



NO TOUCH

Capstone Project Report MID SEMESTER EVALUATION

Submitted by:

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Problem Statement

Traditional attendance systems in institutions are time consuming and prone to proxies. Modern attendance systems like contact based fingerprint verification systems are unhygienic and have high capital and infrastructure needs.

Other large-scale attendance systems using various contactless biometric verification like facial recognition are less secure, have no method to verify your marked attendance and require high end infrastructure.

These problems can be overcome by using a contactless biometric verification system for attendance.

Project Scope

Develop an attendance system which is secure, efficient, fast and avoids physical contact to promote hygiene. The system needs to be scalable so that any institution or organisation can adopt it without high capital or infrastructure needs.





Approved Objectives



- Develop a robust, efficient and bug free application capable of running on a wide array of smartphones.
- Extract the maximum features from the input image while minimizing the computation cost.
- Verify the extracted features with existing fingerprint data with high precision.
- Secure the attendance system against proxy attendance attempts by providing necessary features to restrict the student from marking their attendance more than once.

Literature Survey



Year	Research Location	Paper Name	Broad Area/Domain
2021	Michigan, United States of America	C2CL: Contact to Contactless Fingerprint Matching	Use of contactless fingerprint photos for fingerprint matching
2021	Darmstadt, Germany	Mobile Touchless Fingerprint Recognition: Implementation, Performance and Usability Aspects	Fingerprint selfies for verification using mobile devices.
2020	Rajasthan, India	On Matching Finger-selfies using Deep Scattering Networks	Fingerprint segmentation using Saliency mask, Deep scatter networks for matching



Problems Identified



- Extensive research has been carried out in the field of fingerprint verification however the use of deep neural networks to enhance fingerprints is still a novel approach in this problem area.
- Different lighting conditions and camera quality have hampered the results of image segmentation tasks when dealing with fingerprint images.
- Fingerprint Verification methods based on physical scanners yield poor results with difference in pressure and foreign particles of each fingerprint impression recorded by scanners.

