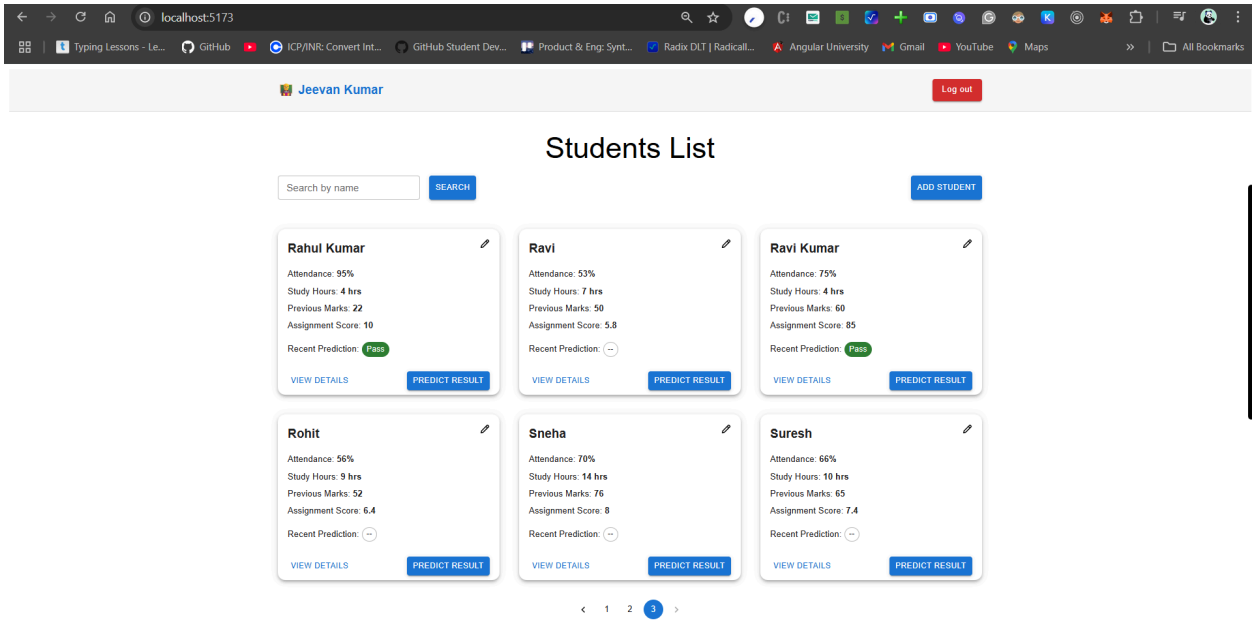
VIEW DETAILS
PREDICT RESULT
1
2
3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Jeevan Kumar
Log out
Students List
Search by name
SEARCH
ADD STUDENT
Rahul Kumar
Attendance: 95%
Study Hours: 4 hrs
Previous Marks: 22
Assignment Score: 10
Recent Prediction: Pass
VIEW DETAILS
PREDICT RESULT
Ravi
Attendance: 53%
Study Hours: 7 hrs
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PREDICT RESULT
Ravi Kumar
Attendance: 75%
Study Hours: 4 hrs
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Assignment Score: 85
Recent Prediction: Pass
VIEW DETAILS
PREDICT RESULT
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Attendance: 56%
Study Hours: 9 hrs
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PREDICT RESULT
Sneha
Attendance: 70%
Study Hours: 14 hrs
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PREDICT RESULT
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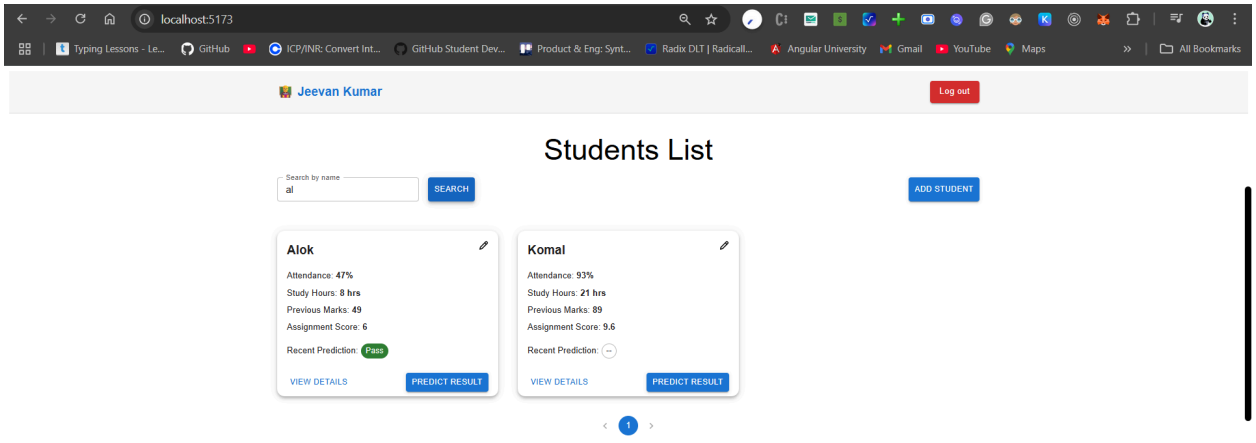
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SEARCH
ADD STUDENT
Alok
Attendance: 47%
Study Hours: 8 hrs
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PREDICT RESULT
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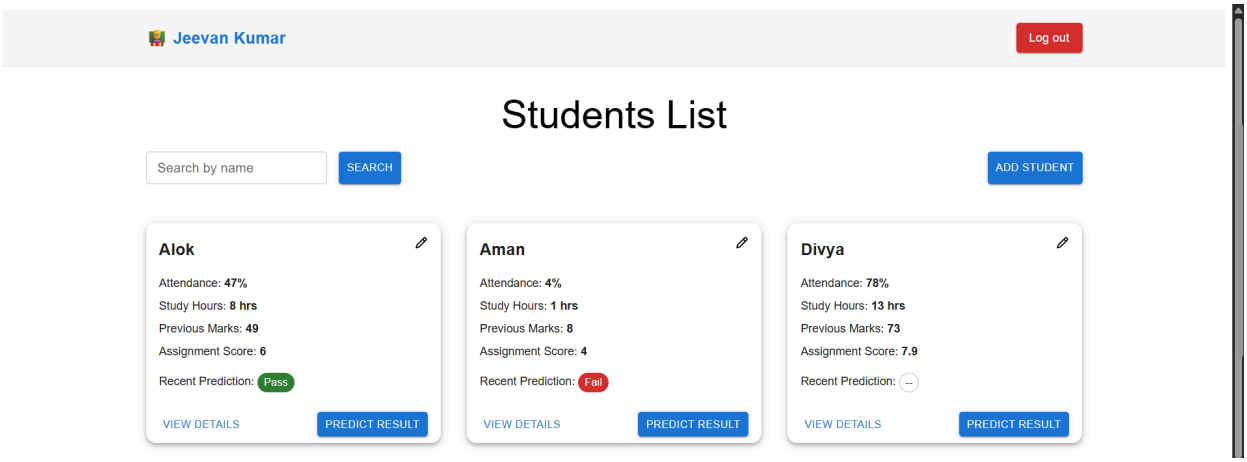
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Search by name
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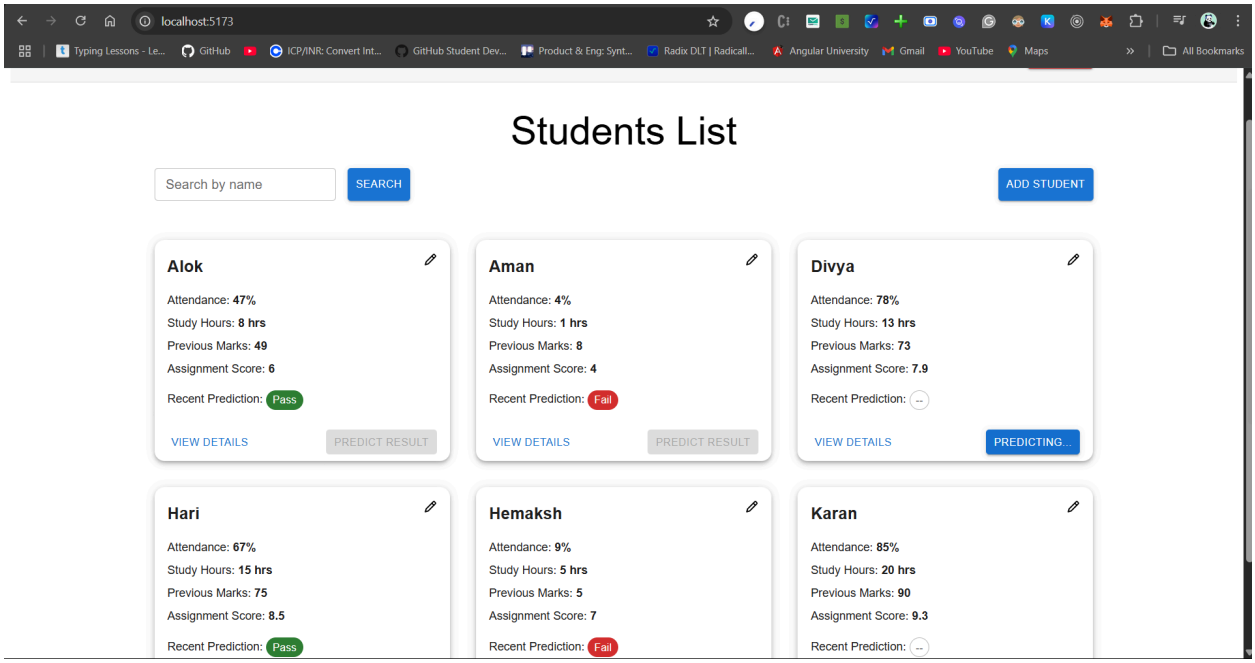
Recent Prediction: Pass
VIEW DETAILS
PREDICT RESULT
Aman
Attendance: 4%
Study Hours: 1 hrs
Previous Marks: 8
Assignment Score: 4
Recent Prediction: Fail
VIEW DETAILS
PREDICT RESULT
Divya
Attendance: 78%
Study Hours: 13 hrs
Previous Marks: 73
Assignment Score: 7.9
Recent Prediction: --
VIEW DETAILS
PREDICT RESULT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Students List
Search by name
SEARCH
ADD STUDENT
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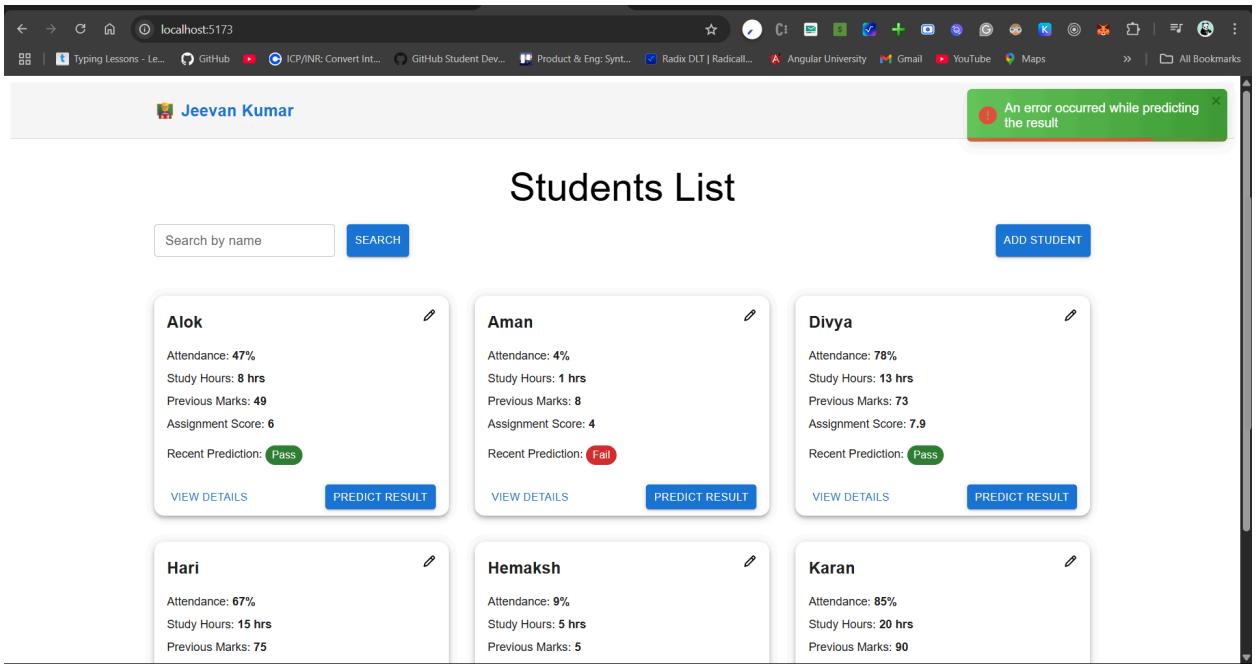
Assignment Score: 9.3
Recent Prediction: --


