Integration of Flask and Python on The Face Recognition Based Attendance System.

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Abstract: Face recognition has been around for a while, but in recent years it has become increasingly widely used. This is because machine learning has improved deep learning and allowed systems to analyse vast amounts of data more quickly. Higher accuracy and quicker processing speeds are the results of this. By 2027, it's predicted that the global industry for facial recognition will be worth $12.92 billion, and not just for safety and security. The study provides an introduction to the associated facial recognition and interface using flask and sqlalchemy technologies. The study discusses the many stages of development and associated technologies. We introduce face recognition research for actual conditions as well as generic evaluation criteria and face recognition databases. Face recognition and cloud computing are the future.

***Index Items*- Face Recognition, Flask, open cv**.

I. Introduction

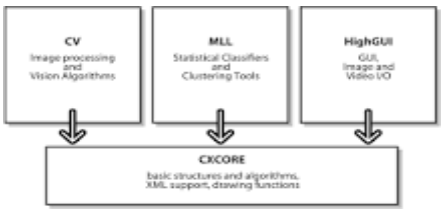
As with other widely used biometric technologies like fingerprint, iris, and finger vein pattern recognition, face recognition is a biometric technique. Through the use of software, face recognition may identify a person based on particular features of their physiology. The method of facial recognition typically involves three simple phases. First, your face is captured in a picture or video; this can happen in real-time whether you're in a crowd or not. Next, the programme detects a number of different facial features called landmarks or modal spots on the face. These might include the separation of the eyes, the size of the nose, the depth of the eye sockets, and the distance from the forehead to the chin. Every programme employs several nodal points and may may collect up to 80 different measurements.

II. Background and related work

1. Face Recognition

Face recognition using Open CV

For face detection, the OpenCV Python library is utilised. As the video is beginning at the same time that the attendance is being recorded, let's use a classroom as an example, which has many various items like pens, paper, bags, and bottles. All of these things should be ignored, and only the face should be recognised; the open cv library accomplishes this.



OPENCV Structure and content

2. *Flask*

Armin Ronacher developed the flask micro framework for the web in 2004. Flask is written in the python programming language. Flask is a framework for building web apps quickly and easily with the capacity to enhance complex applications. It is licenced under a three clause BSD License. It began as a straightforward wrapper for Werkzeug and Jinja and has grown to be one of the most popular python web application frameworks.

```
from flask import Flask

app = Flask(__name__)

@app.route('/')
def hello():
    return "Hello, Flask!"

if __name__ == '__main__':
    app.run(debug=True)
```

3. *SQLAlchemy DATABASE*

An object-relational mapper (ORM) for the Python programming language, SQLalchemy is an open-source SQL toolkit that was distributed under the MIT License. Its high availability and dependability eliminate the need to maintain the intricate servers that house SQL servers. These services include telemetry that monitors resource usage, faults detected, and other pertinent information for a SQL database, among other practical functions.

Telemetry, first The Azure SQL database hosts millions of databases worldwide, in contrast to an on-premise SQL server. All significant database metrics are gathered and recorded, much like the flight data recording box in a plane. Tracking information about failures and exceptions that frequently occur is crucial in our approach. a database called Azure SQL. Both cold storage and hot storage are used to organise the collected data. When having data with little latency is essential, such as in alerting situations, hot storage is used. Hot storage queries should produce results that are nearly real-time in a short period of time. On the other hand, because cold storage has a larger amount of data and a longer retention duration, it is frequently utilised for post-processing and other ad-hoc analyses. Cold storage querying is typically slower and cannot be used for processing in close to real-time because of the amount of data being stored there.

B. Database consultants An essential prospect is made possible by gathering the telemetry data from a very big number of various databases.Even if various workloads are experienced by different customers, general trends in database usage can still be extracted and identified. These various workloads might be categorised based on their workload thumbprints by analysing the telemetry data. When specific problems are found and the necessary corrective measures are available, the database can also be automatically tuned.

4. *Email Sending*

Simple Mail Transfer Protocol is referred to as SMTP. The Simple Mail Transfer Protocol (SMTP) is a set of rules for communication that enables applications to send electronic mail over the internet. Based on email addresses, it is an application used to deliver messages to other computer users. o It can deliver a single message to one or more recipients. o It allows users on the same or separate computers to exchange mail.
o Text, voice, video, and graphic messages can all be sent.
o It is also capable of sending messages across networks other than the internet.

