राष्ट्रीय प्रौद्योगिकी संस्थान सिक्किम
National Institute of Technology Sikkim
An Institute of National Importance

# Multi-Model Biometric Verification using Face, Finger and Voice


Presented By -
Shashi Saurabh Sinha
B180043CS

Under Supervision of -
Dr.Pankaj Kumar Keserwani
Assistant Professor
NIT Sikkim, Ravangla

# Content

# Identification of Problem

- Unimodal biometric system which uses only single feature for verification.
- Unimodal is not robust, reliable and accurate as compared to the unimodal systems.

# Project Goal and Objective

- To propose the Multi-modal Biometric Verification.
- Capture face, finger and voice biometric data from person for multi modal Biometric verification.
- Provide High security and assurance and no one can easily fake it.

# Introduction

- Biometric Verification is process of identify people using physical characteristics i.e. fingerprint, face recognition, speech recognition etc.
- It can be used to label and describe individual.
- It can been recognized as the most trust proof.

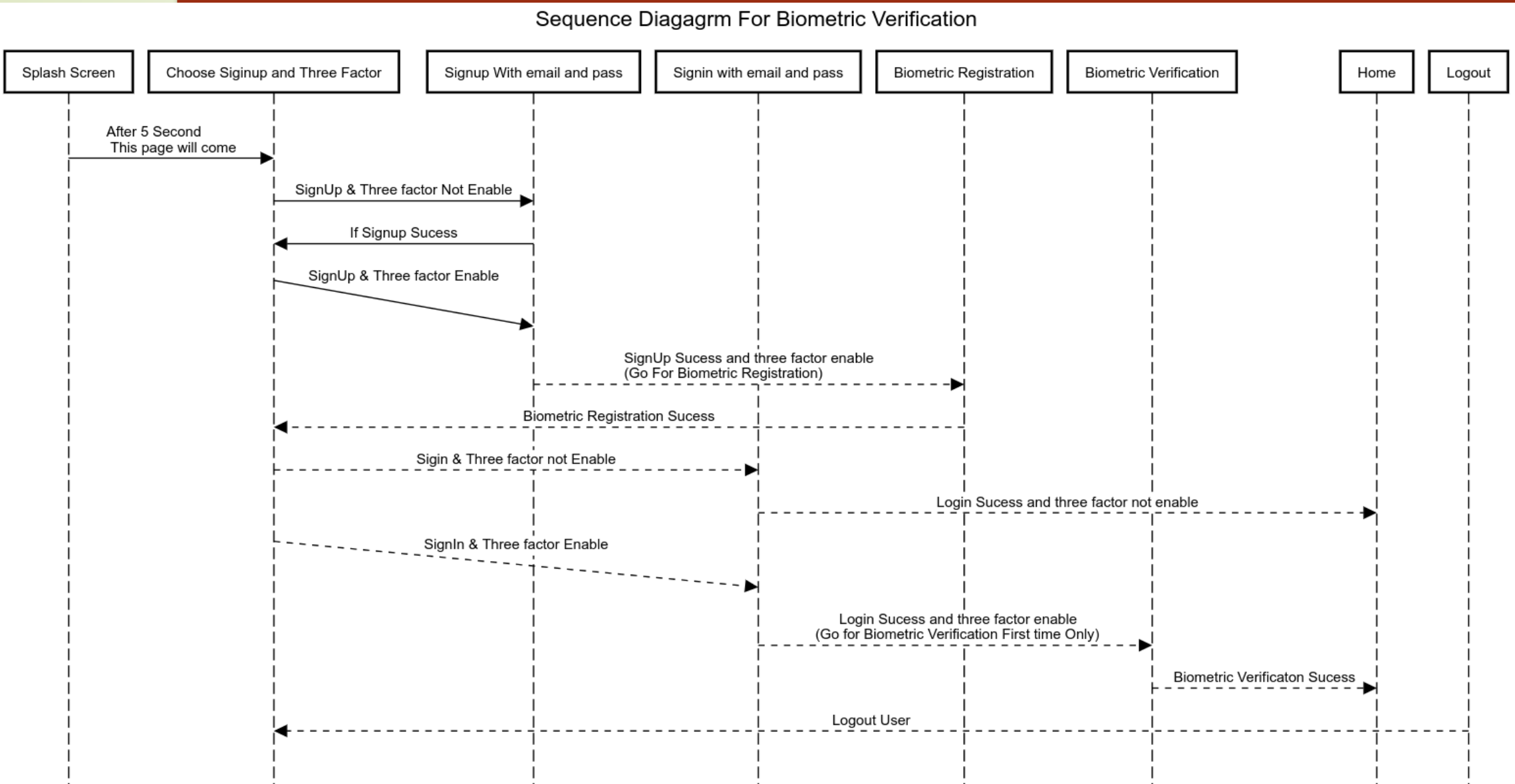
# CHARCTERISTICS

- Iris Recognition
- Fingerprint
- Hand Scanner and finger reader systems
- Facial recognition
- Voice recognition voiceprint
- Vein recognition voiceprint
- Heart bit recognition

