

SmartAttend Application

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Abstract: *In this project, we're taking on the task of creating an Android college attendance system, which will utilize facial recognition, location tracking via Google Maps API (GMAP), and, optionally, bio verification for attendance in classrooms. The system guarantees that only the students, themselves physically present at the respective classrooms, will be able to mark their attendance, thereby providing security and ensuring the integrity of attendance records. The application has been developed primarily in Java and XML on the front end and uses Firebase Authentication and Real-time Database on the backend. The three user types supported by the system are students, teachers, and parents. Along with facial recognition and verification based on location, it could also consist of biometrics such as fingerprint scanning to increase security. Parents will get real-time updates about where their children are, students can check attendance records, and teachers share news about attendance. Therefore, it will automate attendance with additional real-time communications to parents*

Keywords: Android, Facial Recognition, Firebase, Location Services, Real-time Database, Attendance, Anti-Spoofing, Notification

I. INTRODUCTION

Proper management of attendance within the institution calls for discipline, engagement of students, and academic accountability. Traditional methods of attendance, such as manual roll calls and RFID-based systems, are very vulnerable to inefficiencies, errors, and fraudulent practices such as proxy attendance. This project thus introduces an Android-based College Attendance System that relies on face recognition, real-time location tracking through Google Maps API (GMAP).

This system will ensure that a student can only mark their attendance if they are physically present in their respective classes. The face recognition technology prevents identity fraud, and by using GPS location tracking, one verifies the student's presence at the designated place. The Firebase Authentication and Firebase Real-time Database power the backend, ensuring effective data management, real-time data access for both teachers and parents, and, of course, teacher can also share updates with the student.

It also provides real-time notifications to parents so that they can track the presence of their child on campus. Teachers can easily track the attendance records of students, which helps in reducing administrative workload and accuracy. This project integrates modern technologies to enhance security, eliminate proxy attendance, and create a transparent, efficient, and automated attendance system for educational institutions.

II. METHODOLOGY

The proposed Android-Based College Attendance System uses face recognition of students through Convolutional Neural Networks (CNN), real-time location tracking using Google Maps API (GMAP), and biometric authentication (optional) in ensuring a secure, automated marking process. The methodology includes the following key phases:

1. Data Collection and Preprocessing

- Upon registration, students must present their facial data that will be stored in the database.
- The real-time face images are captured through the front camera of the Android device.
- The images are pre-processed
- The pre-processed facial images are stored in Firebase for authentication

2. Face Recognition Using CNN

- If a student is trying to mark attendance, then the system captures the real-time face image.
- Face detection module is done using OpenCV's Haar Cascade classifier or Multi-task Cascaded Convolutional Networks (MTCNN) for localizing the face.
- A pre-trained CNN model, Mobile Net, Face Net, or a custom CNN is passed the detected face for comparison.
- The CNN draws out unique facial features and then compares them to the stored embeddings in the database.
- If the cosine similarity score or Euclidean distance is in acceptable range, then the face is authenticated positively.

3. Location Verification Using Google Maps API

- The application fetches the live GPS coordinates of the student using the Google Maps API.
- Geofencing mechanism will hold the fact that the student stays within a predefined radius of the classroom, that is, within 10 meters or so.
- If the location is within the registered classroom coordinates, the attendance process continues.
- If the student is outside the allowed radius, attendance is denied, thus preventing remote fraudulent marking.

4. Attendance Marking and Data Storage

- The attendance automatically records itself on the Firebase Realtime Database using timestamp after these steps are verified- face recognition and location.

5. Real-Time Notifications and Teacher Access

- Produces notifications if his or her child is absent in school.
- Student absence and attendance are readily available in the teachers dashboard as well.
- Face recognition using CNN Model: The student is authenticated through facial recognition by using deep learning.

6. Workflow of the System

- Student Login: The student logs into the mobile app via Firebase Authentication.
- Taking Real time Photo, capturing Face through System End.
- Face recognition using CNN Model: The student is authenticated through facial recognition by using deep learning.
- Location Validation (Google Maps API): The student's GPS location is verified.
- Attendance Recording: If all conditions are met, attendance is recorded in Firebase Real-time Database.
- Notifications: Parents receive real-time updates, and teachers can access attendance records.

