

**Major Project
(23ONMCR-753)
of the programme**

Master of Computer Applications

Batch - January 2024

Fourth Semester

**CENTRE FOR DISTANCE & ONLINE EDUCATION
CHANDIGARH UNIVERSITY**

Submitted By: **Deepak kumar**

Enrollment No: **O24MCA160426**

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)

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Title

STUDENT PERFORMANCE Analyzer 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: **Deepak kumar**
Enrollment No: **O24MCA160426**

Centre for Distance and Online Education
Chandigarh University
December 2025

Certificate

This is to certify that the project entitled “**Student Performance Predictor using Machine Learning**” is a bona fide work carried out by **Deepak kumar**(Enrollment No: **O24MCA160426**) 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 Analyzer 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:

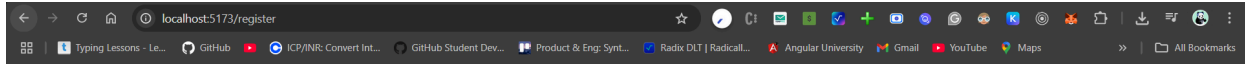
- Requirement Analysis
- System Design
- Implementation
- Testing
- Deployment
- Maintenance

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

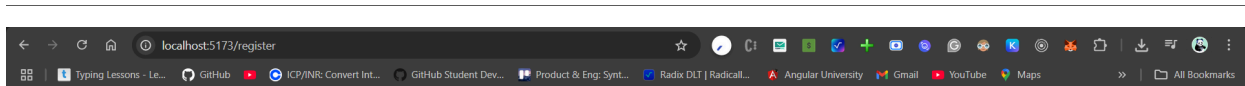
Registration View-



Teacher Register

REGISTER

Already have an account [Log in here.](#)



Teacher Register

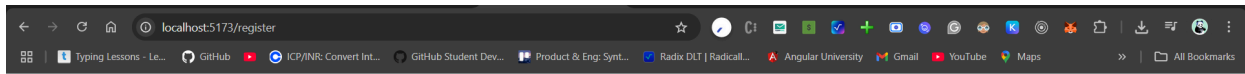
name is required

Email is required

Password is required

REGISTER

Already have an account [Log in here.](#)



Teacher Register

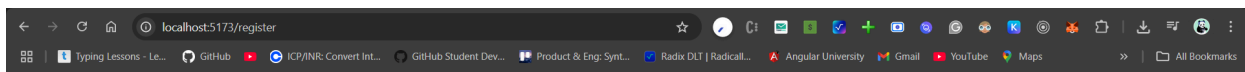
name
Girish

Email
girish.example.com
Invalid email format

Password
Password is required

REGISTER

Already have an account? [Log in here.](#)



Teacher Register

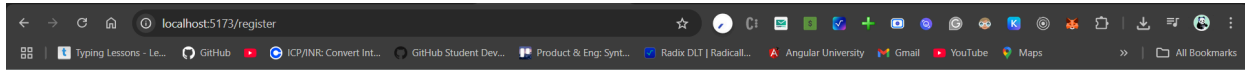
name
Girish

Email
girish@example.com

Password
.....
Password must be at least 6 characters

REGISTER

Already have an account? [Log in here.](#)



Teacher Register

name

Girish

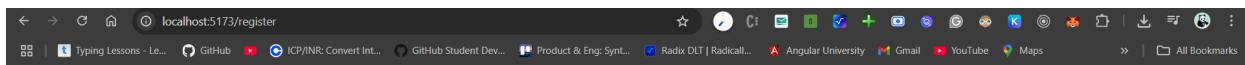
Email

girish@example.com

Password

SUBMITTING...

Already have an account [Log in](#) here.



Teacher Register

name

Girish

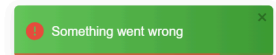
Email

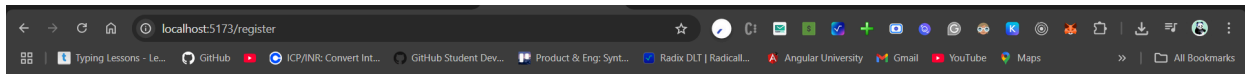
girish@example.com

Password

REGISTER

Already have an account [Log in](#) here.