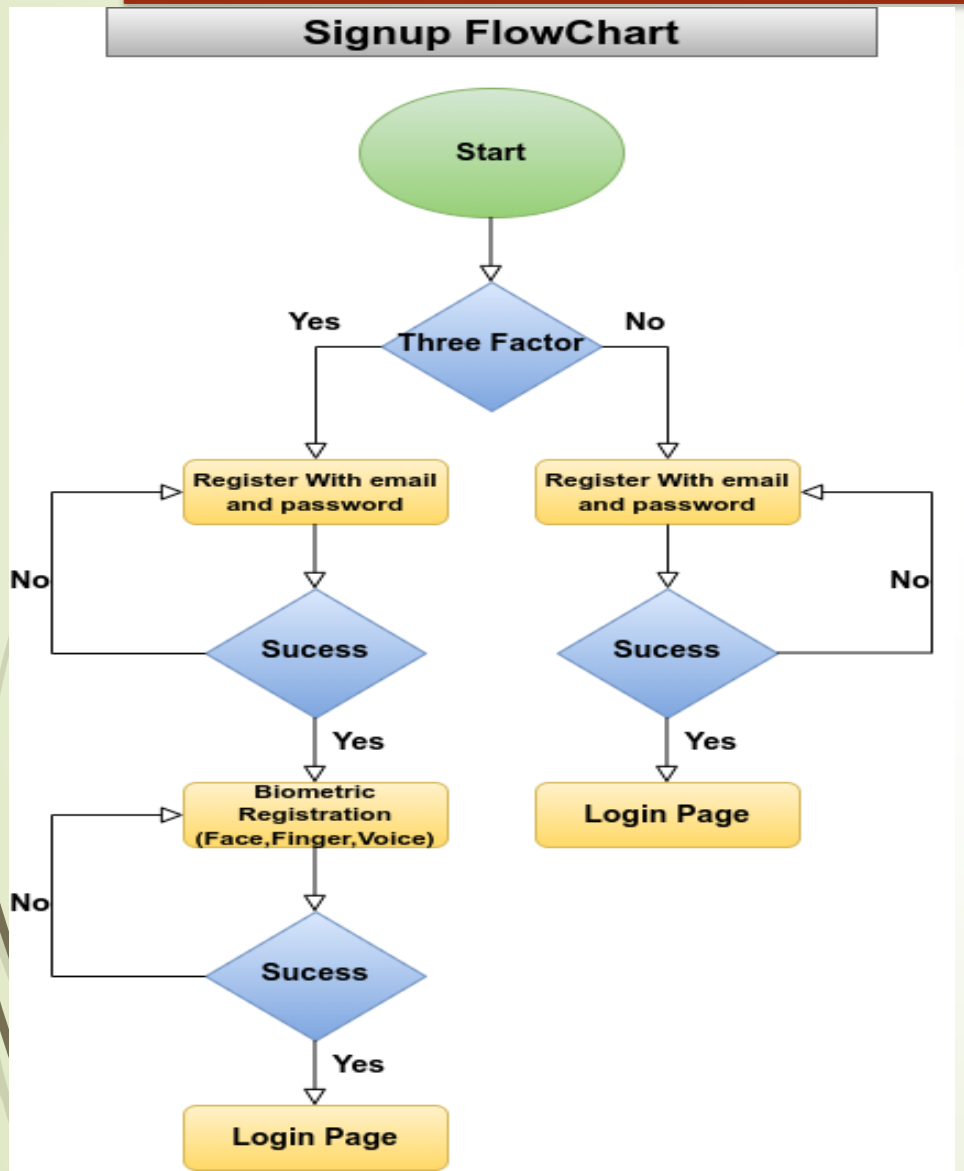
# Literature Review

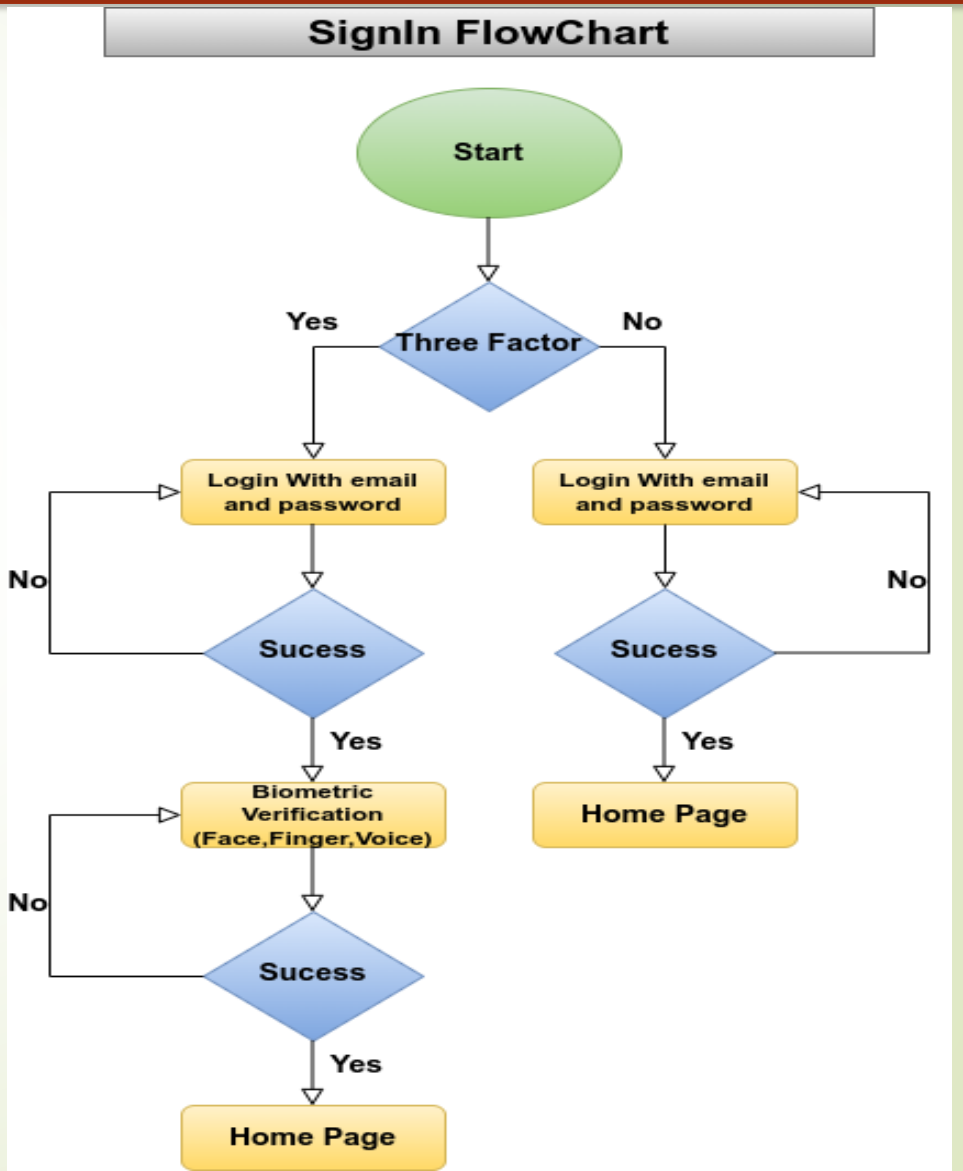
| S/N | Year | Methodology | Feature | Research Gap |
|---|---|---|---|---|
| 1 | 2019 | A combination of biometric Fingerprint scanner, cryptography, OTP used for better security. | Design and implement an application using biometry and cryptography | It not used the advanced cryptography algorithm to protect the data. |
| 2 | 2020 | This propounds a multimodal biometric user verification system by integrating fingerprint; facial recognition and lip print images. | In this it uses lip print verfication which make it unique and more secure. | Lip print verification is complex and make it very hard ,also it make take time to verify. |
| 3 | 2021 | Accurateness, serviceability and reducing cost have made the biometric technology a secure. | In this paper it deal with almost all verification process and also compare its advantage and disadvantage and compare between all on feature. | There is no model show in this paper to implement the biometric security. |