III. WORKING

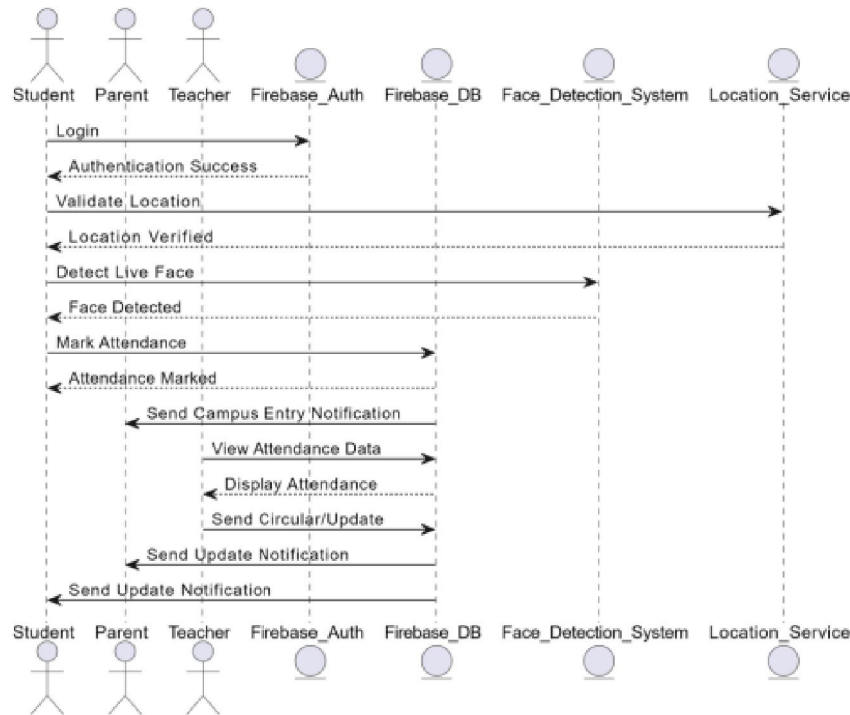


Fig. 1 Work Flow of Smart Attend Application

The Android-Based College Attendance System works by integrating CNN-based face recognition, real-time location tracking using Google Maps API, and to ensure secure and automated attendance marking.

User Login & Authentication

- Students log in via Firebase Authentication
- Teacher’s access attendance records, and parents receive notifications.

Face Recognition (CNN Model)

- The system captures a real-time image using the front camera.
- The CNN model extracts facial features and matches them with stored embedding.

Location Validation (Google Maps API)

- The system fetches the GPS location and checks if the student is inside the classroom radius.
- If outside the allowed range, attendance is denied.

Attendance Marking & Data Storage

- If all checks (face, location,) pass, attendance is recorded in Firebase Real-time Database.

Notifications & Reporting

- Parents receive Updates.
- Teachers access dashboards to view attendance reports.

Proposed Work for Student Face Attendance Android App Using Google Maps (GMap)

The Student Face Attendance Android App was created to automatize and enrich the attendance process in schools and other learning centers by using Google Maps (GMap) to verify locations and face recognition for verification. It ensures that the students are indeed on campus before they mark their attendance. Firebase Realtime Database and Firebase Authentication are used to secure data and authenticate by the application.

Proposed System Workflow

User Authentication (Firebase Authentication)

- Students and faculty members register/login using Firebase Authentication.
- User data, including name, student ID, and email, is securely stored in Firebase.

Location Verification (Google Maps API)

- When a student attempts to mark attendance, the app fetches the student's current GPS location.
- The system verifies if the location is within the college campus boundaries using geofencing.
- If the student is outside the predefined area, attendance cannot be marked.

Face Recognition-Based Attendance

- Once the location is verified, the app prompts the student to scan their face.
- The scanned face is matched against pre-stored facial data in Firebase for authentication.
- If the face matches successfully, attendance is marked in the Firebase Realtime Database.

Attendance Record Management (Firebase Realtime Database)

- Attendance records are stored in Firebase Realtime Database
- Faculty members can view real-time attendance reports for monitoring and analysis.

Admin and Faculty Access

- Faculty members have access to the attendance dashboard.
- Admins can set geofencing boundaries for the institution using Google Maps API.

