Face Recognition System for Attendance Tracking

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Abstract

This report describes the development and implementation of a face recognition system designed to improve attendance accuracy and engagement in schools, Universities and Workplaces.

1 Introduction

The objective of this project is to use face recognition technology to prevent fraudulent sign-ins and engage students with personalized greetings.

2 Problem Statement

In educational institutions, particularly preschools and primary schools, accurate tracking of student attendance is crucial for both administrative and safety reasons. Traditional methods, such as manual sign-ins or even electronic systems that rely on physical ID cards, are susceptible to fraud. Students may have their friends sign in for them, leading to inaccurate attendance records.

- Fraudulent Sign-Ins: Manual and ID card-based systems can be easily manipulated by students, leading to false attendance records.
- Lack of Engagement: Standard attendance systems often lack features that actively engage and motivate students to attend school regularly.

3 Solution Overview

The project utilizes real-time face detection and recognition technology to verify the identity of students as they enter the school. Upon successful identification, the system records their attendance and displays a personalized greeting, including the student's image and a message appropriate for the time of day (e.g., "Good Morning" or "Good Afternoon"). This approach aims to enhance both the accuracy of attendance tracking and the overall student experience.

- Face detection and recognition using the `face_recognition` library.
- Personalized greetings displayed using OpenCV.
- Attendance tracking managed with Pandas and OpenPyXL.

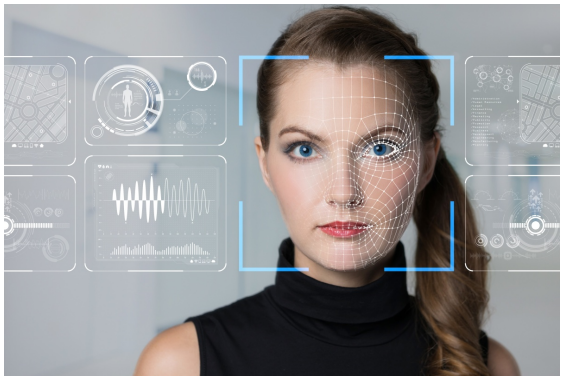

Figure 1:

4 Resources Used

- `face_recognition` library for face detection and recognition.
- OpenCV for image processing and display.
- Pandas and OpenPyXL for managing and storing attendance data.
- Images sourced from Google for testing.

5 Code

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pythonstyle language=Python, backgroundcolor=white, basicstyle=, `breaklines=true, keywordstyle=blue, commentstyle=green, stringstyle=red, showstringspaces=false, numbers=left, numberstyle=`$_{\text{gray,}}$

`stepnumber=1, captionpos=b, frame=single, rulecolor=black,`

Below is the Python code used for the Smart Attendance System:

[style=pythonstyle] import face$_{r}ecognitionimportcv2importnumpyasnpfromdatetimeimportdatetimeimportpan$

Function to load known faces and their encodings def load$_{k}nown_{f}aces() : known_{f}ace_{e}ncodings =$
$[]known_{f}ace_{n}ames = []image_{p}aths =$ "$abdulkalam" : r"E : projects_{0}1\dot{v}env_{p}ics_{k}alam.jpg","nelsonmandela" : r"E$

for name, path in image$_{p}aths.items() : ifos.path.isfile(path) : image = face_{r}ecognition.load_{i}mage_{f}ile(path)enc$
$face_{r}ecognition.face_{e}ncodings(image)[0]known_{f}ace_{e}ncodings.append(encoding)known_{f}ace_{n}ames.append(name)e$
$print(f"Imagefilenotfoundat : path")$

return known$_{f}ace_{e}ncodings, known_{f}ace_{n}ames, image_{p}aths$

Function to mark attendance in an Excel file def mark$_{a}ttendance(name, students) : today_{d}ate =$
$datetime.now().strftime("filename = today_{d}ate + ".xlsx"$

if os.path.isfile(filename): df = pd.read$_{e}xcel(filename, engine =' openpyxl')else : df =$
$pd.DataFrame(columns = ["Name","Time"])$

person$_{m}arked_{t}oday = any((df['Name'] == name)(df['Time'].str.startswith(today_{d}ate)))$

if not person$_{m}arked_{t}odayandnameinstudents : new_{e}ntry = pd.DataFrame([[name, datetime.now().strftime("d$
$pd.concat([df, new_{e}ntry], ignore_{i}ndex = True)df.to_{e}xcel(filename, index = False, engine ='$
$openpyxl')students.remove(name)print(f"Attendancerecordedforname.Remainingstudents :$
$students")$

Function to display an image with a text overlay def display$_{i}mage_{w}ith_{t}ext(image_{p}ath, text) :$
$image = cv2.imread(image_{p}ath)ifimageisnotNone : font = cv2.FONT_{H}ERSHEY_{S}IMPLEXfont_{s}cale =$

$1font_color = (255, 255, 255)thickness = 2text_size = cv2.getTextSize(text, font, font_scale, thickness)[0]text_x =$
$(image.shape[1]-text_size[0])//2text_y = (image.shape[0]+text_size[1])//2cv2.putText(image, text, (text_x, text_y), fon$

cv2.imshow('Detected Person', image) cv2.waitKey(3000) cv2.destroyAllWindows() else: print("Image not found.")

Load known faces and image paths $known_face_encodings, known_face_names, image_paths = load_known_faces()$

Initialize the webcam $video_capture = cv2.VideoCapture(0)$

Track the current day to reset the students list at the beginning of each day $current_day = datetime.now().strftime("students = known_face_names.copy()$

Start capturing video from the webcam while True: ret, frame = $video_capture.read()if notret :$
$break$

$rgb_small_frame = cv2.cvtColor(frame, cv2.COLOR_BGR2RGB)face_locations = face_recognition.face_locations$
$face_recognition.face_encodings(rgb_small_frame, face_locations)$

for (top, right, bottom, left), $face_encodinginzip(face_locations, face_encodings) : matches =$
$face_recognition.compare_faces(known_face_encodings, face_encoding)name = "Unknown"$

if True in matches: $first_match_index = matches.index(True)name = known_face_names[first_match_index]mark_att$
$image_paths.get(name)if image_path : current_time = datetime.now()hour = current_time.hourif hour <$
$12 : greeting_text = f"GoodMorningname, haveagreatday!"else : greeting_text = f"GoodAfternoonname!"display_i$

$today_day = datetime.now().strftime("iftoday_day! = current_day : current_day = today_daystudents =$
$known_face_names.copy()$

cv2.imshow('Attendance System', frame)

if cv2.waitKey(1) 0xFF == ord('q'): break

$video_capture.release()cv2.destroyAllWindows()$

6 Conclusion

Conclusion The Smart Attendance System is a modern tool that makes tracking attendance in schools much easier and more accurate. By using face recognition technology, the system can automatically identify students and record their attendance without manual input. It also adds a personal touch by greeting students with messages based on the time of day, which can make school more inviting, especially for young children. The system updates daily to keep track of each day's attendance separately and handles errors to ensure smooth operation. In the future, it could be improved by connecting with school management systems, supporting more students, and offering better user interfaces. Overall, this system shows how technology can make everyday tasks more efficient and effective.

7 References

Tutorial : https://www.youtube.com/watch?v=A6464U4bPPQt=932s

Zip: https://drive.google.com/drive/folders/1acFgGLoYguA–91BjTJIAC1EKQIRWkDV?usp=sharing