Teacher Register

✓ Registration done successfully ✕

name

Girish

Email

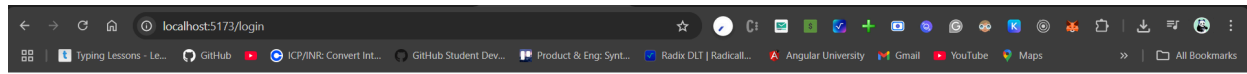
girish@example.com

Password

REGISTER

Already have an account [Log in](#) here.

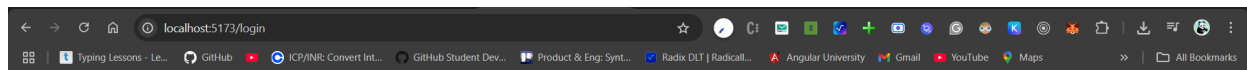
Login View-



Teacher Login

LOGIN

[Teacher registration](#)



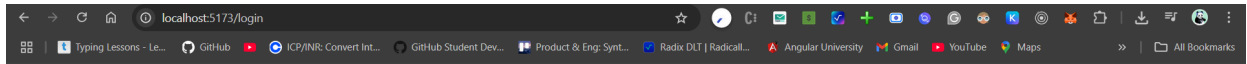
Teacher Login

Email is required

Password is required

LOGIN

[Teacher registration](#)



Teacher Login

Email
invalid.example.com5

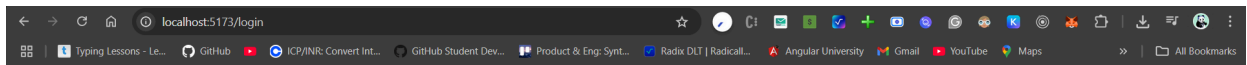
Invalid email format

Password

Password is required

LOGIN

[Teacher registration](#)



Teacher Login

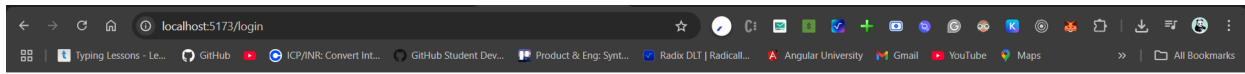
Email
girish@example.com

Password
.....

LOGIN

[Teacher registration](#)

Invalid credentials



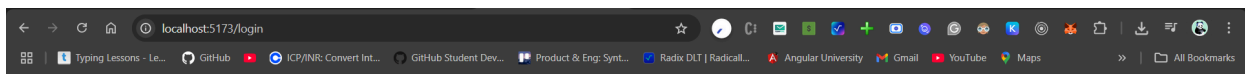
Teacher Login

Email

Password

SUBMITTING...

[Teacher registration](#)



Teacher Login

Email

Password

LOGIN

[Teacher registration](#)

Something went wrong

Teacher Login

Email
girish@example.com

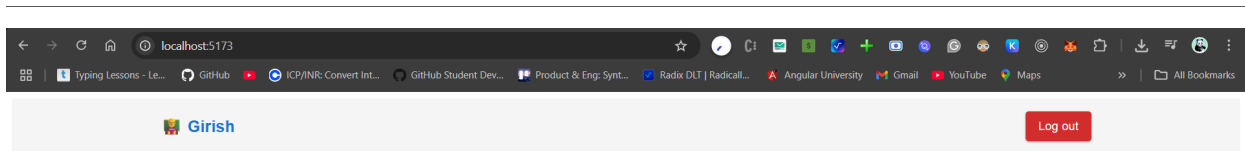
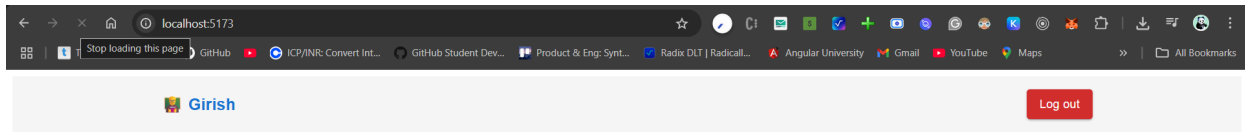
Password

LOGIN

[Teacher registration](#)

✓ Logged in successfully

Home / Students List View -



Girish

An error occurred while fetching students list

Students List

Search by name

SEARCH

ADD STUDENT

No data available.