Setting up communication rules between servers is the primary function of SMTP. The servers can identify themselves and announce the type of service they provide they are attempting to perform is communication. They also provide a method for dealing with issues like a wrong email address. For instance, if the recipient address is incorrect, the receiving server will respond with some sort of error message.

Working :

1. **Mail Composition:** A user composes an electronic mail message using a Mail User Agent before sending it (MUA). A application called Mail User Agent is used to send and receive mail. Body and header are the two components of the communication. The message's primary component is its body, while the header contains details like the sender and recipient addresses. Additionally, the header contains descriptive details like the message's subject. In this instance, the message content resembles a letter, and the header resembles an envelope containing the address of the recipient.
2. **Mail Submission:** After creating an email, the mail client sends the finished message through SMTP on TCP port 25 to the SMTP server.

3. **Delivery of Mail:** E-mail addresses contain two parts: username of the recipient and domain name. For example, vivek@gmail.com, where "vivek" is the username of the recipient and "gmail.com" is the domain name. If the domain name of the recipient's email address is different from the sender's domain name, then MSA will send the mail to the Mail Transfer Agent (MTA). To relay the email, the MTA will find the target domain. It checks the MX record from Domain Name System to obtain the target domain. The MX record contains the domain name and IP address of the recipient's domain. Once the record is located, MTA connects to the exchange server to relay the message.
4. **Receipt and Processing of Mail:** Once the incoming message is received, the exchange server delivers it to the incoming server (Mail Delivery Agent) which stores the e-mail where it waits for the user to retrieve it.
5. **Access and Retrieval of Mail:** The stored email in MDA can be retrieved by using MUA (Mail User Agent). MUA can be accessed by using login and password.

For sending mail yagmail is a simple GMAIL/SMTP client that is created to remove the hassle out of sending emails. With the python library, you can write a few lines of code to include email sending capabilities to your application and sidestep using the cumbersome traditional approaches. To send the unknow person detected person.

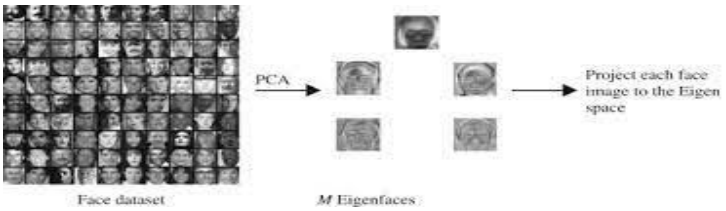
III. Approach

A. To create a face database.

The database is made up of 11 movies of people looking in various directions. Face is then extracted from these videos. Frames are extracted after a detection is made. The database will be built. Via a web camera with a 13MP camera Every class has its own set of rules. There are 234 photos in all. The image has a 244x244 resolution.

B. Cropping of the face ROI

Faces and non-face components are included in the photographs. In this case, identification of people's faces to improve, the specific facial component is required accuracy. The process's initial goal is to find out what's going on. Face Deep Neural Network (DNN)-based methods are used in this technique. The technique of face detection is employed. The technique that is based on DNN is more effective. Face detection technologies that are now in use [10] are less accurate. The pre-trained module of caffe prototxt files for deep learning face detection is used to detect the face. Face detection is a technique for detecting a person's face. The Open CV library includes this function. The face detector based on DNN used the Single Shot Detector (SSD) framework in conjunction with The base network is ResNet.



C. Restructuring

There is a possibility that the cropped photographs will be of different sizes, therefore All photos must be resized to the same size. As a result, the detected Cropped and resized facial pictures to 128x128 resolution. The altered images are moulded into a 1D array of size once more.1X(128)2.

D. Extraction of Characteristics

Face recognition relies heavily on feature extraction. Algorithm. Each face has its own traits that aid in identifying it differentiating one individual from another PCA is used in this method. The terms LDA and LDA are used interchangeably.

1. PCA is an acronym for Personal Computer Analysis.

PCA is a dimensionality reduction method that can be used in a variety of applications such as picture compression and facial feature recognition. extraction, face recognition, and pattern recognition from big datasets image with dimensions Eigen faces are used in PCA depicts Faces that are unique to each individual. Each image is standardised in PCA to align the eyes and the head minimise the size of the mouth of the subject in a picture the information and reveal the stunning facial structure The reduction technique removes extraneous feature data from the facial structure and decomposes it into a smaller orthogonal component called as Eigen is confronted with. The faces are saved in the one-dimensional feature. array. To represent the face, PCA requires a full-frontal face array. Otherwise, there's a good chance you'll get a lot of false alarms. Eigen faces provide us with feature vectors. The vast majority of the feature points are positioned along the first PC line.2.

