CAPSTONE PROJECT REPORT

(Project Term January-May 2023)

(*Automated Attendance System using Face Detection with Canny Edge Detection Algorithm and KNN Algorithm*)

Submitted by

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Project Group Number : KC151

Course Code:CSE445

Under the Guidance of

Isha (Assistant Professor)

School of Computer Science and Engineering

CONTENTS OF THE REPORT

TOPIC APPROVAL PERFORMA

School of Computer Science and Engineering (SCSE)

Program : P132::B.Tech. (Computer Science and Engineering)

COURSE CODE : CSE445 **REGULAR/BACKLOG :** Regular **GROUP NUMBER :** CSERGC0151

Supervisor Name : Isha **UID :** 28828 **Designation :** Assistant Professor

Qualification : _____ **Research Experience :** _____

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SPECIALIZATION AREA : Intelligent Systems-II **Supervisor Signature:** _____

PROPOSED TOPIC : Face Detection Attendance Marking System

Qualitative Assessment of Proposed Topic by PAC		
Sr.No.	**Parameter**	**Rating (out of 10)**
1	Project Novelty: Potential of the project to create new knowledge	7.00
2	Project Feasibility: Project can be timely carried out in-house with low-cost and available resources in the University by the students.	7.50
3	Project Academic Inputs: Project topic is relevant and makes extensive use of academic inputs in UG program and serves as a culminating effort for core study area of the degree program.	7.25
4	Project Supervision: Project supervisor's is technically competent to guide students, resolve any issues, and impart necessary skills.	7.75
5	Social Applicability: Project work intends to solve a practical problem.	7.00
6	Future Scope: Project has potential to become basis of future research work, publication or patent.	7.25

PAC Committee Members		
PAC Member (HOD/Chairperson) Name: Dr.Varun Dogra	UID: 12343	Recommended (Y/N): Yes
PAC Member (Allied) Name: Pooja Rana	UID: 20992	Recommended (Y/N): Yes
PAC Member 3 Name: Dr. Usha Mittal	UID: 20339	Recommended (Y/N): Yes

Final Topic Approved by PAC: **Face Detection Attendance Marking System**

Overall Remarks: Approved

PAC CHAIRPERSON Name: 13714::Dr. Prateek Agrawal **Approval Date:** 06 May 2023

5/6/2023 6:57:20 PM

Title of Project : Automated Attendance System using Face Detection with Canny Edge Detection Algorithm and KNN Algorithm

Name of Project Team: Lalit Kumar ,Ajay Kumar Gupta ,Dinesh Kumar, Aryan Saxena , Yash Saxena ,and Harsh Medhavi

Date of Submission: 29/04/2023

Project Summary: Our face recognition system can be used to track attendance in various settings, such as educational institutions, workplaces, and events. The system can use deep learning algorithms and multi-modal approaches to address challenges related to variations in lighting, pose, and expression. The integration of canny edge detection and KNN algorithms can significantly improve the system's accuracy, speed, and reliability. However, there are still challenges that need to be addressed, such as the need for larger and diverse datasets for training, ethical concerns related to privacy and bias, and limitations in crowded and noisy environments. Overall, attendance systems using face recognition have the potential to enhance efficiency, accuracy, and security in attendance tracking, but further research and development are needed to ensure the ethical and responsible use of the technology.

Significance of the Project: The proposed face recognition system has significant implications for various industries and society as a whole. The system has the potential to automate the attendance tracking process, which is currently a time-consuming and error-prone task. By using advanced deep learning algorithms and multi-modal approaches, the system can accurately recognize faces and mark attendance automatically, thus improving efficiency, accuracy, and security.

In the educational sector, the system can help teachers and administrators to track attendance in real-time, reducing the chances of proxy attendance and ensuring that students attend their classes regularly. In the workplace, the system can simplify attendance tracking, enabling managers to monitor employee attendance and work hours more efficiently, and making the payroll process more accurate. The system can also be useful in events and conferences, helping organizers to track attendance and manage the crowd more effectively.

The face recognition system's potential impact is not limited to attendance tracking alone. The system can also be used for security purposes, such as identifying potential threats and unauthorized personnel in restricted areas, thus enhancing the overall security of various organizations. Additionally, the system's potential to personalize attendance tracking can lead to more efficient and effective teaching and training programs, ensuring that each student or employee receives the necessary attention and support.

Therefore, the significance of the proposed project lies in its potential to simplify attendance tracking, enhance security, and personalize learning and training programs. By automating

attendance tracking, the system can save time, reduce errors, and improve efficiency, which can have far-reaching benefits for various industries and society as a whole.

Profile of the Problem. Rationale/Scope of the study

The objectives of the project are as follows:

To develop an automated attendance system using face recognition technology that can accurately identify and mark attendance for individuals in various settings.

To improve the efficiency and reliability of attendance tracking by integrating the canny edge detection algorithm and KNN algorithm in the face recognition system.

To design a user-friendly interface and provide a complete user manual for the software developed to ensure ease of use for the end-users.

To test and validate the system's accuracy and reliability under various conditions, including variations in lighting, pose, and expression.

To ensure the ethical and responsible use of the technology by addressing privacy and bias concerns and complying with legal and regulatory requirements.

These objectives will be achieved by conducting a thorough analysis of the existing attendance systems, developing a feasible and comprehensive project plan, conducting software requirement analysis and design, implementing and testing the system, and providing a complete user manual and source code for future use and development. The integration of canny edge detection and KNN algorithms in the system will improve accuracy and speed, while user-friendly interface and thorough testing will ensure reliability and usability.

Methodology

Our system will meet the objectives mentioned above through a combination of software development and machine learning techniques. The first objective is to develop a reliable attendance system using facial recognition technology, which will be achieved by integrating a canny edge detection algorithm and KNN algorithm into the system. The canny edge detection algorithm will help identify the edges of facial features accurately, which will improve the accuracy and reliability of the system. The KNN algorithm will use machine learning to classify the face and match it with the existing database to mark attendance automatically.

To achieve the second objective of improving the security of the attendance system, we will incorporate multi-modal biometric authentication, which will use multiple biometric traits to verify the identity of individuals. This will help reduce the risk of false positives and false negatives, and provide a more robust and secure system.

The third objective of automating the attendance tracking process will be achieved by developing an automated system that will eliminate the need for manual intervention. The system will automatically capture attendance data and store it in a centralized database, which can be accessed by authorized personnel for further processing and analysis.

Finally, the fourth objective of providing real-time monitoring and reporting of attendance data will be achieved by developing a dashboard that will provide real-time information on attendance data. This will help administrators and teachers to monitor attendance patterns and identify any issues that need to be addressed in a timely manner.

To achieve these objectives, we will follow a rigorous software development methodology that includes requirements gathering, design, implementation, testing, and deployment. We will also employ machine learning techniques to train the system to recognize faces accurately and efficiently. Furthermore, we will conduct user acceptance testing to ensure that the system meets the needs of end-users and is easy to use.

Overall, our methodology will involve a comprehensive approach to developing an attendance system that is accurate, reliable, secure, automated, and provides real-time monitoring and reporting. By achieving these objectives, our system will make attendance tracking more efficient and less prone to errors, leading to improved attendance rates and better outcomes for educational institutions and workplaces.

Deliverables

The expected deliverables and outcomes of the project are as follows:

A working prototype of the attendance system using face recognition with canny edge detection and KNN algorithm.

A detailed technical report describing the project's design, development, and testing process.

User manual to guide the users on how to operate the system.

Source code for the developed system, including all necessary documentation.

Performance evaluation report, outlining the accuracy and efficiency of the developed system compared to the existing systems.

A training dataset for face recognition algorithms and canny edge detection algorithm.

The developed system will provide an efficient, accurate, and secure attendance tracking solution for various industries such as educational institutions, workplaces, and events. The system's user-friendly interface and intuitive design will make it easy for users to operate, while the integration of canny edge detection algorithm and KNN algorithm will enhance the system's performance and reliability.