localhost:5173
Jeevan Kumar
An error occurred while predicting the result
Students List
Search by name
SEARCH
ADD STUDENT
Alok
Attendance: 47%
Study Hours: 8 hrs
Previous Marks: 49
Assignment Score: 6
Recent Prediction: Pass
VIEW DETAILS
PREDICT RESULT
Aman
Attendance: 4%
Study Hours: 1 hrs
Previous Marks: 8
Assignment Score: 4
Recent Prediction: Fail
VIEW DETAILS
PREDICT RESULT
Divya
Attendance: 78%
Study Hours: 13 hrs
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Assignment Score: 7.9
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Study Hours: 15 hrs
Previous Marks: 75
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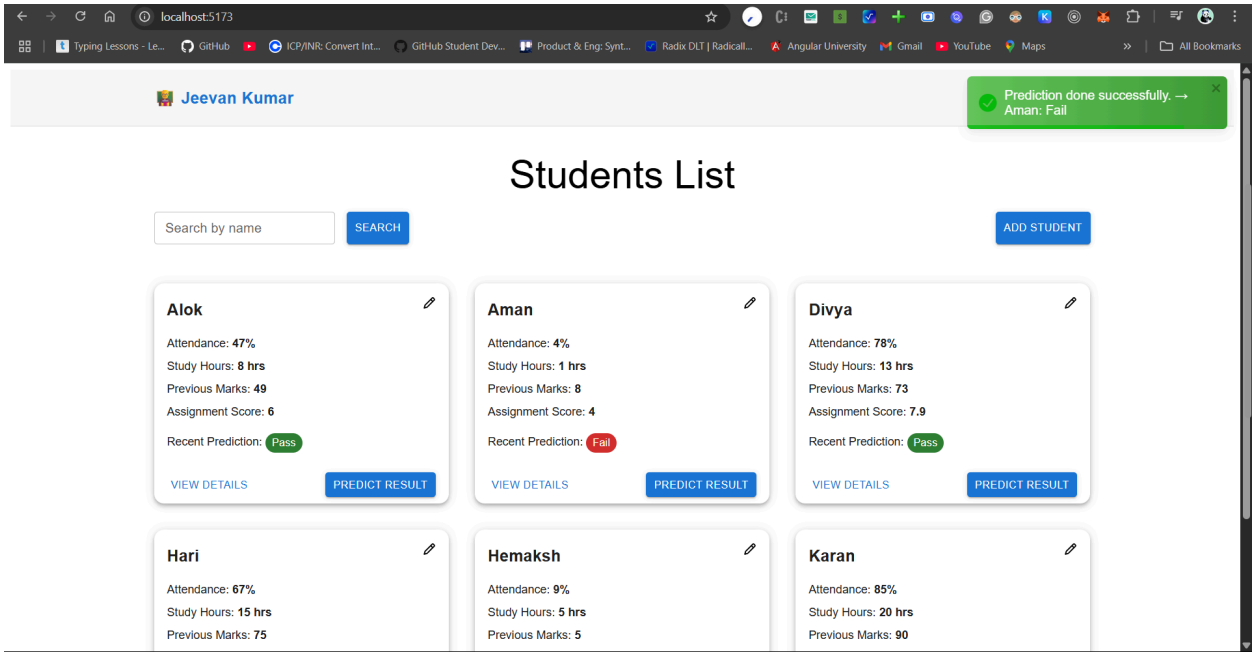
Attendance: 9%
Study Hours: 5 hrs
Previous Marks: 5
Karan
Attendance: 85%
Study Hours: 20 hrs
Previous Marks: 90