# Sequence Diagram

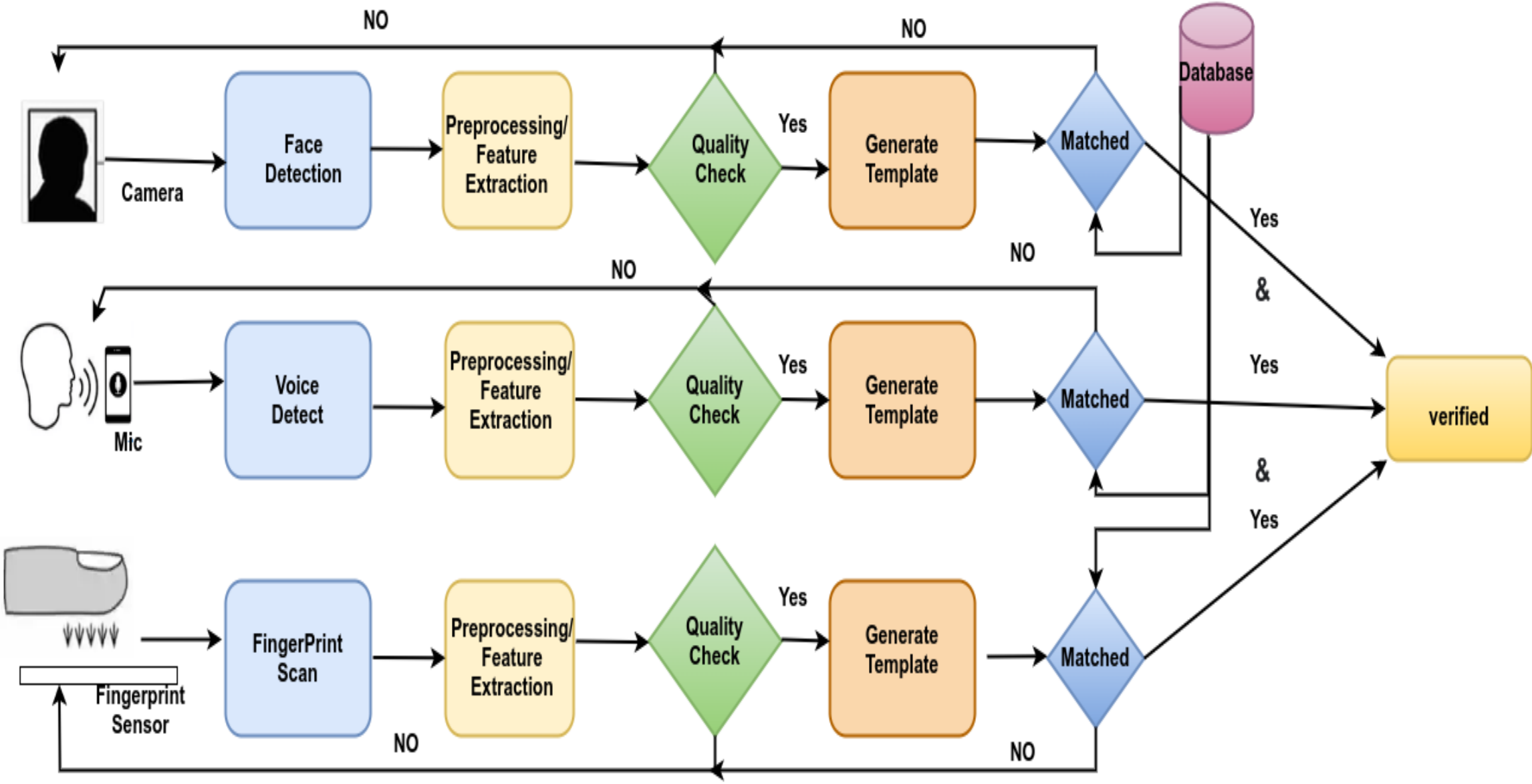


# Flow Chart


Signup FlowChart
Start
Three Factor
Yes
No
Register With email and password
Register With email and password
No
No
Sucess
Sucess
Yes
Yes
Biometric Registration (Face,Finger,Voice)
Login Page
No
Sucess
Yes
Login Page


SignIn FlowChart
Start
Three Factor
Yes
No
Login With email and password
Login With email and password
No
No
Sucess
Sucess
Yes
Yes
Biometric Verification (Face,Finger,Voice)
Home Page
No
Sucess
Yes
Home Page