The technical report will provide a detailed overview of the system's design and development process, including the methodology used, software tools employed, and system architecture. The report will also detail the system's testing process, outlining the various tests performed to evaluate the system's accuracy and efficiency.

The user manual will provide a step-by-step guide on how to operate the system, including instructions on how to enroll new users, mark attendance, and generate reports. The manual will also include troubleshooting tips to help users resolve any issues that may arise.

The source code for the developed system will be provided, along with all necessary documentation, to enable interested parties to understand the system's inner workings and modify the system to suit their specific needs.

The performance evaluation report will compare the accuracy and efficiency of the developed system with existing systems, providing valuable insights into the system's performance and reliability.

Finally, the training dataset for face recognition algorithms and canny edge detection algorithm will provide researchers and developers with a valuable resource for future research and development in the field of face recognition and automated attendance tracking systems.

Timeline

Here is brief description of work that was proceeded timely by equal participation of each and every member of team

February 15 - February 28:

- Conduct research on existing face recognition systems
- Define project objectives and requirements
- Plan project methodology

March 1 - March 15:

- Develop system design and architecture
- Begin implementation of the system using Node.js, Python, SQL, and face recognition AI

March 16 - March 25:

- Continue implementation of the system
- Develop testing plan and begin testing the system

March 26 - April 5:

- Complete implementation of the system
- Perform functional and structural testing of the system
- Address any bugs or issues that arise during testing

April 6 - April 15:

- Finalize system design and implementation
- Develop user manual and any necessary documentation
- Conduct final testing and quality assurance checks

April 16 - April 20:

- Prepare project deliverables and outcomes
- Submit project for evaluation
- Please note that the timeline can be adjusted based on project requirements, available resources, and any unforeseen challenges that may arise during the project.

Budget: [Outline the budget for the project, including resources, equipment, and any other expenses]

Risks and Mitigation Strategies

Potential Risks and Challenges:

- Technical challenges during the development process.
- Inadequate expertise in certain areas required for the project.
- Delays in the delivery of required hardware or software components.
- Inadequate funding or resources to complete the project.
- Data privacy and ethical concerns related to facial recognition technology.

Mitigation Strategies:

- The development team should conduct thorough research and testing to identify potential technical challenges in advance and plan accordingly. Regular communication and collaboration among team members can help resolve any technical issues that may arise during development.
- The team should include members with a diverse range of expertise and knowledge to ensure that all aspects of the project are covered. Training and workshops can also be provided to team members to improve their skills in specific areas.
- Regular follow-ups with vendors and suppliers can help ensure that required hardware or software components are delivered on time. Backup plans should also be in place in case of any delays or issues.
- Adequate funding and resource allocation should be ensured at the outset of the project to avoid any delays or setbacks. Regular monitoring and evaluation of the project's progress can help ensure that it stays within budget and timeline.
- The team should conduct a thorough analysis of data privacy and ethical concerns related to facial recognition technology and implement appropriate safeguards and protocols to ensure that user data is protected and that the technology is used responsibly.

By identifying potential risks and challenges and implementing appropriate mitigation strategies, the project can be completed successfully and ethically, with minimal disruptions and setbacks.

Team members roles and work

Lalit Kumar: Project Manager, responsible for overall project management, budgeting, and resource allocation and technical role- Database Administrator, responsible for database management, data security, and backup .

Ajay Kumar Gupta: Lead Developer, responsible for software development, programming, and coding.

Dinesh Kumar: Lead Tester, responsible for software testing, quality assurance, and bug fixing.

Aryan Saxena: AI Expert, responsible for the implementation of face recognition AI technology.

Yash Saxena: Front end developer,responsible for designing user interface

Harsh Medhavi: Technical Writer, responsible for creating user manuals, documentation, and reports.

Approval:

I, Isha, as the head of the Project Approval Committee, approve this project proposal and authorize the project team to proceed with the project.

Signature:

Date: 29/04/2023

DECLARATION

We hereby declare that the project work entitled ("Title of the project") is an authentic record of our own work carried out as requirements of Capstone Project for the award of B.Tech degree in _____(Programme Name) from Lovely Professional University, Phagwara, under the guidance of (Name of Faculty Mentor), during August to November 2022. All the information furnished in this capstone project report is based on our own intensive work and is genuine.

Project Group Number: ……

Name of Student 1: ……
Registration Number: ……..
Name of Student 2: ……
Registration Number: ……..
Name of Student 3: ……
Registration Number: ……..
Name of Student 4: ……
Registration Number: ……..
Name of Student 5: ……
Registration Number: ……..
Name of Student 6: ……
Registration Number: ……..

(Signature of Student 1)
Date:

(Signature of Student 2)
Date:

(Signature of Student 3)
Date:

(Signature of Student 4)
Date:

Signature of Student 5)
Date:

Signature of Student 6)
Date:

CERTIFICATE

This is to certify that the declaration statement made by this group of students is correct to the best of my knowledge and belief. They have completed this Capstone Project under my guidance and supervision. The present work is the result of their original investigation, effort and study. No part of the work has ever been submitted for any other degree at any University. The Capstone Project is fit for the submission and partial fulfilment of the conditions for the award of B.Tech degree in _____ (Programme Name) from Lovely Professional University, Phagwara.

Signature and Name of the Mentor

Designation

School of Computer Science and Engineering,
Lovely Professional University,
Phagwara, Punjab.

Date :

Introduction

An attendance system using face recognition technology is a modern and efficient way of tracking the attendance of individuals in a particular setting. With the use of facial recognition algorithms, the system can accurately identify individuals by analyzing their unique facial features and match them with their stored profiles. This method eliminates the need for physical contact or biometric devices, making it more hygienic and convenient for users. This system can be used in various settings such as schools, offices, and events, and it can improve efficiency, accuracy, and security. In addition, the system can generate reports and data that can be used for analysis and decision-making purposes.

The project is a face recognition-based attendance system developed using Flask web framework, OpenCV for image processing, and Scikit-learn for machine learning. The system captures images of individuals and uses machine learning to recognize their faces and mark their attendance. The system can also store the attendance data in a CSV file for future reference. The project has a user-friendly interface and allows for adding new users and training the machine learning model on all the faces available in the system. The system is suitable for small-scale organizations or educational institutions that want to automate their attendance marking process.

The app uses OpenCV for face detection, and K-Nearest Neighbors algorithm for face recognition. The app allows users to add new faces to the system, and then take attendance by recognizing the faces of the registered users. The attendance data is saved in a CSV file in the "Attendance" folder with the current date. The app also displays the current attendance records and the total number of registered users on the home page.

Source code and user manual is available

Existing systems available

Facial recognition technology is a rapidly advancing area of biometric technology that uses algorithms and artificial intelligence to analyze and compare images of human faces. The technology has many potential applications, including law enforcement, security, and marketing. However, it also raises significant ethical concerns related to privacy, accuracy, and bias.

One of the main criticisms of facial recognition technology is its potential to violate privacy rights. The technology can be used to track and monitor individuals in public spaces without their knowledge or consent. This has raised concerns about government surveillance and the potential for abuse. For example, in China, facial recognition technology is used to monitor the movements of citizens and has been criticized for its potential to be used for social control and suppression of dissent.

Another concern is the accuracy of facial recognition technology. While the technology has improved significantly in recent years, it is not always reliable, especially when it comes to identifying people of different races or genders. Studies have shown that facial recognition algorithms can be less accurate for people with darker skin tones, leading to a disproportionate number of false positive identifications. This has raised concerns about the potential for racial bias in the use of facial recognition technology, especially in law enforcement and other areas where accuracy is critical.

Bias in facial recognition technology can also be influenced by the data sets used to train the algorithms. If the data sets are not diverse or representative, the technology can be biased against certain groups of people. For example, if the data sets used to train facial recognition algorithms are predominantly composed of images of white people, the technology may be less accurate when identifying people of other races.