IV. RESULTS AND DISCUSSION

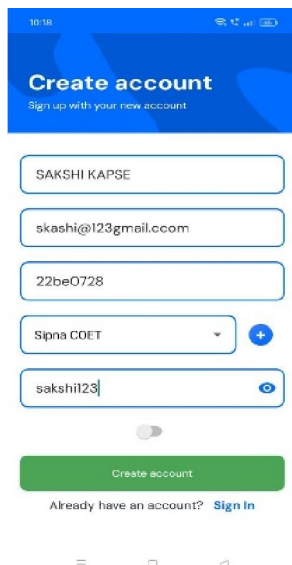


Fig. 2 Sign Up page



Fig. 3 Login Page

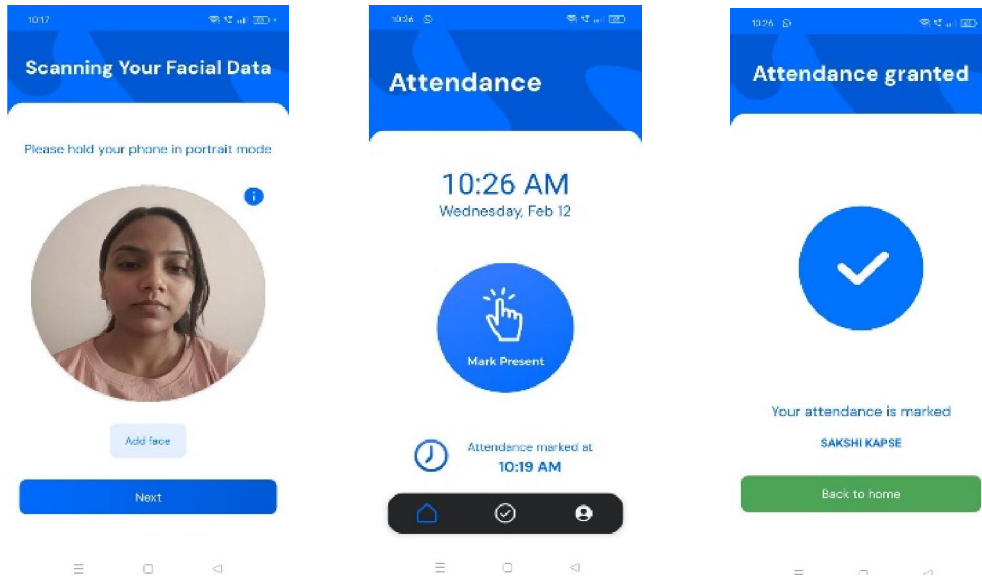


Fig. 4 Attendance Marking



Fig. 5 Attendance Progress

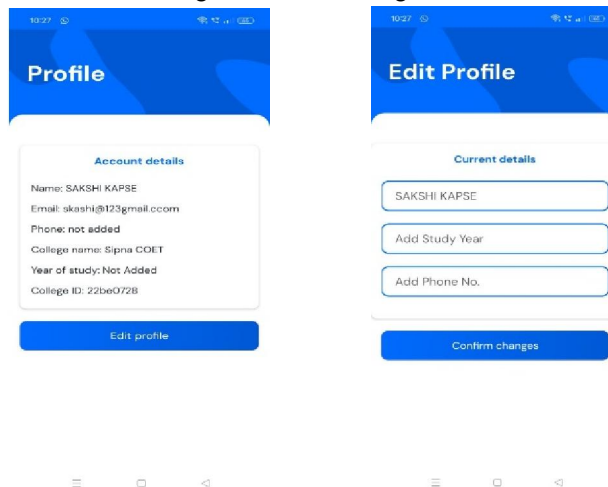


Fig. 6 User Profile

V. FUTURE SCOPE

- **AI-Powered Emotion Detection** – Analyze student engagement levels during attendance marking.
- **Voice-Based Attendance** – Implement voice recognition as an alternative authentication method.
- **Integration with College ERP Systems** – Automate grading, attendance reports, and academic tracking.
- **Offline Mode Support** – Enable attendance marking without an internet connection, syncing when online.
- **Blockchain for Attendance Security** – Secure attendance records with blockchain technology for tamper-proof data.
- **Integration with Smart ID Cards** – Combine RFID/NFC technology with face recognition for enhanced verification.
- **Hybrid Recognition System** – Combine face recognition with gait analysis or iris recognition for higher accuracy.

VI. CONCLUSION

The Android-Based College Attendance System successfully automates the attendance process using CNN-based face recognition and real-time location tracking with Google Maps API. By eliminating manual roll calls and proxy attendance, the system ensures accuracy, security, and efficiency in student attendance management.

With Firebase Realtime Database for data storage and Firebase for real-time notifications/sms, parents stay informed about their child's attendance status, while teachers can efficiently track and manage records via a dedicated dashboard. The integration of liveness detection and geo-fencing further strengthens security, ensuring only physically present students can mark their attendance.

This system not only enhances the transparency and reliability of attendance tracking but also reduces administrative workload. With potential future enhancements such as AI-powered emotion detection, offline mode, and blockchain-based security, the project has significant scalability and adaptability for various educational and corporate environments.

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