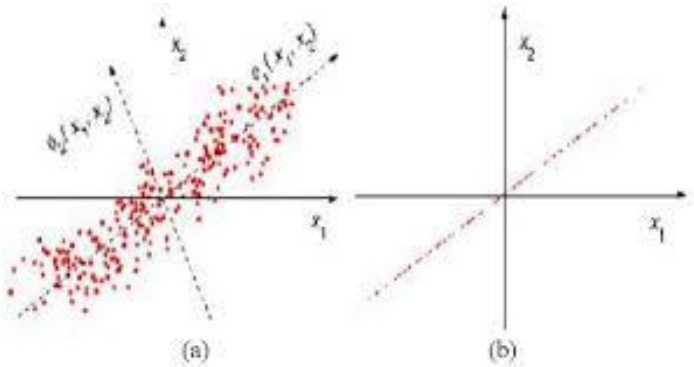


Fig. 2. Graphical Example of PCA (a) PCA basis (b) 1D representation of

One of the data description approaches is LDA. The goal of LDA is to categorise the projected data into distinct groups. In Human faces are represented in terms of data using this method. matrix(X). Turk was the first researcher to apply LDA for this purpose. Face recognition is a technique for recognising someone's face LDA differs from PCA in that it uses a two-dimensional vector.in order to represent the face 2-Dimensional PCA is another name for LDA. The LDA algorithm was proposed to process the Eigen vectors from show the heading that isolates the covariance matrix There are various appearance classes. The only disadvantage of PCA is that it is a time-consuming process. The LDA face feature extraction approach has a flow a scalability issue Because of this, the PCA and LDA were used the following benefits: 1. Requirement for a small amount of memory:

1. Low memory requirement: It is not necessary to use all of the photos, but it is necessary to store low memory Eigen vectors. Also, during the testing phase, the Eigen vector of the as a result of the employment of a test image, less memory is required. The batch mode is used by PCA and LDA.

2. Reduced computational complexity: As the algorithms become more complicated, this approach uses less memory and has a lower complexity difficulty of computation and the amount of time necessary it's time to execute

3. High recognition accuracy: PCA and LDA work effectively together. Using a covariance matrix, separate the facial traits. It demonstrates a high level of recognition accuracy.

