
Smart Attendance Management System

OVERVIEW [[Github](#)]

This software is an Attendance Management System for schools & colleges. Basic idea behind the project is to ease the process of marking the attendance by the lecturer.

More specifically, this system will be designed to help the lecturer mark the attendance using the latest technologies like Machine Learning (ML), Computer Vision. The system also contains a database containing the data of the student.

TEAM

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MOTIVATION

Any organization, either large or small, requires an attendance tracking system for effective maintenance of projects and tasks. It is essential for the management to have records of the time and attendance of each student to handle discrepancies and variations within the organization. In today's competitive world, each and every technology has drastic improvements when automated. Since, manual attendance tracking is a tedious and inefficient process for a group of students, the smart attendance management system with face recognition capabilities takes a huge leap in this scenario.

Automatic Facial Recognition is a competent biometrics technology that is used in human machine interaction, security systems, and image processing techniques. Smart attendance system with a modern face recognition system is a real-time solution to handle students with their day-to-day activities and can be used to detect human faces automatically by capturing the current date, time, and location.

REQUIREMENT ANALYSIS

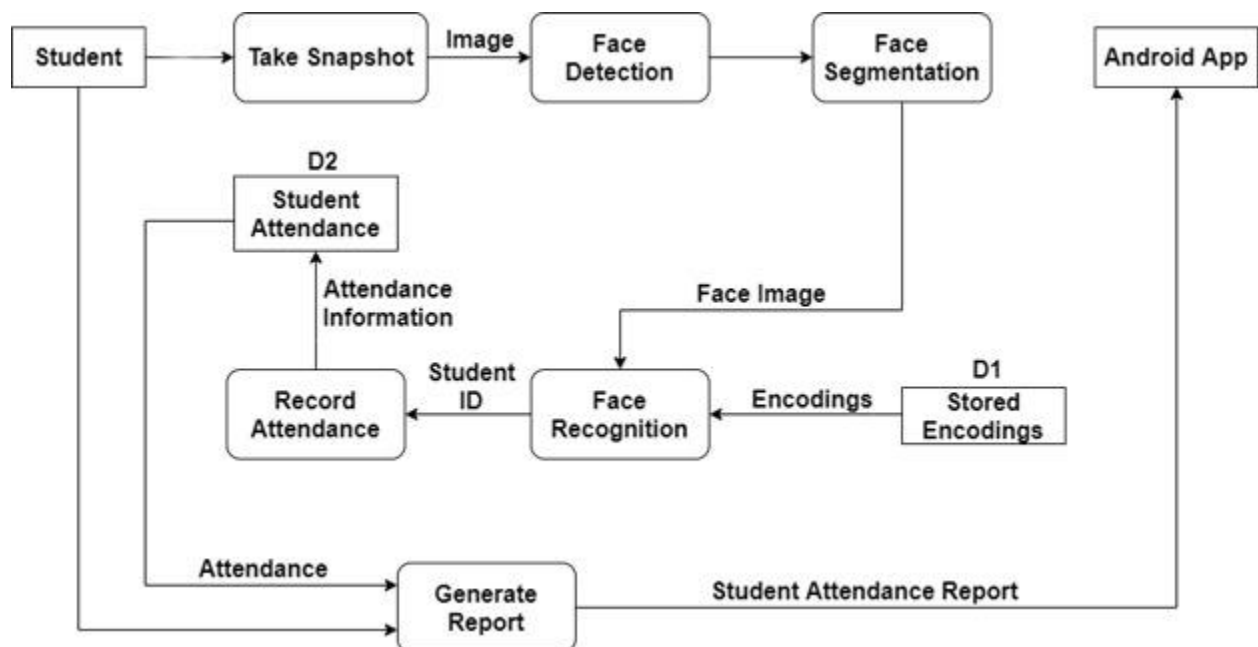
1. Hardware required:
 - a. Computer with intel i5 and above processor
 - b. 4GB system RAM or above
 - c. Mobile phone with working camera
2. Software required:
 - a. Android OS with API Level 24
 - b. MongoDB
3. APIs and Libraries:
 - a. Design dependencies: 'com.google.android.material:material:1.2.1', tk(python)
 - b. Networking dependencies: 'com.squareup.retrofit2:retrofit:2.4.0', 'com.squareup.retrofit2:converter-gson:2.4.0'
 - c. Database Connector: pymongo
 - d. Deep Learning Libraries: Tensorflow, Keras, OpenCV, MTCNN
 - e. Helper Libraries: Numpy, matplotlib

