

Automatic Attendance System

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Class - COE 3

Roll No - 2017UCO1684 , 2017UCO1681

Subject Code - CEC21

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Objective

In this project we aim to build an Attendance Marking System with the help of facial recognition owing to the difficulty in the manual as well as other traditional means of attendance system.

Introduction

In today's competitive world, with increasing working hours and less classroom time, teachers need tools which help them manage precious class time efficiently. Manually taking attendance makes the daily attendance a mundane task for the faculty and unnecessarily consumes classroom time.

Problems with manual attendance system -

1. Manual attendance is tedious and time-consuming.
2. Teachers spend their precious teaching time in administrative tasks.
3. Inherently vulnerable to proxies and manual error
4. A lot of paperwork is needed

Face Recognition Trends

Face Recognition technology is gradually evolving to a universal biometric solution since it requires virtually zero effort from the user end while compared with other biometric options . It's in trend now-a-days because of following reasons:

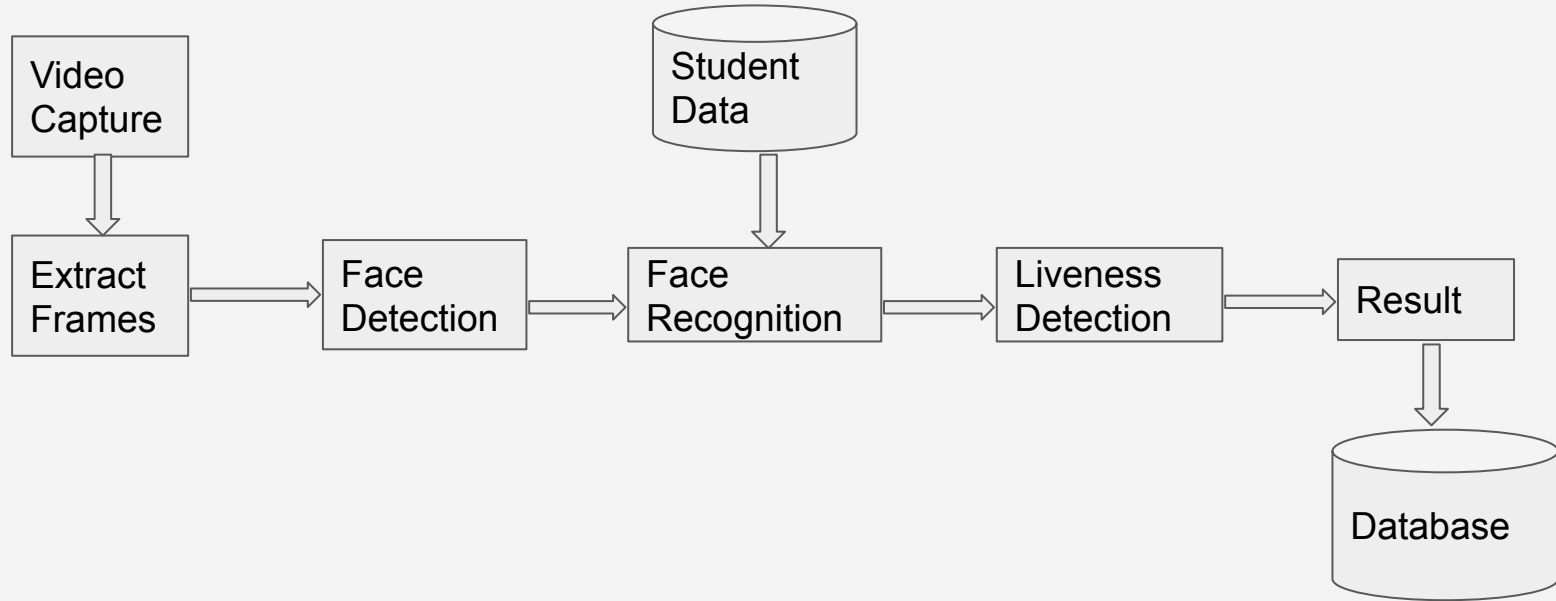
- It is accurate
- It allows for high enrolment
- It allows verification rates .

But as promising as facial recognition is, it does have flaws. User photos can be used to spoof facial recognition software . Hence we use eyeblinks as a liveness detection clue against photo spoofing in face recognition .

