A

Mini Project

On

DIGITALIZED ATTENDANCE MARKING USING FACIAL RECOGNITION

(Submitted in partial fulfillment of the requirements for the award of Degree)

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the project entitled "**DIGITALIZED ATTENDANCE MARKING USING FACIAL RECOGNITION**" being submitted by **C. ROHIT KUMAR (177R1A0571), J. R AVI (177R1A0581) and U. VAMSHI KRISHNA (177R1A0572)** in partial fulfillment of the requirements for the award of the degree of B.Tech in Computer Science and Engineering of the Jawaharlal Nehru Technological University Hyderabad, during the year 2020-2021. It is certified that they have completed the project satisfactorily.

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ABSTRACT

In this paper, a real time ML based system was built for the Facial Recognition using images that have been captured with the help of a PC camera. The main purpose of this project is to design a model that can capture live feed from computer web camera, analyses the data, detect and recognize the face. After recognition is done, the data is then uploaded to Fire store database (Cloud Database). The students and faculty can then view their status using an android application developed using Fire Store as back end. The novelty of our project is developing a full stack application by integrating both machine learning and android development, thereby providing an interface to the users. Existing attendance systems use file as storage devices and thus has lot of complexities while handling with data. Moreover, existing systems won't have the facility of cloud storage and an application interface to interact with. Our model is trained using pre trained CNN architecture named VGG16. The reason we used VGG16 is it provides higher accuracy while dealing with facial recognition. Our model was trained using 300 images of each student captured using web camera in different angles and light conditions, in order to increase our accuracy and also to detect and recognize faces in different conditions. Our model scored an accuracy of 96% for training data set.

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1. INTRODUCTION

1. INTRODUCTION

1.1 PROJECT SCOPE

Nowadays, there is a lot of attention being given to the ability of the car to drive itself. One of the many important aspects for a self-driving car is the ability for it to detect traffic signs in order to provide safety and security for the people not only inside the car but also outside of it. The traffic environment consists of different aspects whose main purpose is to regulate flow of traffic, make sure each driver is adhering to the rules so as to provide a safe and secure environment to all the parties concerned.

1.2 PROJECT PURPOSE

The main objective of our project is to design and construct a computer-based system which can automatically detect the road signs so as to provide assistance to the user or the machine so that they can take appropriate actions. The proposed approach consists of building a model using convolutional neural networks by extracting traffic signs from an image using color information. We have used convolutional neural networks (CNN) to classify the traffic signs and we used color-based segmentation to extract/crop signs from images.

1.3 PROJECT FEATURES

We achieved facial recognition using deep neural networks. Our model recognize face and then upload it to central database present over internet named Fire Store. Thus, it will reduce the problem of file system existing in prevailing system. The ML model being discussed in this document was trained using VGG16 network and tested using HaarCascade Facial recognition module.

2. SYSTEM ANALYSIS

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SYSTEM ANALYSIS

System Analysis is the important phase in the system development process. The System is studied to the minute details and analyzed. The system analyst plays an important role of an interrogator and dwells deep into the working of the present system. In analysis, a detailed study of these operations performed by the system and their relationships within and outside the system is done. A key question considered here is, "what must be done to solve the problem?" The system is viewed as a whole and the inputs to the system are identified. Once analysis is completed the analyst has a firm understanding of what is to be done.

2.1 PROBLEM DEFINITION

Taking attendance is a long process and takes lot of effort and time, especially if it involves huge number of students. It is also problematic when an exam is held and causes a lot of disturbance. Moreover, the attendance sheet is subjected to damage and loss while being passed on between different students or teaching staff. And when the number of students enrolled in a certain course is huge, the lecturers tend to call the names of students randomly which is not fair student evaluation process either. This process could be easy and effective with a small number of students but on the other hand dealing with the records of a large number of students often leads to human error.

2.2 EXISTING SYSTEM

Currently the system that exists for attendance marking is conventional way of marking and biometric marking. Conventional attendance marking is done by faculty calling each student and marking attendance in a paper or book and then uploading it later. Biometric attendance is done by taking the biometric marking of student's fingers and marking attendance. There are many more attendance marking systems available such as Iris Recognition attendance system and lot more.

❖ LIMITATIONS OF EXISTING SYSTEM

- No centralized system available
- Redundancy of data
- No central database available
- Student can't track their attendance
- Proxy if attendance is possible
- Wastage of class time

To avoid all these limitations and make the working more accurately the system needs to be computerized.