localhost:5173
Jeevan Kumar
Prediction done successfully. → Aman: Fail
Students List
Search by name
SEARCH
ADD STUDENT
Alok
Attendance: 47%
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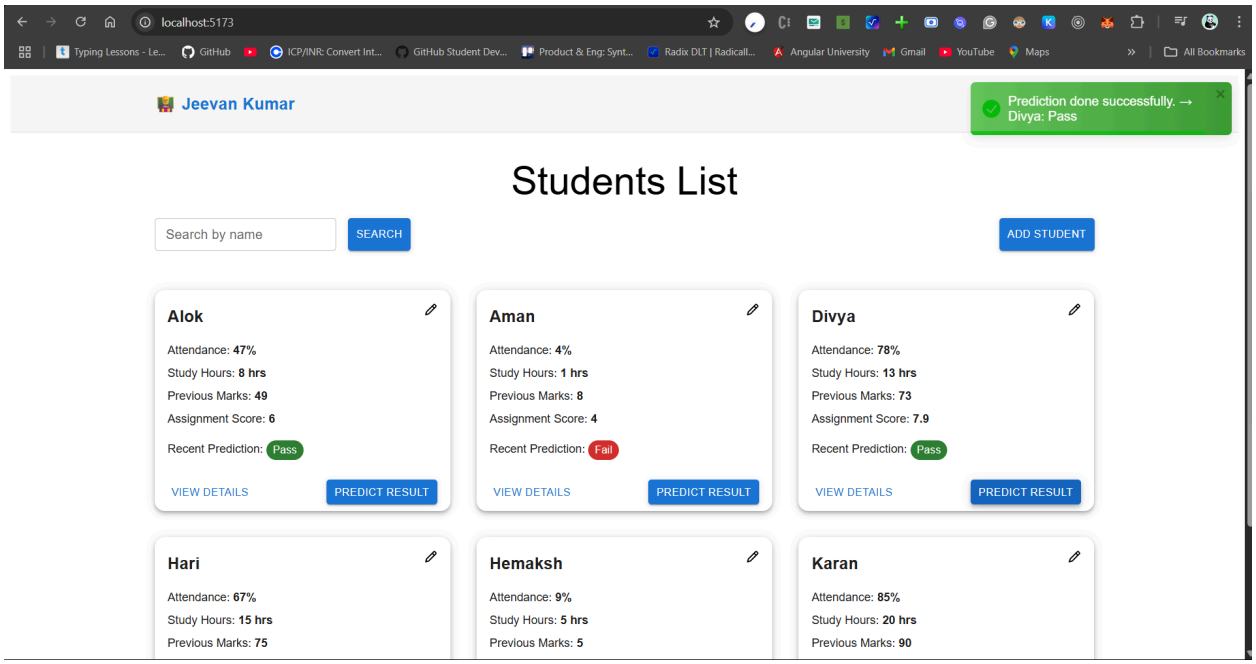
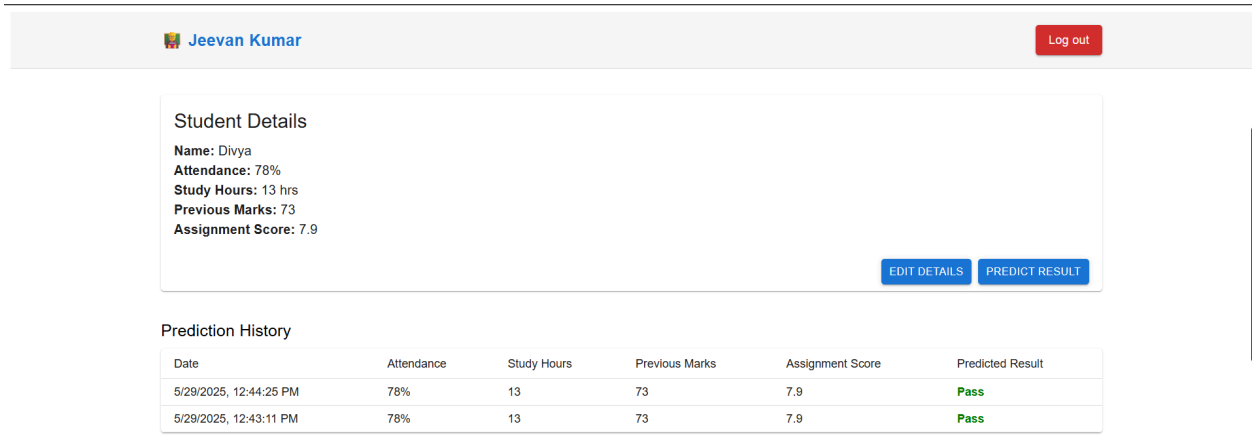
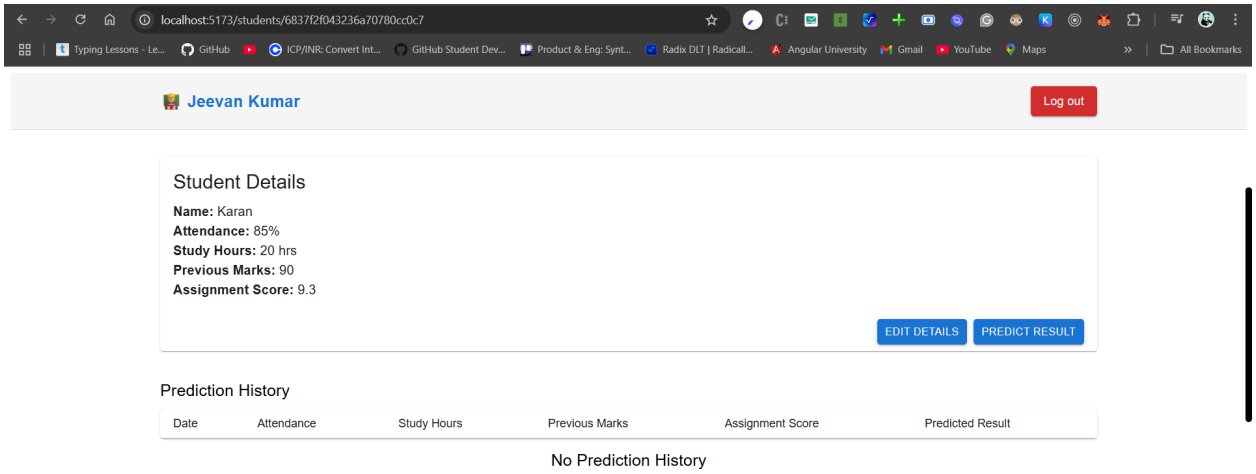
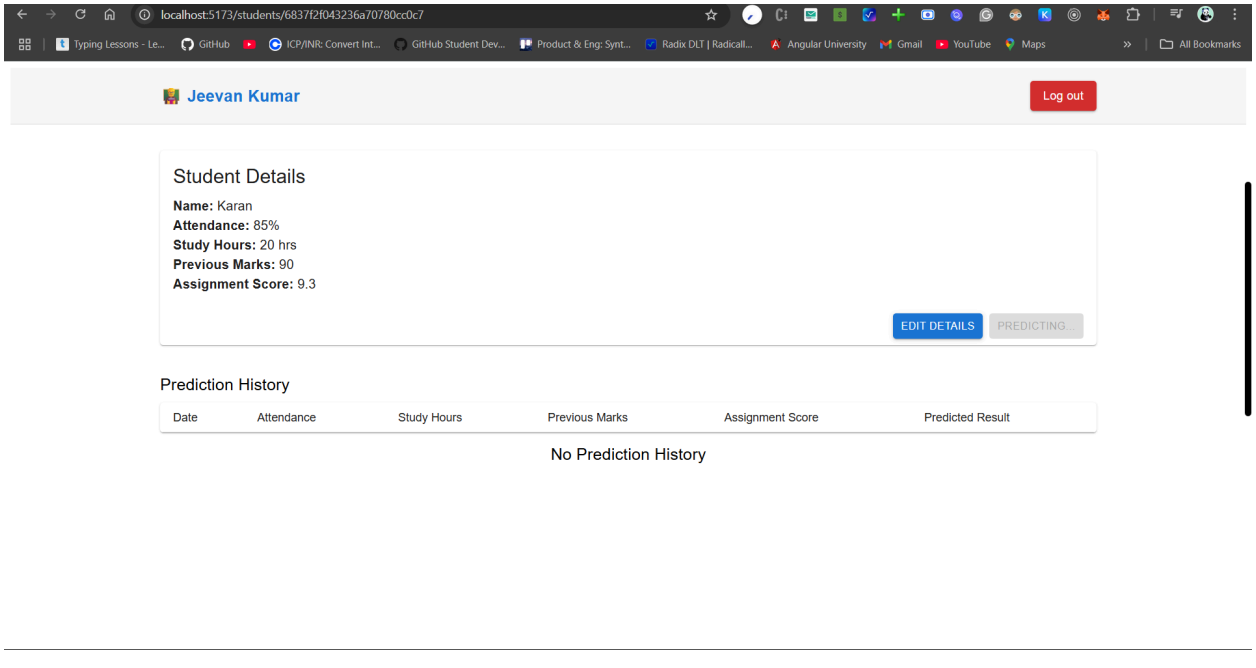
Study Hours: 20 hrs
Previous Marks: 90

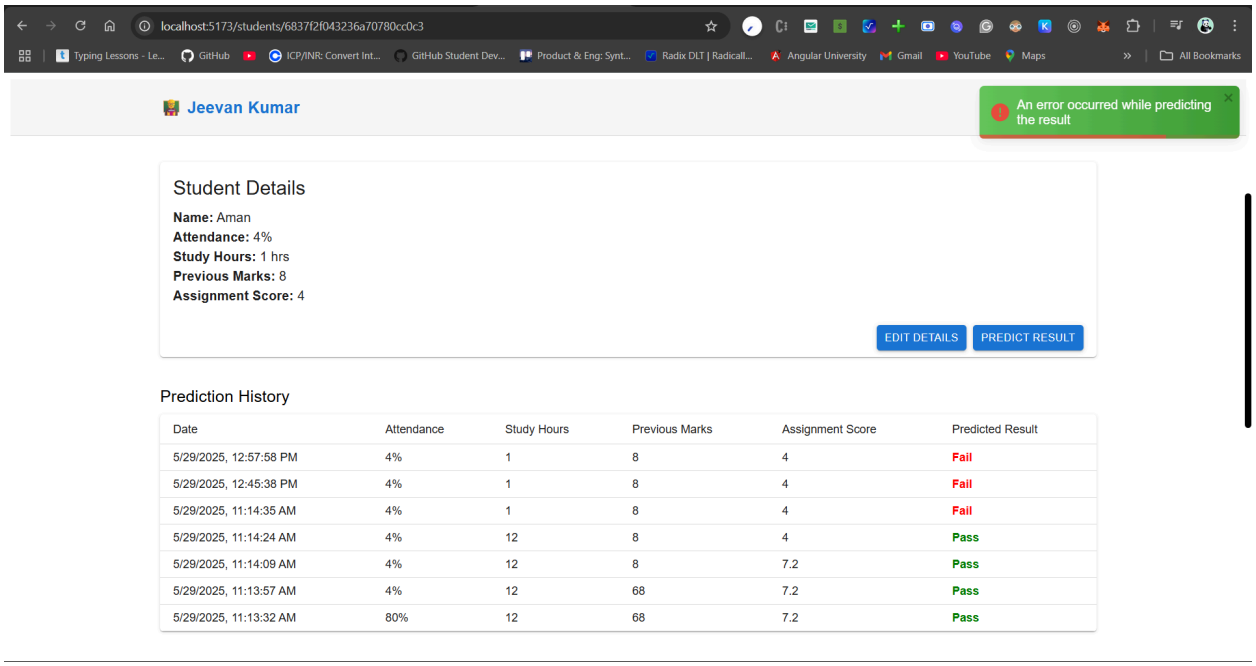

localhost:5173
Jeevan Kumar
Prediction done successfully. → Divya: Pass
Students List
Search by name
SEARCH
ADD STUDENT
Alok
Attendance: 47%
Study Hours: 8 hrs
Previous Marks: 49
Assignment Score: 6
Recent Prediction: Pass
VIEW DETAILS
PREDICT RESULT
Aman
Attendance: 4%
Study Hours: 1 hrs
Previous Marks: 8
Assignment Score: 4
Recent Prediction: Fail
VIEW DETAILS
PREDICT RESULT
Divya
Attendance: 78%
Study Hours: 13 hrs
Previous Marks: 73
Assignment Score: 7.9
Recent Prediction: Pass
VIEW DETAILS
PREDICT RESULT
Hari
Attendance: 67%
Study Hours: 15 hrs
Previous Marks: 75
Hemaksh
Attendance: 9%
Study Hours: 5 hrs
Previous Marks: 5
Karan
Attendance: 85%
Study Hours: 20 hrs
Previous Marks: 90