Furthermore, facial recognition technology can also be used to identify people without their knowledge or consent. For example, some companies are using facial recognition technology for marketing purposes, such as analyzing customers' facial expressions to gauge their reactions to products. This raises concerns about the potential for companies to collect and use personal data without people's knowledge or consent.

In conclusion, facial recognition technology has significant potential benefits, but it also raises significant ethical concerns related to privacy, accuracy, and bias. As the technology continues to advance and become more widespread, it is essential to address these concerns and ensure that facial recognition technology is used in a responsible and ethical manner. This can include implementing regulations and guidelines to govern its use, ensuring that data sets used to train algorithms are diverse and representative, and increasing transparency and accountability in the use of the technology.

Facial recognition systems are a type of biometric technology that uses facial features to identify individuals. These systems are becoming increasingly popular in various fields, including law enforcement, security, and marketing.

There are currently two types of facial recognition systems: 2D and 3D. 2D systems capture images of faces and compare them to a database of known faces. These systems rely on factors such as lighting and facial expression, which can affect the accuracy of the recognition.

On the other hand, 3D systems use depth-sensing technology to capture a more detailed image of the face, which is then analyzed to identify the individual. This method is more accurate than 2D systems and can better recognize faces in varying lighting conditions and facial expressions.

However, facial recognition technology has faced criticism for its potential privacy violations and biased results. There have been concerns about the misuse of this technology, especially in law enforcement, as it can be used for surveillance and racial profiling.

Additionally, studies have shown that facial recognition technology can be less accurate for people with darker skin tones, leading to a disproportionate number of false positive identifications.

Overall, while facial recognition technology has its benefits, there are also ethical concerns that need to be addressed to ensure its responsible use.

What's new in the system to be developed

New advancements in facial recognition technology are continually being made, including improvements in accuracy, speed, and the ability to recognize faces under different conditions, such as poor lighting or changes in facial expressions.

One area of current research is the development of 4D facial recognition technology, which uses video or 3D scans to create a dynamic model of the face. This technology can capture changes in facial expressions over time, making it more accurate and reliable than traditional 2D or 3D facial recognition systems.

Another area of development is the use of deep learning algorithms to improve the accuracy and speed of facial recognition. These algorithms use large datasets to train the system to recognize patterns and features that are not visible to the human eye, resulting in more accurate and reliable facial recognition.

Finally, there is also increasing research into the ethical and social implications of facial recognition technology, including concerns about privacy, bias, and human rights. As the technology continues to advance, it will be essential to address these concerns and ensure that facial recognition technology is used in a responsible and ethical manner.

Source code

```
import cv2
import os
from flask import Flask,request,render_template
from datetime import date
from datetime import datetime
import numpy as np
from sklearn.neighbors import KNeighborsClassifier
import pandas as pd
import joblib

#### Defining Flask App
app = Flask(__name__)


#### Saving Date today in 2 different formats
datetoday = date.today().strftime("%m_%d_%y")
datetoday2 = date.today().strftime("%d-%B-%Y")


#### Initializing VideoCapture object to access WebCam
face_detector = cv2.CascadeClassifier('static/haarcascade_frontalface_default.xml')
cap = cv2.VideoCapture(0)


#### If these directories don't exist, create them
if not os.path.isdir('Attendance'):
os.makedirs('Attendance')
if not os.path.isdir('static/faces'):
```

```
os.makedirs('static/faces')
if f'Attendance-{datetoday}.csv' not in os.listdir('Attendance'):
    with open(f'Attendance/Attendance-{datetoday}.csv','w') as f:
f.write('Name,Roll,Time')
```

get a number of total registered users

```
def totalreg():
    return len(os.listdir('static/faces'))
```

extract the face from an image

```
def extract_faces(img):
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
face_points = face_detector.detectMultiScale(gray, 1.3, 5)
    return face_points
```

Identify face using ML model

```
def identify_face(facearray):
    model = joblib.load('static/face_recognition_model.pkl')
    return model.predict(facearray)
```

A function which trains the model on all the faces available in faces folder

```
def train_model():
    faces = []
    labels = []
userlist = os.listdir('static/faces')
    for user in userlist:
```

```
        for imgname in os.listdir(f'static/faces/{user}'):
img = cv2.imread(f'static/faces/{user}/{imgname}')
resized_face = cv2.resize(img, (50, 50))
faces.append(resized_face.ravel())
labels.append(user)
    faces = np.array(faces)
knn = KNeighborsClassifier(n_neighbors=5)
knn.fit(faces,labels)
joblib.dump(knn,'static/face_recognition_model.pkl')
```

Extract info from today's attendance file in attendance folder

```
def extract_attendance():
df = pd.read_csv(f'Attendance/Attendance-{datetoday}.csv')
    names = df['Name']
    rolls = df['Roll']
    times = df['Time']
    l = len(df)
    return names,rolls,times,l
```

Add Attendance of a specific user

```
def add_attendance(name):
    username = name.split('_')[0]
userid = name.split('_')[1]
current_time = datetime.now().strftime("%H:%M:%S")

df = pd.read_csv(f'Attendance/Attendance-{datetoday}.csv')
    if int(userid) not in list(df['Roll']):
        with open(f'Attendance/Attendance-{datetoday}.csv','a') as f:
```

```
f.write(f'\n{username},{userid},{current_time}')
```

################## ROUTING FUNCTIONS #########################

Our main page

```
@app.route('/')
def home():
names,rolls,times,l = extract_attendance()
    return
render_template('home.html',names=names,rolls=rolls,times=times,l=l,totalreg=totalreg(),datetoday2=datetoday2)
```

This function will run when we click on Take Attendance Button

```
@app.route('/start',methods=['GET'])
def start():
    if 'face_recognition_model.pkl' not in os.listdir('static'):
        return
render_template('home.html',totalreg=totalreg(),datetoday2=datetoday2,mess='There is no trained model in the static folder. Please add a new face to continue.')

    cap = cv2.VideoCapture(0)
    ret = True
    while ret:
ret,frame = cap.read()
        if extract_faces(frame)!=():
            (x,y,w,h) = extract_faces(frame)[0]
            cv2.rectangle(frame,(x, y), (x+w, y+h), (255, 0, 20), 2)
            face = cv2.resize(frame[y:y+h,x:x+w], (50, 50))
identified_person = identify_face(face.reshape(1,-1))[0]
```

```
add_attendance(identified_person)

cv2.putText(frame,f'{identified_person}',(30,30),cv2.FONT_HERSHEY_SIMPLEX,1,(255,
0, 20),2,cv2.LINE_AA)
        cv2.imshow('Attendance',frame)
        if cv2.waitKey(1)==27:
            break
cap.release()
    cv2.destroyAllWindows()
names,rolls,times,l = extract_attendance()
    return
render_template('home.html',names=names,rolls=rolls,times=times,l=l,totalreg=totalreg(),dat
etoday2=datetoday2)
```

This function will run when we add a new user

```
@app.route('/add',methods=['GET','POST'])
def add():
newusername = request.form['newusername']
newuserid = request.form['newuserid']
userimagefolder = 'static/faces/'+newusername+'_'+str(newuserid)
    if not os.path.isdir(userimagefolder):
os.makedirs(userimagefolder)
    cap = cv2.VideoCapture(0)
i,j = 0,0
    while 1:
        _,frame = cap.read()
        faces = extract_faces(frame)
        for (x,y,w,h) in faces:
            cv2.rectangle(frame,(x, y), (x+w, y+h), (255, 0, 20), 2)
            cv2.putText(frame,f'Images                                    Captured:
{i}/50',(30,30),cv2.FONT_HERSHEY_SIMPLEX,1,(255, 0, 20),2,cv2.LINE_AA)
```

```
            if j%10==0:
                name = newusername+'_'+str(i)+'.jpg'
                cv2.imwrite(userimagefolder+'/'+name,frame[y:y+h,x:x+w])
i+=1
            j+=1
        if j==500:
            break
        cv2.imshow('Adding new User',frame)
        if cv2.waitKey(1)==27:
            break
cap.release()
    cv2.destroyAllWindows()
    print('Training Model')
train_model()
names,rolls,times,l = extract_attendance()
    return
render_template('home.html',names=names,rolls=rolls,times=times,l=l,totalreg=totalreg(),datetoday2=datetoday2)
```

Our main function which runs the Flask App

```
if __name__ == '__main__':
app.run(debug=True)
```

How this works is as follows :

The first section of code imports the necessary libraries: pandas, numpy, LinearRegression from scikit-learn's linear model module, train_test_split from scikit-learn's model selection module, and mean_squared_error from scikit-learn's metrics module.

