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Smart Attendance System Using Face-Recognition

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Abstract: ***Every Teacher know how tough it is to manage a class of 80 students. But the teacher's manage the class also . But one thing that is even harder than managing the class of 80 students is to take attendance of that 80 students and maintain register . There are several ways to mark your attendance ,the most common way is to call out the name/Roll no. of the students. There are several drawbacks of this Manual System . One of them is It took longer and it is problematic. Hence people are thinking on switching on Automatic attendance System . From now on , a computer based student attendance checking system is required that supports faculty to keep records of students. Such system are already implemented in Country like China.***
In my face recognition project, a computer system will be able to find and recognize human faces fast and precisely in images or videos that are being captured through a surveillance camera. Numerous algorithms and techniques have been developed for improving the performance of face recognition but the concept to be implemented here is HOG(Histogram of Oriented Gradients). First we have to store a image and finds it encoding ,then after that once the video/image is send to script it will detect faces and reflect it into database.
Keywords: Open-CV, face recognition ,HOG(Histogram of Oriented Gradients).

I. INTRODUCTION

A. Introduction To Project

In a classroom , taking attendance is one of the hectic and time consuming things to do for a lecturer ,especially in a classroom of 60-70 students .The lecturers have to mark the attendance in register by calling out name and it is hard to compute and analyze the data .These methods are more prone to false attendance or proxy. This is called as Manual Attendance System(MAS). There are several ways to mark your attendance ,the most common way is to call out the name/Roll no. of the students. It took longer and it is problematic. From now on , a computer based student attendance checking system is required that supports faculty to keep records of students. For Solution to this problem many people came out with various Automated Attendance System (AAS). Some of the Solutions are Scanning ID cards, using fingerprint sensors and face recognition systems. Each has its own pros and cons.
Even though fingerprint is considered the best biometric method but it is more time Consuming than the manual method.
So the best possible solution was Face-Recognition System. Face-Recognition System is a process to automatically estimate the presence or the absence of the student in the classroom by using face recognition technology. It is also possible to recognize whether the student is sleeping or awake during the lecture and it can also be implemented in the exam sessions to ensure the presence of the student. The presence of the students can be determined by capturing their faces on to a high definition monitor video streaming service, so it becomes highly reliable for the machine to understand the presence of all the students in the classroom

Fig1.1.

B. Problem Statement

"SMART ATTENDANCE SYSTEM USING FACE RECOGNITION"

C. Objective

1) Automatic Attendance

2) Time: Time required for Manual Attendance is more , so our objective is to reduce time of taking attendance so that more time would be used for teaching the students

3) Database: Teacher do not have to maintain the register for marking attendance.

4) Parents will be Notified by Students Attendance.

5) Student can track his/her Attendance very easily.

D. Motivation

It is quite hectic to manage students while teaching . And if the class is of 70-80 students then It is impossible to handle such class. Similarly it is not easy to maintain record of every student in the register . Sometimes teacher get tired and they don't take attendance. That is not their fault but cause of such load it is not possible for every teacher to be relaxed and manage the entire class. Sometimes ,Students forget to give the Attendance ,while the teacher is taking the attendance . That is also not their fault cause all the students are busy talking to each other after a long period . So to overcome this problem of managing the register and taking attendance , we have decided to make the Smart Attendance System using Face Recognition. It will Save time as well as effort of the teacher.

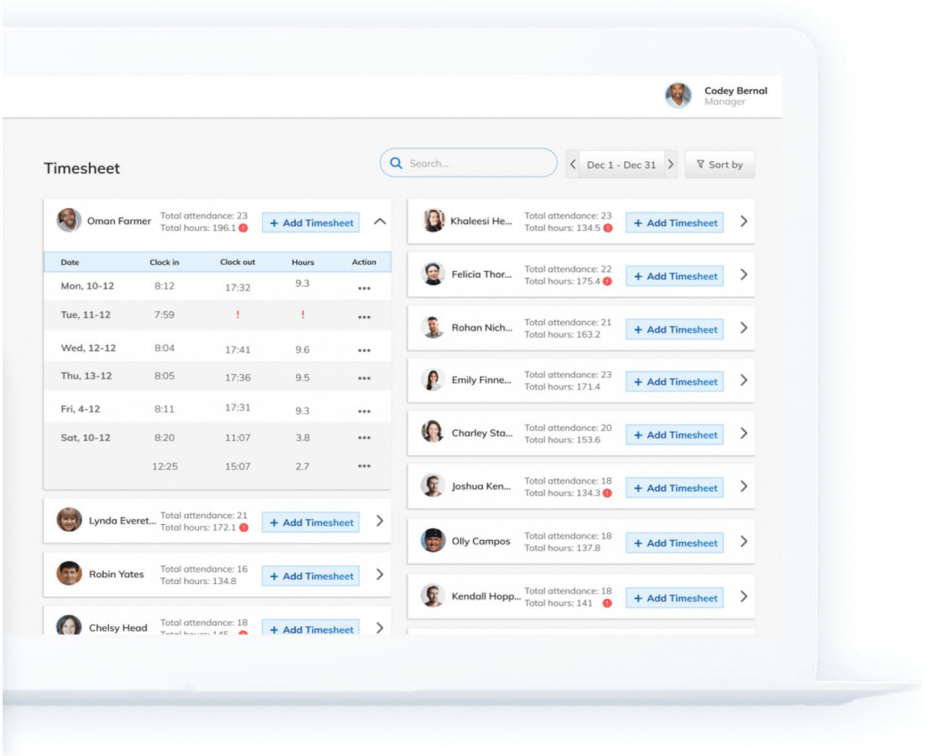


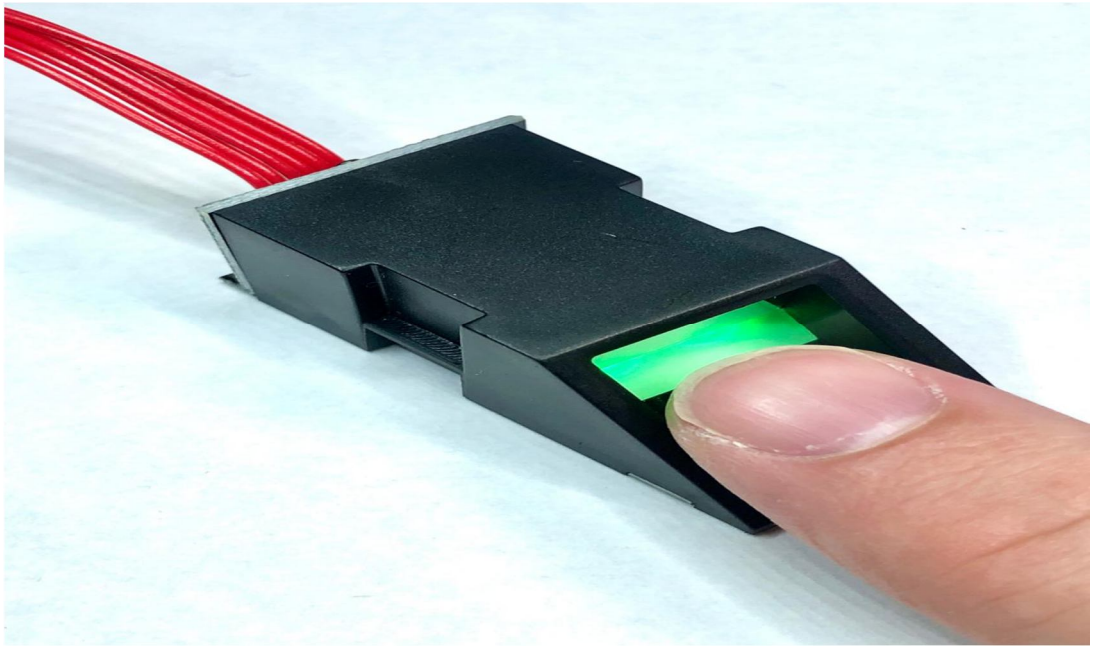
Fig1.2:

II. BACKGROUND

A. Existing Technologies

1) Fingerprint Based recognition system:

In the Fingerprint based existing attendance system, a portable fingerprint device need to be configured with the students fingerprint earlier. Later either during the lecture hours or before, the student needs to record the fingerprint on the configured device to ensure their attendance for the day. The problem with this approach is that during the lecture time it may distract the attention of the students. The second disadvantage is that it is more expensive.



2) RFID(Radio Frequency Identification) Based Recognition System:

In the RFID based existing system, the student needs to carry a Radio Frequency Identity Card with them and place the ID on the card reader to record their presence for the day. The system is capable of to connect to RS232 and record the attendance to the saved database. There are possibilities for the fraudulent access may occur. Some are students may make use of other students ID to ensure their presence when the particular student is absent or they even try to misuse it sometimes.