An error occurred while fetching students list

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

Karan

Attendance: 85%
Study Hours: 20 hrs
Previous Marks: 90
Assignment Score: 9.3
Recent Prediction: ⊖

VIEW DETAILS

PREDICT RESULT

< 1 2 3 >

localhost:5173

Typing Lessons - Le...GitHubICP/INR: Convert Int...GitHub Student Dev...Product & Eng: Synt...Radix DLT | Radicall...Angular UniversityGmailYouTubeMapsAll Bookmarks

Jeevan KumarLog out

Students List

Search by nameSEARCH

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

Previous Marks: 50

Assignment Score: 5.8

Recent Prediction: Fail

VIEW DETAILS

PREDICT RESULT

Ravi Kumar

Attendance: 75%

Study Hours: 4 hrs

Previous Marks: 60

Assignment Score: 85

Recent Prediction: Pass

VIEW DETAILS

PREDICT RESULT

Rohit

Attendance: 56%

Study Hours: 9 hrs

Previous Marks: 52

Assignment Score: 6.4

Recent Prediction: Fail

VIEW DETAILS

PREDICT RESULT

Sneha

Attendance: 70%

Study Hours: 14 hrs

Previous Marks: 76

Assignment Score: 8

Recent Prediction: Fail

VIEW DETAILS

PREDICT RESULT

Suresh

Attendance: 66%

Study Hours: 10 hrs

Previous Marks: 65

Assignment Score: 7.4

Recent Prediction: Fail

VIEW DETAILS

PREDICT RESULT

<123>

localhost:5173

Typing Lessons - Le...GitHubICP/INR: Convert Int...GitHub Student Dev...Product & Eng: Synt...Radix DLT | Radicall...Angular UniversityGmailYouTubeMapsAll Bookmarks

Jeevan KumarLog out

Students List

Search by nameSEARCH

ADD STUDENT

Alok

Attendance: 47%

Study Hours: 8 hrs

Previous Marks: 49

Assignment Score: 6

Recent Prediction: Pass

VIEW DETAILS

PREDICT RESULT

Komal

Attendance: 53%

Study Hours: 21 hrs

Previous Marks: 89

Assignment Score: 9.6

Recent Prediction: Fail

VIEW DETAILS

PREDICT RESULT

<1>

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

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

PREDICTING...

Hari

Attendance: 67%

Study Hours: 15 hrs

Previous Marks: 75

Assignment Score: 8.5

Recent Prediction: Pass

Hemaksh

Attendance: 9%

Study Hours: 5 hrs

Previous Marks: 5

Assignment Score: 7

Recent Prediction: Fail

Karan

Attendance: 85%

Study Hours: 20 hrs

Previous Marks: 90

Assignment Score: 9.3

Recent Prediction: --

localhost:5173

Typing Lessons - Le...GitHubICP/INR: Convert Int...GitHub Student Dev...Product & Eng: Synt...Radix DLT | Radicall...Angular UniversityGmailYouTubeMapsAll Bookmarks

Jeevan Kumar

An error occurred while predicting the result

Students List

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

VIEW DETAILS

PREDICT RESULT

Hemaksh

Attendance: 9%
Study Hours: 5 hrs
Previous Marks: 5

VIEW DETAILS

PREDICT RESULT

Karan

Attendance: 85%
Study Hours: 20 hrs
Previous Marks: 90

VIEW DETAILS

PREDICT RESULT

Jeevan Kumar

Prediction done successfully. → Aman: Fail

Students List

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

Jeevan Kumar

Prediction done successfully. → Divya: Pass

Students List

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 -

 Jeevan Kumar

Log out

Student Details

Name: Divya

Attendance: 78%

Study Hours: 13 hrs

Previous Marks: 73


Assignment Score: 7.9

EDIT DETAILS

PREDICT RESULT

Prediction History

Date	Attendance	Study Hours	Previous Marks	Assignment Score	Predicted Result
5/29/2025, 12:44:25 PM	78%	13	73	7.9	Pass
5/29/2025, 12:43:11 PM	78%	13	73	7.9	Pass

 Jeevan Kumar

Log out

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
No Prediction History					

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

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...GitHubICP/INR: Convert Int...GitHub Student Dev...Product & Eng: Synt...Radix DLT | Radica...Angular UniversityGmailYouTubeMapsAll 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...GitHubICP/INR: Convert Int...GitHub Student Dev...Product & Eng: Synt...Radix DLT | Radica...Angular UniversityGmailYouTubeMapsAll Bookmarks