2.3 PROPOSED SYSTEM

The aim of proposed system is to develop a system of improved facilities. The proposed system is we will build a Facial Recognition algorithm and the novelty of our proposed system is that it is capable of recognizing the multiple faces of the students. After recognition the attendance is marked in Cloud Database. An android application developed for students helps them to continuously check their attendance status and also know about various attendance related details. An android application developed for faculty will help faculty to track the details of each and every student of his class. It will automate the whole attendance process and thereby reducing the overhead imposed on faculty.

❖ ADVANTAGES OF THE PROPOSED SYSTEM

The system is very simple in design and to implement. The system requires moderate system resources and the system will work in almost all configurations. It has got following features

- Data Security
- Central Database
- Tracking of attendance made easy
- File system is eliminated
- Facial recognition also follows covid norms
- Overhead on faculty is eliminated

2.4 FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company.

Three key considerations involved in the feasibility analysis are

- Economic Feasibility
- Technical Feasibility
- Social Feasibility

2.4.1 ECONOMIC FEASIBILITY

The developing system must be justified by cost and benefit. Criteria to ensure that effort is concentrated on project, which will give best, return at the earliest. One of the factors, which affect the development of a new system, is the cost it would require.

The following are some of the important financial questions asked during preliminary investigation:

- The costs conduct a full system investigation.
- The cost of the hardware and software.
- The benefits in the form of reduced costs or fewer costly errors.

Since the system is developed as part of project work, there is no manual cost to spend for the proposed system. Also all the resources are already available, it give an indication of the system is economically possible for development.

2.4.2 TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

2.4.3 BEHAVIORAL FEASIBILITY

This includes the following questions:

- Is there sufficient support for the users?
- Will the proposed system cause harm?

The project would be beneficial because it satisfies the objectives when developed and installed. All behavioral aspects are considered carefully and conclude that the project is behaviorally feasible.

2.5 HARDWARE & SOFTWARE REQUIREMENTS

2.5.1 HARDWARE REQUIREMENTS:

Hardware interfaces specifies the logical characteristics of each interface between the software product and the hardware components of the system. The following are some hardware requirements.

- Processor : Intel Quad Core@ CPU 2.90GHz.
- Hard disk : 20GB and Above.
- RAM : 6GB and Above.
- Monitor : 15.6 inches or above
- Camera : 720p Web camera

2.5.2 SOFTWARE REQUIREMENTS:

Software Requirements specifies the logical characteristics of each interface and software components of the system. The following are some software requirements,

- Operating System : Windows 10
- Languages : Python
- IDE : Jupyter Notebook, Anaconda Navigator
- Libraries : Numpy, Keras, Matplotlib, Scikit-Learn

3. ARCHITECTURE

3. ARCHITECTURE

3.1 PROJECT ARCITECTURE

This project architecture describes about how a image will be processed and classified to recognize the traffic sign from nature. This describes how our model will generate response. The detailed architecture is explained below.