# Three Factor Authentication Flow Chart



# GENERAL CNN-BASED FOR FACE RECOGNITION SCHEMA

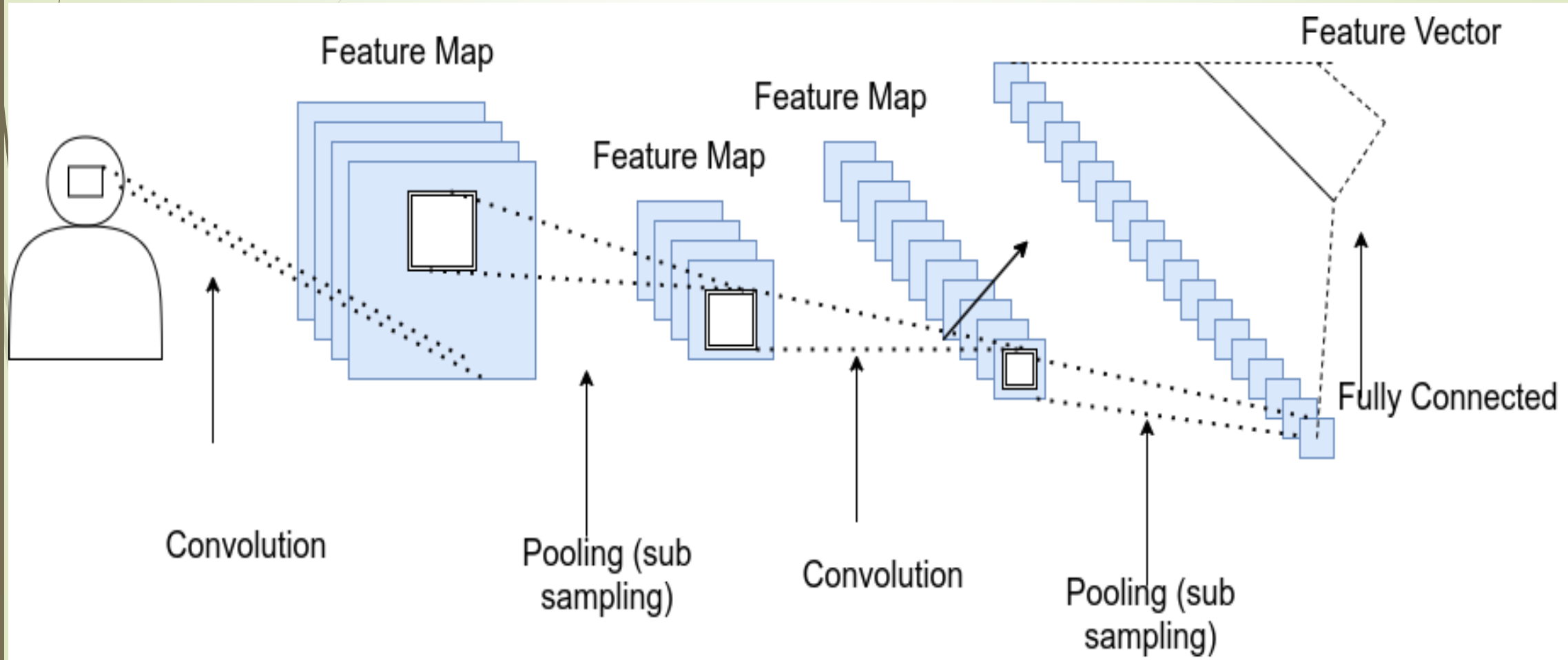
**Convolutional Neural Networks(CNN)**

- A kind of neural network where the input is image.
- Contains less fully connectivity between neurons.

**CNN layers**

- Input layer
- Convolutional layer
- Pooling layer
- Fully connected layer
- Loss layer

# FLOW CHART FOR CNN FACE RECOGNITION




**CNN Structure in Face Recognition Problem**

# Fingerprint Verification Algorithm

**Minutiae based matching algorithm:**

- In this algorithm, the minutiae points of the query and template fingerprints are taken and represented in the form of vectors, every element of this vector is a minutiae point and which describe by different properties such as position, type, orientation, quality of the neighborhood region. We use for the implementation of our project the minutiae based matching is the binarized fingerprint method. This method includes following steps which are as follows.
  - Thinning of image.
  - Minutiae detection.
  - Minutiae matching using Euclidean distance.
  - Displaying that images are matched or not.

# How voice Recognition Work

- It uses technology to assess the biometrics of your voice. This comprises your voice's frequency and cadence, as well as your accent. Every syllable you say is split down into tonal components. This is then digitized and translated into your own distinct voice template. Artificial intelligence, and deep learning are used to power speech recognition.

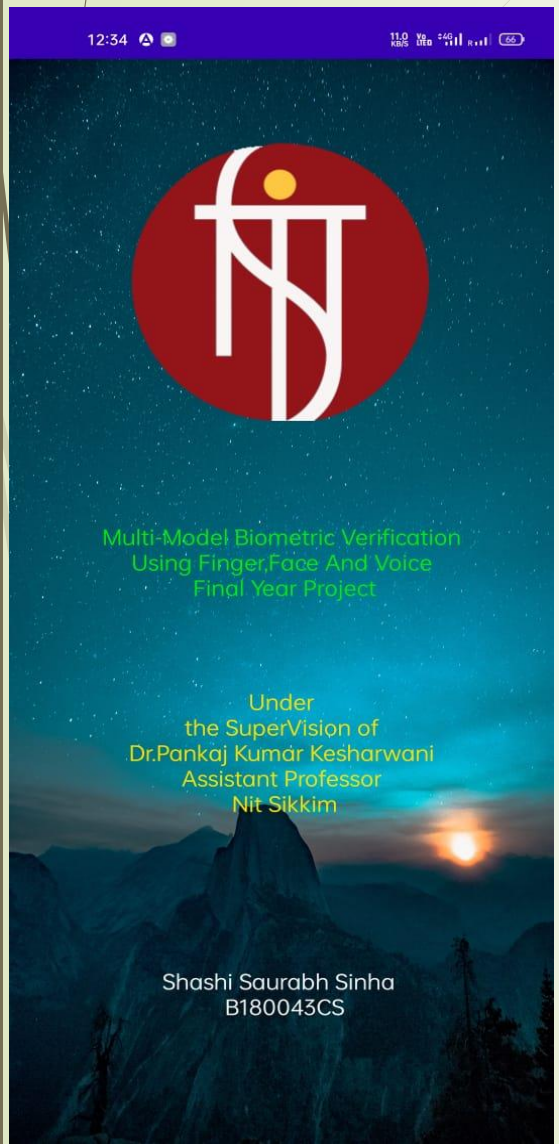
# TENSORFLOW LITE

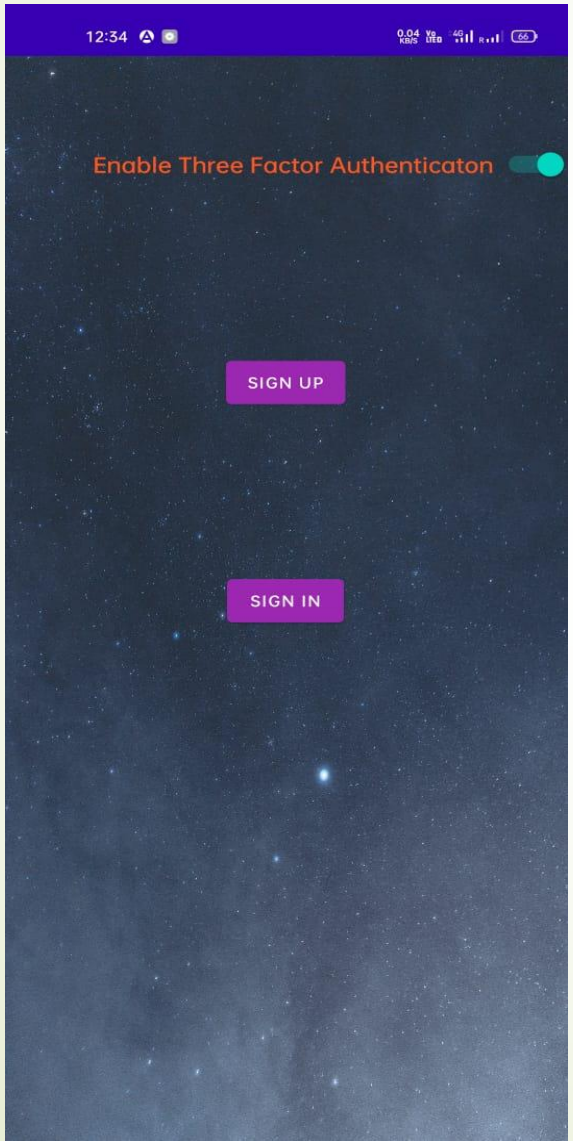
- TensorFlow is a free and open-source machine learning library which is created by Google Artificial Intelligence research organization for the purpose of performing machine learning and deep neural network research.
- Tensorflow Lite allows one to execute machine learning models easily on a smartphone.
- It allowing one to perform traditional machine learning tasks without the need for an external API or server.The models will operate on devices that are not connected to the internet.