Jeevan Kumar

Prediction done successfully. → Karan: Pass

Student Details

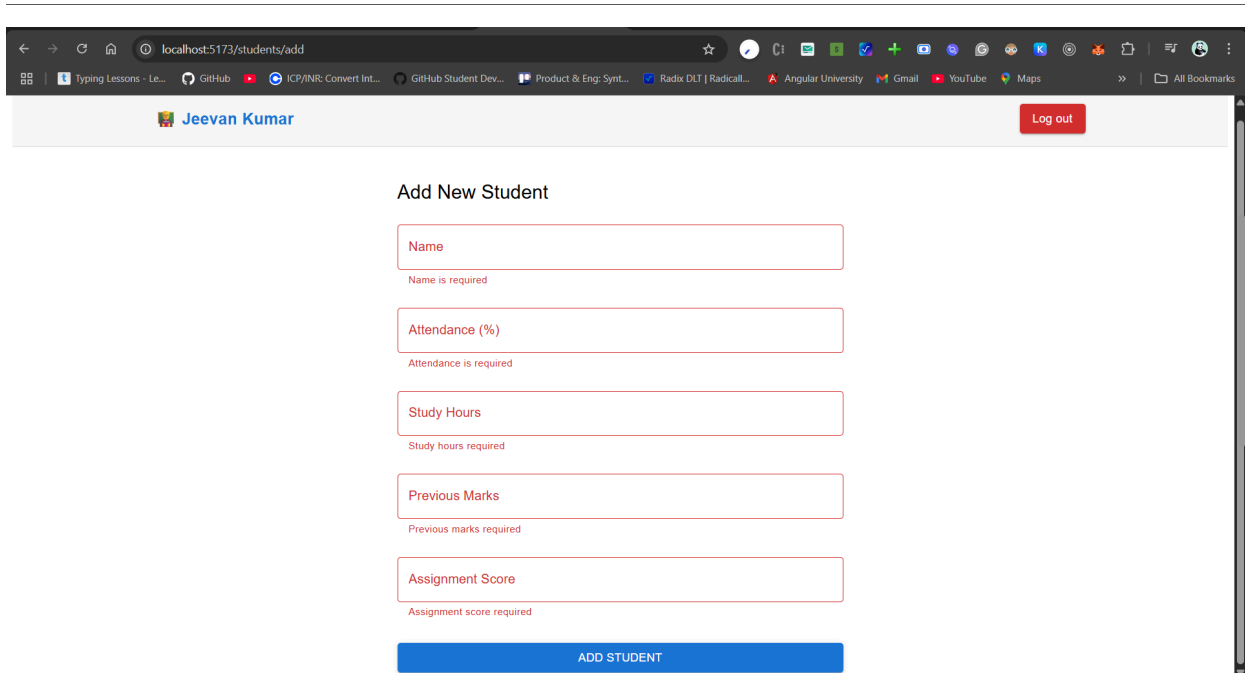
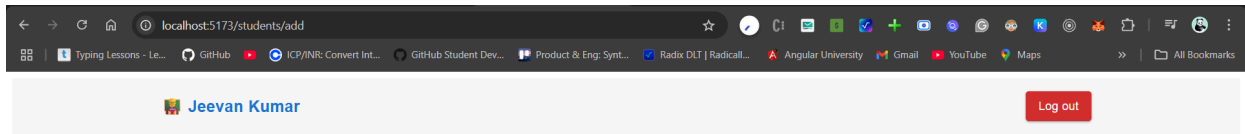
Name: Karan
Attendance: 85%
Study Hours: 20 hrs
Previous Marks: 90
Assignment Score: 9.3

[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 -



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

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

Add New Student

Name
Rupinder Singh

Attendance (%)
15

Study Hours
2

Previous Marks
14

Assignment Score
2.6

ADDING STUDENT...

Add New Student

Name
Ronny singh

Attendance (%)
78

Study Hours
1

Previous Marks
46

Assignment Score
1.5

ADD STUDENT

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...GitHubICP/INR: Convert Int...GitHub Student Dev...Product & Eng: Synt...Radix DLT | Radicall...Angular UniversityGmailYouTubeMapsAll Bookmarks

Jeevan KumarLog out

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...GitHubICP/INR: Convert Int...GitHub Student Dev...Product & Eng: Synt...Radix DLT | Radicall...Angular UniversityGmailYouTubeMapsAll Bookmarks

Jeevan KumarLog out

Edit Student

Name

Aman

Attendance (%)