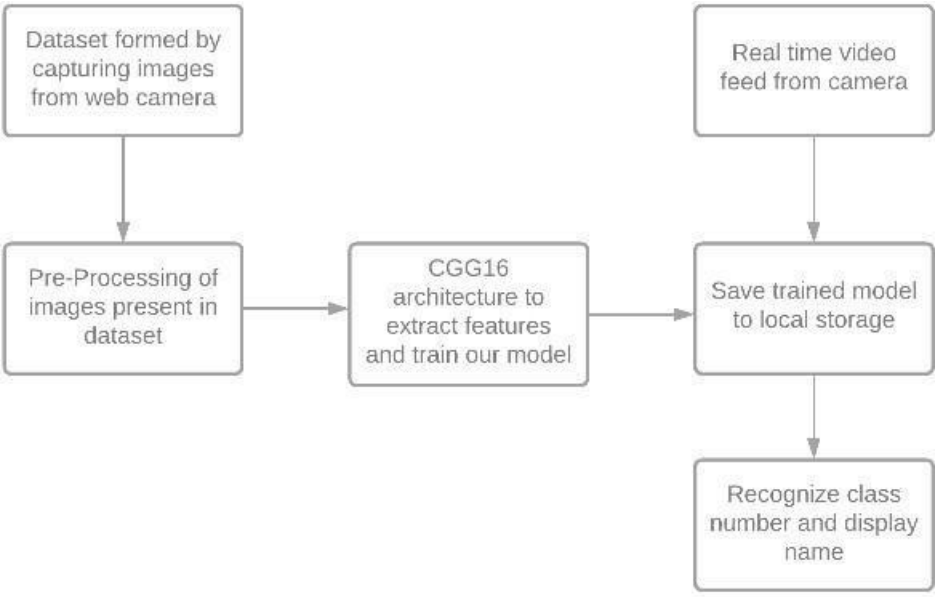


Fig. 3.1 Project Architecture of Digitalized Facial Attendance Marking System

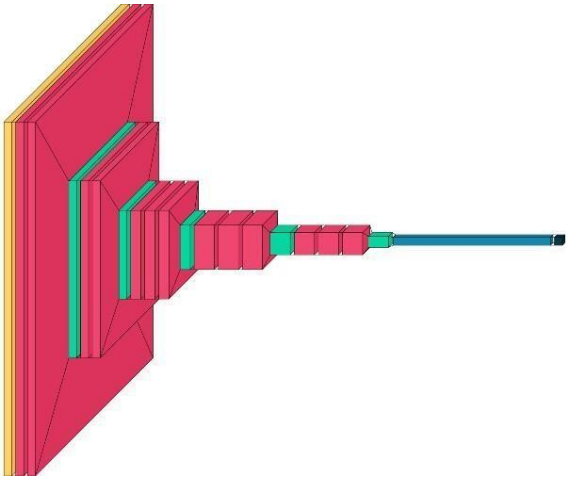


Fig. 3.2 CNN Architecture of Digitalized Facial Attendance Marking System

3.2 USE CASE DIAGRAM

In the use case diagram, we have user who gives input in the form of image and our model interprets it and recognizes the sign.