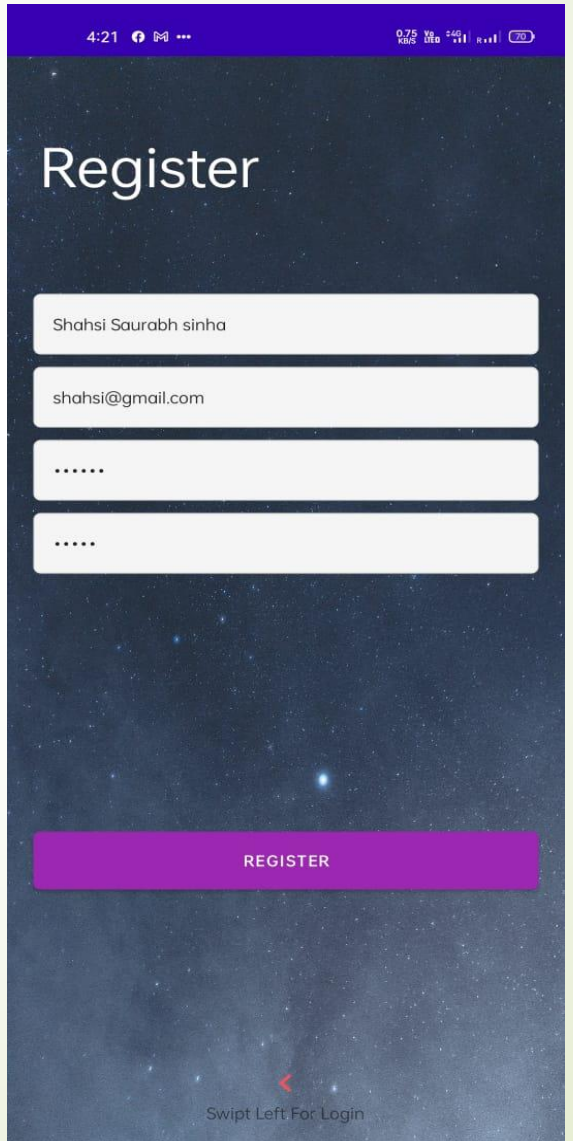
# Convert Train Ml Model into .tfllite file

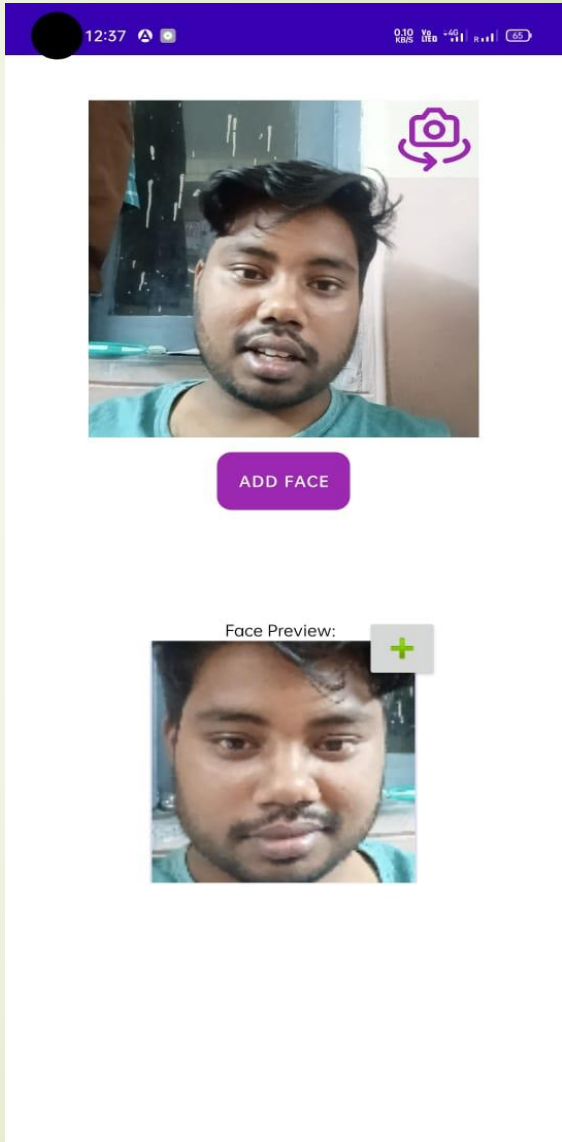
```
import tensorflow as tf
# Convert the model
converter =tf.lite.TFLiteConverter.from_saved_model(saved_model_dir)
(saved_model_dir—Trained Model Address)
tflite_model = converter.convert()


# Save the model.
with open('model.tflite', 'wb') as f:
f.write(tflite_model)
```

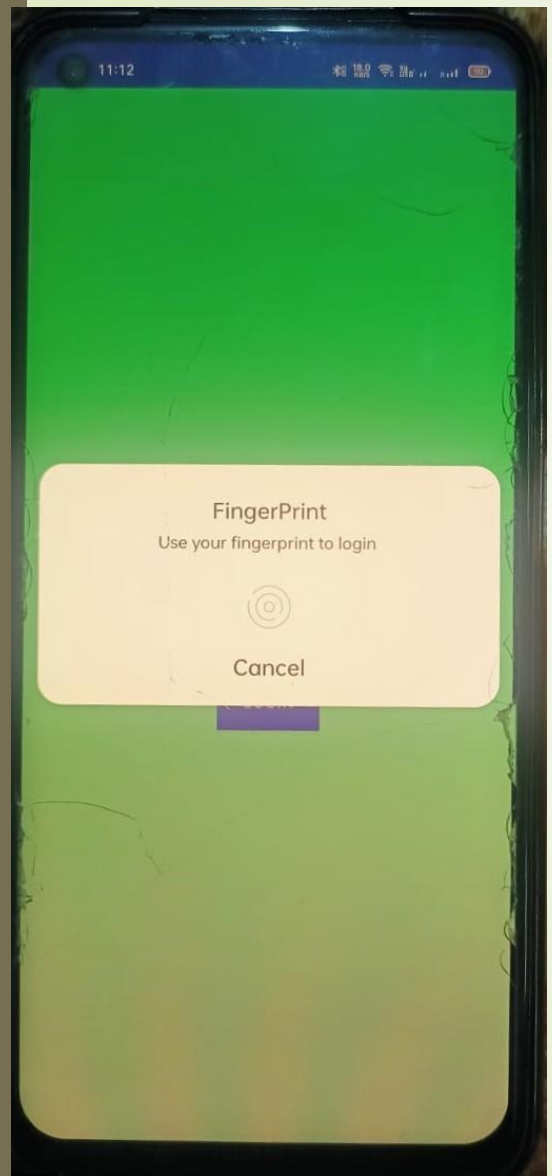
# Result(User Interface)