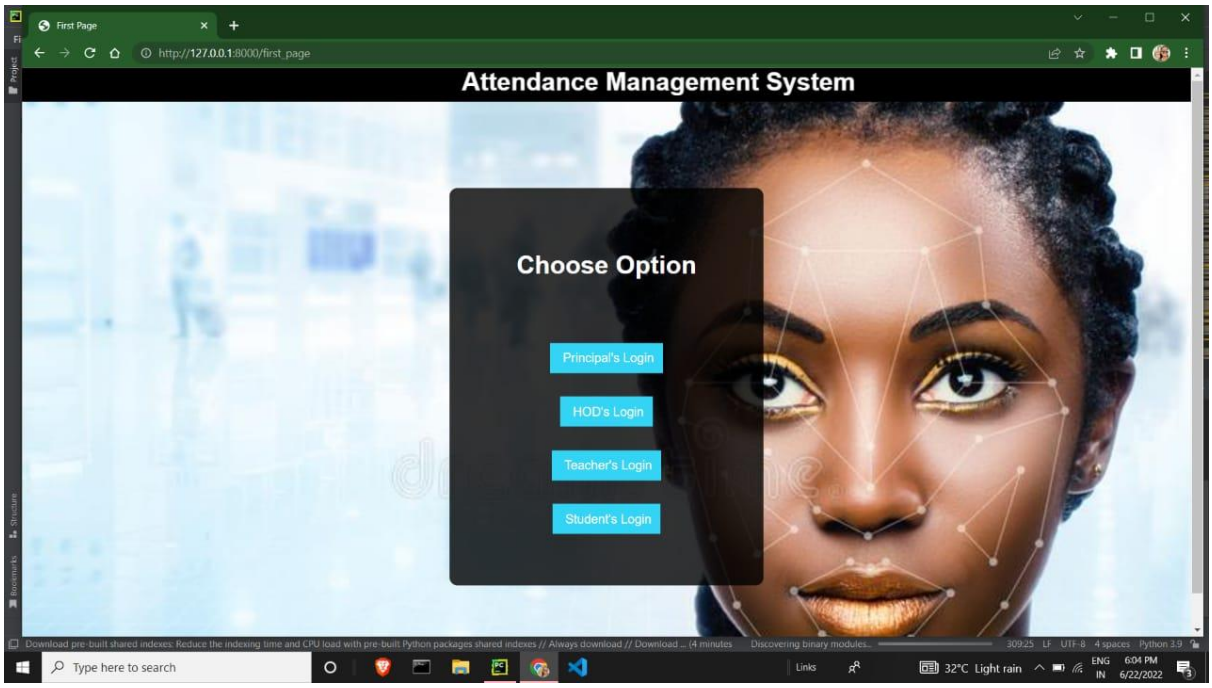
E. Classification

The supervised machine classification algorithm (SVM) is used to separate the feature vectors.

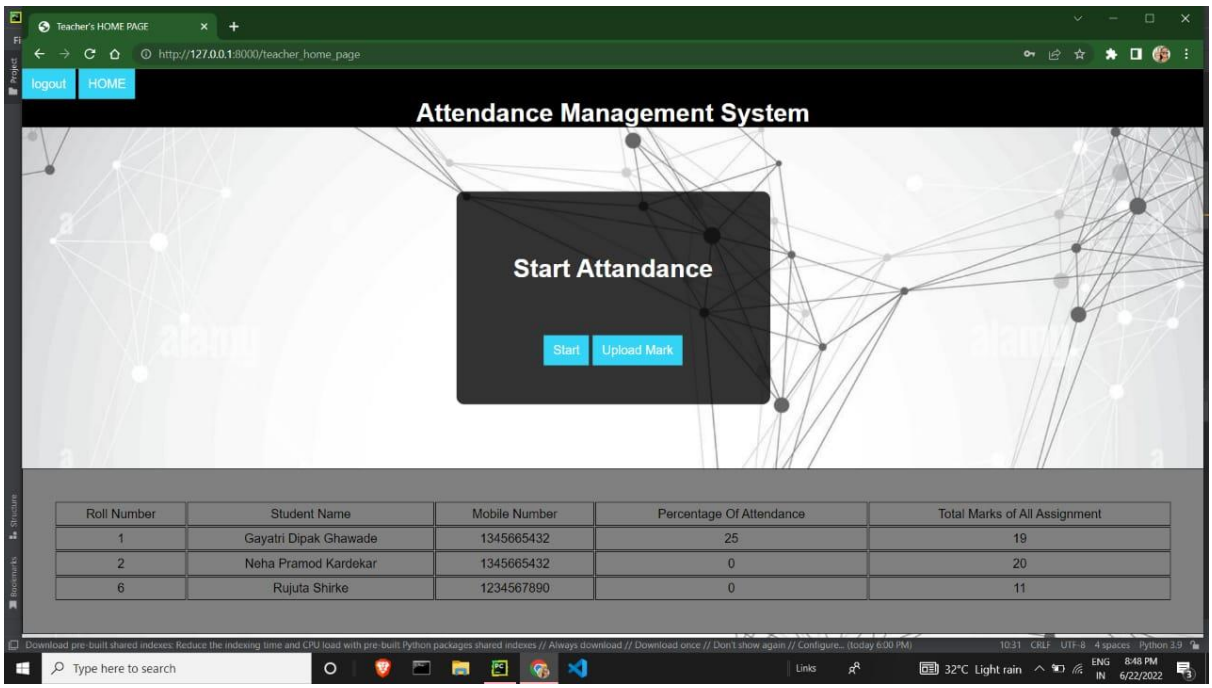
Multilayer Perceptron (MLP).

Support Vector Machine No. 1 (SVM)

In higher education, SVM is an excellent technique for determining the hyperplane between two distinct particular courses. Component space that is used for grouping is of a certain size. It's true.one of the machine learning algorithms There are two types of SVM. Training and testing are the steps that have been assigned. In any event, most classification projects aren't that difficult. Straight forward. To do this, more puzzling structures are required. to construct an optimal partition The data is split into two categories. A straight line can separate the classes in three-dimensional space. shows higher measurements, such as in a 3-D model.