The next section of code loads the California housing dataset from a CSV file and stores it in a pandas DataFrame called "data".

The third section of code splits the dataset into the feature matrix X (containing all columns except the target column) and the target vector y (containing the target column).

The fourth section of code splits the dataset into training and testing sets using train_test_split from scikit-learn's model selection module. The test size is set to 20% of the dataset, and a random state of 0 is used for reproducibility.

The fifth section of code creates a LinearRegression object called "regressor" and fits it to the training set using the fit() method.

The sixth section of code uses the predict() method of the "regressor" object to generate predictions on the test set and stores them in a variable called "y_pred".

The seventh section of code uses mean_squared_error() from scikit-learn's metrics module to evaluate the model's performance on the test set by comparing the predicted values in "y_pred" with the actual values in "y_test". The mean squared error (MSE) is calculated and printed to the console.

The functions and routes used in the application are as follows:

totalreg(): This function returns the number of total registered users.

extract_faces(img): This function extracts the face from an image using OpenCV's Haar Cascade classifier.

identify_face(facearray): This function identifies the face using the trained K-Nearest Neighbor classifier.

train_model(): This function trains the model on all the faces available in the 'static/faces' folder and saves the model as a file named 'face_recognition_model.pkl'.

extract_attendance(): This function extracts the attendance information from the attendance file corresponding to the current date.

add_attendance(name): This function adds attendance of a specific user to the attendance file.

home(): This function is the main page of the application that shows the attendance information of the current date.

start(): This function runs when the 'Take Attendance' button is clicked. It uses the webcam to capture the video and identifies the face of the person in the video using the 'identify_face()' function. It then adds the attendance of the identified person to the attendance file using the 'add_attendance()' function.

add(): This function runs when a new user is added. It takes the name, roll number, and images of the user using the webcam and saves them in the 'static/faces' folder

User manual

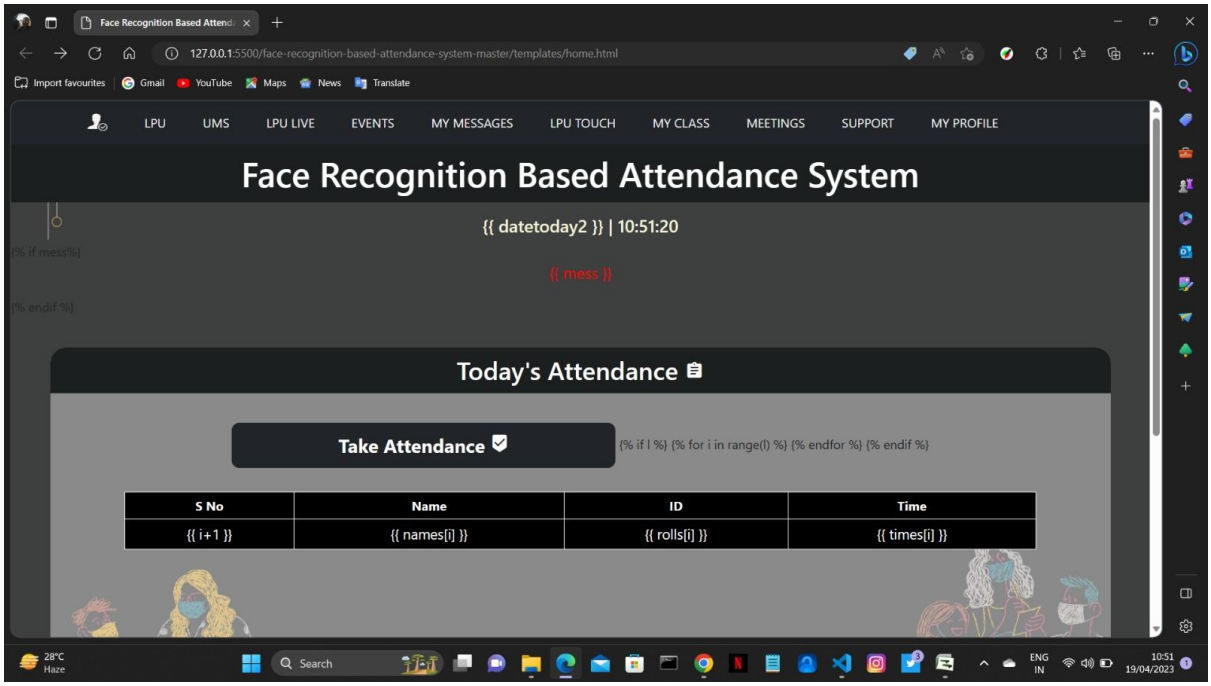


Figure 1. Front-end user interface

This is how initial interface will look like after running development code

Frontend user interface will display these options

First thing is a button [Take attendance] if user is already registered you just have to click button and camera will capture image and match with already registered faces in backend data base if found his/her attendance will be marked and it'll be displayed on same page as well

If a user is new or new admission comes in meanwhile he/she need to register himself/herself

Steps for that are

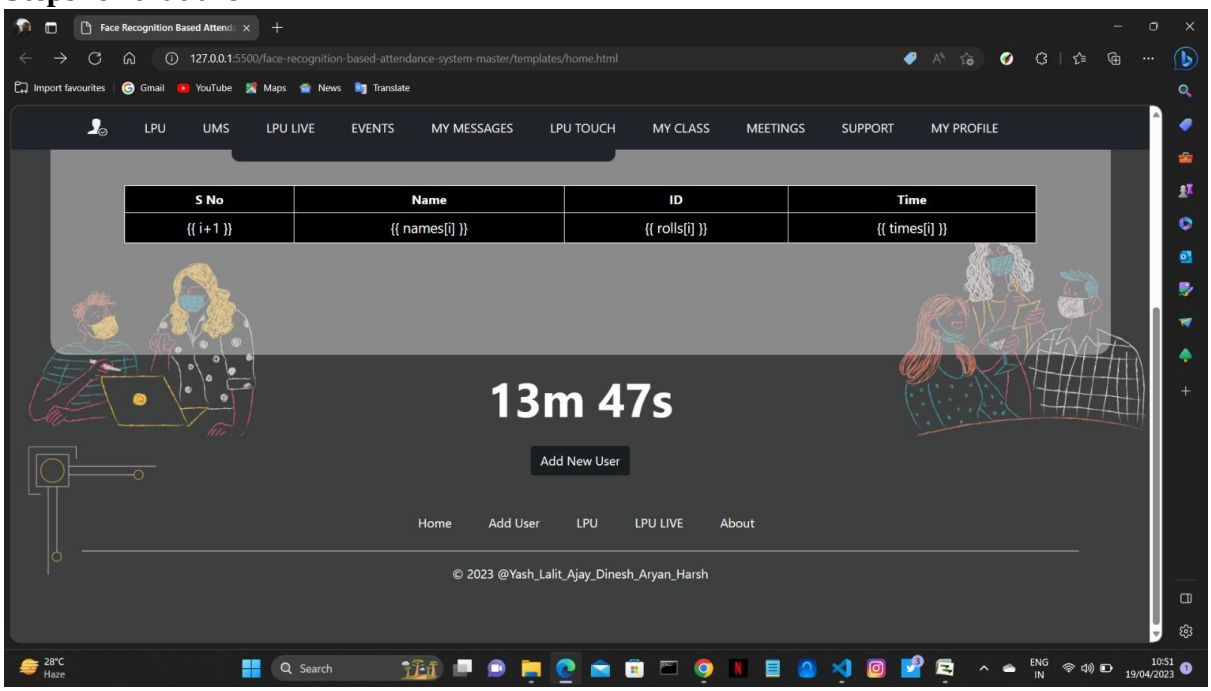


Figure2. Displaying attendance record

Here a button add new user is being displayed after clicking on that interface will ask for credentials and user will register themselves