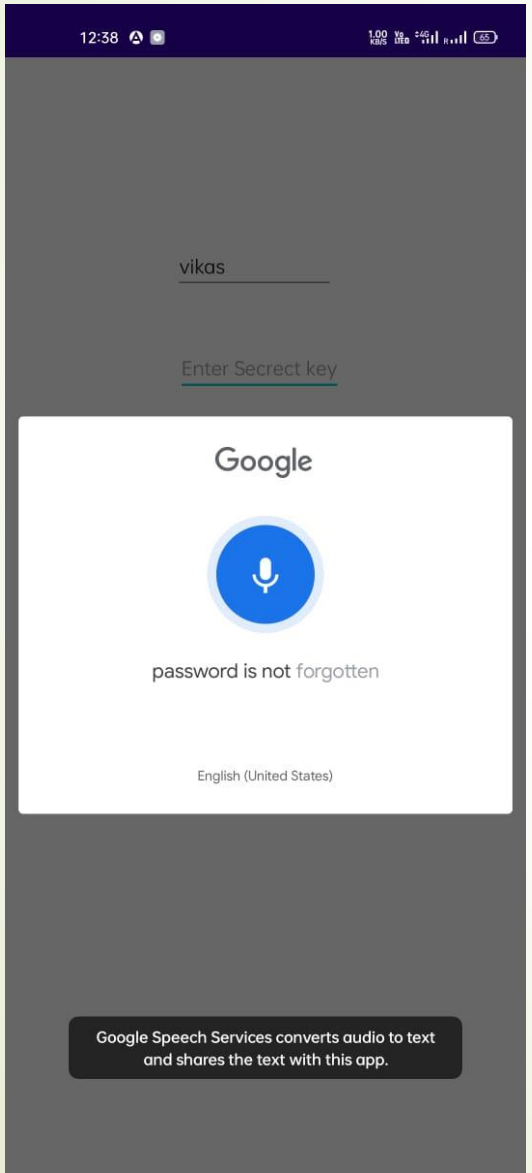


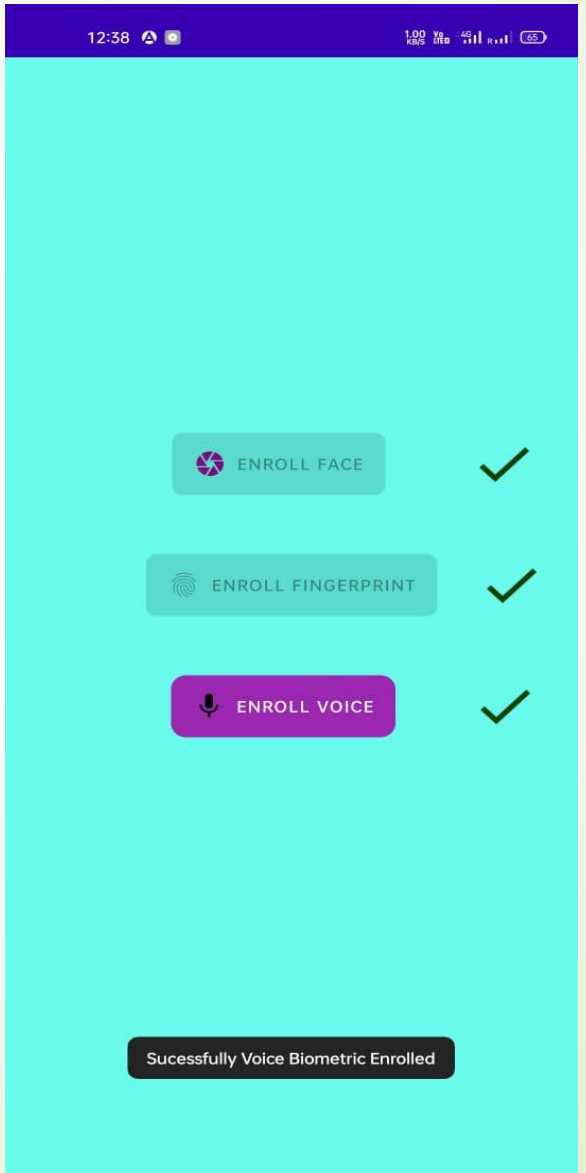



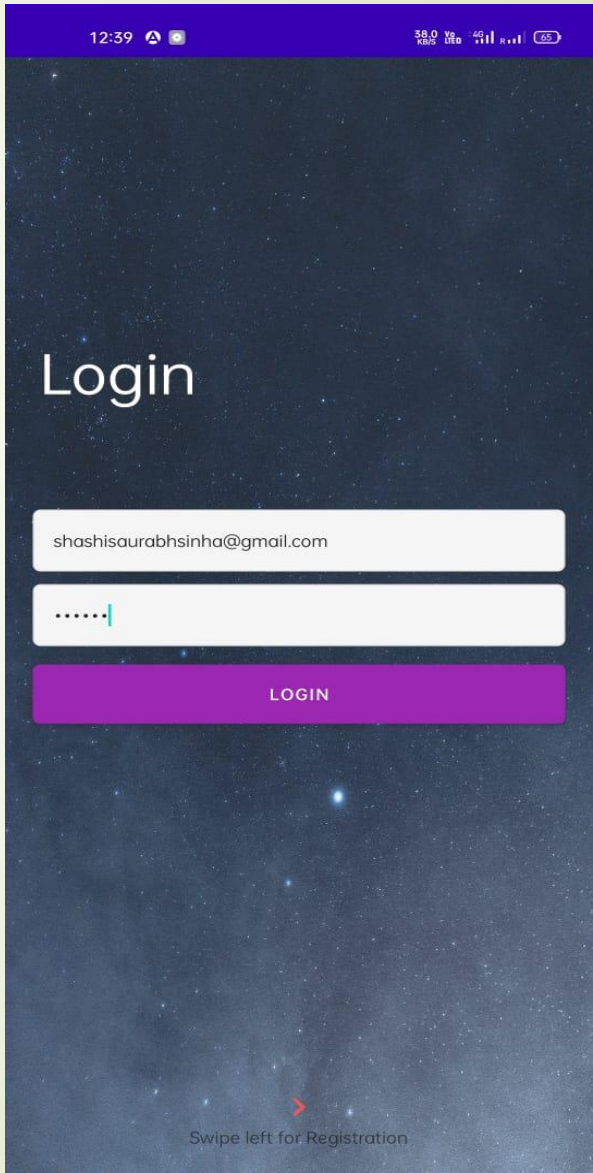



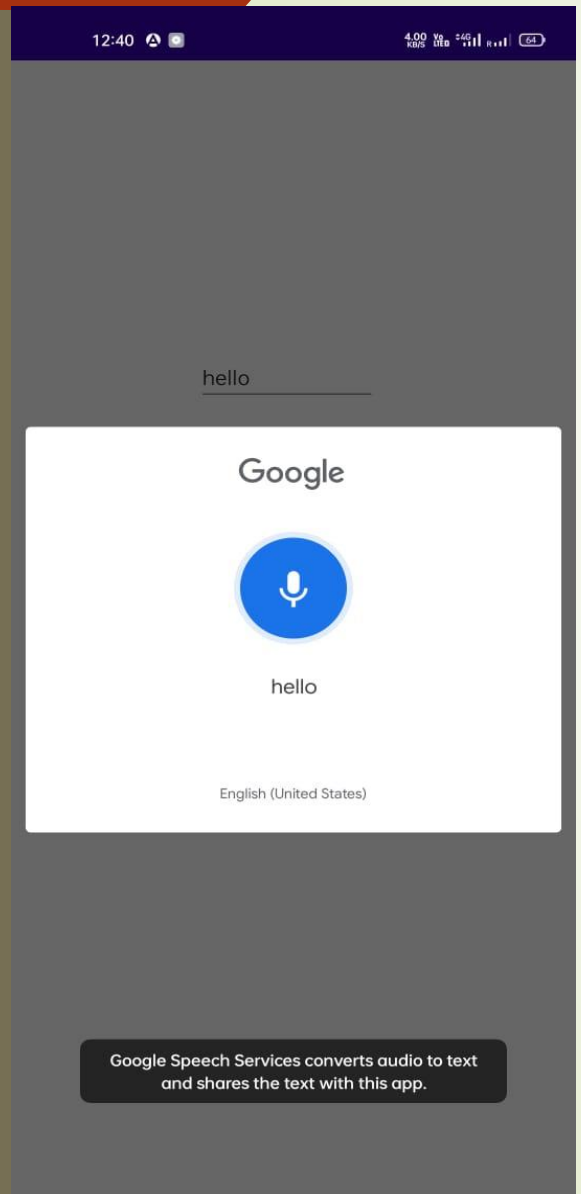



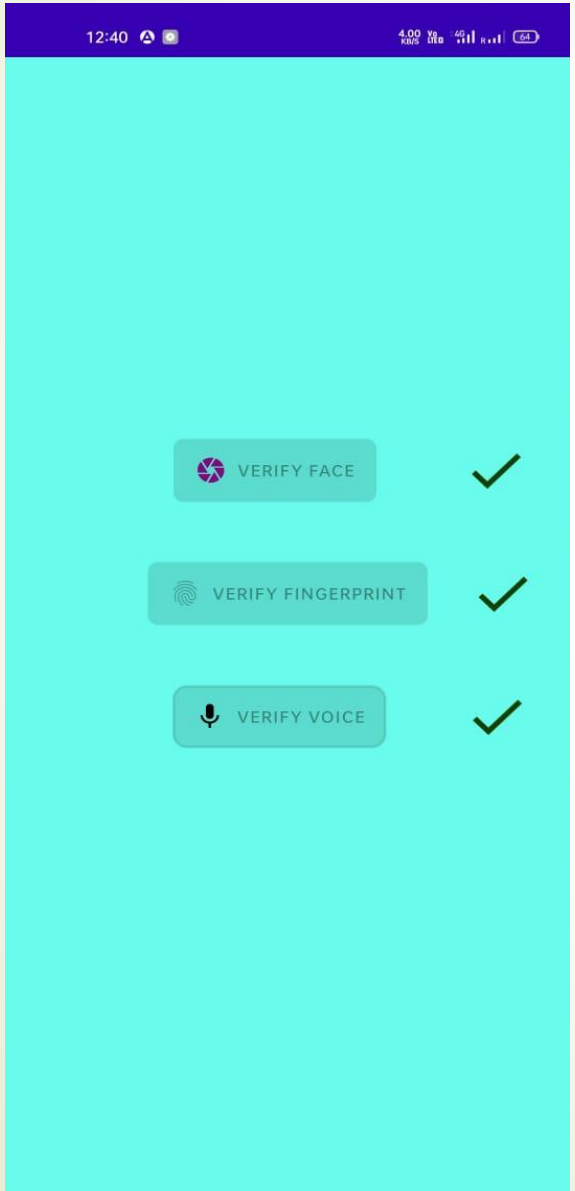

11:12
FingerPrint