455

attendance must be less than or equal to 100

Study Hours

15

Previous Marks

81515

previousMarks must be less than or equal to 100

Assignment Score

41

assignmentScore must be less than or equal to 10

UPDATE STUDENT

[Edit Student](#)

Name	Aman
Attendance (%)	4
Study Hours	1
Previous Marks	8
Assignment Score	4

[Edit Student](#)

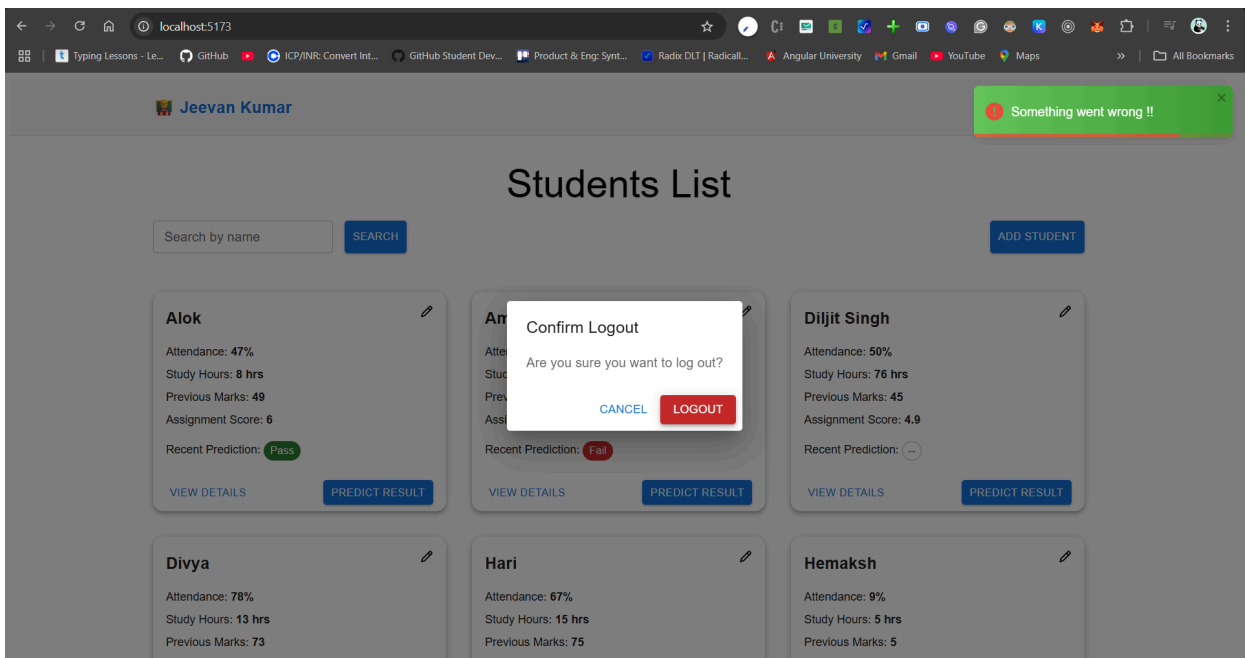
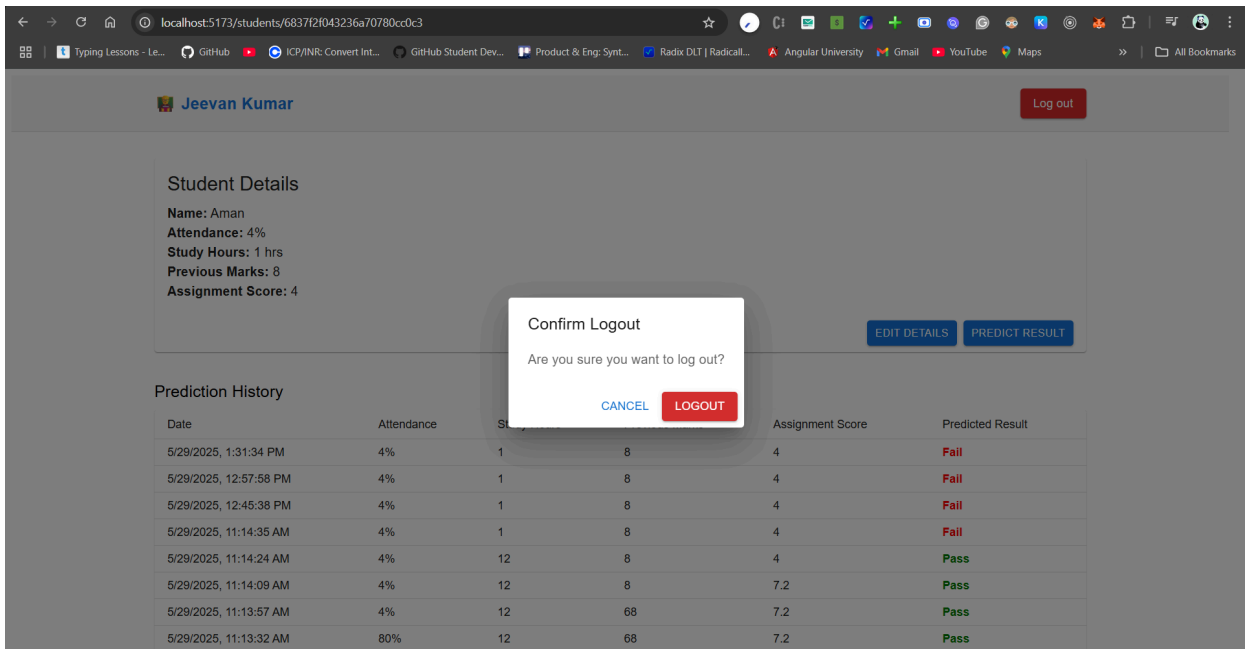
Name	Aman
Attendance (%)	4
Study Hours	1
Previous Marks	8
Assignment Score	4