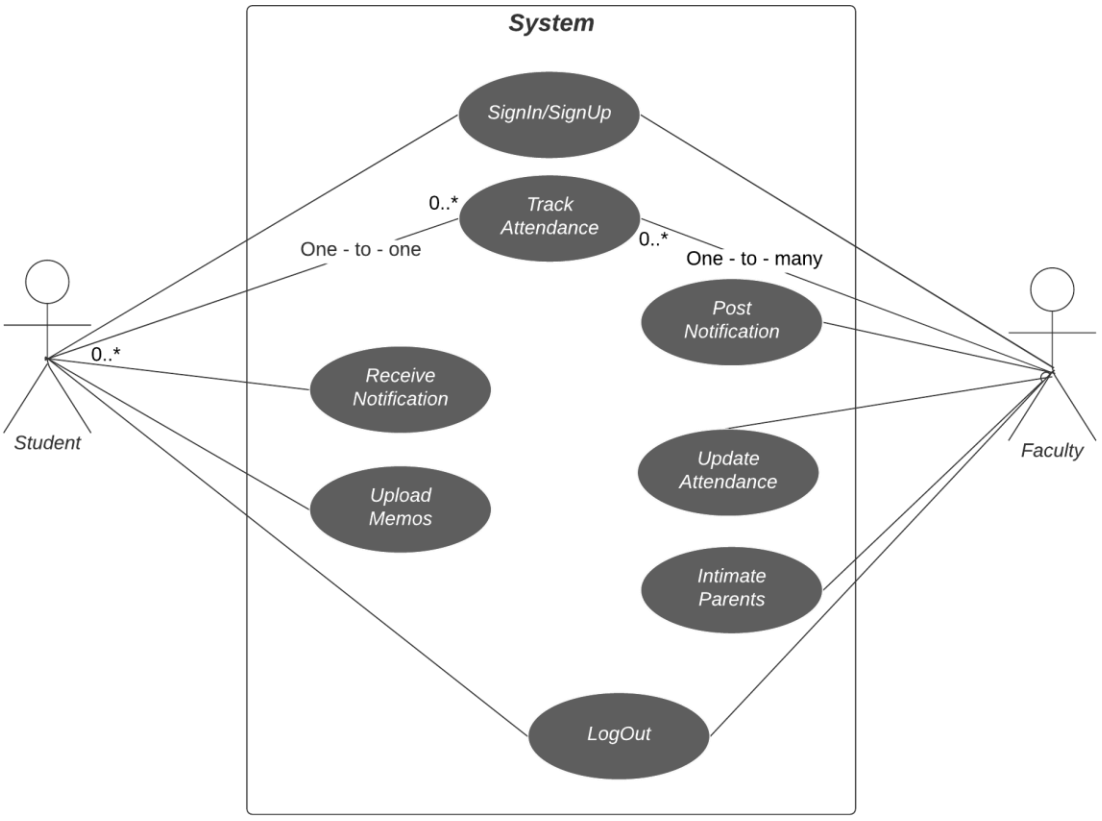


Fig. 3.3.1 Use Case Diagram for Digitalized Facial Attendance Marking System

3.3 SEQUENCE DIAGRAM

The sequence diagram is a type of interaction diagram because it describes how—and in what order—a group of objects works together.

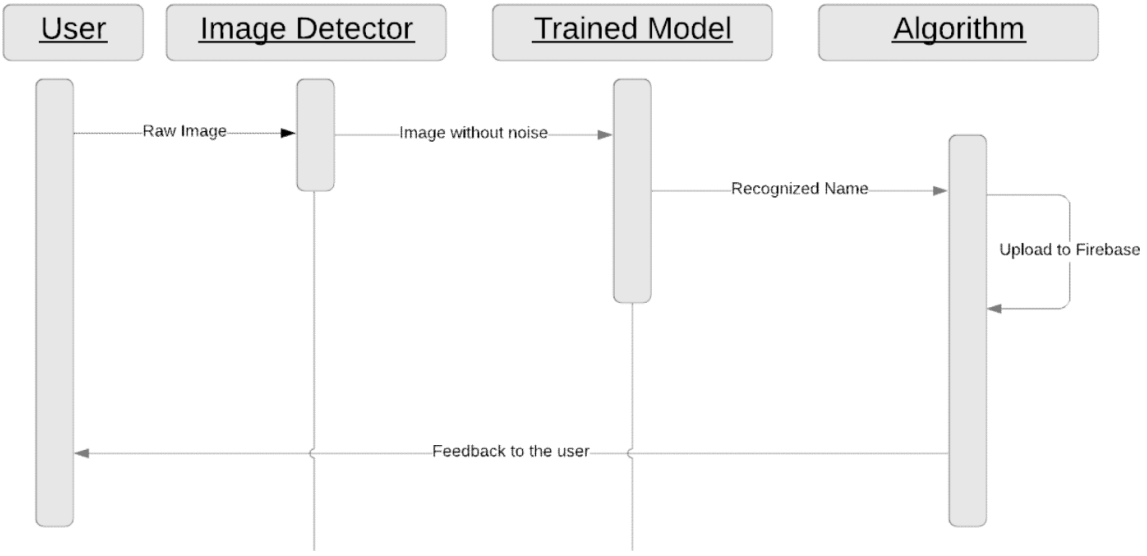


Fig.3.3.2 Sequence Diagram for Digitalized Facial Attendance Marking System

3.4 ACTIVITY DIAGRAM

It describes about flow of activity states.