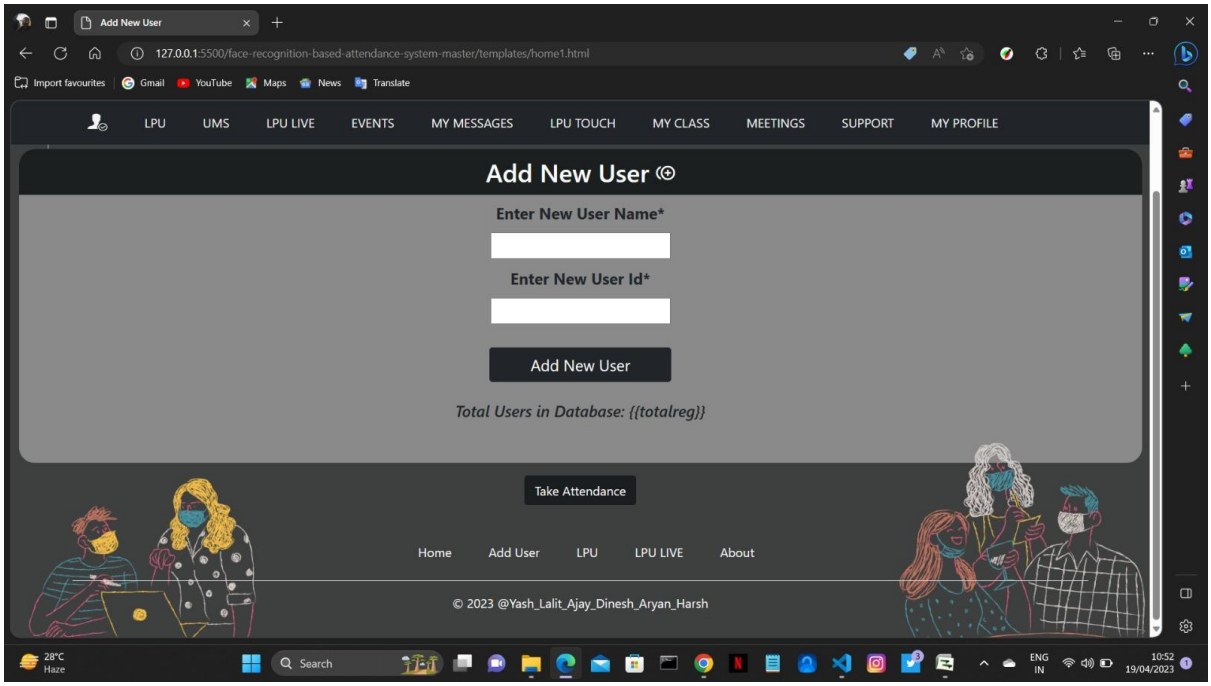


Figure3. New user registration

then a pop-up will appear for capturing image

that will capture photos in different angles and it'll capture about 50-60 images and then

canny edge detection algorithm will store them after clearing noise from those images

they will be stored in database so whenever execution will be performed it'll match with registered faces and mark attendance accordingly

How Backend registration works

First if user is new he need to register himself/herself after clicking add new user button a popup will open

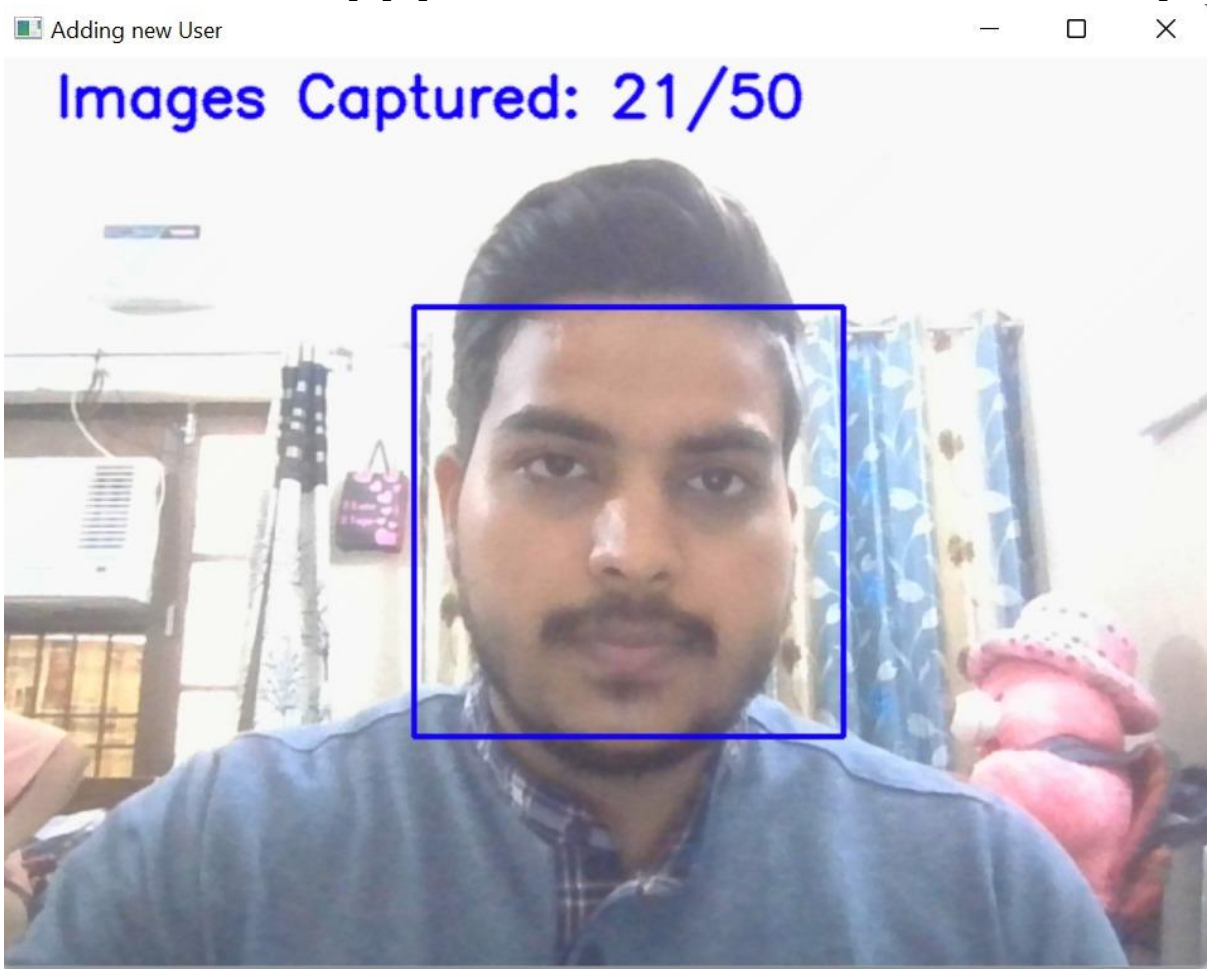
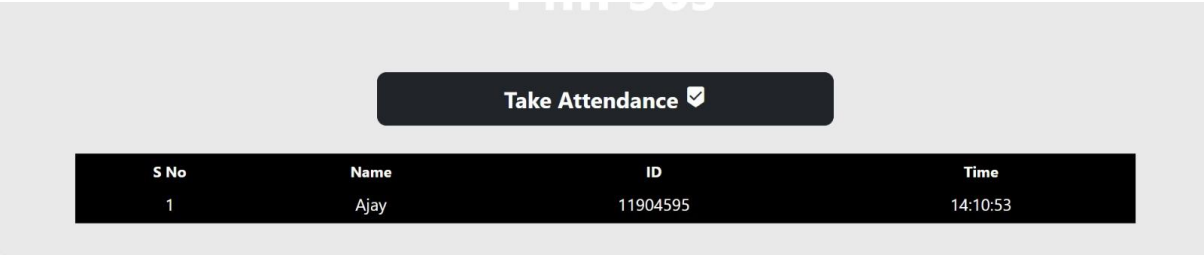