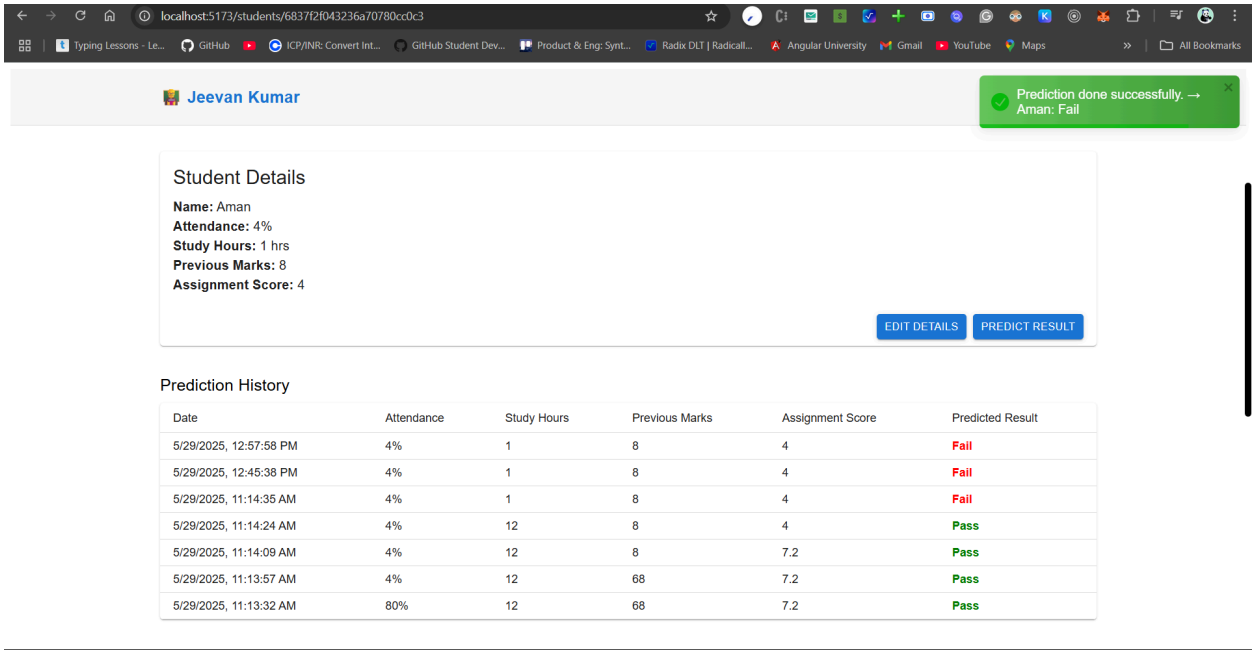
# Student Details View -

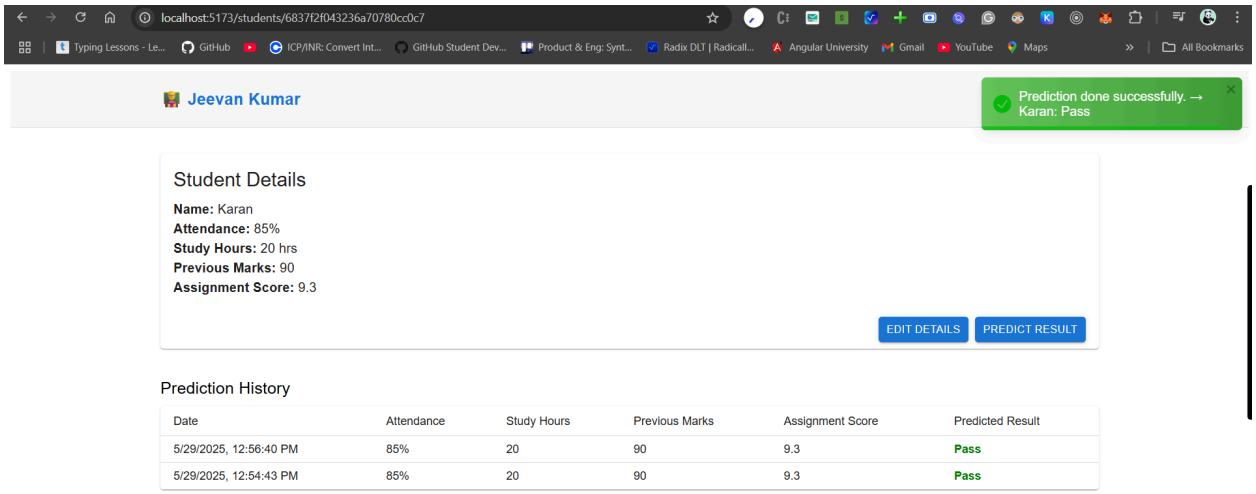


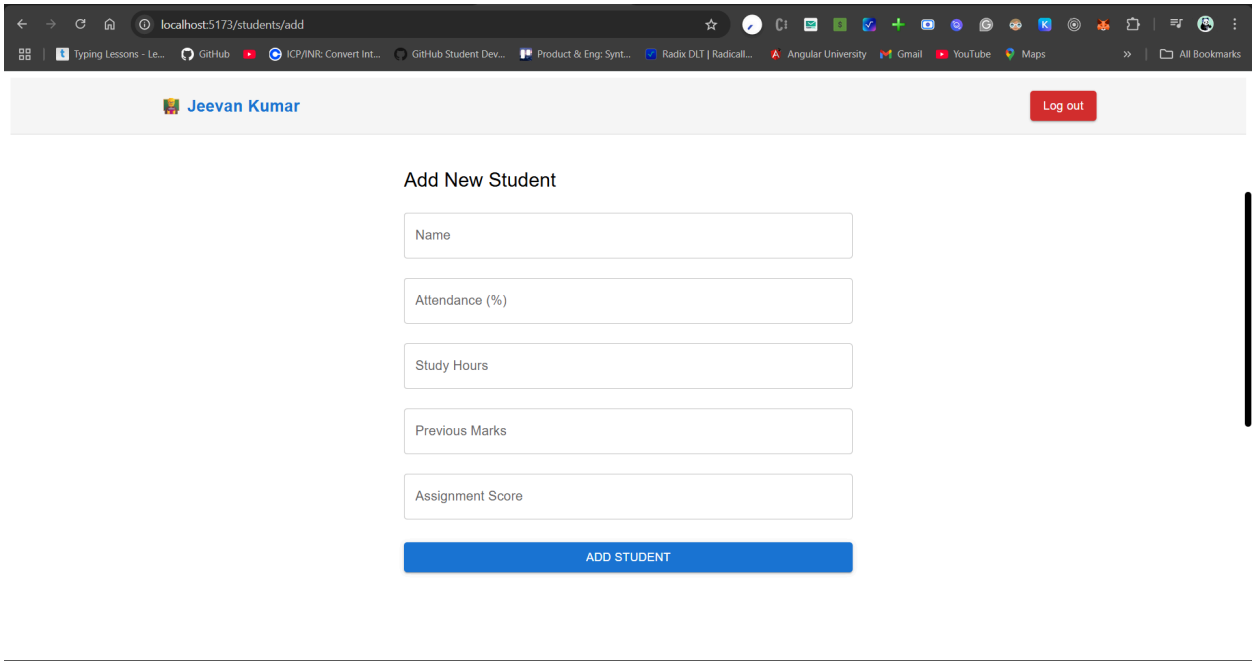

localhost:5173/students/6837f2f043236a70780cc0c7
Jeevan Kumar
Log out
Student Details
Name: Karan
Attendance: 85%
Study Hours: 20 hrs
Previous Marks: 90
Assignment Score: 9.3
EDIT DETAILS
PREDICTING...
Prediction History
Date
Attendance
Study Hours
Previous Marks
Assignment Score
Predicted Result
No Prediction History

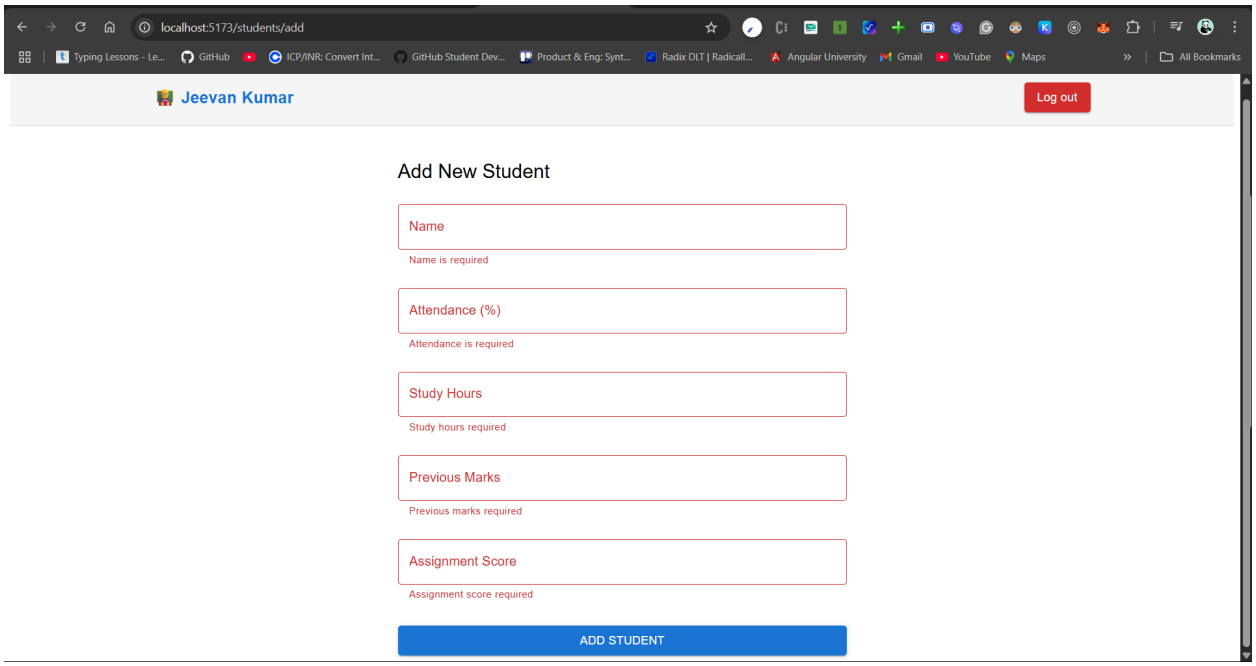

localhost:5173/students/6837f2f043236a70780cc0c3
Jeevan Kumar
An error occurred while predicting the result
Student Details
Name: Aman
Attendance: 4%
Study Hours: 1 hrs
Previous Marks: 8
Assignment Score: 4
EDIT DETAILS
PREDICT RESULT
Prediction History
Date
Attendance
Study Hours
Previous Marks
Assignment Score
Predicted Result
5/29/2025, 12:57:58 PM
4%
1
8
4
Fail
5/29/2025, 12:45:38 PM
4%
1
8
4
Fail
5/29/2025, 11:14:35 AM
4%
1
8
4
Fail
5/29/2025, 11:14:24 AM
4%
12
8
4
Pass
5/29/2025, 11:14:09 AM
4%
12
8
7.2
Pass
5/29/2025, 11:13:57 AM
4%
12
68
7.2
Pass
5/29/2025, 11:13:32 AM
80%
12
68
7.2
Pass