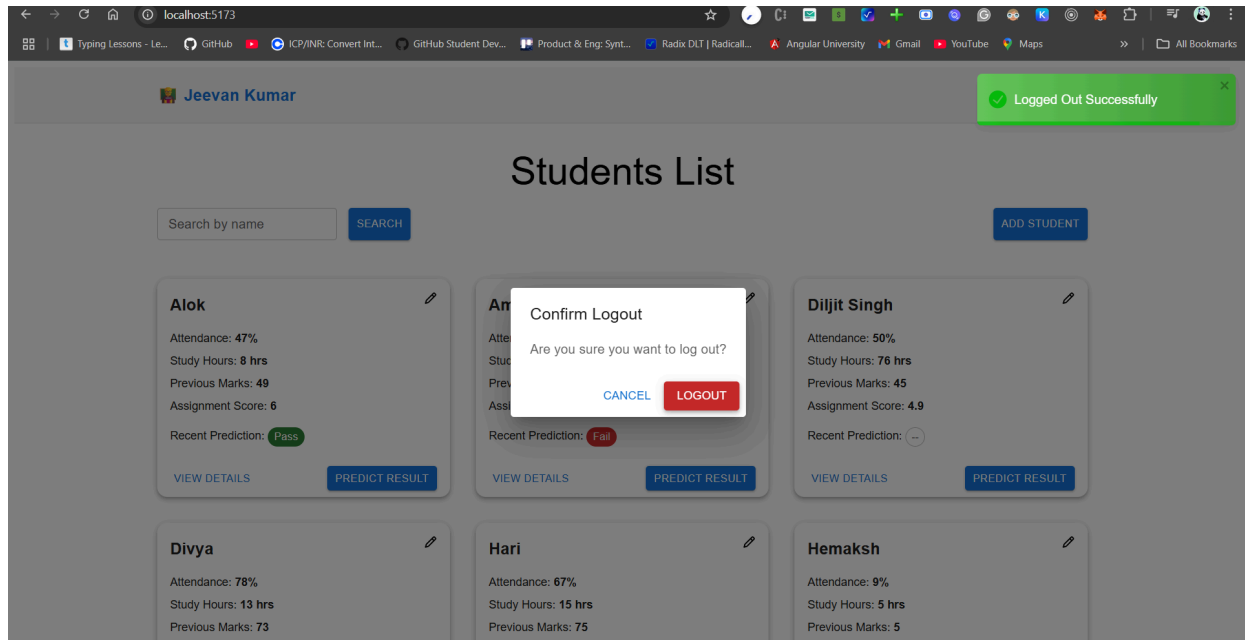
Edit Student

Name	<input type="text" value="Aman"/>
Attendance (%)	<input type="text" value="4"/>
Study Hours	<input type="text" value="1"/>
Previous Marks	<input type="text" value="8"/>
Assignment Score	<input type="text" value="4"/>

UPDATE STUDENT

Logout View -





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/Deepakkarn56/Student-Performance-Analyzer>

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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