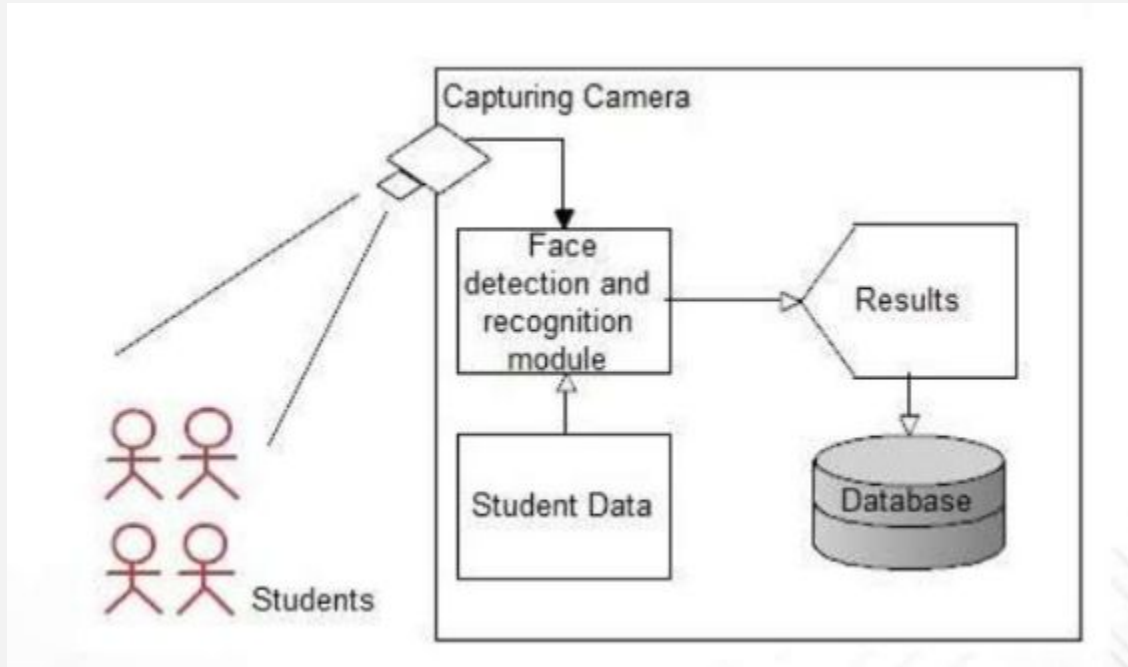
Implementation Overview

1. Face Detection : Taking frames from the running web camera to identify location of faces in frames that acts as region of interest.
 - cv2 library is used.
2. Face Recognition : Recognising Faces to identify whether the person is a registered student or an unknown user.
 - A pre-trained tensorflow model (Facenet) is used.
3. Liveness Detection: To check whether the registered student is live at real time or not using Blink Detection.
 - Trained a model in tensorflow and using cv2 library for eye location.

Block Diagram



Methodology



Implementation Details

Adding New Student

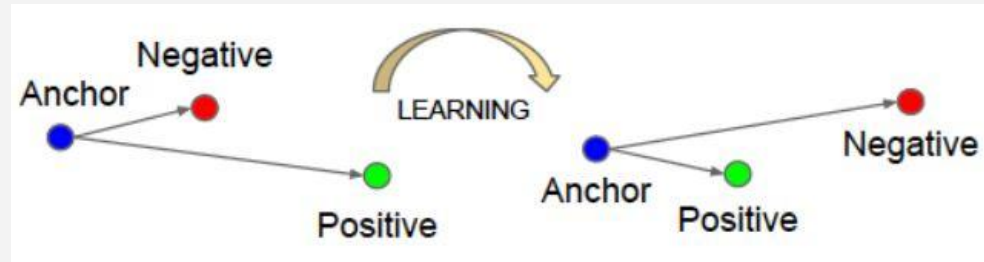
- When a new student is added in the system, a new folder is created in the database with his/her roll number, having **50 frames** of his face at different angles.



Implementation Details

Face Recognition Model

- A pre-trained **FaceNet** model is used which provides a 128 feature vector of a face.
- FaceNet is a model was trained on the concept of Triplet Loss.



Triplet Loss Concept

Implementation Details

Liveness Detection Model

- Blink detection is used for liveness detection .
- A LeNet-5 architecture based model is trained using keras to predict whether or not the eyes are closed.

Model: "sequential"

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 28, 28, 6)	456
conv2d_1 (Conv2D)	(None, 24, 24, 16)	2416
flatten (Flatten)	(None, 9216)	0
dense (Dense)	(None, 120)	1106040
dense_1 (Dense)	(None, 84)	10164
dense_2 (Dense)	(None, 1)	85