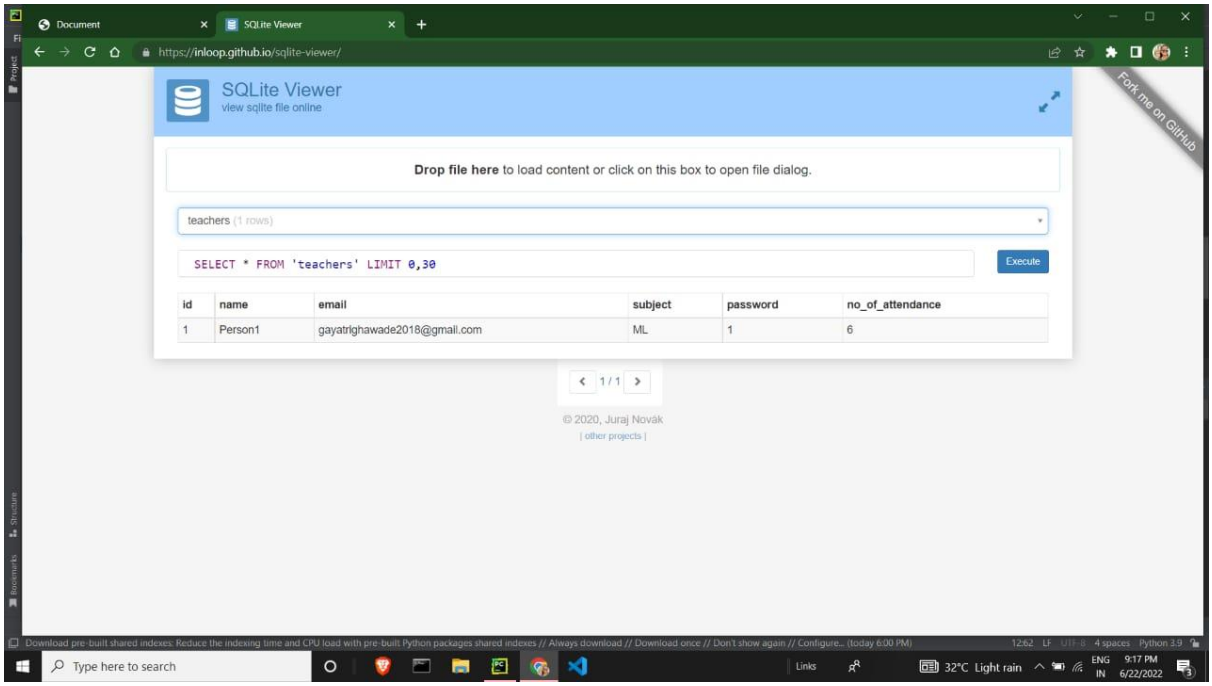


User Interface all signup option

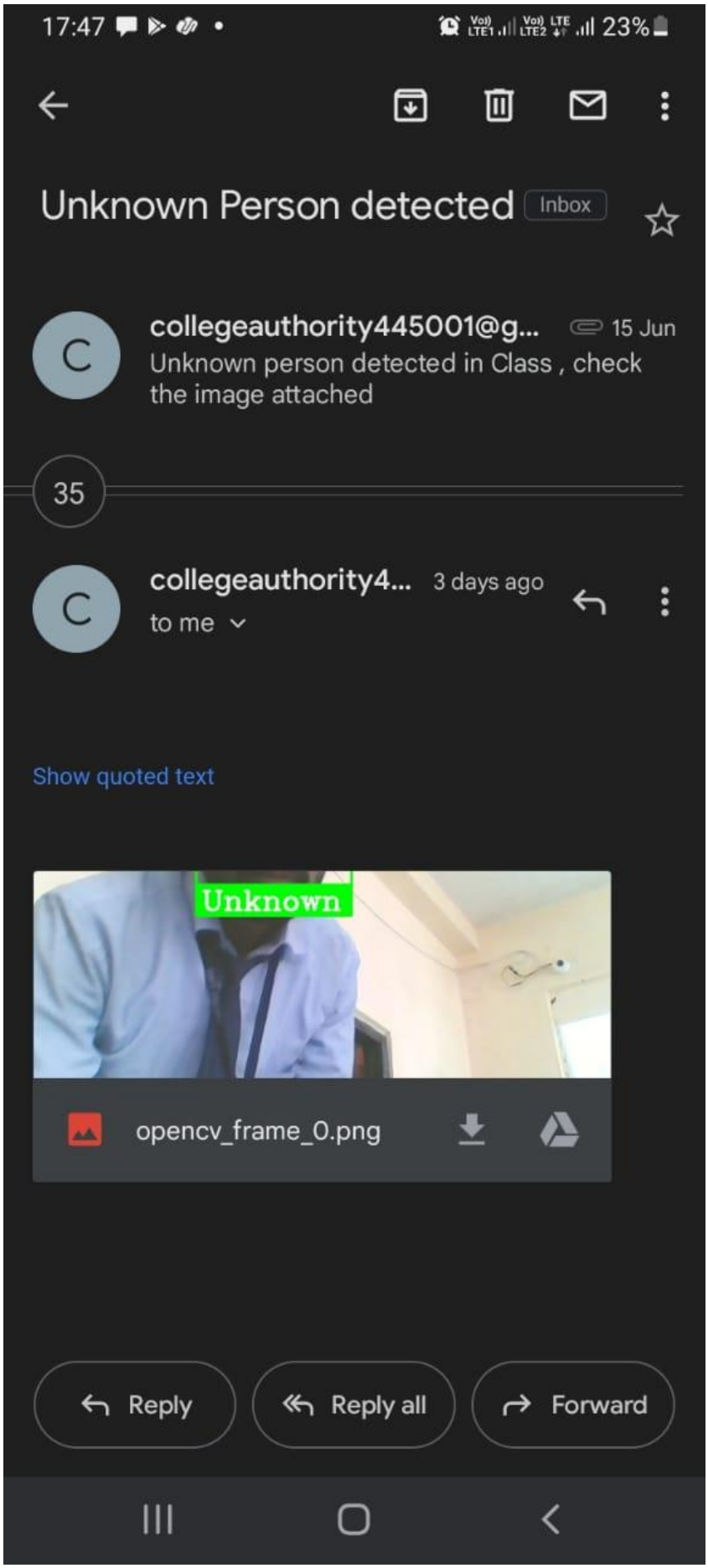


Start Attendance option

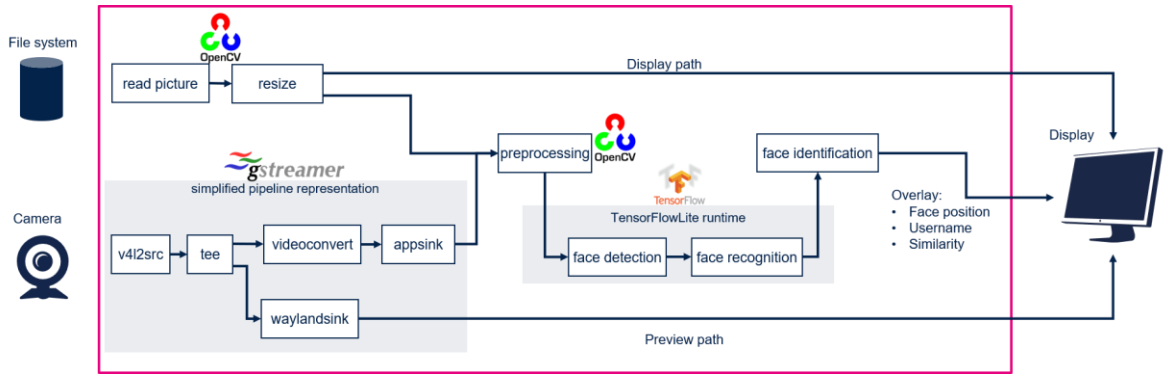
Attendance is Marked



Seen in the Database



Unknown person detected mail



Main Workflow

IV. Future Scope

1. Banking Industry: Check in and check out timing can be marked; this can be used in the company also. Every government department can also have this system it is better than thumb print scanner.
2. Crime Branch: To find the missing person, the criminal living in the different places can be identify through this system. You can mark suspicious move of any person in public person and you can track him/her.

V. Conclusion:

With the help of OpenCV, and hog algorithm present in machine learning we are able to detect the person then extracting the features face is recognized based on this attendance is marked. If the person is unknown then email will go to the respective teacher. This will reduce the time because half if the lecture time is wasted in this thing. Through by taking manual attendance students are marking false attendance. It is difficult for the teacher also to kept the record.

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