Use your fingerprint to login
Cancel

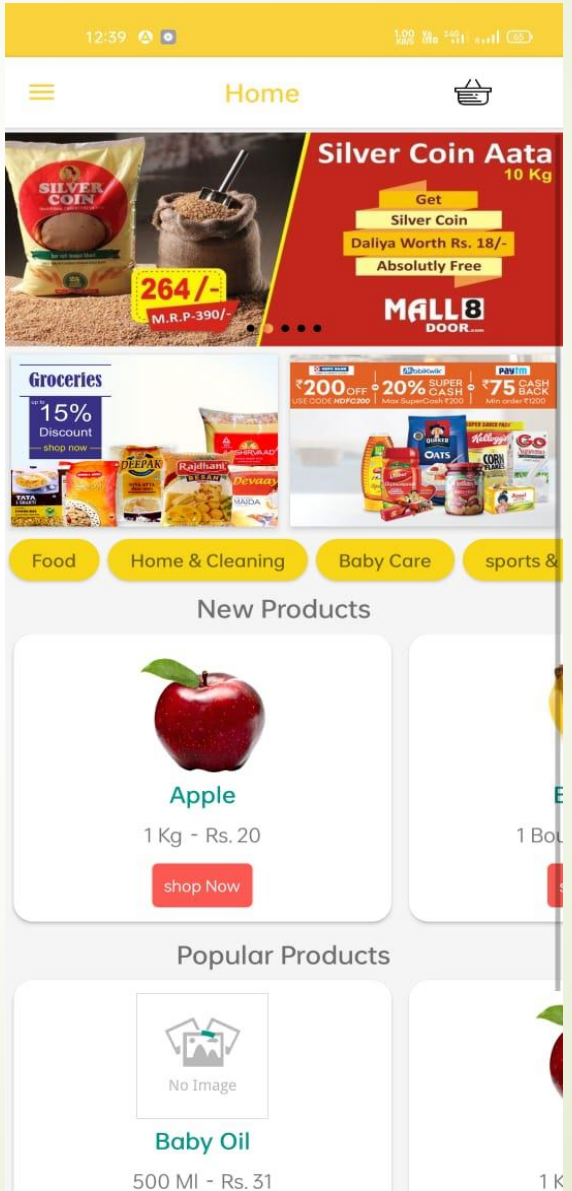

12:38
vikas
Enter Secrect key
Google
password is not forgotten
English (United States)
Google Speech Services converts audio to text and shares the text with this app.