IDEA

The Smart Attendance Management System has three active actors and one cooperating system. The Student, whose attendance is to be taken, the Lecturer, who will take attendance. The Admin will have access to the whole system directly.

The Smart Attendance Management System first scans image of student through camera. This image is processed, and it is checked whether the image contains a face or not, if yes then information like mobile number, address, roll number, PRN number is asked. This information gets stored in the NoSQL database and retrieved when required. Hence analyzing images with the help of machine learning recognizes the person accurately.

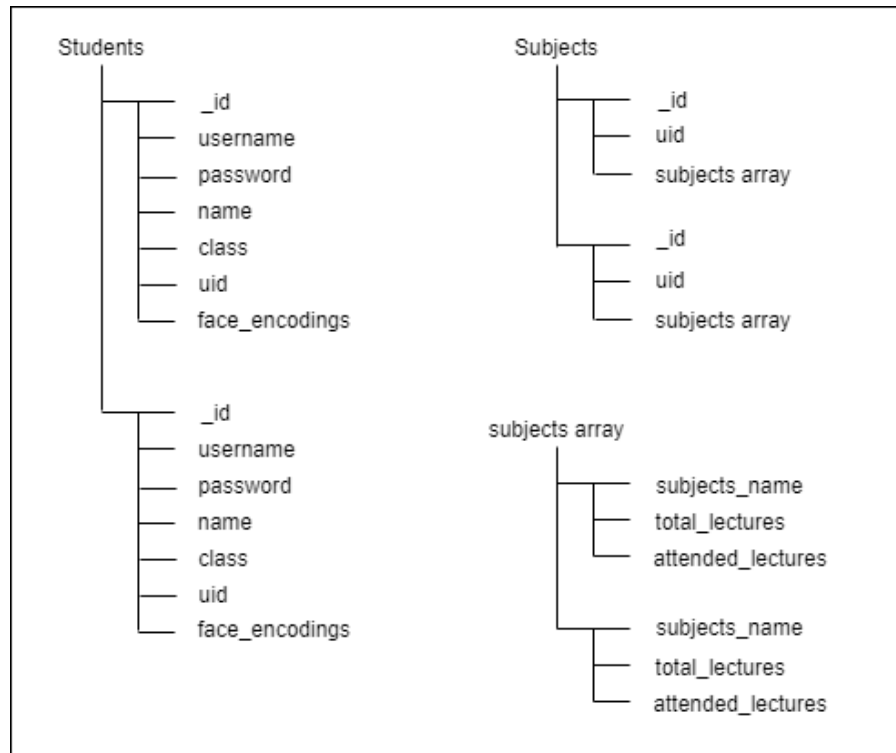
FLOW DIAGRAM



SYSTEM DESIGN

A thorough survey has revealed that various methods and combinations of these methods can be applied in development of a new face recognition system. Among the many possible approaches, we have decided to use a combination of knowledge-based methods for face detection part and neural network approach for face recognition part. The main reason in this selection is their smooth applicability and reliability issues.