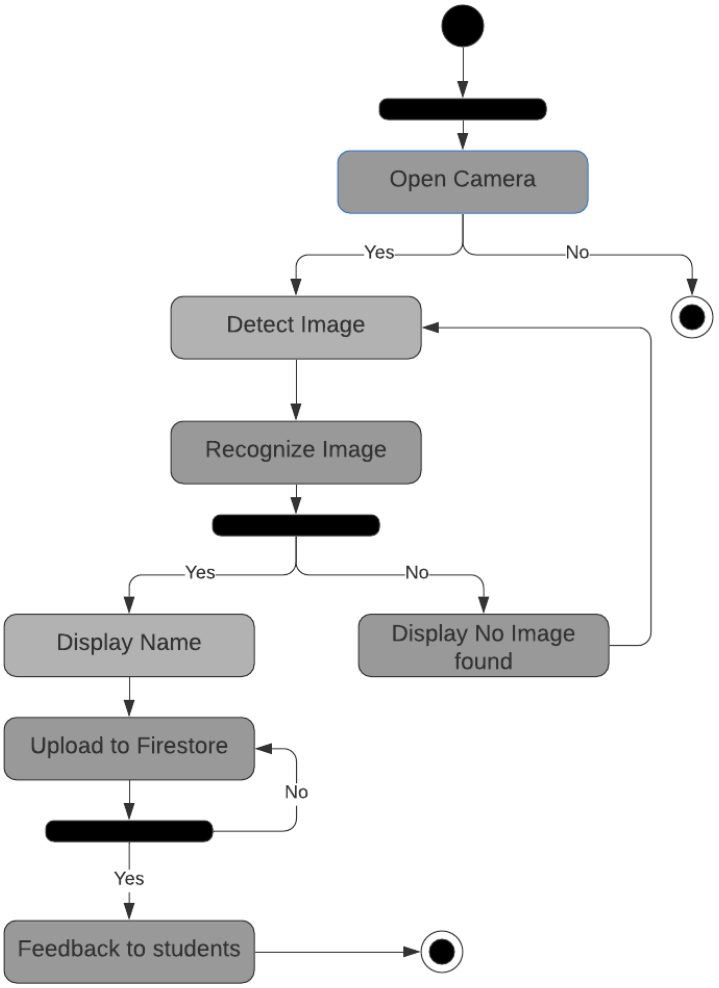


Fig. 3.3.2 Activity Diagram for Digitalized Facial Attendance Marking System

4. IMPLEMENTATION

4. IMPLEMENTATION

4.1 SAMPLE CODE

training.ipynb:

```
from keras.layers import Input, Lambda, Dense, Flatten
from keras.models import Model
from keras.applications.vgg16 import VGG16
from keras.applications.vgg16 import preprocess_input
from keras.preprocessing import image
from keras.optimizers import Adam
from keras.preprocessing.image import ImageDataGenerator
from keras.models import Sequential
import numpy as np
from glob import glob
import matplotlib.pyplot as plt
IMAGE_SIZE = [224, 224]
train_path = 'Datasets/Train'
valid_path = 'Datasets/Test'
vgg = VGG16(input_shape=IMAGE_SIZE + [3], weights='imagenet', include_top=False)
for layer in vgg.layers:
  layer.trainable = False
folders = glob('Datasets/Train/*')
# our layers - you can add more if you want
x = Flatten()(vgg.output)
# x = Dense(1000, activation='relu')(x)
prediction = Dense(len(folders), activation='softmax')(x)
model = Model(inputs=vgg.input, outputs=prediction)

# view the structure of the model
model.summary()
model.compile(Adam(lr=0.001),
loss='categorical_crossentropy',
metrics=['accuracy']
)
from keras.preprocessing.image import ImageDataGenerator

train_datagen = ImageDataGenerator(rescale = 1./255,
                                   shear_range = 0.2,
                                   zoom_range = 0.2,
                                   horizontal_flip = True)
test_datagen = ImageDataGenerator(rescale = 1./255)

training_set = train_datagen.flow_from_directory('Datasets/Train',
                                                 target_size = (224, 224),
                                                 batch_size = 64,
```

```
                                    class_mode = 'categorical')

test_set = test_datagen.flow_from_directory('Datasets/Test',
                                            target_size = (224, 224),
                                            batch_size = 64,
                                            class_mode = 'categorical')
r = model.fit_generator(
  training_set,
  validation_data=test_set,
  epochs=13,
  steps_per_epoch=len(training_set),
  validation_steps=len(test_set)
)
import tensorflow as tf

from keras.models import load_model

model.save('100epochs_model.h5')
plt.plot(r.history['loss'], label='Train Loss')
plt.legend()
plt.show()
plt.savefig('LossVal_loss')
plt.plot(r.history['accuracy'], label = 'Train Accuracy')
plt.legend()
plt.show()
plt.savefig('Accuracy')
import visualkeras
visualkeras.layered_view(model, to_file='output.png').show()
```