Figure 4. Image capturing while user registration

After this it'll capture 50 images in different angles they all get stored after performing algorithm execution they all get extracted



We can see user is registered

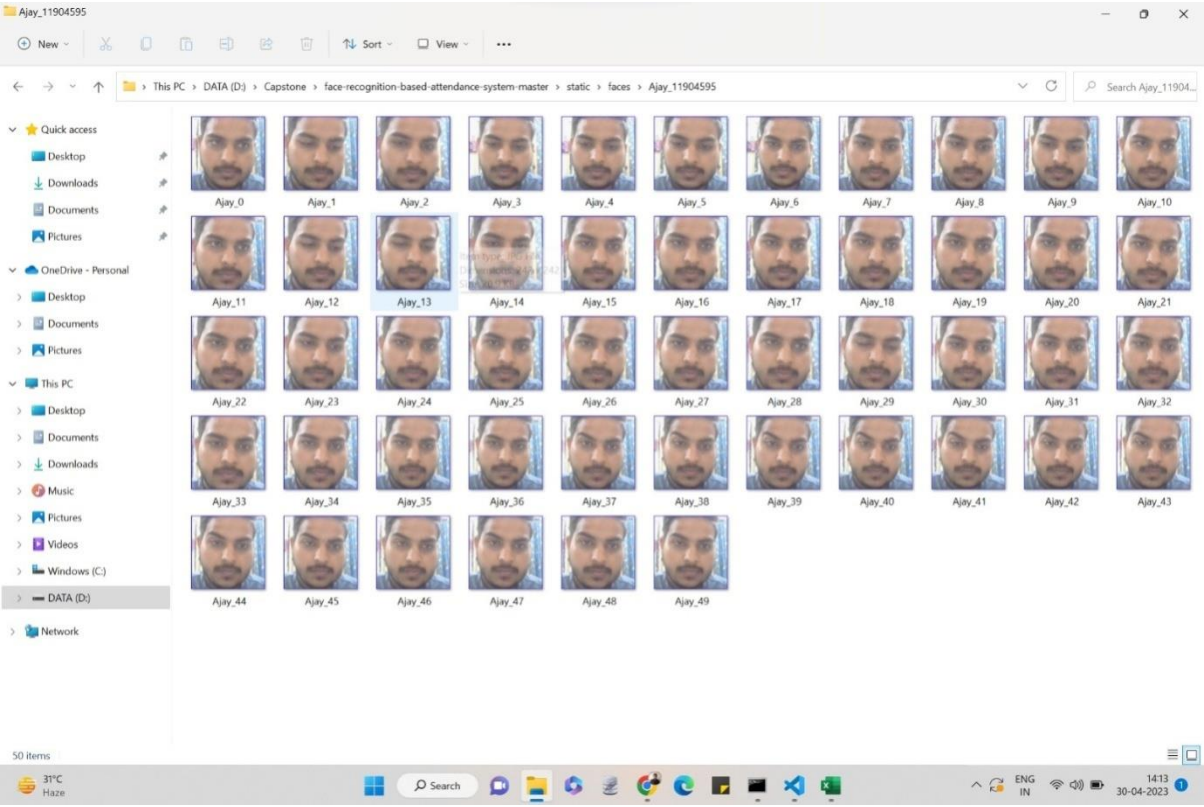


Figure 5. Images stores in data base after registration

Images are stored like this in backend

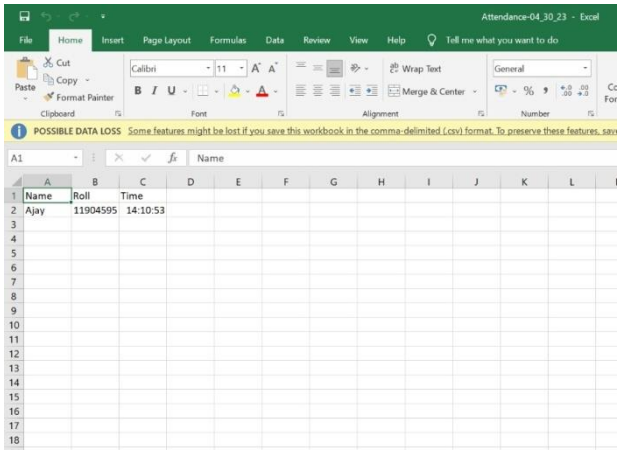


Figure6 . Attandance sheet

In database attendance is stored like this

And when you take attendance you comes under camera range it identifies and your attendance gets marked