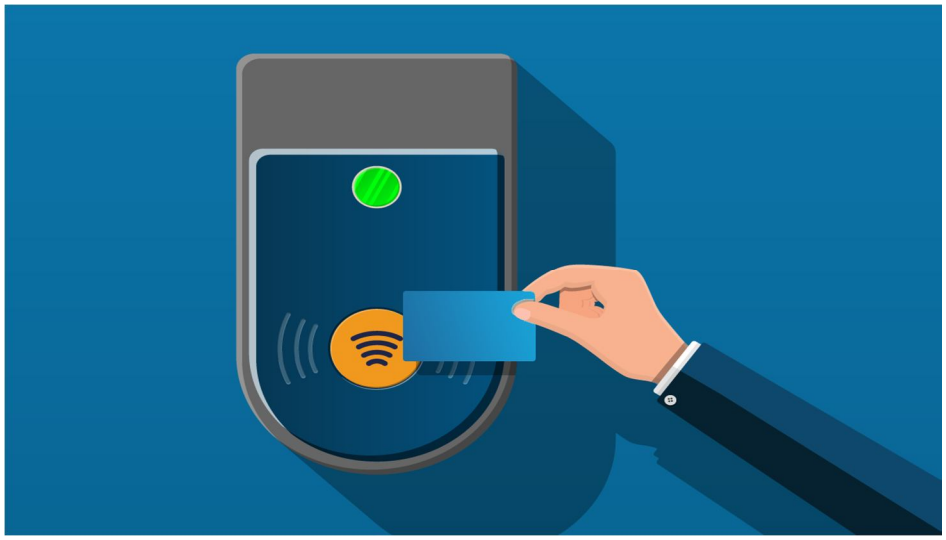


Fig2.2 Basic architecture model of RFID system

3) Iris Based Recognition System

In the Iris based student attendance system, the student needs to stand in front of a camera, so that the camera will scan the Iris of the student. The scanned iris is matched with data of student stored in the database and the attendance on their presence needs be updated. This reduces the paper and pen workload of the faculty member of the institute. This also reduces the chances of proxies in the class, and helps in maintaining the student records safe. It is a wireless biometric technique that solves the problem of spurious attendance and the trouble of laying the corresponding network

Fig2.3 Basic architecture model of Iris system

4) Face Based Recognition System

Some technique uses face-recognition attendance , by taking attendance during entrance of the student in the class. It is a good method and It uses CNN algorithm for face-recognition . It is the best algorithm for taking attendance in the short distance. But it is time consuming . And in college the student have to give attendance during each lecture which will be not a good method and it will waste a lot of time . It is also expensive to built as it will require RasBerryPie for storing the data.

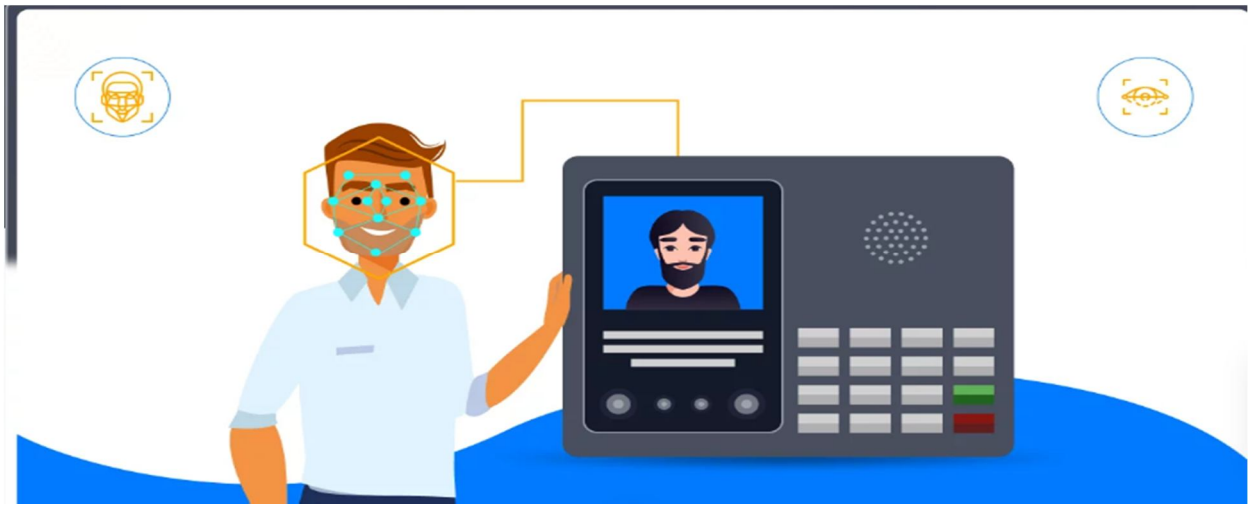


Fig2.4 Basic architecture model of Face-recognition using raspberry Pie system

B. Overview of System

1) Methodology

Methodology which we are going to use while developing this is:

Q] What is HOG?

The histogram of oriented gradients (HOG) is a feature descriptor used in computer vision and image processing for the purpose of face/object detection. The technique counts occurrences of gradient orientation in localized portions of an image. This method is similar to that of edge orientation histograms, scale-invariant feature transform descriptors, and shape contexts, but differs in that it is computed on a dense grid of uniformly spaced cells and uses overlapping local contrast normalization for improved accuracy.

Robert K. McConnell of Wayland Research Inc. first described the concepts behind HOG without using the term HOG in a patent application in 1986. In 1994 the concepts were used by Mitsubishi Electric Research Laboratories.

However, usage only became widespread in 2005 when Navneet Dalal and Bill Triggs, researchers for the French National Institute for Research in Computer Science and Automation (INRIA), presented their supplementary work on HOG descriptors at the Conference on Computer Vision and Pattern Recognition (CVPR). In this work they focused on pedestrian detection in static images, although since then they expanded their tests to include human detection in videos, as well as to a variety of common animals and vehicles in static imagery

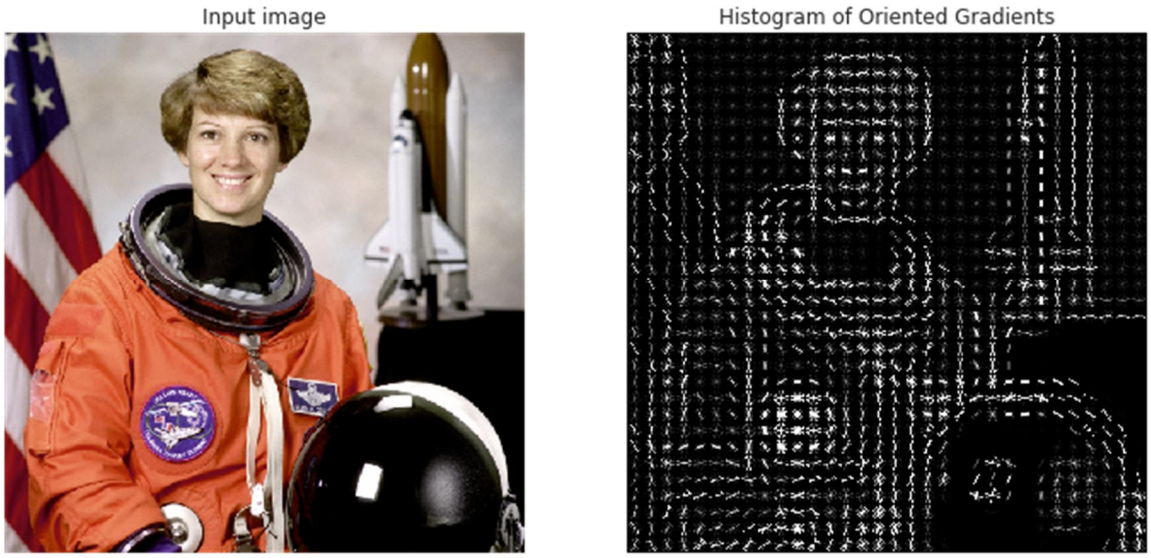


Fig2.5 Basic architecture model of HOG

III. RELATEDWORK

A. Literature Survey

Review Of Literature Survey

Table3.1: Reviewof Literature Survey

Sr. No	Name of The Papers	Authors	Standards	Techniques	Limitations
1.	Face Recognition based Smart Attendance System	Arjun Raj ,Mohammed Shoheb, Arvind K, Chetan K S	IEEE	In this approach it uses LBPH algorithm with Rasberry Pie for Face Recognition	External Device Needed Like Rasberry Pie Which Is Expensive
2.	Face Recognition Based Attendance System using Python	Divya Pande, Kusum Sharma, Priyanka Pitale	IEEE	In this Approach it uses Deep Learning Algorithm (CNN)	CNN is difficult for actual implementation .
3	Design of an E-Attendance Checker through Facial Recognition using Histogram of Oriented Gradients with Support Vector Machine	Allan Jason C. Arceo, Renee Ylka N. Borejon, Mia Chantal R. Hortinela, Alejandro H. Ballado Jr., Arnold C. Paglinawan	IEEE	In this paper, a design of an e-attendance checker was established using HOG and SVM algorithms for face detection and face recognition, respectively.	