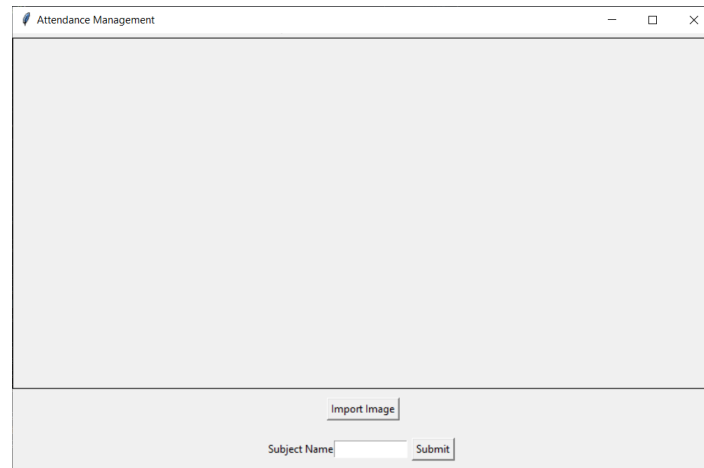
DATABASE STRUCTURE



FLASK API CALLS

Image Upload	POST {{url}}/post_image
Student SignUp	POST {{url}}/post_info
Student Login	GET {{url}}/verify
Get Attendance	GET {{url}}/get_a
Mark Attendance	POST {{url}}/mark_a

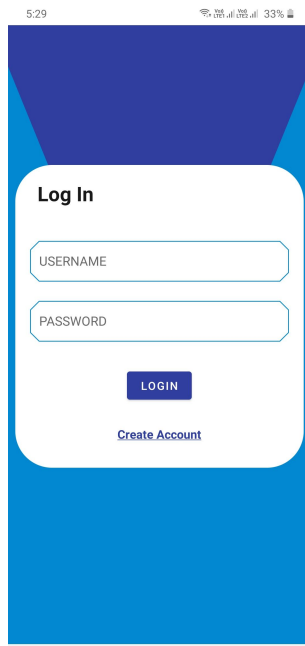
DESKTOP CLIENT



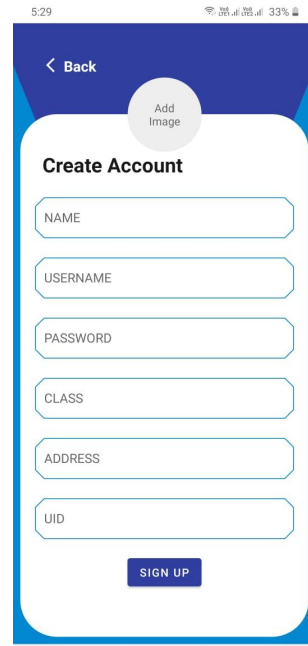
A screenshot of a desktop application window titled "Attendance Management". The window has a standard macOS-style title bar with minimize, maximize, and close buttons. The main content area is a large, empty light gray rectangle. At the bottom of the window, there is a footer bar containing an "Import Image" button, a text input field labeled "Subject Name", and a "Submit" button.

ANDROID APPLICATION

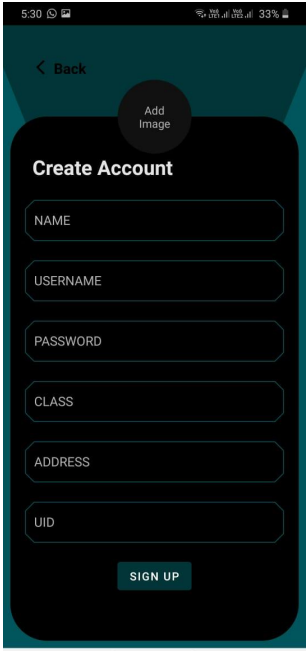
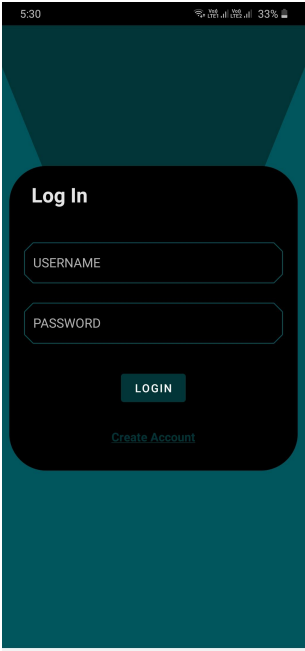
Login/Sign Up