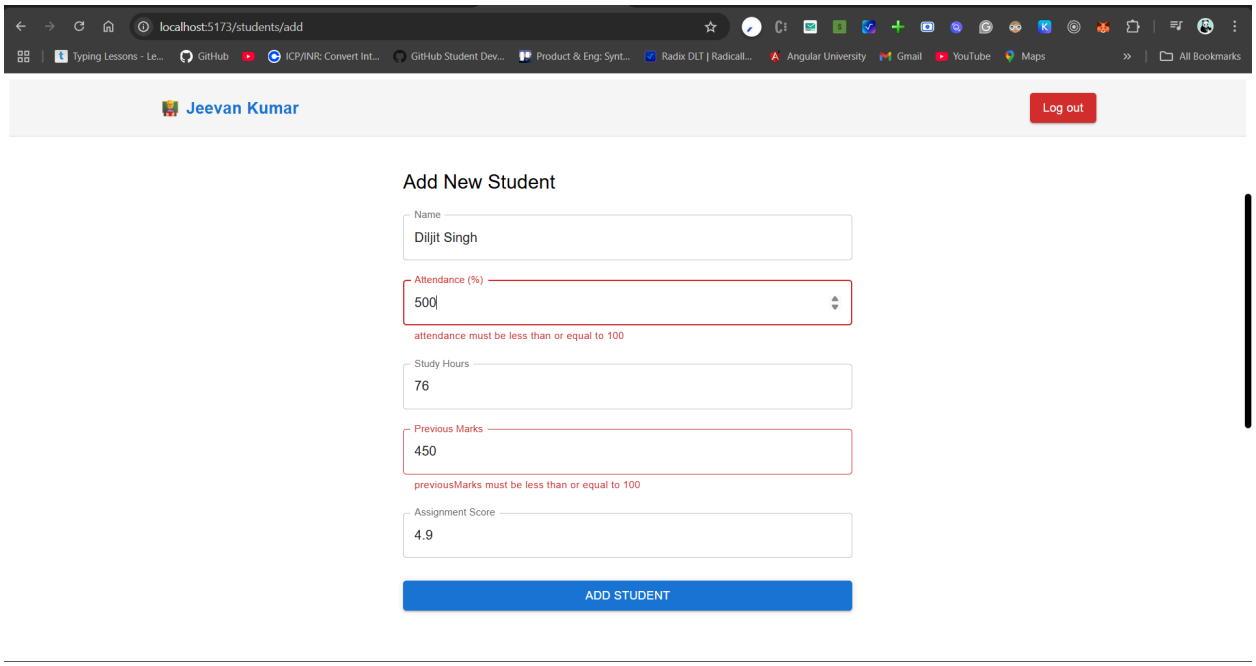

localhost:5173/students/6837f2f043236a70780cc0c3
Typing Lessons - Le...
GitHub
ICP/INR: Convert Int...
GitHub Student Dev...
Product & Eng: Synt...
Radix DLT | Radicall...
Angular University
Gmail
YouTube
Maps
All Bookmarks
Jeevan Kumar
Prediction done successfully. → Aman: Fail
Student Details
Name: Aman
Attendance: 4%
Study Hours: 1 hrs
Previous Marks: 8
Assignment Score: 4
EDIT DETAILS
PREDICT RESULT
Prediction History
Date | Attendance | Study Hours | Previous Marks | Assignment Score | Predicted Result
5/29/2025, 12:57:58 PM | 4% | 1 | 8 | 4 | Fail
5/29/2025, 12:45:38 PM | 4% | 1 | 8 | 4 | Fail
5/29/2025, 11:14:35 AM | 4% | 1 | 8 | 4 | Fail
5/29/2025, 11:14:24 AM | 4% | 12 | 8 | 4 | Pass
5/29/2025, 11:14:09 AM | 4% | 12 | 8 | 7.2 | Pass
5/29/2025, 11:13:57 AM | 4% | 12 | 68 | 7.2 | Pass
5/29/2025, 11:13:32 AM | 80% | 12 | 68 | 7.2 | Pass

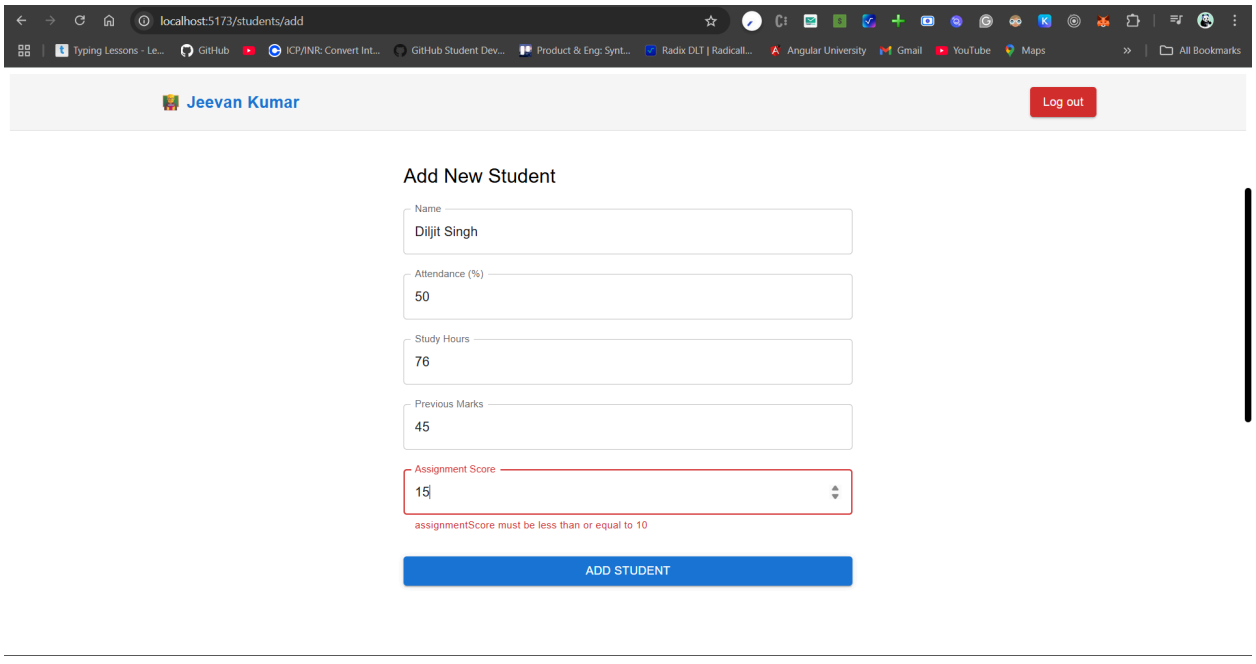

localhost:5173/students/6837f2f043236a70780cc0c7
Typing Lessons - Le...
GitHub
ICP/INR: Convert Int...
GitHub Student Dev...
Product & Eng: Synt...
Radix DLT | Radicall...
Angular University
Gmail
YouTube
Maps
All Bookmarks
Jeevan Kumar
Prediction done successfully. → Karan: Pass
Student Details
Name: Karan
Attendance: 85%
Study Hours: 20 hrs
Previous Marks: 90
Assignment Score: 9.3
EDIT DETAILS
PREDICT RESULT
Prediction History
Date | Attendance | Study Hours | Previous Marks | Assignment Score | Predicted Result
5/29/2025, 12:56:40 PM | 85% | 20 | 90 | 9.3 | Pass
5/29/2025, 12:54:43 PM | 85% | 20 | 90 | 9.3 | Pass