4.	Attendance system based on Dynamic Face Recognition	Shizen Huang, Haoman Luo	IEEE	The system supports multi-user attendance and face-liveness detection at the same time . The face detection part of the system is based on (MTCNN) algorithm and the face recognition part is based on FaceNet Algorithm	Cause we have to write 2 algorithm ,1 for face detection and other for face-recognition ,The system automatically gets heavy . It is also very time consuming.
5	Face Recognition using HOG	Adam Geitgey	(medium.com)	In this article, it uses HOG algorithm for face detection on live video. This paper explain us clearly how the HOG algorithm works.	It doesn't keep the record of attendance .
6	A Motion Detection System in Python and Opencv Year(2021)	Suraiya Parveen, Javeria Shah	IEEE	. This paper suggests a motion detection software system that enables us to see the movement around an object or a visual area	This paper explains us how the OpenCv library of python works . But motion detection part is not related to our project.

IV. RESEARCH APPROACH

A. Introduction to System Engineering

Our, system architecture is divided into 2 phases:

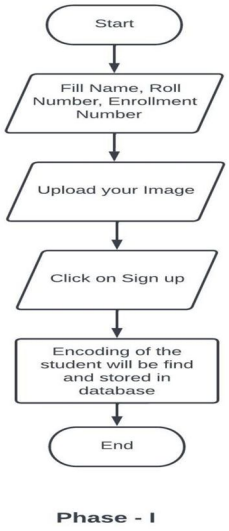


Fig4.1 Phase 1 of our architecture

1) Phase 1

Basically the Phase 1 includes the Student side work, 1st the student face have to be registered through our website. Then the registered face will under the process of encoding.
There encoding will be done of each and every face that have been received from the user.
The encodings will be then saved in the database with the respective name registered by the student.
Here the Phase 1 comes to end.
Now the rest of the part is done in Phase 2.

2) Phase 2

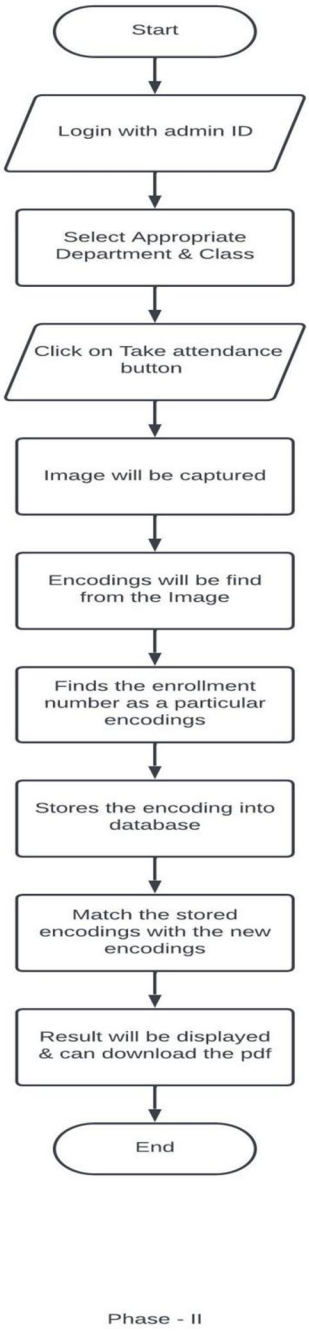


Fig4.2 Phase 2 of our Architecture

3) Phase 2

The phase 2 will be started when actual attendance need to be taken.
1st Teacher have to click on Take attendance button which will be there on our webapp. Further the image of the entire class will be captured.
Then the face's will be determined from the Captured Image.
Encoding will be found of the recognized face's and then the encoding will be matched from the encoding in the database .
The database will then return the registered name for the given encoding . And the attendance will be marked for that student.
The teacher can now download the PDF of the attendance.

B. System Requirements

Hardware Requirements	Software Requirements
Processor: Intel i3/i5/i7	Operating System: Windows
Speed: 1.1 GHz	Front End: HTML,CSS
RAM: 4 GB(min)	Scripts: JavaScript
Hard Disk: 40 GB	Database: PostgreSQL
Keyboard	IDE: VS Code
Mouse	FraeWork:Django
Monitor	

NON–FUNCTIONAL/FUNCTIONAL REQUIREMENTS:
Not needed till now (as the project is in developing phase).

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1) Planning And Scheduling

Table4.3: Planning and Scheduling

Sr.No	Task Name	Duration	Starting Date	Finish Date
1	Defining the Problem Statement	15days	10-09-2022	25-09-2022
2	Selection of Guide	5 days	13-09-2022	17-09-2022
3	Project Title Selection	7 days	16-09-2022	24-09-2022
4	Research of Block Diagram	14 days	27-09-2022	11-10-2022
5	Research on Literature Survey	6 days	11-10-2022	17-10-2022
6	Study Operation	30 days	17-10-202	17-11-2022
7	Survey Components	5 days	17-11-2022	21-11-2022
8	Preparing for presentation	3 days	19-11-2022	21-11-2022
9	Presentation day	1 day	22-11-2022	22-11-2022
10	Report Discussion	15 days	22-11-2022	06-12-2022
11	Report Making	3 days	07-11-2022	27-12-2022
12	Report Submission	1 day	31-12-2022	31-12-2022

2) Gantt Chart

Agenda		Duration in Weeks													
Sr. No	Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Selection of Guide														
2	Project Title Selection														
3	Study of the project objectives														
4	Research of Block Diagram														
5	Research on Literature Review														
6	Study Operation														
7	Survey Components														
8	Preparation for Presentation														
9	Day of Presentation														
10	Report Discussion														
11	Report Making														
12	Submit of Report														

Figure4.3: Ganttchart

V. SYSTEM MODELING

A. Class Diagram

Figure5.1: Class Diagram

B. Use Case Diagram

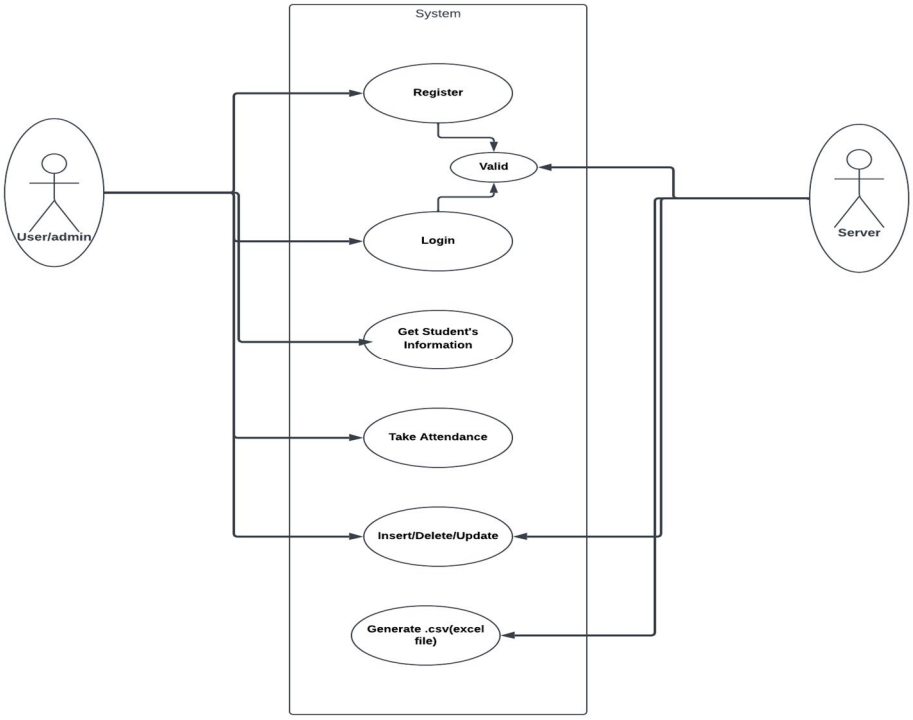
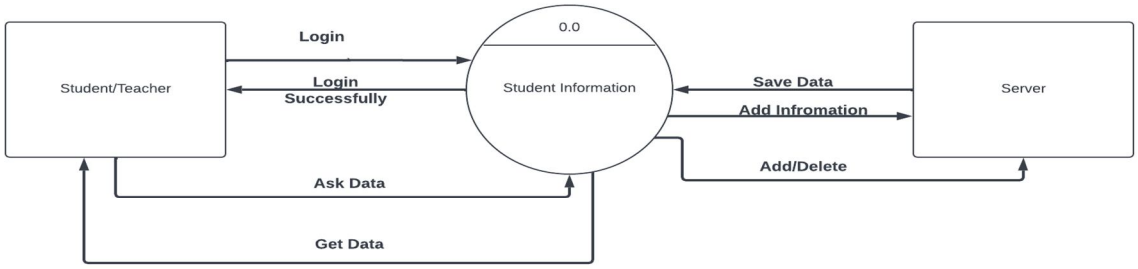