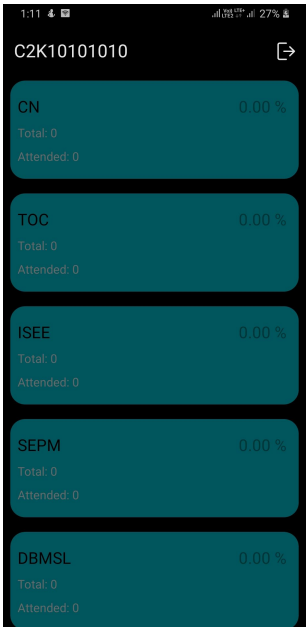
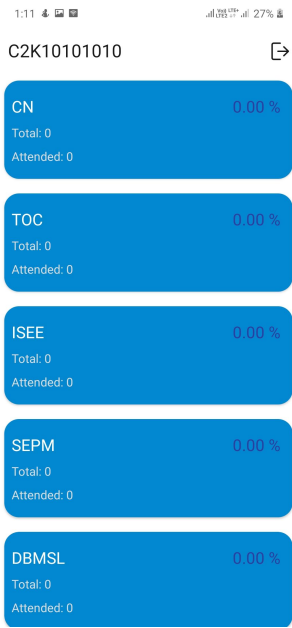
A screenshot of the Android application's login screen. The screen has a blue gradient background. At the top, the status bar shows the time as 5:29 and a 33% battery level. The main content is a white rounded rectangle with the title "Log In". Below the title are two text input fields labeled "USERNAME" and "PASSWORD". A blue "LOGIN" button is positioned below the password field. At the bottom of the white rectangle is a link that says "Create Account".



A screenshot of the Android application's "Create Account" screen. The screen has a blue gradient background. At the top, the status bar shows the time as 5:29 and a 33% battery level. The main content is a white rounded rectangle with the title "Create Account". Above the title is a circular button labeled "Add Image". Below the title are six text input fields labeled "NAME", "USERNAME", "PASSWORD", "CLASS", "ADDRESS", and "UID". A blue "SIGN UP" button is positioned below the "UID" field. A "< Back" button is located at the top left of the white rectangle.



Attendance Report



CONCLUSION

Face recognition systems are part of facial image processing applications and their significance as a research area is increasing recently. Implementations of the system are crime prevention, video surveillance, person verification, and similar security activities. The goal is reached by face detection and recognition methods. Knowledge-Based face detection methods are used to find, locate and extract faces in acquired images. Implemented methods are skin color and facial features. Neural networks are used for face recognition.

RGB color space is used to specify skin color values, and segmentation decreases searching time of face images. Facial components on face candidates are appeared with implementation of LoG filter. LoG filter shows good performance on extracting facial components under different illumination conditions. FFNN is performed to classify to solve pattern recognition problems since face recognition is a kind of pattern recognition. Classification result is accurate. Classification is also flexible and correct when the extracted face image is small oriented, closed eye, and small smiled. Proposed algorithm is capable of detecting multiple faces, and the performance of the system has acceptable good results.

FUTURE SCOPE

This application can further be developed into a system which will also include fingerprint and iris scanning. We can also build an interactive and friendly User Interface for the application. Adding to this, the platform can be made more robust and secure. The future of smart attendance management systems is it's integration with different machine learning techniques with artificial intelligence. We can also develop different methods for identifying a person uniquely according to environmental conditions. So there is a lot more scope for future development.

REFERENCES

1. L. Zhi-fang, Y. Zhi-sheng, A.K.Jain and W. Yun-qiong, 2003, “Face Detection And Facial Feature Extraction In Color Image”, Proc. The Fifth International Conference on Computational Intelligence and Multimedia Applications (ICCIMA 03), pp.126-130, Xi'an, China.
2. C. Lin, 2005, “Face Detection By Color And Multilayer Feedforward Neural Network”, Proc.2005 IEEE International Conference on Information Acquisition, pp.518-523, Hong Kong and Macau, China.
3. [Siamese Neural Networks for One-shot Image Recognition](#), 2015.
4. [One-shot learning, Wikipedia.](#)
5. [Siamese Network, Wikipedia.](#)
6. [Triplet loss, Wikipedia.](#)