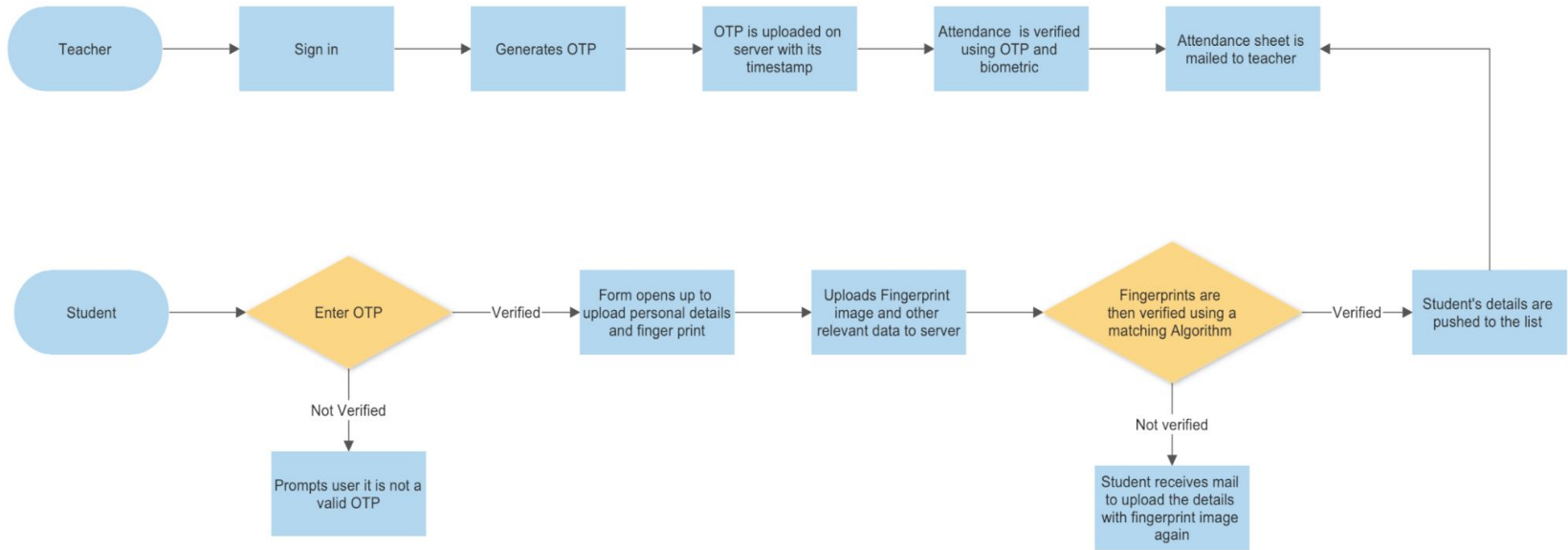


Tools/Platforms Used

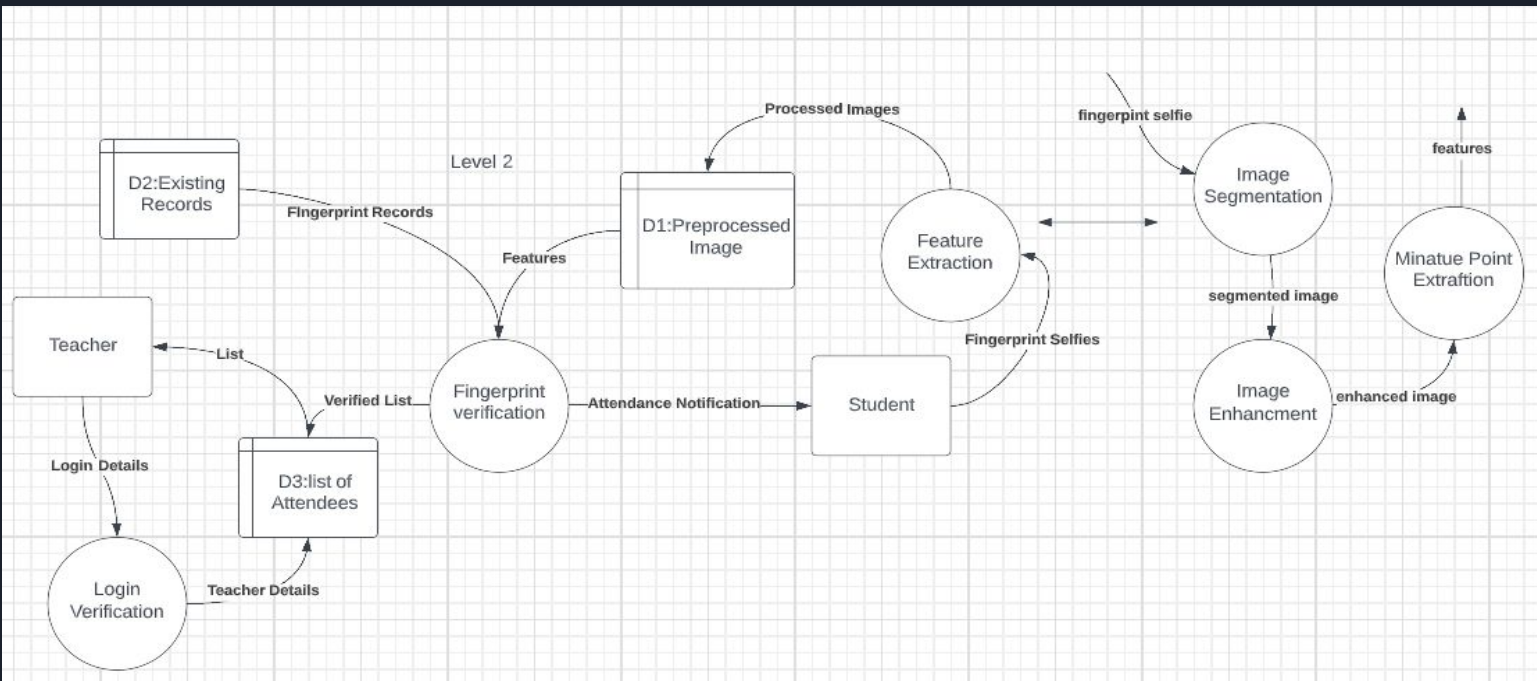


- **Python:** A high-level language used largely in Automation, Machine Learning, and Data Analytics. The following libraries are used: Pytorch, Keras, TensorFlow, NumPy, Pandas, scikit-learn, matplotlib, Sci-Py, OpenCV.
- **React Native:** It is a JavaScript framework used widely for cross platform mobile application development.
- **Firebase:** It is a platform developed by Google for mobile and web application development. It will be used to develop the backend for our application
- **Django:** It is an open-source back-end server side web framework.

