CS379FA23-HW2 Report Template

Title: Face Recognition-Based Attendance System

Student's Full Name: Charlie Ehrbar

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1. Introduction

The objective of this homework was to familiarize myself with the three ML models, CNN, SIFT, and a pre-trained model, and use the three to update an attendance system. Users would first have their faces detected and enrolled in said system, storing features from all three models. Users could also choose the second option and have a camera record their face, capture an image, and compare it using the aforementioned models to already stored users in the database. After a match is made with one of the other users, their attendance is marked for that time and date. The third option plots the total number of times each user has been marked attendance-wise.

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2. Methodology

2.1 Enrolling a New User Implementation

There isn't much security in the way of authenticating a new user. Once a face has been detected, the image collects features from all three models and stores the object in a tuple. The tuple is then pickled, and that object is stored in the database folder. While creating the enrollment process, I realized how important UML diagrams are before the beginning of a project. I found myself reusing chunks of code while realizing how important cohesion is for both readability and performance.

2.2 Updating CSV file and recording attendance Implementation

The user's image is captured from a live feed, and its features are extracted as if they were a new user. The user's image is compared to all of the users from the database. The highest score from all the matches is used, and that person is marked for attendance. If the file is not created, one is made, and the person's name and the current date and time are recorded. Again, the importance of a UML diagram was shown as I realized having a separate models class would have made this part more readable and efficient.

2.3 Plot the attendance summary from attendance.csv

Plotting the attendance was done using Chatgpt with a relatively simple prompt. Just give it the CSV file format and ask it to tally the number of occurrences and plot it against the names.

2.4 Code Explanation and Commenting

Provide detailed explanations and comments for the implemented code. Explain the purpose and functionality of key functions and methods. Discuss any critical design decisions and optimizations made during the implementation.

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3. Interpretation

3.1 Explain how to enroll a new user

Enrolling a user is as simple as indicating the choice to do so at the main menu by entering 1. Entering a first and last name allows the camera to capture an image of yourself; after extracting features, the image and captured features are stored away.

3.2 Explain how to record attendance

This functions similarly to registering a new user. Choose option two on the main menu. A camera is run constantly; at a key press, an image is captured, and features are extracted and compared to other users. The closest match is then recorded, and their attendance is marked.

3.3 Performance Evaluation Results

When running the evaluation test, which is run separately from main.py. It was clear the pre-trained VG model functioned far above both SIFT and CNN. The VG model reached the 10 matches at a much faster rate.

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4. Conclusion

Overall, the attendance marking system operates on three different modes: enrollment, a new user's image is added to the system; attendance, a user is matched against others in the database, and the highest match is marked as being present, and plotting, in which the number of times a person has been marked presented is plotted against their name. I found myself realizing the importance of UML diagrams as the project evolved. I backtracked further and further thoroughly until I realized the sheer importance of cohesion and how it would have made the project, its organization of it, and its completion time both shorter and easier. In the future of this projection, with an implementation of a GUI, multiple images could be used for further identification and the visualization of these comparison between different faces in the database can be visualized.

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5. References

ChatGPT
Google Collab (Given during class)