FaceFrontEnd.py:

```
import time
from threading import Thread

from PIL import Image
from keras.applications.vgg16 import preprocess_input
import base64
from io import BytesIO
import json
import random
import cv2
from keras.models import load_model
import numpy as np
import firebase_admin
import google.cloud
from firebase_admin import credentials, firestore
from datetime import datetime
import pyttsx3
today = datetime.now().date()
timed = datetime.now().time()
today = today.strftime("%d-%m-%Y")
def alarm(msg):
    global alarm_status
    global alarm_status2
    global saying
    engine = pyttsx3.init()
    engine.setProperty('rate', 150)
    engine.say(msg)
    engine.runAndWait()
cred = credentials.Certificate("./serviceJSON.json")
app = firebase_admin.initialize_app(cred)
store = firestore.client()
from keras.preprocessing import image
model = load_model('facefeatures_new_model.h5')
face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_default.xml')
def face_extractor(img):
    # Function detects faces and returns the cropped face
    # If no face detected, it returns the input image
    #gray = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
    faces = face_cascade.detectMultiScale(img, 1.3, 5)
    if faces is ():
        return None
    # Crop all faces found
    for (x,y,w,h) in faces:
        cv2.rectangle(img,(x,y),(x+w,y+h),(0,255,255),2)
        cropped_face = img[y:y+h, x:x+w]
    return cropped_face
# Doing some Face Recognition with the webcam
```

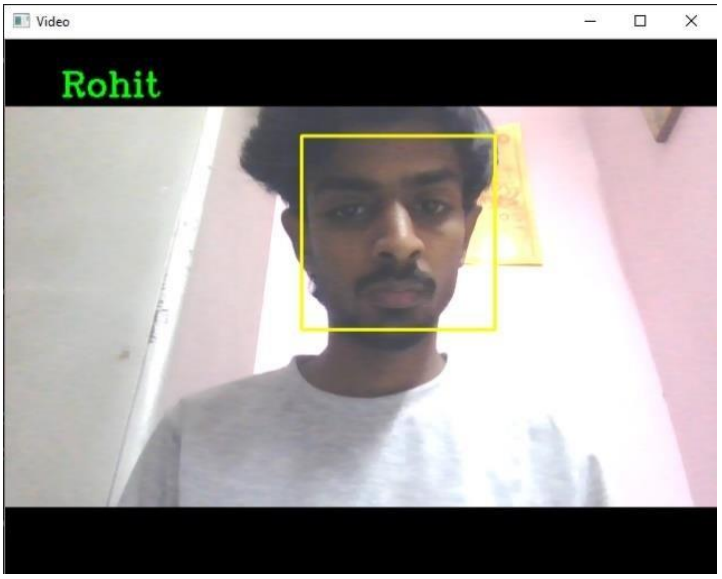
```
video_capture = cv2.VideoCapture(0)
def upload_data_firebase(roll,name):
    doc_ref1 = store.collection(roll).document(today)
    doc_ref1.set({'Status': "Present"})
    t = Thread(target=alarm, args=('Good Morning! Attendance marked',))
    t.deamon = True
    t.start()
while True:
    _, frame = video_capture.read()
    #canvas = detect(gray, frame)
    #image, face =face_detector(frame)
    face=face_extractor(frame)
    if type(face) is np.ndarray:
        face = cv2.resize(face, (224, 224))
        im = Image.fromarray(face, 'RGB')
          #Resizing into 128x128 because we trained the model with this image size.
        img_array = np.array(im)
                    #Our keras model used a 4D tensor, (images x height x width x channel)
                    #So changing dimension 128x128x3 into 1x128x128x3
        img_array = np.expand_dims(img_array, axis=0)
        pred = model.predict(img_array)
        print(pred)

        name="None matching"
        doc_ref = store.collection("NoOfWorkingDays").document(today)
                    .set({'Status': 'Working Day'})
        if(pred[0][1]>0.5):
            name='Rohit'
            upload_data_firebase("177r1a0578@gmail.com",name)
        elif (pred[0][2] > 0.5):
            name = 'Karthikeya'
            upload_data_firebase("177r1a0571@gmail.com", name)
        elif (pred[0][3] > 0.5):
            name = 'Praneesha'
            upload_data_firebase("177r1a0576@gmail.com", name)

        cv2.putText(frame,name, (50, 50), cv2.FONT_HERSHEY_COMPLEX,
                            1, (0,255,0), 2)
    else:
        cv2.putText(frame,"No face found", (50, 50), cv2.FONT_HERSHEY_COMPLEX,
                            1, (0,255,0), 2)
    cv2.imshow('Video', frame)
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break
video_capture.release()
cv2.destroyAllWindows()
```

5. SCREEN SHOTS

5. SCREEN SHOTS

5.1 REAL TIME FACIAL RECOGNITION

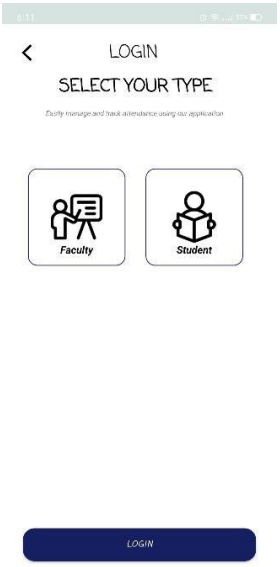
This is terminal where user can see the output.