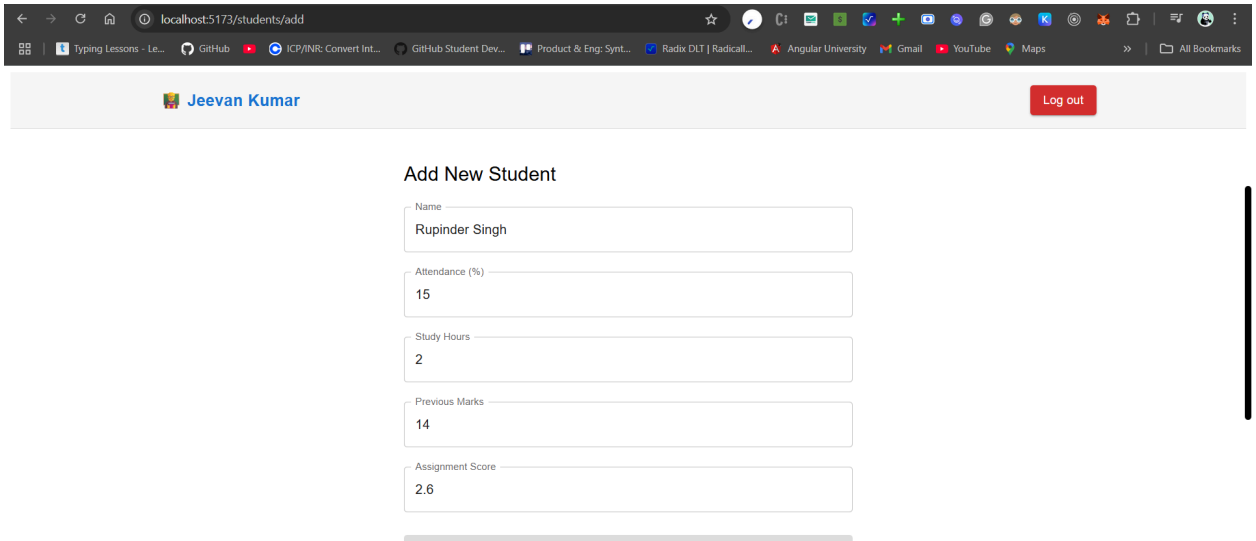
# Add New Student View -

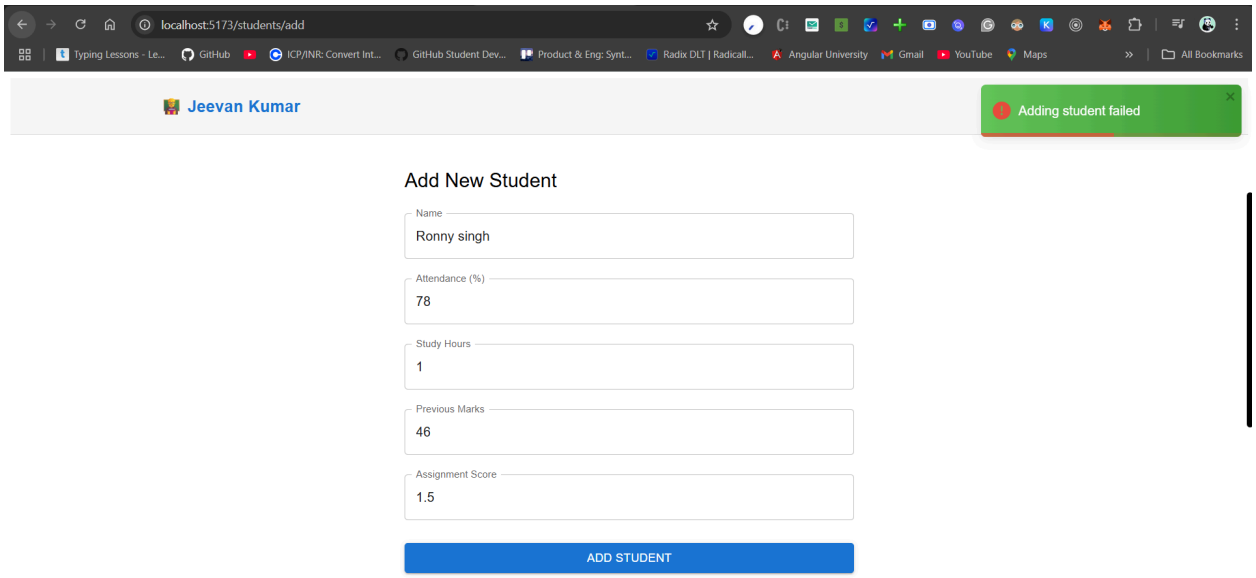


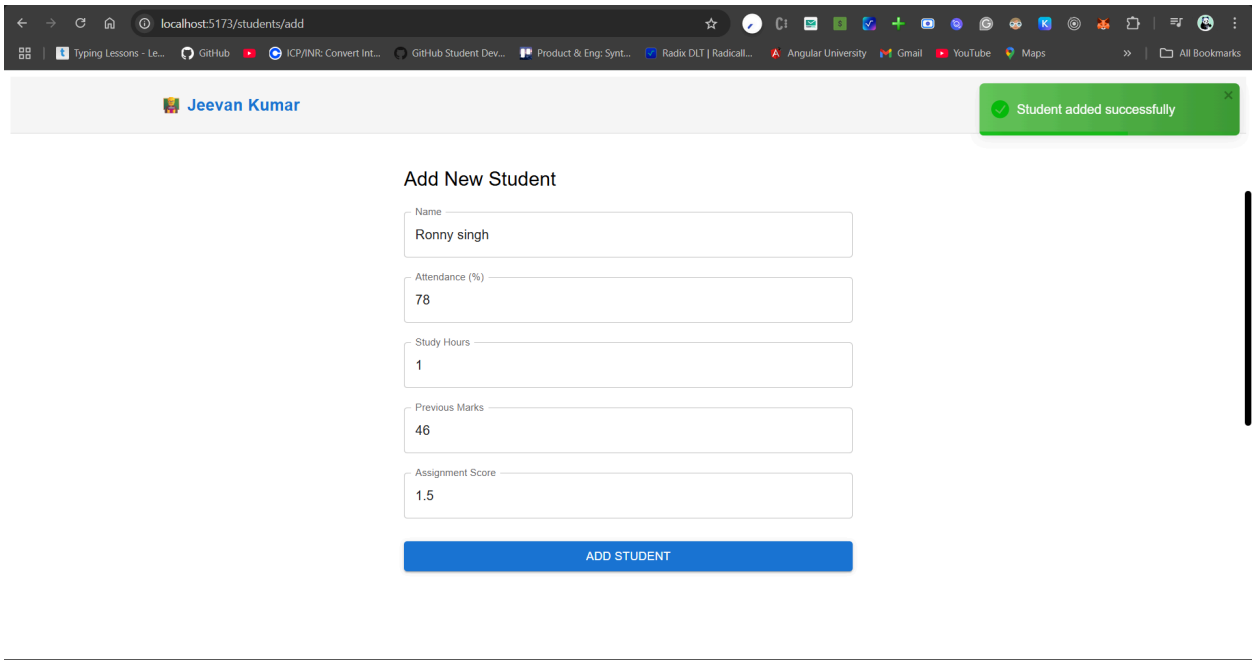




localhost:5173/students/add
Typing Lessons - Le...
GitHub
ICP/INR: Convert Int...
GitHub Student Dev...
Product & Eng: Synt...
Radix DLT | Radicall...
Angular University
Gmail
YouTube
Maps
All Bookmarks
Jeevan Kumar
Log out
Add New Student
Name
Diljit Singh
Attendance (%)
500
attendance must be less than or equal to 100
Study Hours
76
Previous Marks
450
previousMarks must be less than or equal to 100
Assignment Score
4.9
ADD STUDENT

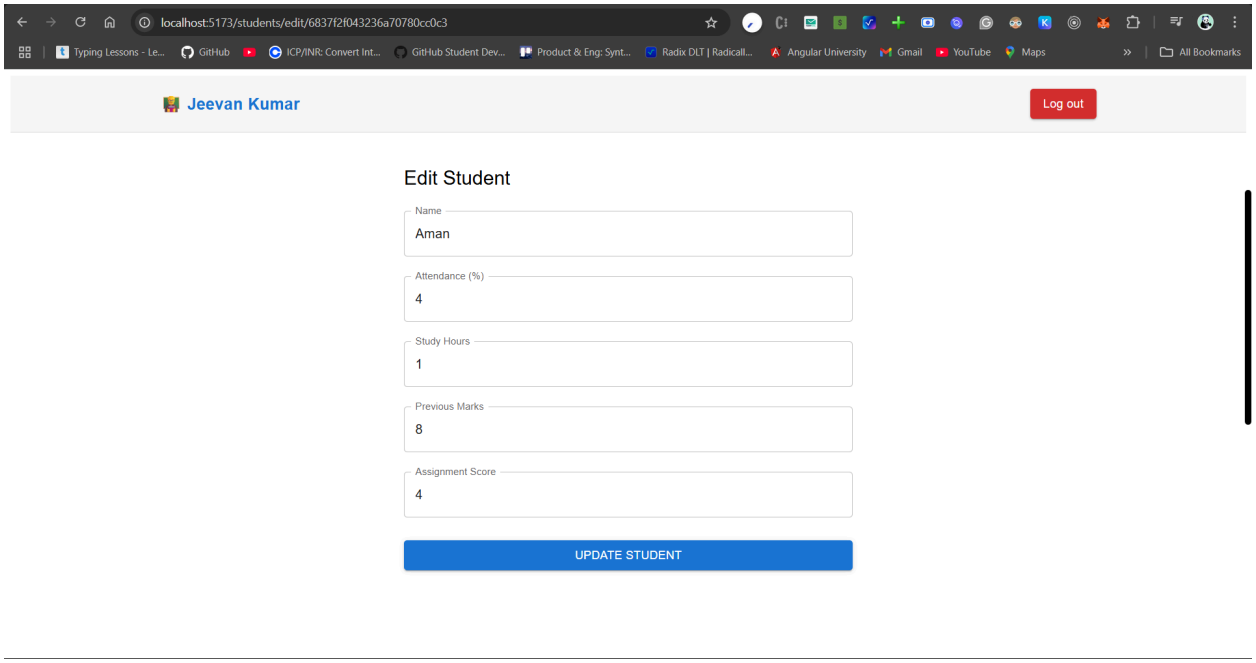

localhost:5173/students/add
Typing Lessons - Le...
GitHub
ICP/INR: Convert Int...
GitHub Student Dev...
Product & Eng: Synt...
Radix DLT | Radicall...
Angular University
Gmail
YouTube
Maps
All Bookmarks
Jeevan Kumar
Log out
Add New Student
Name
Diljit Singh
Attendance (%)
50
Study Hours
76
Previous Marks
45
Assignment Score
15
assignmentScore must be less than or equal to 10
ADD STUDENT

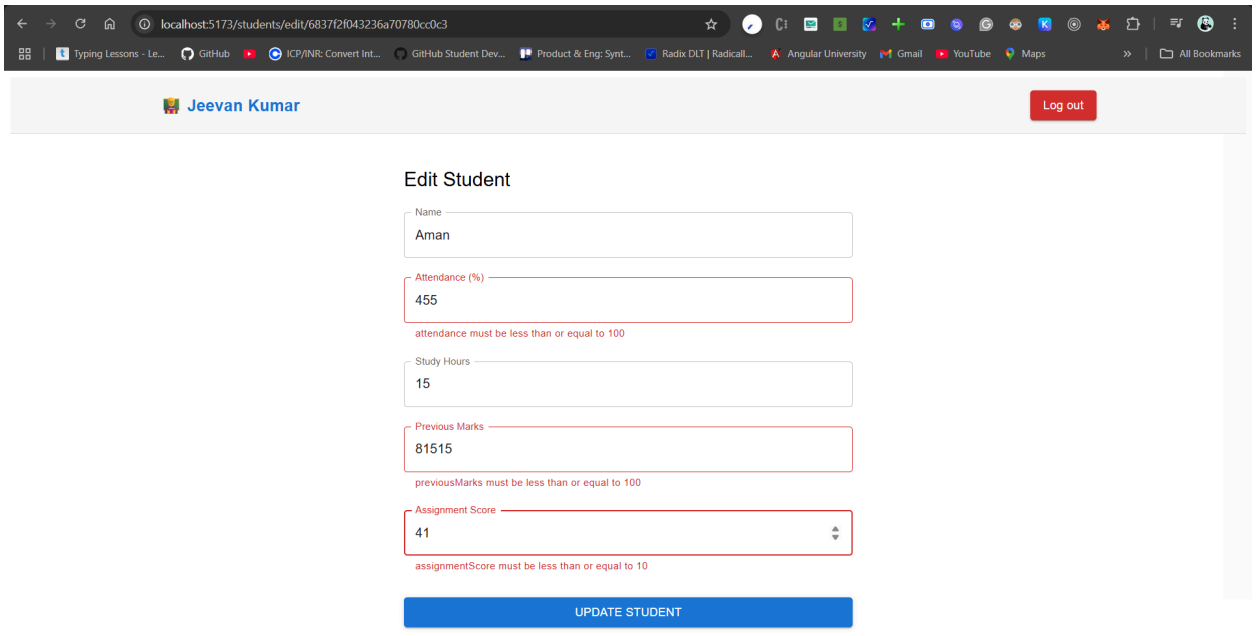

localhost:5173/students/add
Typing Lessons - Le...
GitHub
ICP/INR: Convert Int...
GitHub Student Dev...
Product & Eng: Synt...
Radix DLT | Radicall...
Angular University
Gmail
YouTube
Maps
All Bookmarks
Jeevan Kumar
Log out
Add New Student
Name
Rupinder Singh
Attendance (%)
15
Study Hours
2
Previous Marks
14
Assignment Score
2.6
ADDING STUDENT...