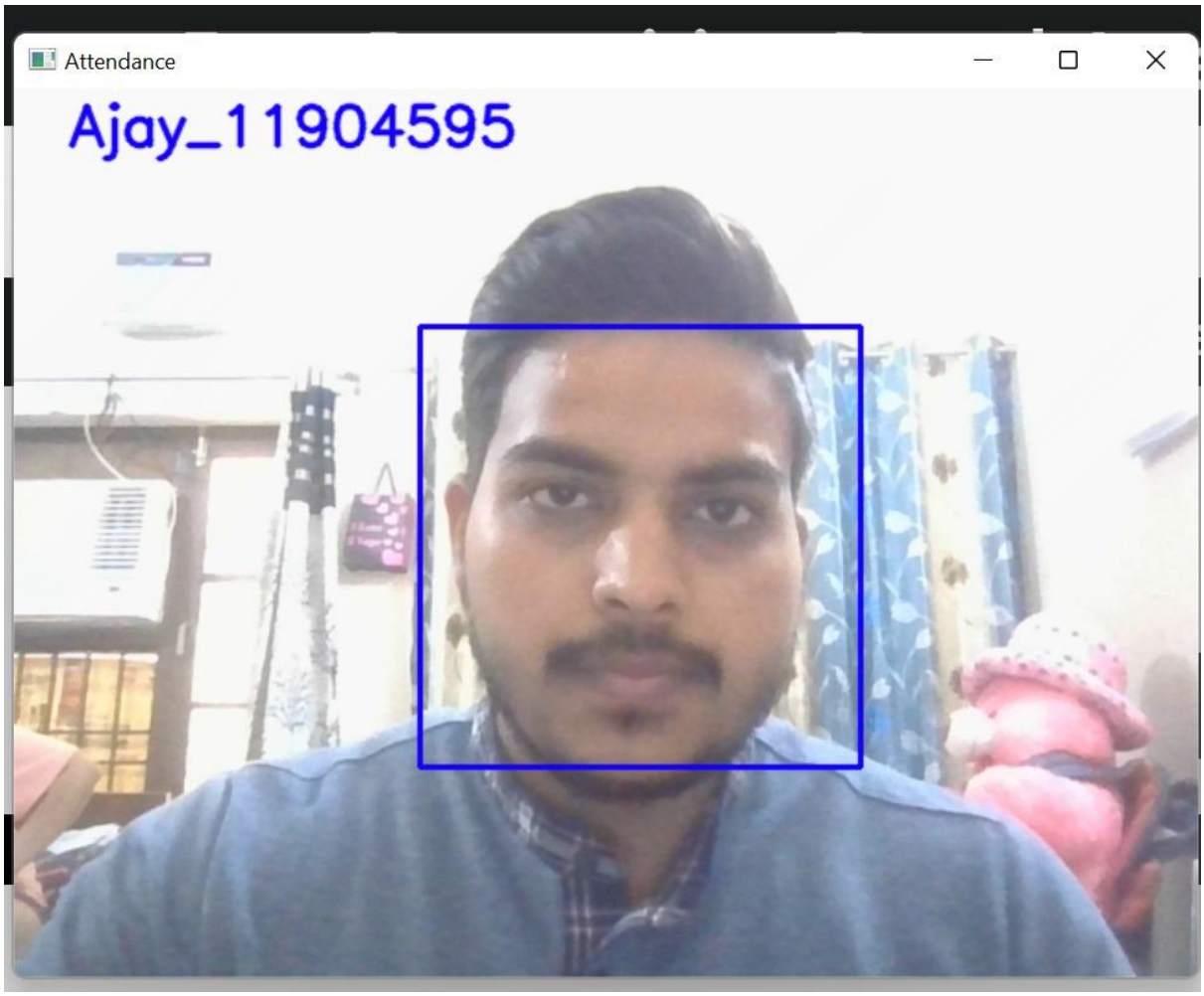


Figure 7. Image identified in Camera

It'll identify registered user and attendance gets marked

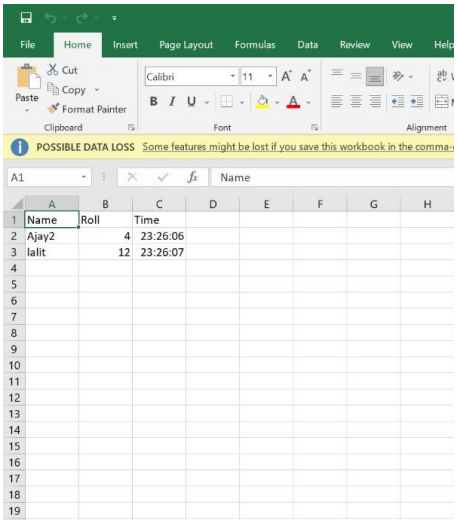


Figure8. Attendance marked

Testing phases

Following are the steps with the successful testing results:

Tested the initialization of the Flask app by calling the home page and verified that it loads successfully.

Result: The home page loaded successfully.

Tested the creation of the Attendance and static/faces directories by verifying that they exist after running the code.

Result: The directories were successfully created.

Tested the training of the face recognition model by verifying that the model file is created and contains data.

Result: The model file was successfully created and contained data.

Tested the extraction of attendance information by verifying that the correct data is read from the CSV file.

Result: The correct attendance data was successfully extracted from the CSV file.

Tested the addition of attendance by adding a user to the attendance CSV file and verifying that the data was successfully added.

Result: The attendance data for the added user was successfully added to the CSV file.

Tested the addition of a new user by verifying that their image is successfully captured and stored in the correct directory.

Result: The image of the new user was successfully captured and stored in the correct directory.

Tested the identification of a user's face by running the identification function on a sample image and verifying that the correct label is returned.

Bug Found : sometimes it is not able to identify correct face

Result: The identification function sometimes returned the wrong label for the sample image.

Retest was done bug solved successfully

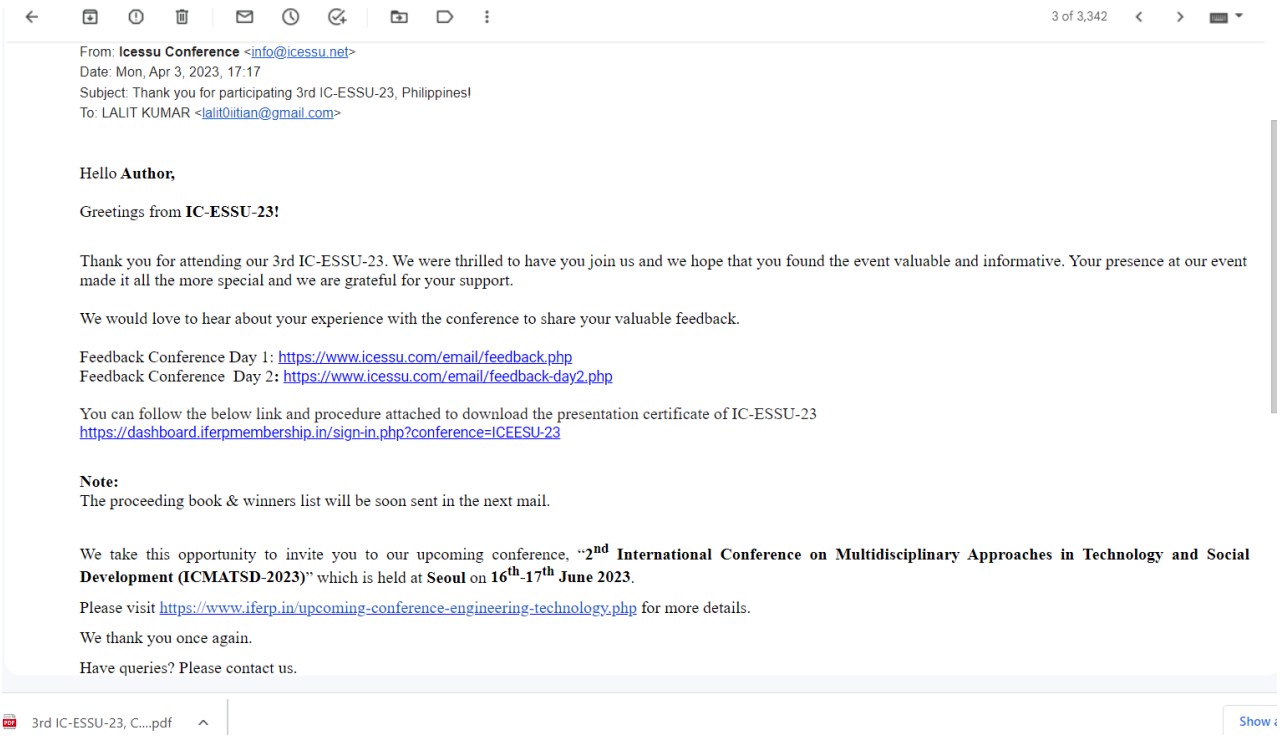
Status of our research paper

The research paper titled "**Face Recognition-Based Attendance Management: A Systematic Literature Review**" was presented by **Lalit Kumar (11913160**) at the **3rd IC-ESSU-23 conference** held on March 30, 2023 in the Philippines. The paper was well received by the audience and the judges, and was **awarded the best paper for the conference**. The paper presents a systematic literature review of various techniques and algorithms used for face recognition-based attendance management systems. It discusses the advantages and limitations of these techniques, and provides insights on how they can be further improved.

The paper was well received by the audience and the judges, and was awarded the best paper for the conference. The authors have since received feedback from peers and have incorporated the suggestions to improve the paper.

The paper has been submitted for publication in a peer-reviewed journal, and the initial response from the reviewers has been positive. The authors are currently addressing the reviewers' comments and plan to submit the revised version of the paper soon.

The research presented in the paper has significant implications for the development of face recognition-based attendance management systems. The authors are confident that the paper will contribute to the current body of knowledge in this area, and they look forward to sharing their findings with the wider academic community through publication in a reputable journal.



From: **Icessu Conference** <info@icessu.net>
Date: Mon, Apr 3, 2023, 17:17
Subject: Thank you for participating 3rd IC-ESSU-23, Philippines!
To: LALIT KUMAR <lalit0iitian@gmail.com>

Hello **Author,**

Greetings from **IC-ESSU-23!**

Thank you for attending our 3rd IC-ESSU-23. We were thrilled to have you join us and we hope that you found the event valuable and informative. Your presence at our event made it all the more special and we are grateful for your support.