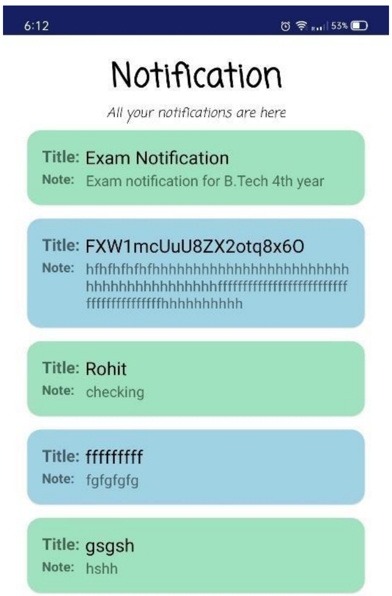
5.1. Screenshot: **'ROHIT'** Face Recognition

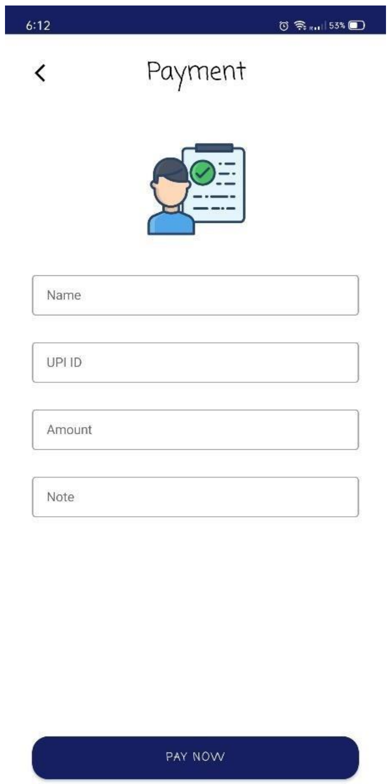
5.2 ATTENDANCE TRACKING APPLICATION

5.2.1 LOGIN FORM

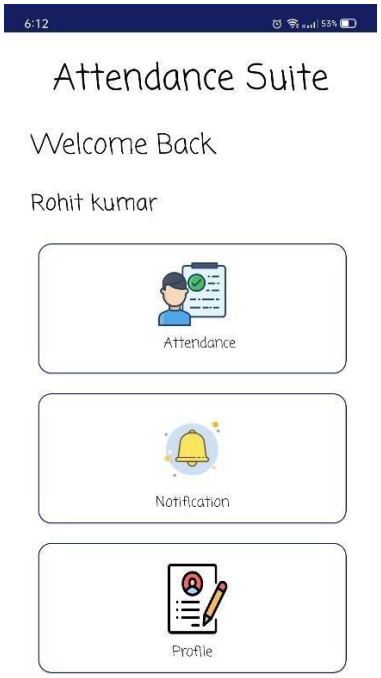


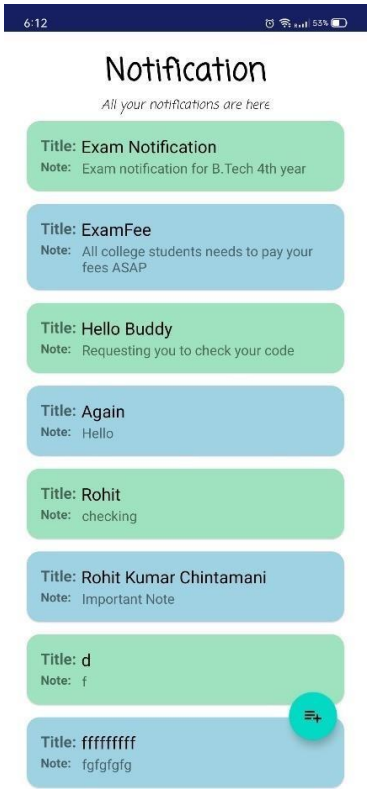
5.2.2 STUDENT MODULE





5.2.3 FACULTY MODULE





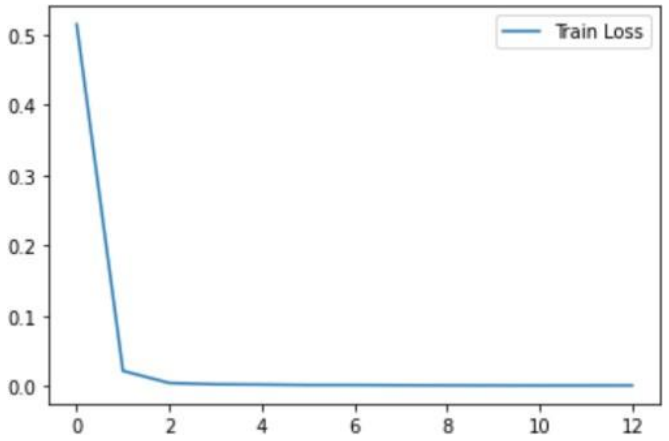


Fig. 5.2 Loss Calculation

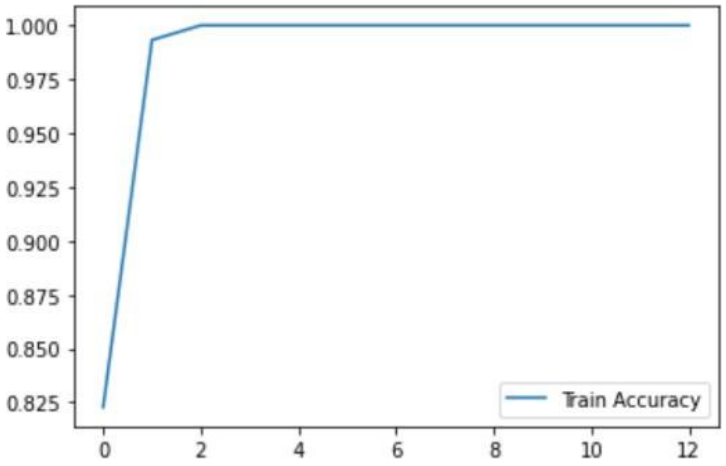


Fig. 5.3 Accuracy Calculation

6. TESTING

6. TESTING

6.1 INTRODUCTION TO TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, subassemblies, assemblies and/or a finished product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

6.2 TYPES OF TESTING

6.2.1 UNIT TESTING

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

6.2.2 INTEGRATION TESTING

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

6.2.3 FUNCTIONAL TESTING

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered on the following items:

Valid Input : identified classes of valid input must be accepted.

Invalid Input : identified classes of invalid input must be rejected.

Functions : identified functions must be exercised.

Output : identified classes of application outputs must be exercised.

Systems/Procedures: interfacing systems or procedures must be invoked.

Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes.

6.3 TEST CASES

6.3.1 FACIAL RECOGNITION

Test case ID	Test case name	Purpose	Test Case	Output
1	New Image 1 for recognition from live feed	Recognizing face for Image 1	The user gives the in the form of an image that contains a face in it	Face of Image1 is recognized successfully