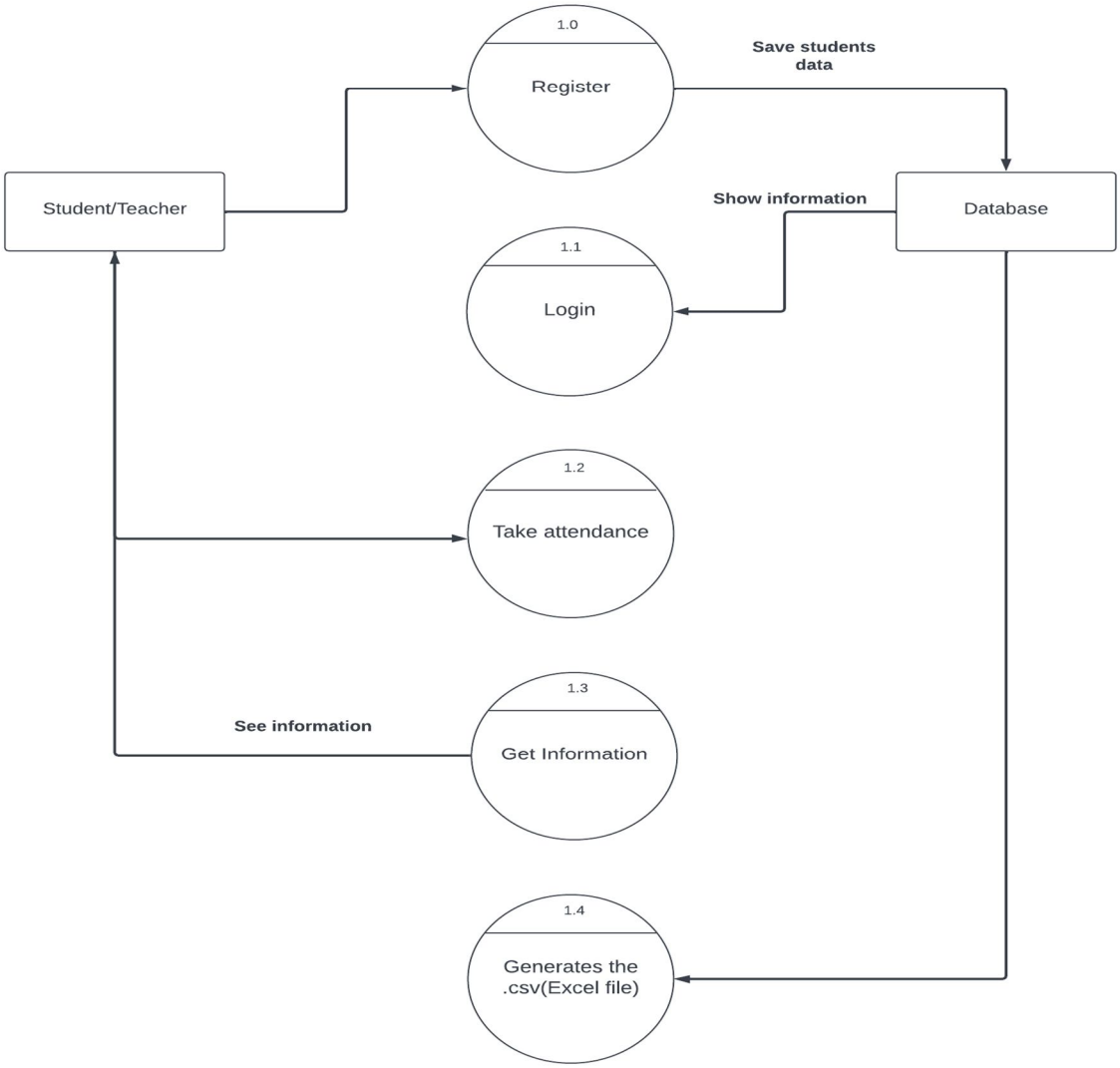
Figure5.2: Use Case Diagram

C. Activity Diagram

Level 0



Level 1

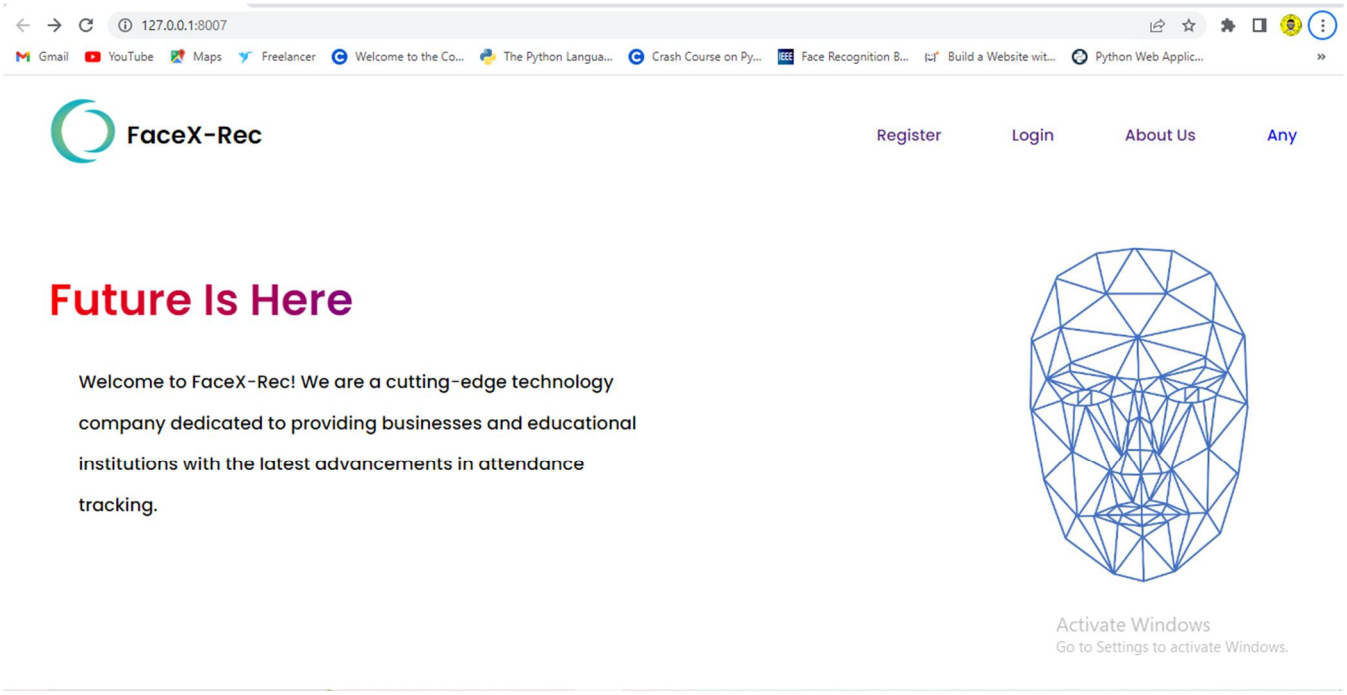


VI. RESULT

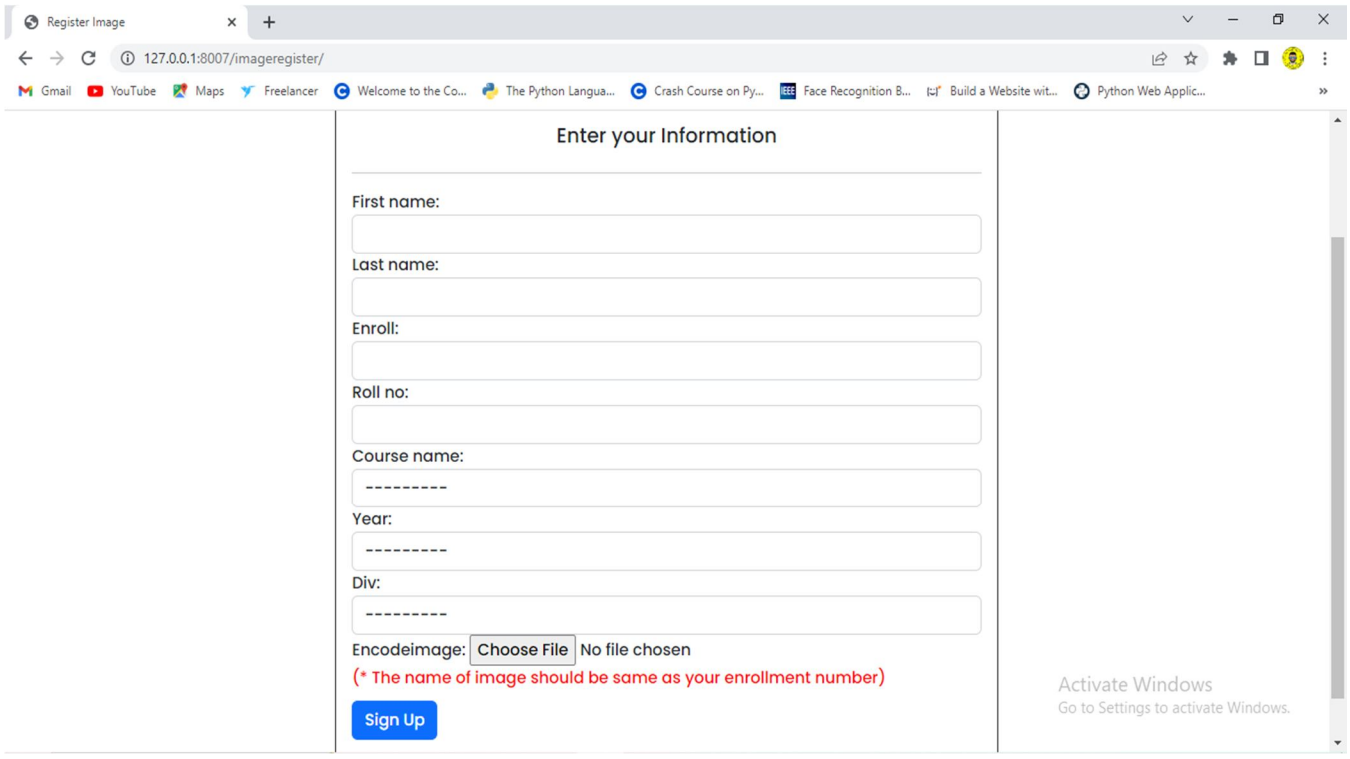
1) Phase 1: Student Register Their image.