Block diagram

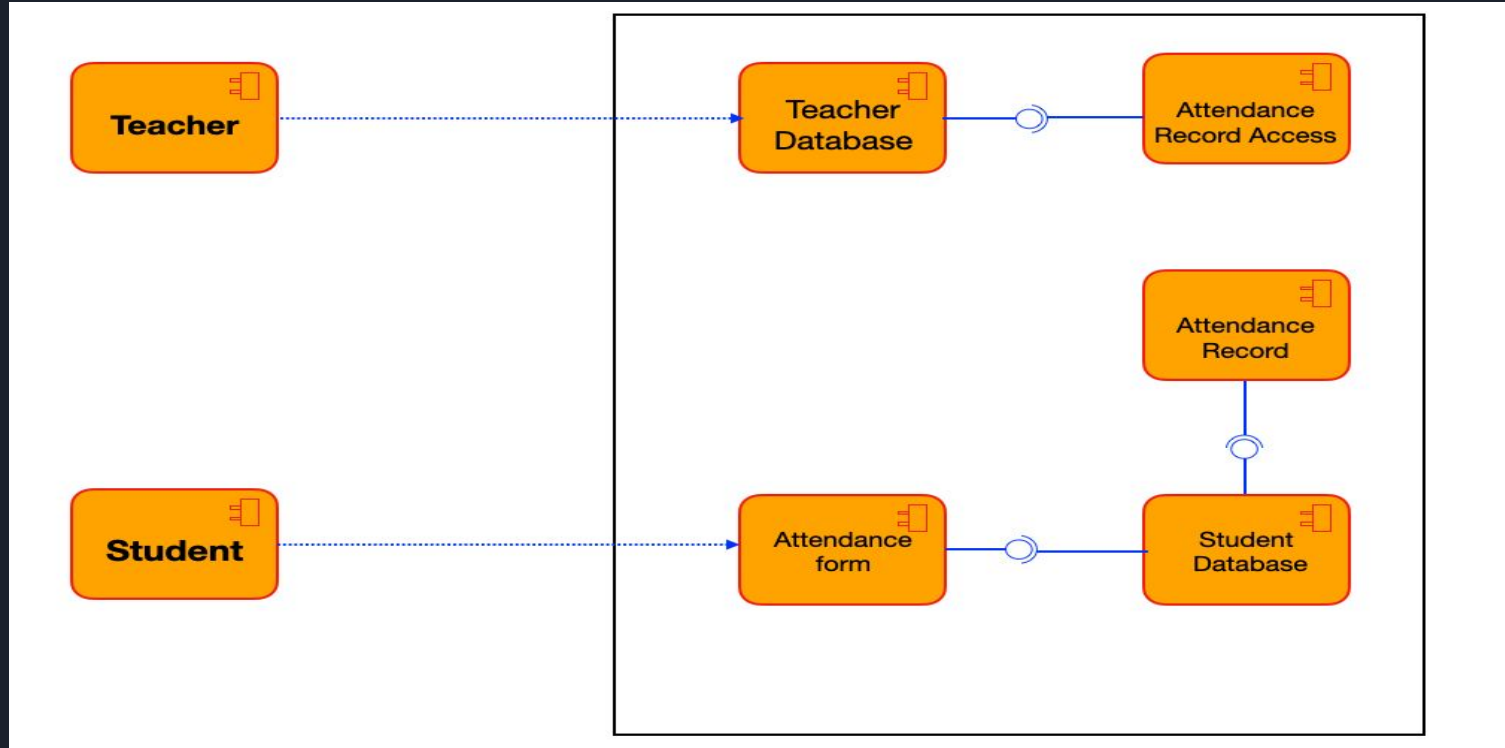


Data Flow Diagram



LEVEL 2

System Architecture



Working Prototype