Total params: 1,119,161

Trainable params: 1,119,161

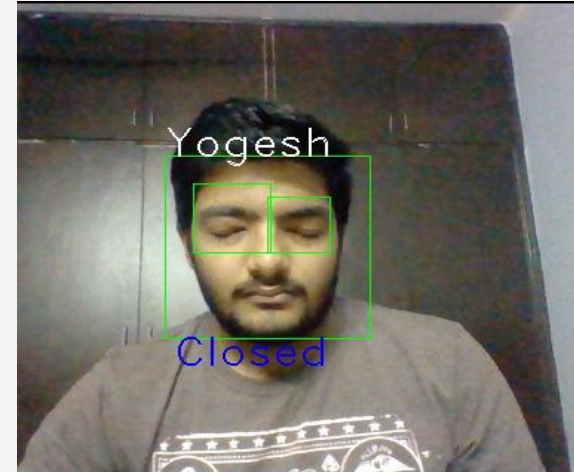
Non-trainable params: 0

Model Architecture

Implementation Details

Taking Attendance

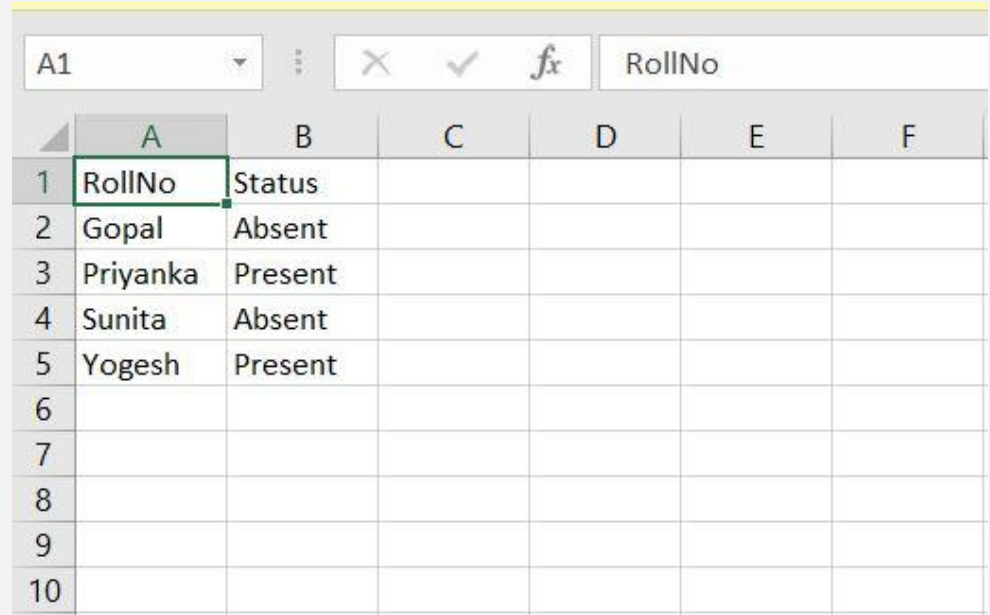
- So using cv2 Haar Cascade Classifier, we were able to detect faces and eyes location.
- If eyes are open in one frame and closed in next frame this means that we have detected a blink so the student is live.
- If student is live then mark present.



Implementation Details

CSV Attendance Register

- Attendance of students got marked automatically as the students are detected .
- After the application is closed, an excel sheet is generated that contains attendance of all students.

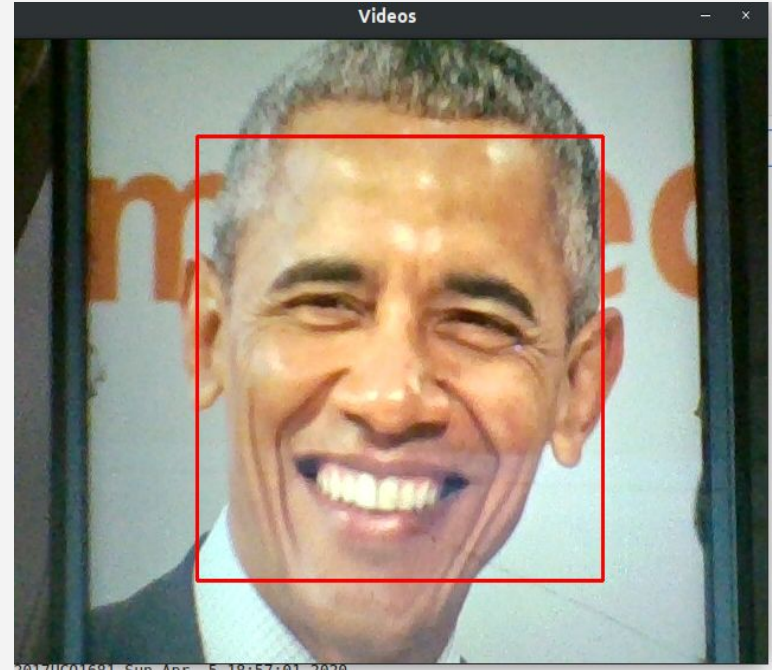


	A	B	C	D	E	F
1	RollNo	Status				
2	Gopal	Absent				
3	Priyanka	Present				
4	Sunita	Absent				
5	Yogesh	Present				
6						
7						
8						
9						
10						

Implementation Details

Unknown Person

- If the person is unknown then that person will not be recognised.



Implementation Details

Photo Spoof

- If someone try to mark attendance using a photo then liveness detection will fail as the status of eyes will not change,hence attendance will not be marked.



	A	B	C
1	RollNo	Status	
2	Gopal	Absent	
3	Priyanka	Absent	
4	Sunita	Absent	
5	Yogesh	Absent	
6			

Conclusion

- Successfully able to add attendance record of registered students in a csv file.
- Able to identify unknown persons and reject students not present at real time.

Areas of Improvement

- Improvements in model for detecting faces at different brightness levels.
- More accurate API's for face and eye detection at different angles.
- Optimize code for faster execution speed.
- Train on larger datasets and deploying deeper models to increase accuracy .

Thank You