The Name of the image should be same as the enrollment No:.

- *Step 1*

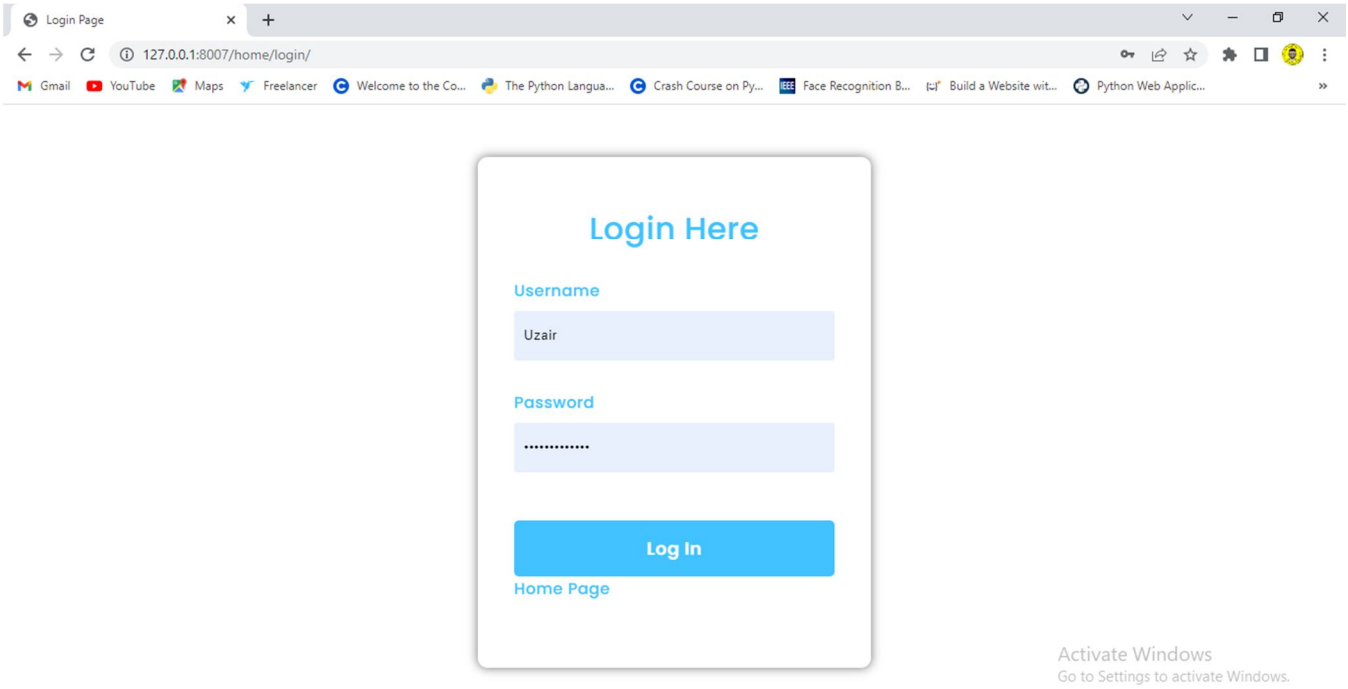


- *Step 2*

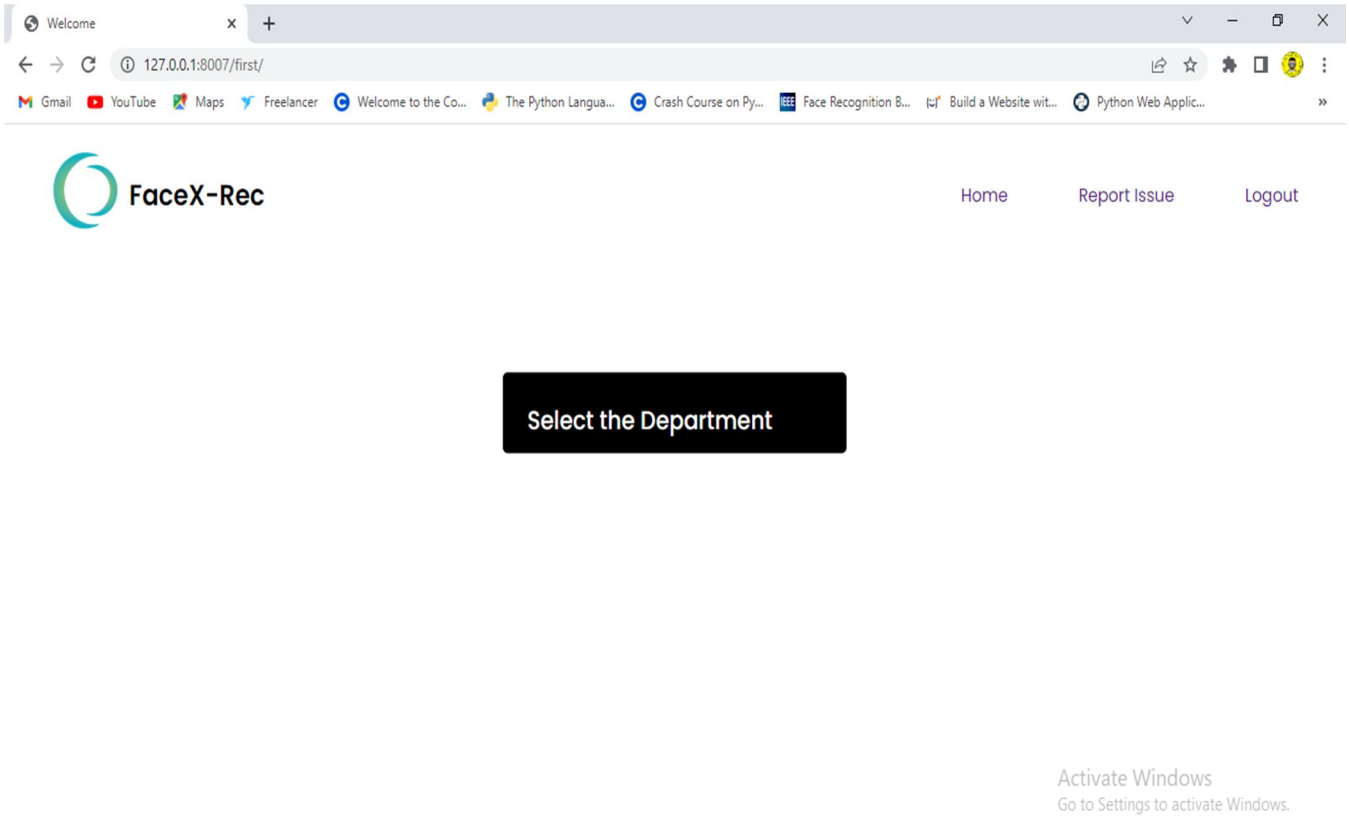


2) *Phase 2:* Teacher Process for Taking Attendance:

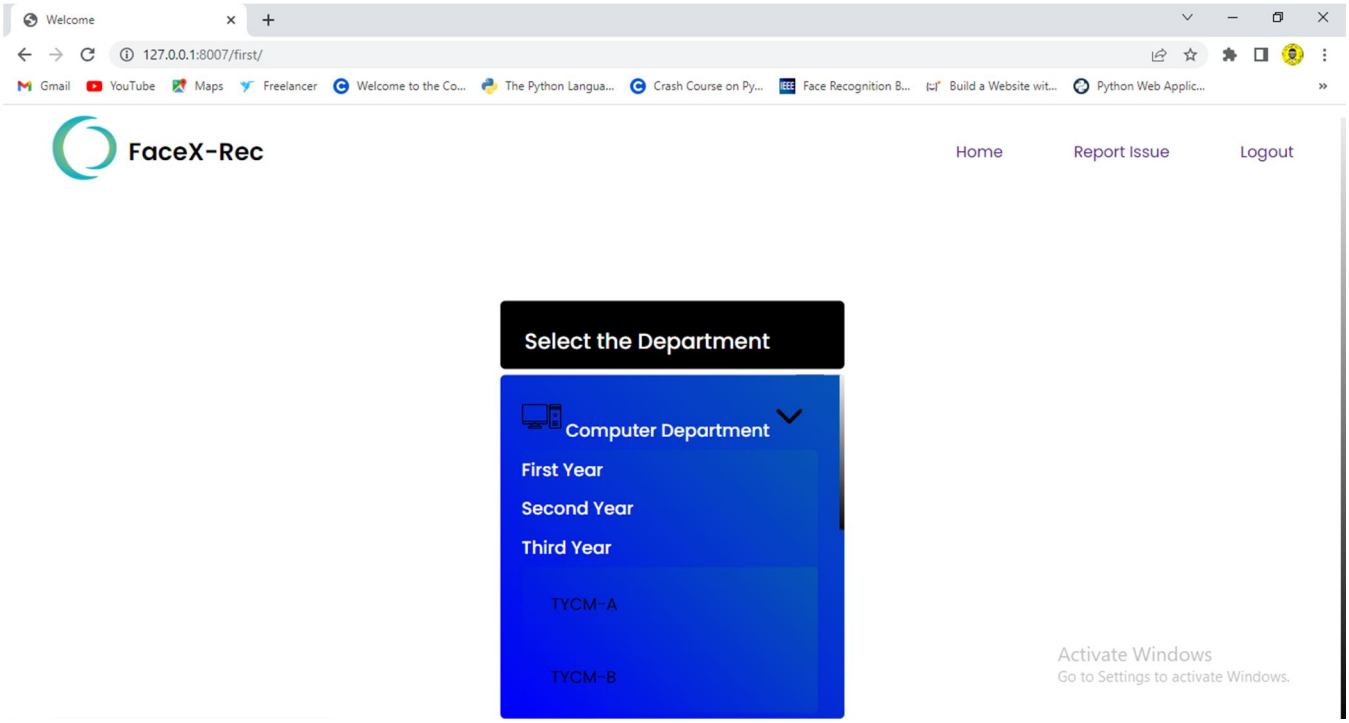
- *Step 1:* First Teacher must Login



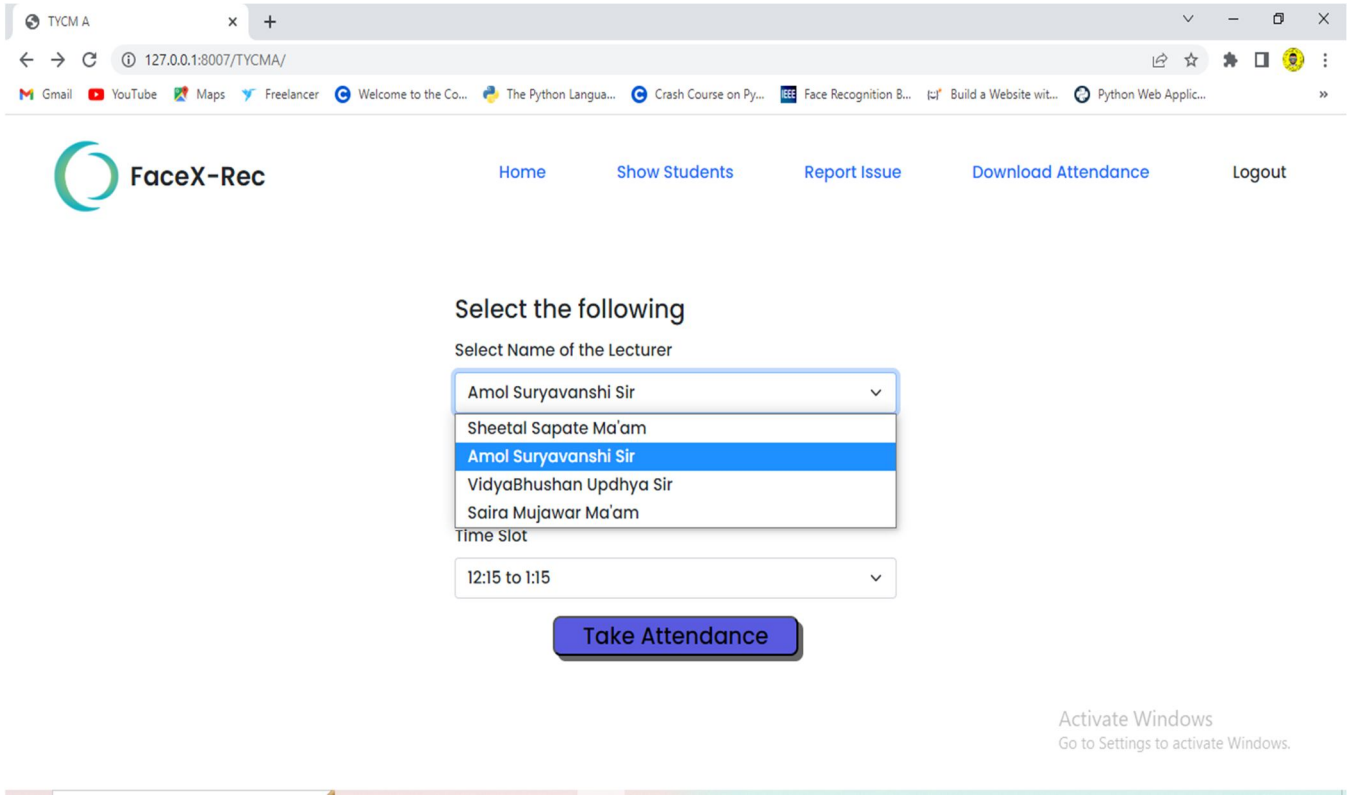
- *Step 2:* Select Deprtment



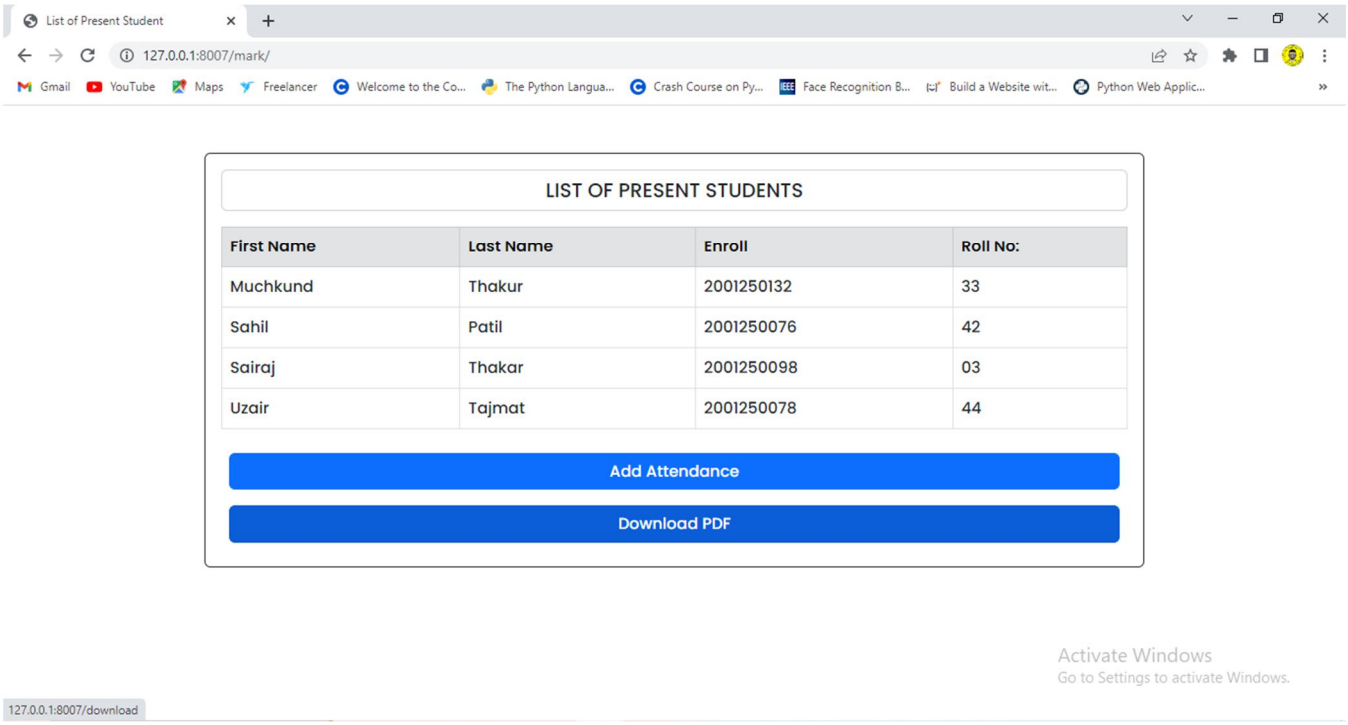
- *Step 3:* Select Appropriate Year and Class