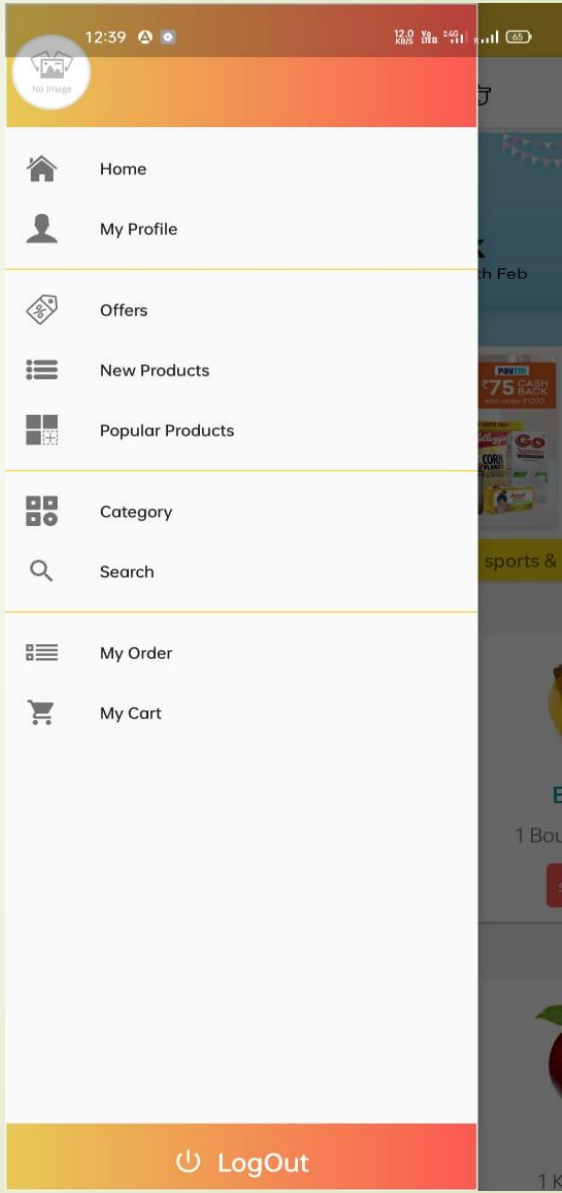

12:38
ENROLL FACE
ENROLL FINGERPRINT
ENROLL VOICE
Sucessfully Voice Biometric Enrolled


12:39
Login
shashisaurabhsinha@gmail.com
LOGIN
Swipe left for Registration


12:40
hello
Google
hello
English (United States)
Google Speech Services converts audio to text and shares the text with this app.


12:40
VERIFY FACE
VERIFY FINGERPRINT
VERIFY VOICE


12:39
Home
Silver Coin Aata
10 Kg
Get
Silver Coin
Daliya Worth Rs. 18/-
Absolutly Free
264/-
M.R.P-390/-
MALL 8 DOOR
Groceries
15% Discount
shop now
Food
Home & Cleaning
Baby Care
sports &
New Products
Apple
1 Kg - Rs. 20
shop Now
Popular Products
No Image
Baby Oil
500 Ml - Rs. 31


12:39
Home
My Profile
Offers
New Products
Popular Products
Category
Search
My Order
My Cart
LogOut

# ADVANTAGE OF BIOMETRIC VERIFICATION

- High secrity and assurance-Biometric identification provides the answer to “someting a person has and is” and helps verify identity.
- User Experience-Convenient and fast.
- Non-Transferable-Everyone has access to a unique set of biometrics.
- Spoof-Proof-Biometrics are hard to fake or steal.

# DISADVANTAGE OF BIOMETRIC VERIFICATION

- Costs-Significant investment needed in Biometrics for security.
- Data breaches-Biometric databases can still be hacked.
- Tracking and data-Biometric devices like facial recoginition systems can limit privacy for users.
- False positives,bias and inaccuracy-False rejects and false accesps can still occur Preventing select users from accessing systems.

# APPLICATION OF BIOMETRIC VERIFICATION

- SERVICE:-Enterprise of E-Government services
- SECURITY:National Security and individual security
- WORK PLACE:-Airport,Bank,Offices,Schools
- SYSTEMS:-Internet Banking,ATM,voting machine and biometric attendence system

# FUTURE WORK

- Improve the accuracy by using advanced algorithm also make it fast and secure so that it will be deploy everywhere.

# Conclusion

- Biometrics create better security for certain places that need to be secure.
- Biometrics will make our society safer by only allowing authorized people out of secure facilities and by keeping the unauthorized people out.

# References


- Ibrahim, S., Egila, M.G., Shawky, H., Elsaid, M.K., El-Shafai, W., El-Samie, A. and Fathi, E., 2020. Cancelable face and fingerprint recognition based on the 3D jigsaw transform and optical encryption. Multimedia Tools and Applications, 79(19), pp.14053-14078.
- Kaur, N., 2021, March. A study of biometric identification and verification system. In 2021 International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE) (pp. 60-64). IEEE.
- Połap, D. and Woźniak, M., 2018. Voice recognition by neuro-heuristic method. Tsinghua Science and Technology, 24(1), pp.9-17.
- Herbadji, A., Guermat, N., Ziet, L. and Cheniti, M., 2019, November. Multimodal Biometric Verification using the Iris and Major Finger Knuckles. In 2019 International Conference on Advanced Electrical Engineering (ICAEE) (pp. 1-5). IEEE.
- Alarifi, A., Amoon, M., Aly, M.H. and El-Shafai, W., 2020. Optical PTFT asymmetric cryptosystem-based secure and efficient cancelable biometric recognition system. IEEE Access, 8, pp.221246-221268.
- Natgunanathan, I., Mehmood, A., Xiang, Y., Beliakov, G. and Yearwood, J., 2016. Protection of privacy in biometric data. IEEE access, 4, pp.880-892.
- M. Arsenovic, S. Sladojevic, A. Anderla, and D. Stefanovic, “FaceTime - Deep learning based
- face recognition attendance system,” SISY 2017 - IEEE 15th Int. Symp. Intell. Syst. Informatics,Proc., pp. 53–57, 2017

# Thank you…