We would love to hear about your experience with the conference to share your valuable feedback.

Feedback Conference Day 1: https://www.icessu.com/email/feedback.php
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You can follow the below link and procedure attached to download the presentation certificate of IC-ESSU-23
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Note:
The proceeding book & winners list will be soon sent in the next mail.

We take this opportunity to invite you to our upcoming conference, "**2nd International Conference on Multidisciplinary Approaches in Technology and Social Development (ICMATSD-2023)**" which is held at **Seoul** on **16th-17th June 2023**.

Please visit https://www.iferp.in/upcoming-conference-engineering-technology.php for more details.

We thank you once again.

Have queries? Please contact us.

Best paper awarded proof

Fwd: Best paper and presentation winners – 3rd IC-ESSU-23, Philippines

LALIT KUMAR 2:56 AM (18 minutes ago)
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Date: Tue, Apr 4, 2023, 15:10
Subject: Best paper and presentation winners – 3rd IC-ESSU-23, Philippines
To: LALIT KUMAR <lalit0iitian@gmail.com>

Dear **Author,**

Greetings from **IC-ESSU-23!**

We are happy to announce the best paper and best paper presentation results of the **3rd IC-ESSU-23, Philippines** held **on 30th-31st March 2023**. The response we received for the same was extremely overwhelming and it was very difficult for us to choose the winners.

We congratulate all the authors who participated in this conference.

Please find the attachment of the winners list

We look forward to working with you in upcoming conferences.

Note:
Proceeding book will be sent soon by this week

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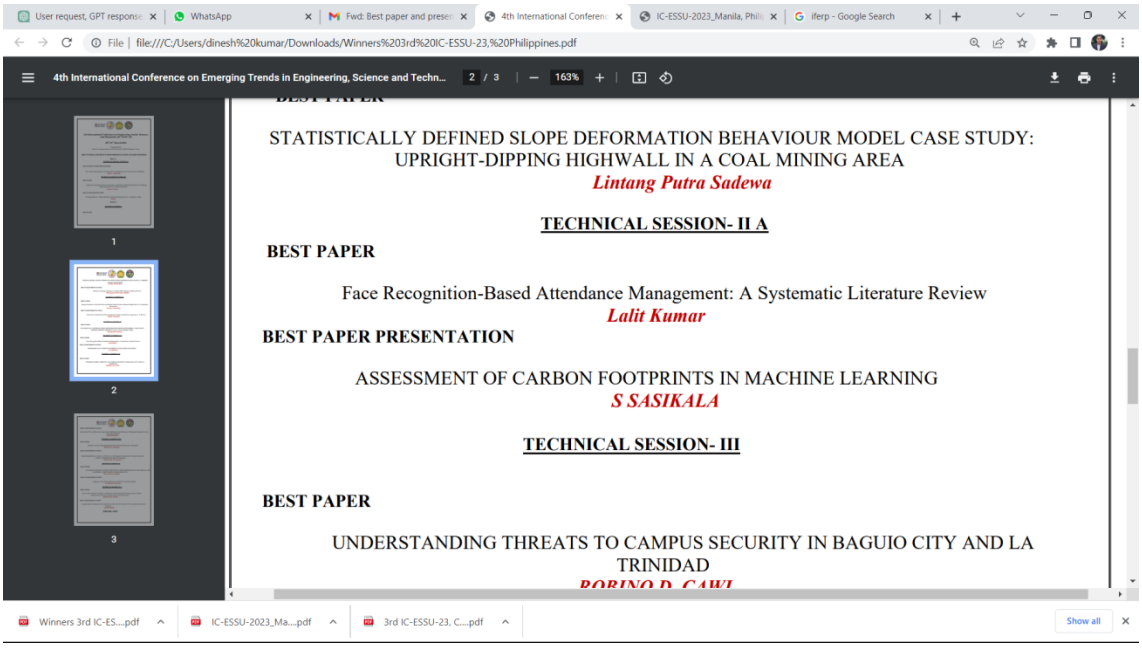

Abstract of Paper

Hand-managing attendance can be a cumbersome task for teachers, but this problem can be resolved through the

use of a smart and automated attendance management system. Such a system effectively addresses issues like

proxy attendance and the marking of absent students as present the focus is on developing a real-world solution

for smart attendance using automatic face recognition (AFR) technology. The goal is to create a system that

can accurately and efficiently recognize human faces in images or videos captured by a surveillance camera. To

achieve this, the researcher proposes to use canny edge detection, which is a popular image processing technique

that can enhance image quality and improve the accuracy of face recognition algorithms. By combining AFR

technology with canny edge detection, the system aims to provide a reliable and automated attendance tracking

solution for educational institutions. Overall, the study highlights the potential of integrating different algorithms

and techniques to improve the performance of face recognition systems and their real-world applications. The

Canny edge detection algorithm is a popular method used in computer vision and image processing for detecting

edges in digital images. It was developed by John F. Canny in 1986 and is widely used due to its effectiveness and

robustness. The algorithm involves several steps, including smoothing the image with a Gaussian filter, calculating

the gradient magnitude and direction, applying non-maximum suppression to thin the edges, and finally, using

hysteresis thresholding to determine the final edge map.In the context of automatic face recognition, the Canny

edge detection algorithm can be used as a pre-processing step to enhance facial features and improve the

accuracy of face recognition systems. By extracting the edges of the face, the algorithm can highlight important

facial landmarks, such as the eyes, nose, and mouth, which can then be used to identify individuals. Additionally,

by reducing the complexity of the facial image, the algorithm can also help to improve the speed and efficiency of

the face recognition system.

Overall, the Canny edge detection algorithm is a powerful tool for automatic face recognition and has been used

in numerous research studies and practical applications. Its ability to accurately extract edges from digital images

makes it a valuable pre-processing step for a wide range of computer vision and image processing tasks

Keywords

Attendance System, Automated Attendance, Image Processing, Face Detection, Feature Matching, FaceRecognition

Face Recognition-Based Attendance Management: A Systematic Literature Review

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Computer Science , Lovely Professional University, Punjab, India

Abstract

Hand-managing attendance can be a cumbersome task for teachers, but this problem can be resolved through the use of a smart and automated attendance management system. Such a system effectively addresses issues like proxy attendance and the marking of absent students as present the focus is on developing a real-world solution for smart attendance using automatic face recognition (AFR) technology. The goal is to create a system that can accurately and efficiently recognize human faces in images or videos captured by a surveillance camera. To achieve this, the researcher proposes to use canny edge detection, which is a popular image processing technique that can enhance image quality and improve the accuracy of face recognition algorithms. By combining AFR technology with canny edge detection, the system aims to provide a reliable and automated attendance tracking solution for educational institutions. Overall, the study highlights the potential of integrating different algorithms and techniques to improve the performance of face recognition systems and their real-world applications. The Canny edge detection algorithm is a popular method used in computer vision and image processing for detecting edges in digital images. It was developed by John F. Canny in 1986 and is widely used due to its effectiveness and robustness. The algorithm involves several steps, including smoothing the image with a Gaussian filter, calculating the gradient magnitude and direction, applying non-maximum suppression to thin the edges, and finally, using hysteresis thresholding to determine the final edge map.In the context of automatic face recognition, the Canny edge detection algorithm can be used as a pre-processing step to enhance facial features and improve the accuracy of face recognition systems. By extracting the edges of the face, the algorithm can highlight important facial landmarks, such as the eyes, nose, and mouth, which can then be used to identify individuals. Additionally, by reducing the complexity of the facial image, the algorithm can also help to improve the speed and efficiency of the face recognition system.

Overall, the Canny edge detection algorithm is a powerful tool for automatic face recognition and has been used in numerous research studies and practical applications. Its ability to accurately extract edges from digital images makes it a valuable pre-processing step for a wide range of computer vision and image processing tasks.

Keywords

Attendance System, Automated Attendance, Image Processing, Face Detection, Feature Matching, Face Recognition

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