Smart Attendance System with Face Recognition

A Synopsis Submitted

in Partial Fulfillment of the Requirements

for the Degree of

BACHELOR OF TECHNOLOGY

in

Department of Artificial Intelligence & Artificial Intelligence & Machine Learning

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June, 2024

Synopsis

1. **Introduction**
   In educational institutions, manual attendance tracking is time-consuming and prone to errors. This project addresses the problem by developing a real-time attendance tracking system using face recognition technology. The system automatically identifies students through live video feeds, encodes facial features, and records attendance in a Firebase database. This approach aims to enhance the efficiency of attendance management while ensuring secure, scalable, and reliable data handling.

2. **Objectives**
   - To develop a real-time attendance system using face recognition via live video feeds.
   - To implement a secure authentication system to ensure only authorized users can access data.
   - To use Firebase for cloud-based storage and asynchronous updates for scalability.
   - To ensure data consistency and integrity through real-time updates to the Firebase database.
   - To enhance the system's reliability by preventing attendance marking through digital or static photos.

3. **Literature Review**
   Face recognition technology has been widely researched and applied in various domains, including surveillance and security. Several face recognition algorithms, such as FaceNet, OpenFace, and Dlib, have shown significant success in providing accurate face encodings. Previous studies highlight the potential of cloud-based solutions like Firebase for handling real-time data storage and updates. Research also suggests the importance of improving recognition accuracy in varied environments and preventing fraudulent attendance marking through the use of static images.

4. **Methodology**
   The project methodology will include the following phases:
   - **Data Collection:** Capturing live video streams to detect and identify student faces**.**
   - **Face Detection and Recognition:** Utilizing face detection algorithms such as MTCNN and face recognition models like FaceNet or Dlib to encode and match student faces in real-time**.**
   - **Real-time Processing:** Integrating live video feeds to continuously process facial encodings and compare them with the existing database.
   - **Database Integration:** Using Firebase for cloud-based storage of attendance records and student data, with asynchronous updates to ensure scalability.

- **Secure Authentication:** Implementing authentication protocols to ensure authorized access to the system's features
- **Attendance Marking:** Automatically updating attendance records in Firebase when a student's face is successfully recognized**.**
- **Anti-spoofing Measures:** Implementing measures to detect and prevent the use of digital or static photos for attendance marking.

5. **Project Plan and Timeline**
   - **Week 1-2**: System design and architecture setup, including Firebase integration.
   - **Week 3-4**: Face detection and recognition algorithm implementation and testing.
   - **Week 5**: Integration of live video feeds for real-time recognition.
   - **Week 6**: Implementation of secure authentication and cloud storage.
   - **Week 7**: Testing of real-time processing, attendance marking, and database synchronization.
   - **Week 8**: Deployment, testing of anti-spoofing measures, and final documentation.

6. **Expected Outcomes**
   - A fully functional, real-time attendance tracking system based on face recognition.
   - Secure and efficient handling of student data with cloud-based storage using Firebase.
   - Scalable asynchronous updates for real-time attendance management.
   - Improved efficiency by eliminating manual attendance tracking and preventing fraudulent attendance marking.
   - Future improvements aimed at enhancing face recognition accuracy and implementing robust anti-spoofing techniques.

7. **References**

   - Schroff, F., Kalenichenko, D., & Philbin, J. (2015). FaceNet: A Unified Embedding for Face Recognition and Clustering. *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 815-823.
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   - Firebase Documentation (2023). Google Cloud, https://firebase.google.com/docs.

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