2	New Image 2 for recognition from live feed	Recognizing face for Image 2	The user gives the in the form of an image that contains a face in it	Face of Image2 is recognized successfully

3	New Image 3 for recognition from live feed	Recognizing face for for Image 3	The user gives the in the form of an image that contains a face in it	Face of Image3 is recognized successfully

7. CONCLUSION

7. CONCLUSION & FUTURE ENHANCEMENTS

7.1 PROJECT CONCLUSION

In this paper, a real-time ML based Facial Recognition system was built using colored images from PC camera. The use of Convolutional Neural Networks helps our model to recognize in times of dark lightening conditions. The system achieved a maximal accuracy of about 96% for training and 97% for the validation set. Our model will also recognize faces that aren't trained by our model. I believe our full stack model will ease the burden of faculty in maintaining attendance and provide easy accessibility to the end users. This way we were able to extend our ML model to a full stack application.

7.2 FUTURE ENHANCEMENTS

From the perspective of Facial Recognition Attendance System, the traditional way of marking attendance on a notebook is eliminated and a centralized database has been established with the help of which a student can check and track his attendance using our application. In future we can extend this project to detect multiple faces from a picture and mark their attendances accordingly. We can also help the faculty by automating the whole process by extending our model to multiple face detection and recognition.

8. BIBLIOGRAPHY

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