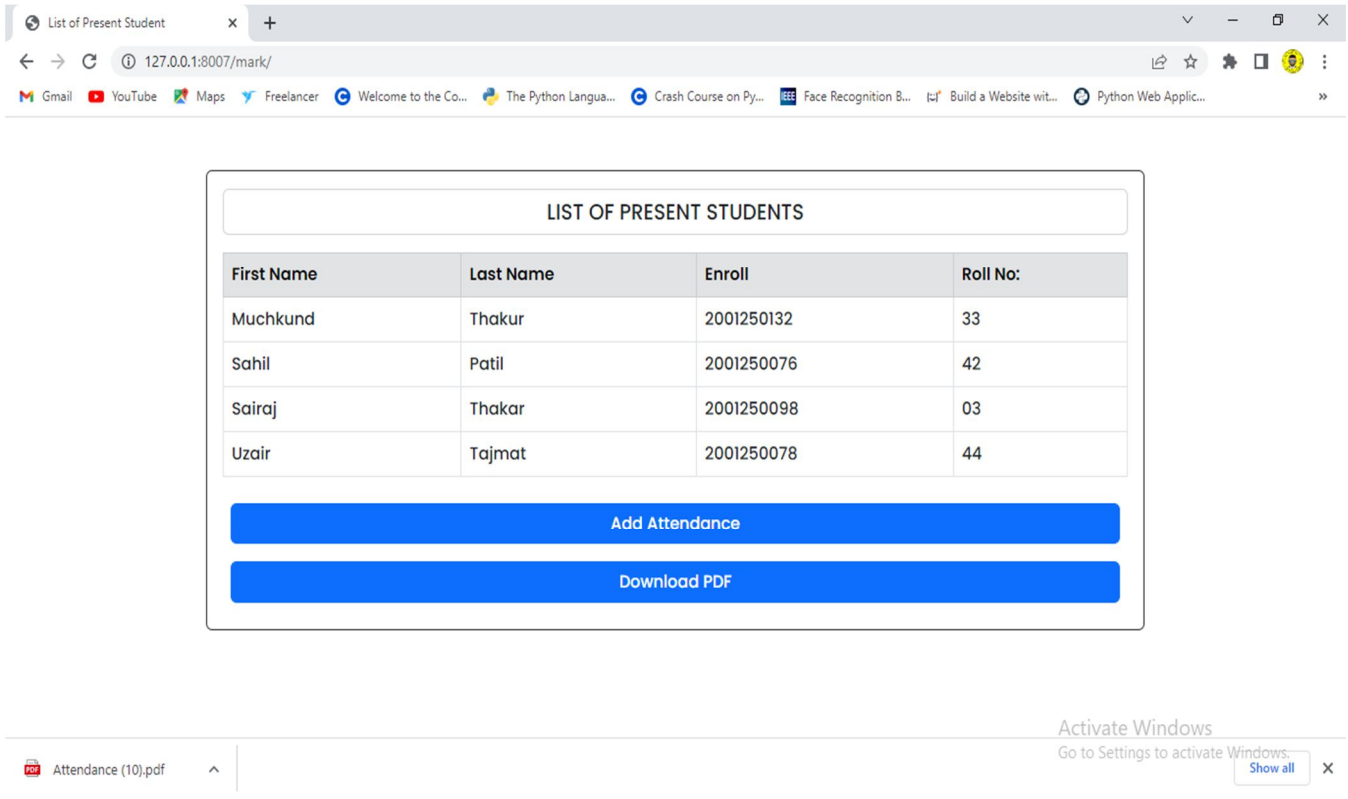
- *Step 4:* Select Appropriate Name of the Lecturer ,Subject and Time Slot and Press Take Attendance Button.



Now the attendance will be marked of the present Attendance

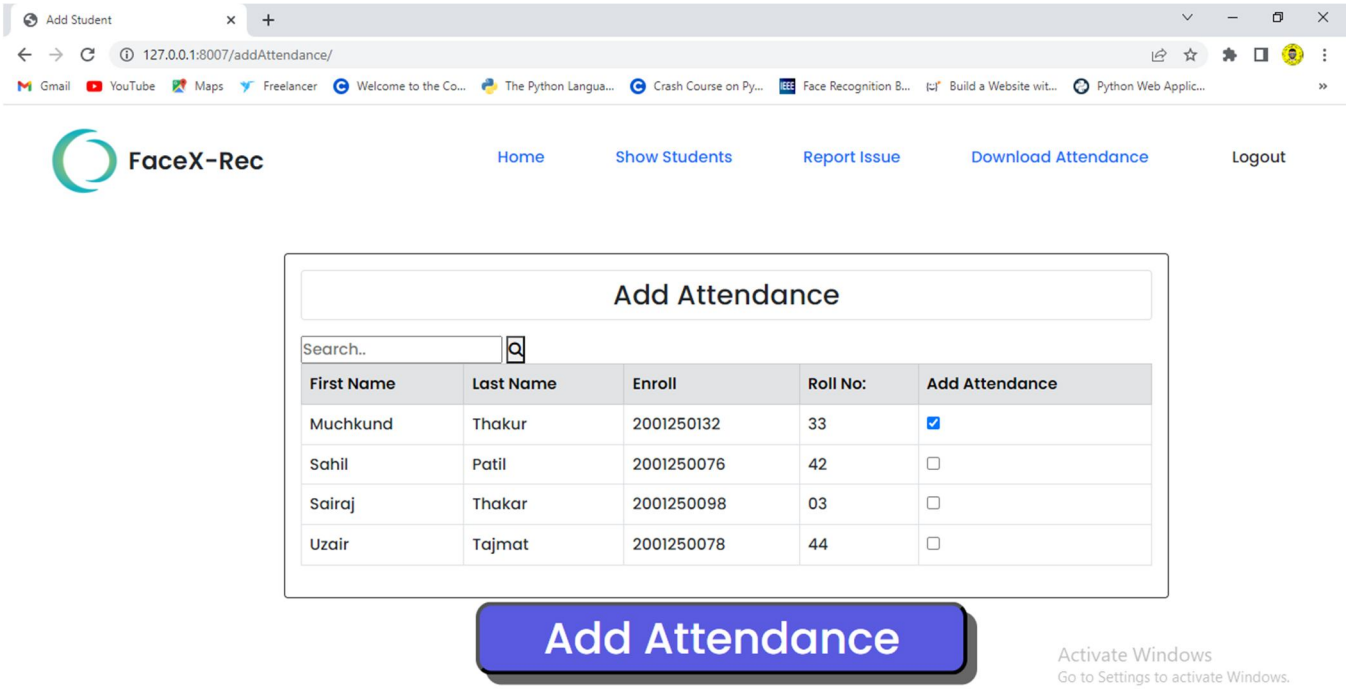


- *Step 5:* Now the teacher can Download attendance of the present Students.



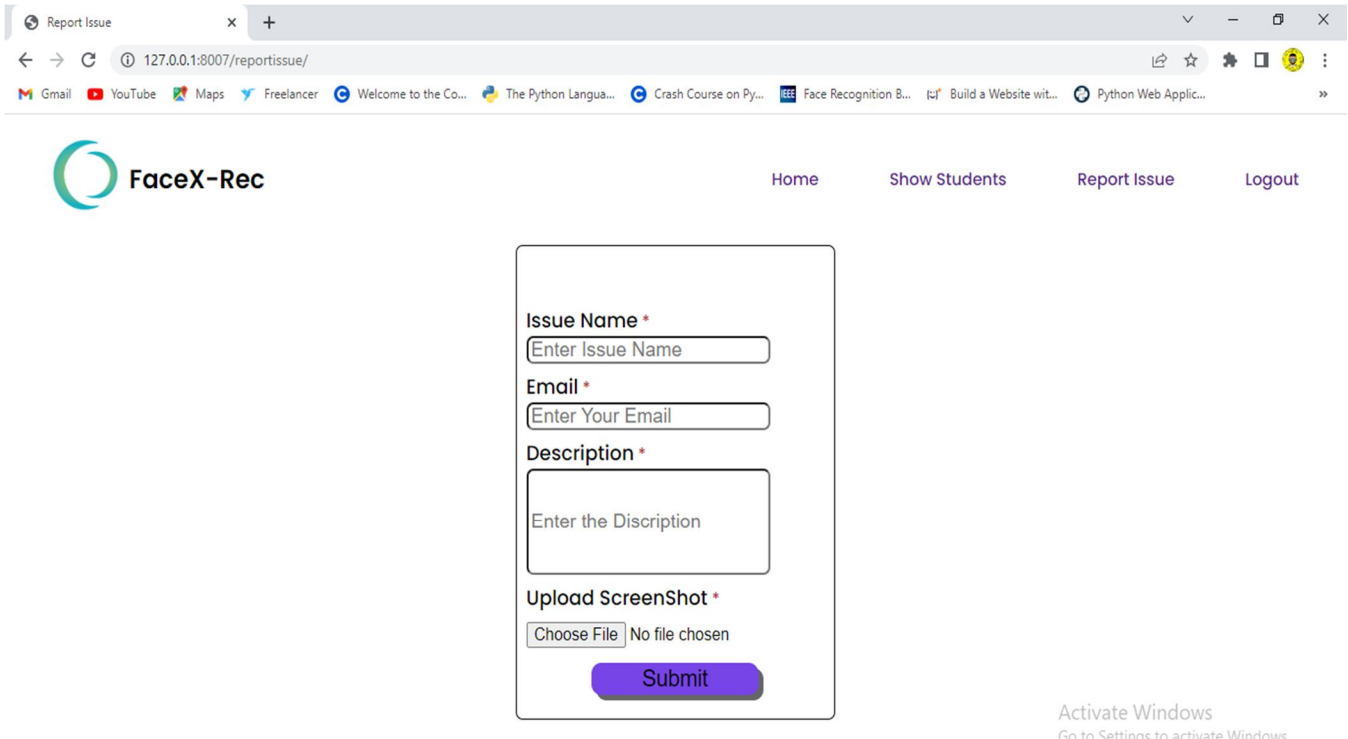
Downloaded PDF of attendance.