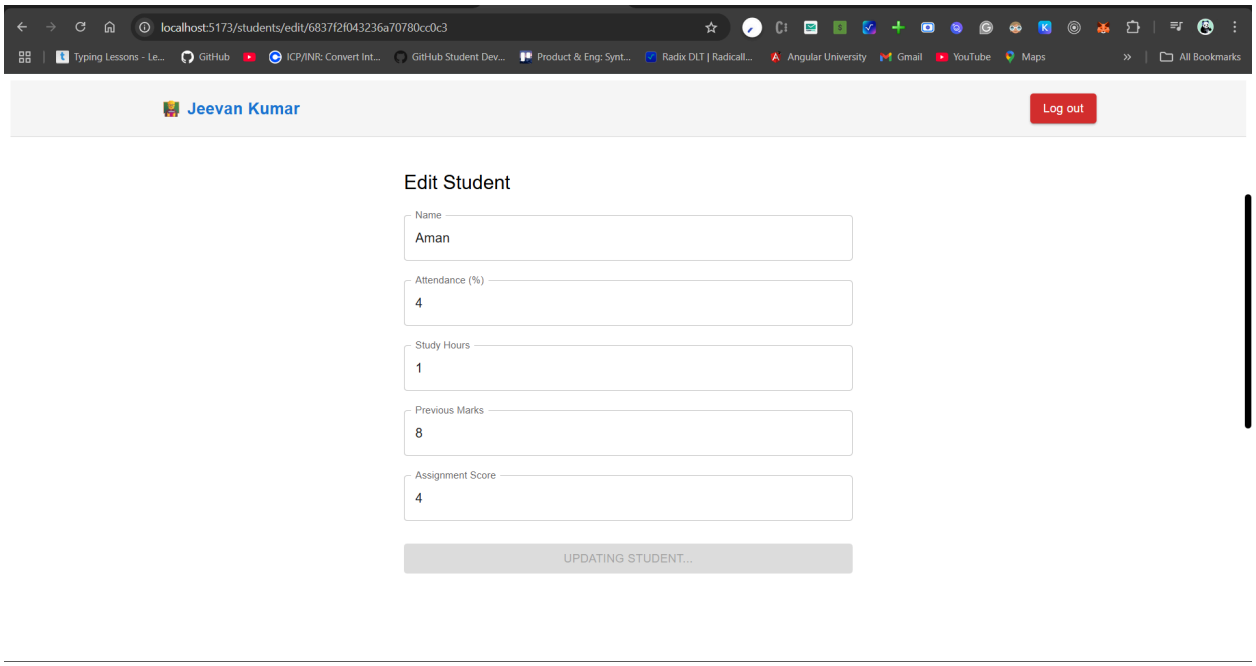

localhost:5173/students/add
Typing Lessons - Le...
GitHub
ICP/INR: Convert Int...
GitHub Student Dev...
Product & Eng: Synt...
Radix DLT | Radicall...
Angular University
Gmail
YouTube
Maps
All Bookmarks
Jeevan Kumar
Adding student failed
Add New Student
Name
Ronny singh
Attendance (%)
78
Study Hours
1
Previous Marks
46
Assignment Score
1.5
ADD STUDENT

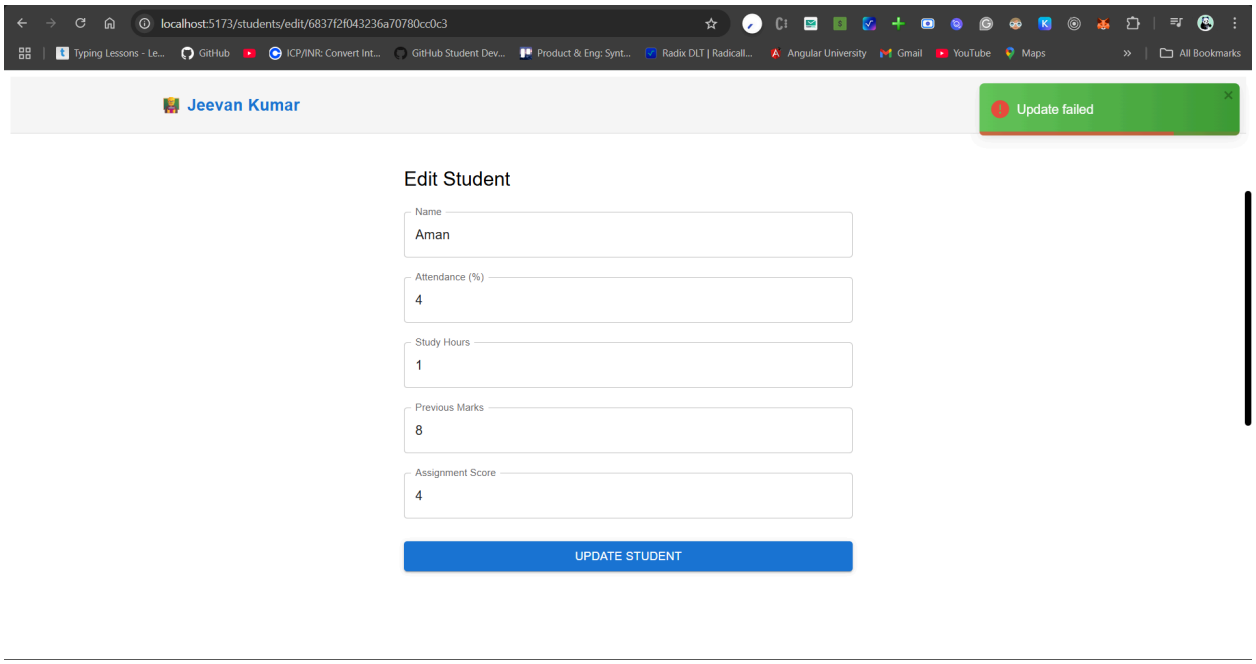

localhost:5173/students/add
Typing Lessons - Le...
GitHub
ICP/INR: Convert Int...
GitHub Student Dev...
Product & Eng: Synt...
Radix DLT | Radicall...
Angular University
Gmail
YouTube
Maps
All Bookmarks
Jeevan Kumar
Student added successfully
Add New Student
Name
Ronny singh
Attendance (%)
78
Study Hours
1
Previous Marks
46
Assignment Score
1.5
ADD STUDENT