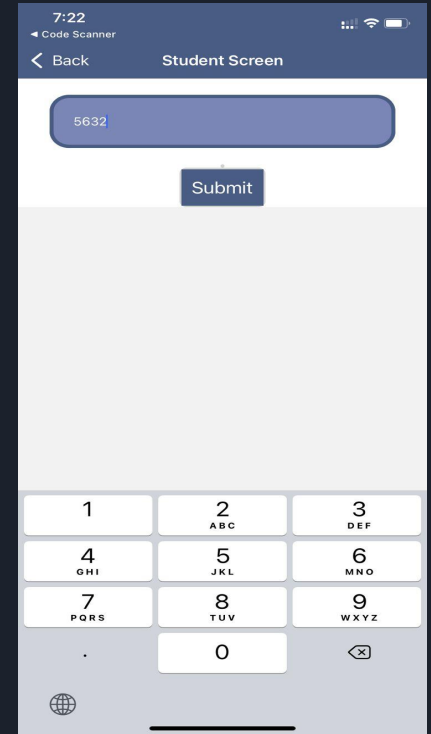
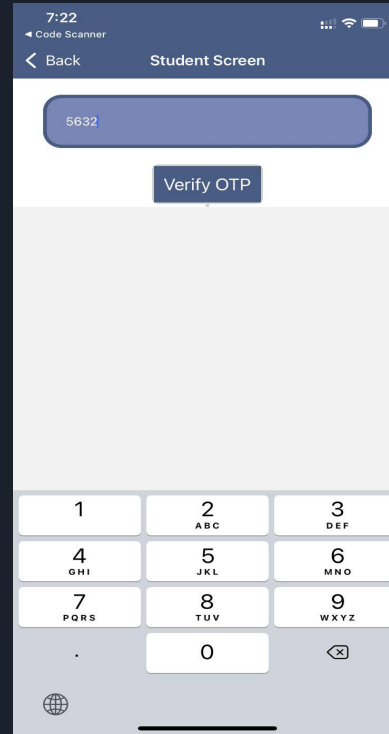
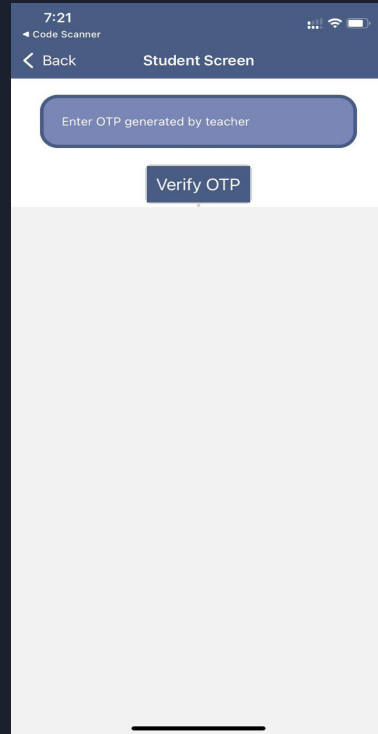
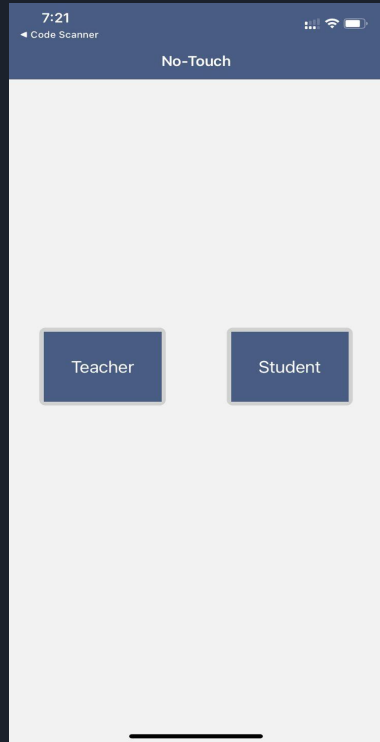