You can Even add Attendance of the Students who are not recognized during the attendance

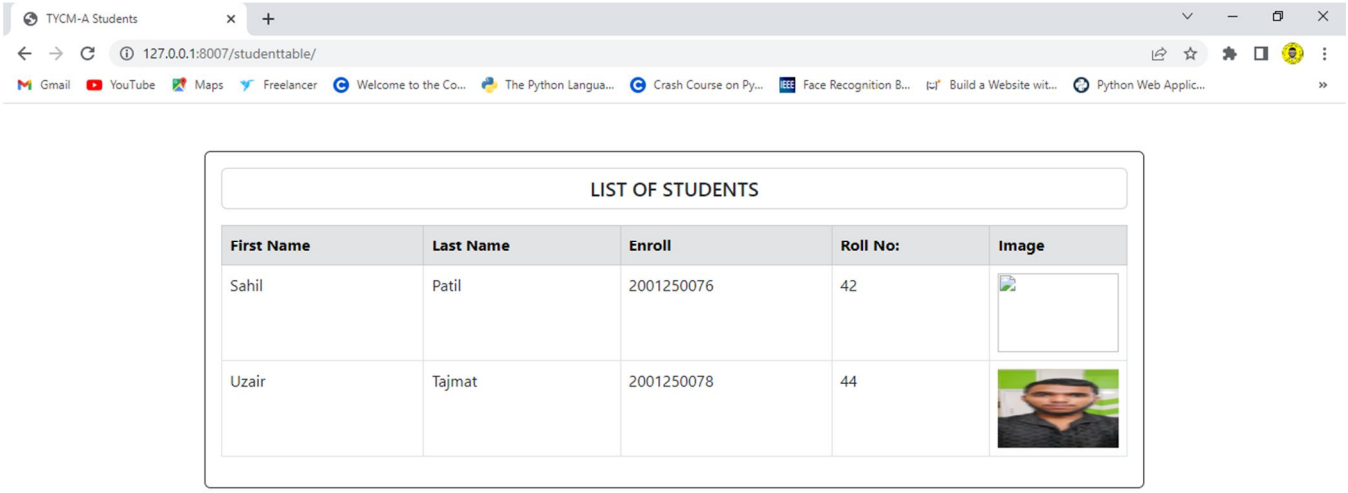


VII. ADDITIONAL FUNCTIONALITIES

There are some of the additional functionality that a teacher can Use.



This shows the list of students of that particular Class.



VIII. LIST OF PUBLICATION

Table IV: Publication Details

Sr.No	Title ofPaper	Name ofAuthors	Name ofjournalpublication /conference	Volume/issue/date /PageNo	Impactfactor
1.	Design of an E-Attendance Checker through Facial Recognition using Histogram of Oriented Gradients with Support Vector Machine	Allan Jason C. Arceo, Renee Ylka N. Borejon, Mia Chantal R. Hortinela, Alejandro H. Ballado Jr., Arnold C. Paglinawan	IEEE	Volume 10, Issue 11, November 2020	9.165

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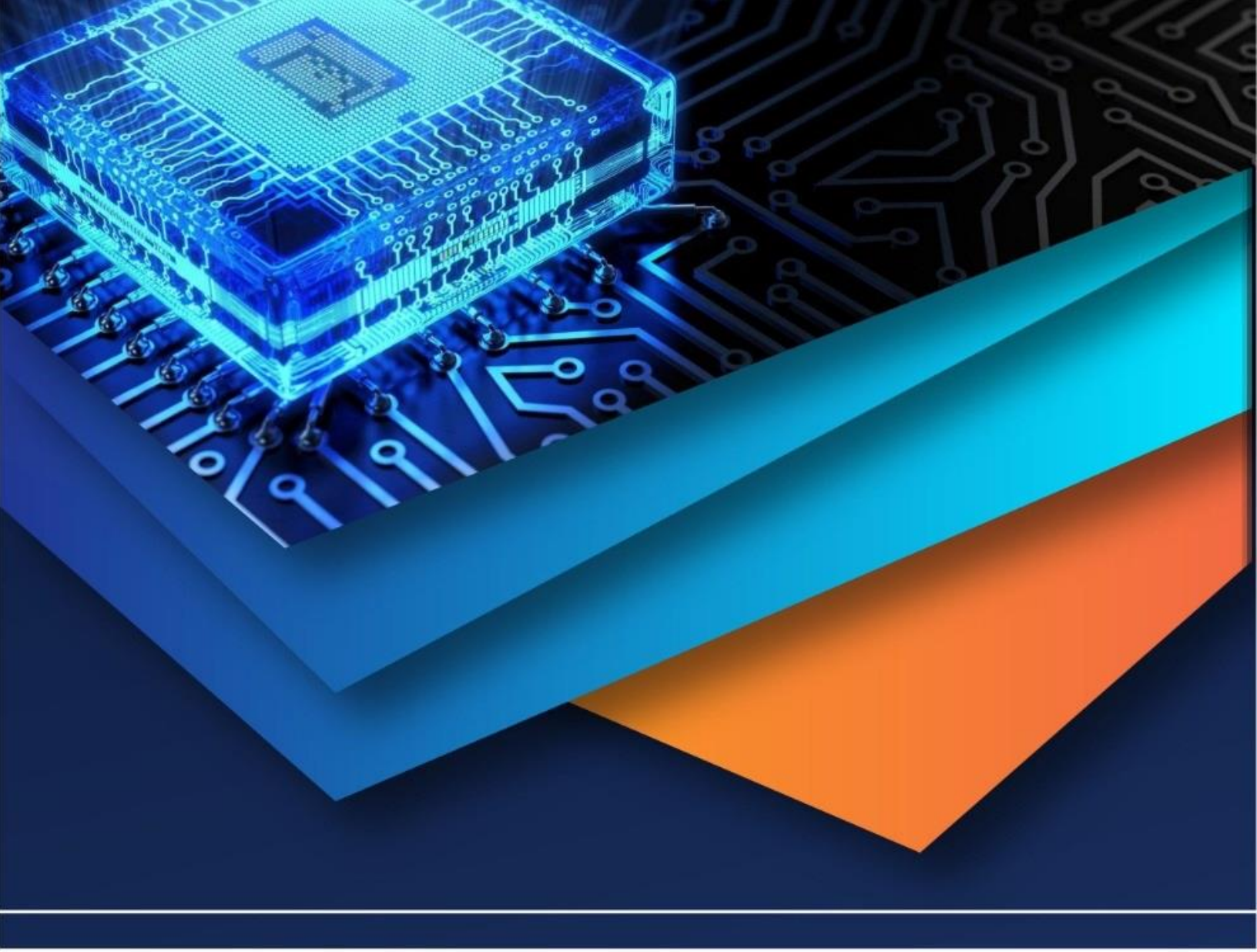
[1] Face Recognition based Smart Attendance System Year:2020 Arjun Raj ,Mohammed Shoheb, Arvind K, Chetan K
[2] Face Recognition Based Attendance System using Python Year:2020 Divya Pande,Kusum Sharma,Priyanka Pitale
[3] A Django Web Application to Promote Local Service Providers Year(2022) Puneet V,Osman Khan,Venkatesh P, Ravi Kiran ,Surendar P
[4] Design of an E-Attendance Checker through Facial Recognition using Histogram of Oriented Gradients with Support Vector Machine Year:2020 Allan Jason C. Arceo, Renee Ylka N. Borejon, Mia Chantal R. Hortinela, Alejandro H. Ballado Jr., Arnold C. Paglinawan
[5] A Motion Detection System in Python and Opencv Year:2020 Author:Suraiya Parveen,Javeria Shah
[6] www.codewithmoshyt.com Year:2020 Author: Mosh
[7] A Motion Detection System in Python and Opencv Year(2021) Author: Suraiya Parveen, Javeria Shah
[8] Face Recognition using HOG (medium.com) Author:Adam Geitgey



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