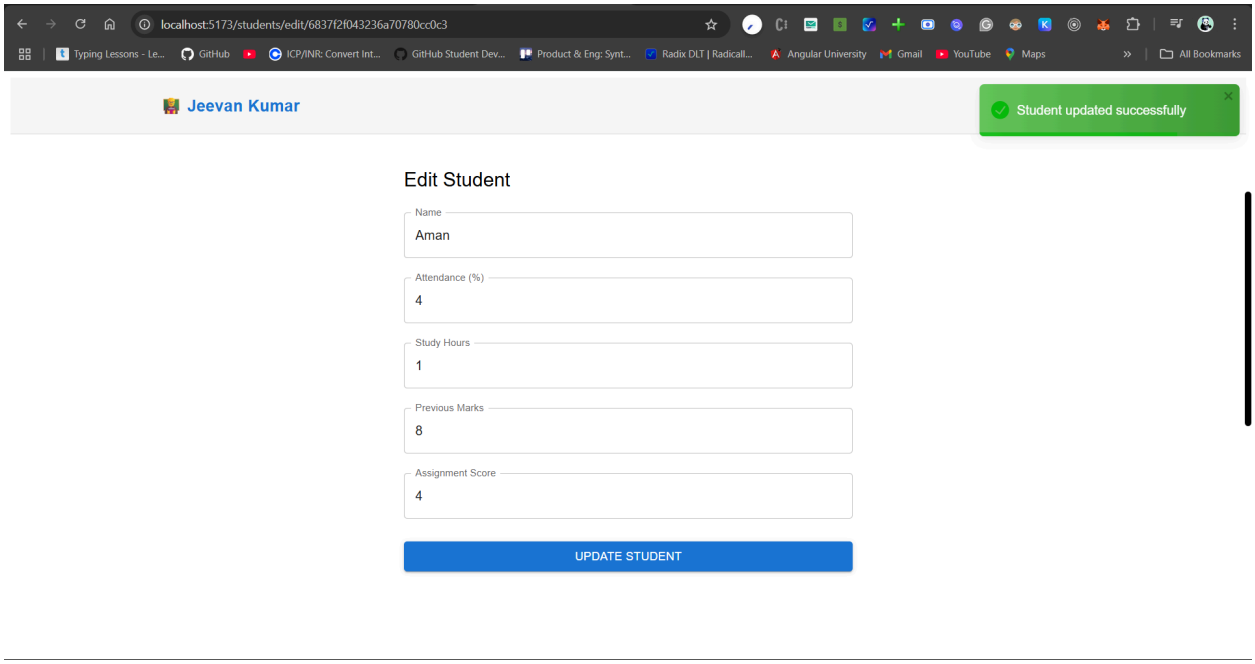
# Edit Student Details View -



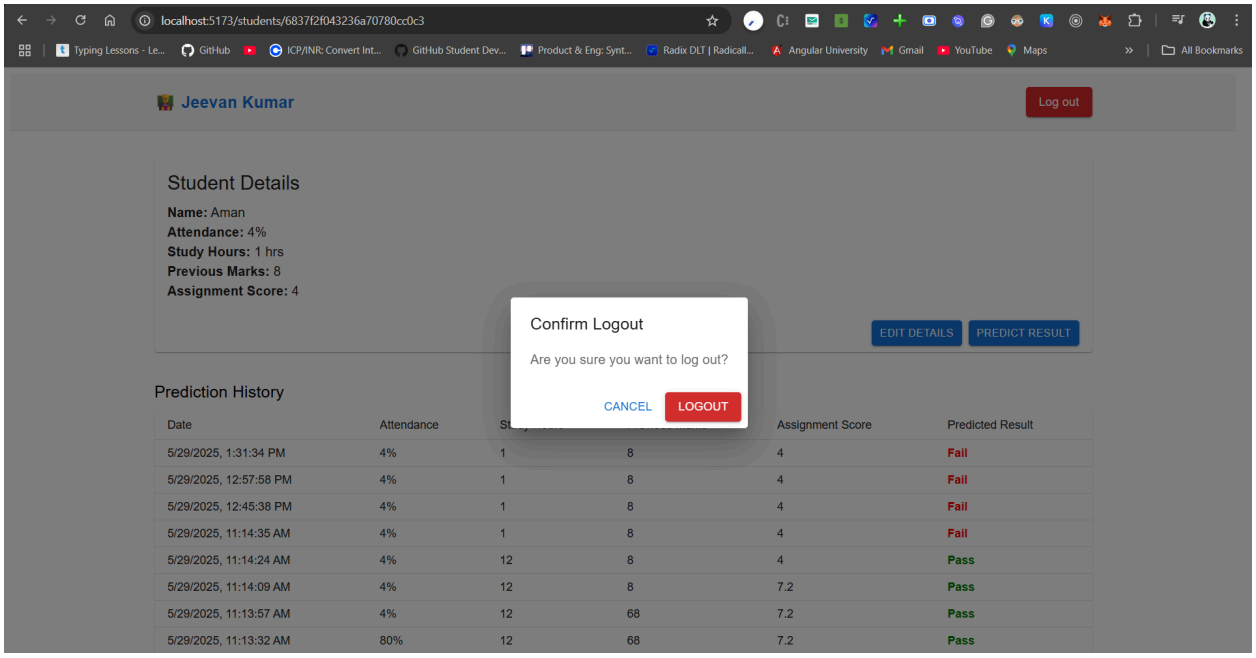



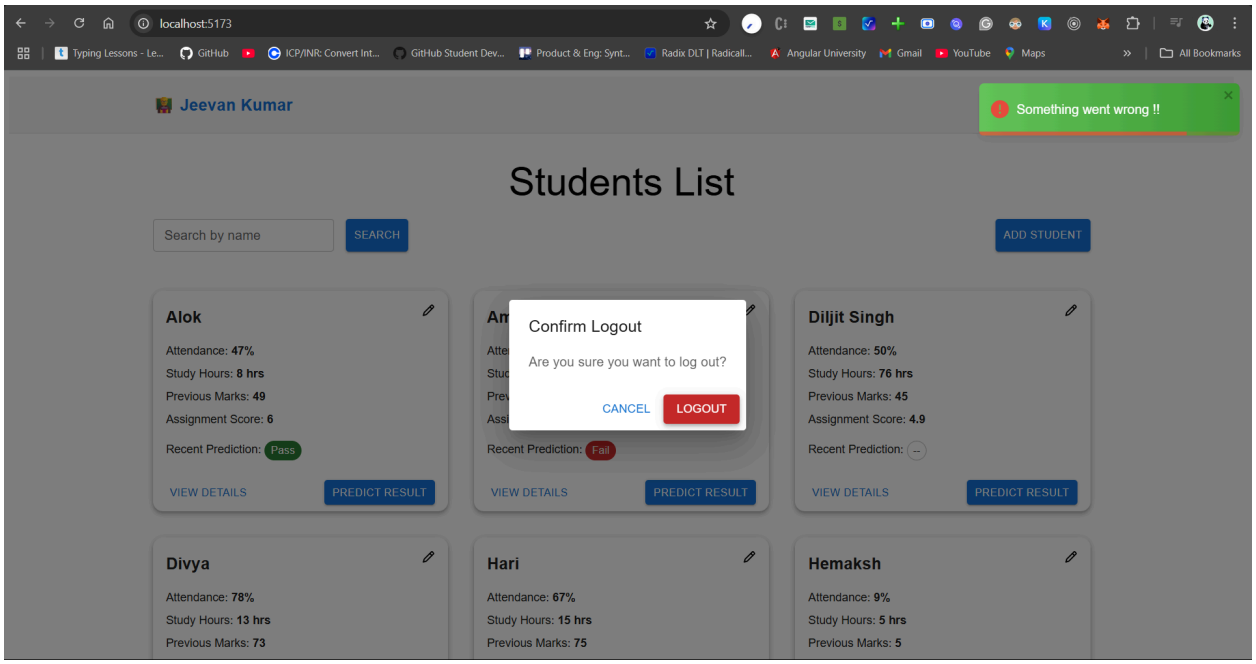

localhost:5173/students/edit/6837f2f043236a70780cc0c3
Typing Lessons - Le...
GitHub
ICP/INR: Convert Int...
GitHub Student Dev...
Product & Eng: Synt...
Radix DLT | Radicall...
Angular University
Gmail
YouTube
Maps
All Bookmarks
Jeevan Kumar
Log out
Edit Student
Name
Aman
Attendance (%)
4
Study Hours
1
Previous Marks
8
Assignment Score
4
UPDATING STUDENT...

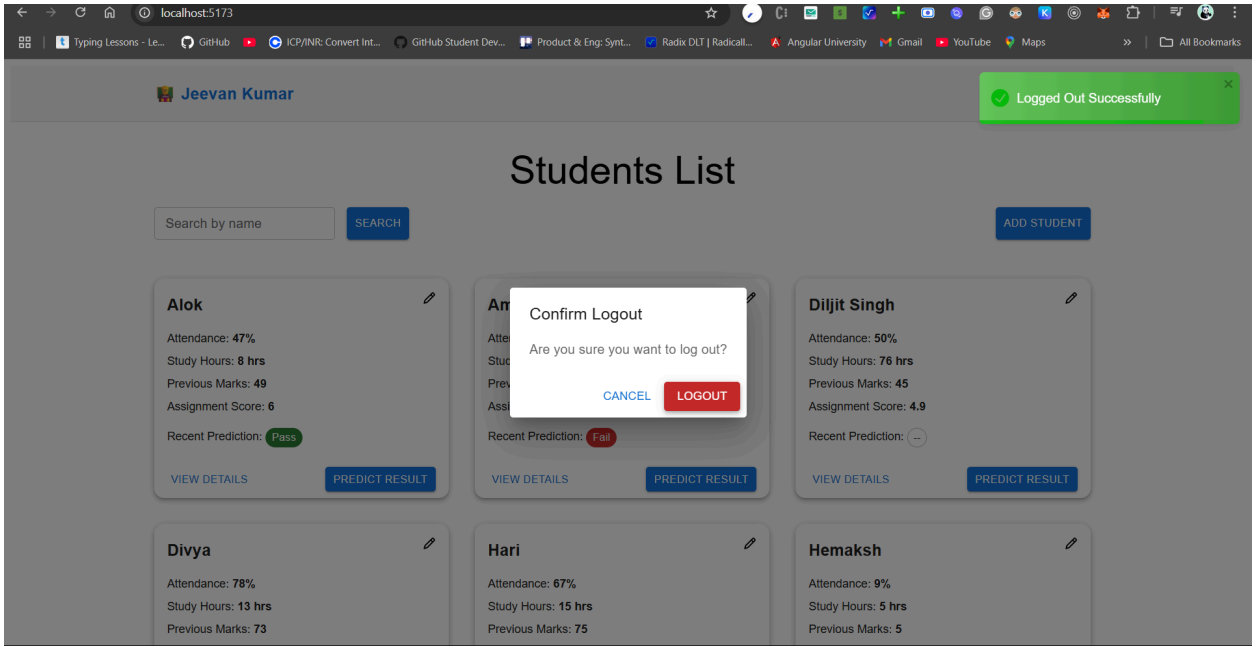

localhost:5173/students/edit/6837f2f043236a70780cc0c3
Typing Lessons - Le...
GitHub
ICP/INR: Convert Int...
GitHub Student Dev...
Product & Eng: Synt...
Radix DLT | Radicall...
Angular University
Gmail
YouTube
Maps
All Bookmarks
Jeevan Kumar
Update failed
Edit Student
Name
Aman
Attendance (%)
4
Study Hours
1
Previous Marks
8
Assignment Score
4
UPDATE STUDENT


localhost:5173/students/edit/6837f2f043236a70780cc0c3
Typing Lessons - Le...
GitHub
ICP/INR: Convert Int...
GitHub Student Dev...
Product & Eng: Synt...
Radix DLT | Radicall...
Angular University
Gmail
YouTube
Maps
All Bookmarks
Jeevan Kumar
Student updated successfully
Edit Student
Name
Aman
Attendance (%)
4
Study Hours
1
Previous Marks
8
Assignment Score
4
UPDATE STUDENT

# Logout View -


localhost:5173/students/6837f2f043236a70780cc0c3
Jeevan Kumar
Log out
Student Details
Name: Aman
Attendance: 4%
Study Hours: 1 hrs
Previous Marks: 8
Assignment Score: 4
Confirm Logout
Are you sure you want to log out?
CANCEL
LOGOUT
EDIT DETAILS
PREDICT RESULT
Prediction History
Date
Attendance
Assignment Score
Predicted Result
5/29/2025, 1:31:34 PM 4% 1 8 4 Fail
5/29/2025, 12:57:58 PM 4% 1 8 4 Fail
5/29/2025, 12:45:38 PM 4% 1 8 4 Fail
5/29/2025, 11:14:35 AM 4% 1 8 4 Fail
5/29/2025, 11:14:24 AM 4% 12 8 4 Pass
5/29/2025, 11:14:09 AM 4% 12 8 7.2 Pass
5/29/2025, 11:13:57 AM 4% 12 68 7.2 Pass
5/29/2025, 11:13:32 AM 80% 12 68 7.2 Pass


localhost:5173
Jeevan Kumar
Something went wrong !!
Students List
Search by name
SEARCH
ADD STUDENT
Alok
Attendance: 47%
Study Hours: 8 hrs
Previous Marks: 49
Assignment Score: 6
Recent Prediction: Pass
VIEW DETAILS
PREDICT RESULT
Confirm Logout
Are you sure you want to log out?
CANCEL
LOGOUT
Recent Prediction: Fail
Diljit Singh
Attendance: 50%
Study Hours: 76 hrs
Previous Marks: 45
Assignment Score: 4.9
Recent Prediction: --
Divya
Attendance: 78%
Study Hours: 13 hrs
Previous Marks: 73
Hari
Attendance: 67%
Study Hours: 15 hrs
Previous Marks: 75
Hemaksh
Attendance: 9%
Study Hours: 5 hrs
Previous Marks: 5




# Coding & Implementation

The application consists of:

- User auth (Teacher)
- Student management system (CRUD)
- Python ML microservice trained on a synthetic dataset of 1000 students
- A React interface to collect data and show a prediction

**SOURCE CODE & PPT —**
**https://github.com/jeevan42/Sudent-performance-predictor**

Prediction uses logistic regression on attendance, study hours, previous marks, and assignment score.

# Testing

- Accuracy: Achieved ~85% accuracy using real and synthetic data
- Integration Testing between frontend/backend and Python ML
- Validations and error handling for edge cases (missing fields, invalid input)

# Application

This system can be used by:

- Teachers to predict outcomes before exams
- Institutions to identify students needing support
- EdTech platforms for personalized learning insights

# Conclusion

This project showcases a sophisticated real-world application of machine learning technology specifically tailored for the education sector. Designed with scalability in mind, the system is built to handle increasing volumes of data and users seamlessly, making it suitable for institutions of various sizes, from small schools to large universities. Its practical implementation ensures that it addresses genuine educational challenges, providing actionable insights that educators and administrators can rely on.

The user-friendly interface and intuitive design make it accessible to users with varying degrees of technical expertise, facilitating smooth adoption without requiring extensive training. By leveraging intelligent algorithms, this system enhances decision-making processes related to student performance, curriculum development, and resource allocation. Ultimately, it aims to improve overall learning outcomes, helping educators identify areas where students may need additional support and enabling personalized learning experiences.

In essence, this intelligent educational system is a powerful tool that not only supports academic stakeholders in making informed decisions but also contributes meaningfully to the evolution of modern educational practices by integrating cutting-edge machine learning techniques.

# Bibliography(APA Style)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- Node.js Docs. https://nodejs.org/
- React Docs. https://reactjs.org/
- MongoDB Docs. https://www.mongodb.com/


***END OF REPORT***