Image Preprocessing pipeline

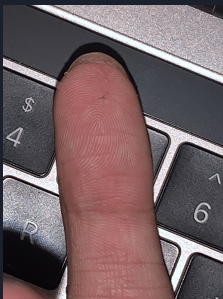
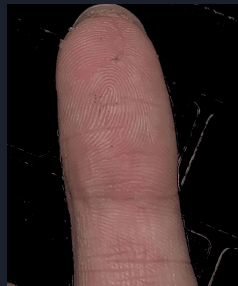


Image from iPhone XR
(2019)

After segmentation using
skin colour and saliency
based mask



Unet for fingerprint
extraction and
enhancement

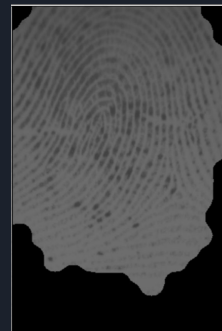
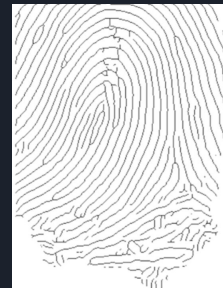
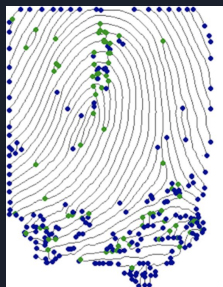


Image after using
gabor filter and
thin image



Marking minutiae points for
verifying fingerprint





Contributions of Individual Team Members



- **Shashank Kirtania**- Image segmentation and preprocessing
- **Rohan Matta**- Application Development
- **Dhruv Goel** - Fingerprint Verification and Backend
- **Kartik Gupta** - Image Processing and Backend

Work Accomplished



- We have started the development of our application using React Native.
- We have developed our Landing page which gives the option to proceed to the student or teacher page. On clicking the student button, the user is navigated to the student page where they enter the OTP (one time password) provided by their respective teachers for the particular class they are attending.
- On entering the correct OTP, users will be allowed to enter details like Name, Roll number and upload their finger selfie.
- We have also started the development of the feature extraction pipeline responsible for extracting minutiae points from the fingerprint selfies.
- We have implemented the image segmentation pipeline which isolates the fingerprint from the background. This segmented image will be further processed to access the minutiae points for a given image.



Future Work Plan



We plan to extend our project building a robust application that allows organisation or institutes to verify the user in a safe and hygienic manner. To do that we will have to make sure that our remote servers work efficiently and maintain a proper log of attendance for teachers.

We believe in future this project can also be used to do remote KYC for verifying a person for official jobs like remote opening of bank accounts, verifying yourself for the 'living certificate'. To incorporate features we would need to implement a encrypted system that can be mapped with ADHAAR information, for which we would require even better cloud servers and databases.