

Project Report

Embedded System LAB II

Attendance Management System using Face Recognition



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Problem Statement :

To develop a Attendance system using Face Recognition

Objective :

The task is to built a face recognition attendance system using Jetson nano

Introduction :

A face recognition attendance system uses artificial intelligence (AI) to identify people based on their facial characteristics to track attendance. It works by taking a picture of a person's face and comparing it to a database of pre-registered faces. If there is a match, the system records the person's attendance. Face recognition attendance systems can be used in many places, including workplaces, stores, and other organizations. They can also be integrated with existing time and attendance software, or used for security and access control.

PROPOSED

SYSTEM:

All the students of the class must register themselves by entering the required details and then their images will be captured and stored in the dataset. During each session, faces will be detected from live streaming video of the classroom. The faces detected will be compared with images present in the dataset. If a match is found, attendance will be marked for the respective student. All the work is done using jetson nano

Jetson nano: Jetson Nano is a small, powerful computer for embedded applications and AI IoT that delivers the power of modern AI in a \$99 (1KU+) module. Get started fast with the comprehensive JetPack SDK with accelerated libraries for deep learning, computer vision, graphics, multimedia, and more.

Requirements :

- Jetson Nano Developer Kit.
- Compatible microSD card (at least 32GB).
- 5V 4A power supply (or a USB-C power supply for newer versions).
- A laptop with an SSH client installed (e.g., Linux terminal, macOS terminal, or software like PuTTY for Windows)
- MicroSD card reader.

- Monitor, keyboard, and mouse (for initial configuration if SSH setup is unavailable).
- Ethernet cable or USB Wi-Fi dongle (if networking is needed).

Steps to configure Jetson Nano :

- Connect jetson nano with laptop
- Open Power Shell enter Nvidia And its User name

```
PS C:\Users\MEERRU> ssh nvidia@192.168.55.1
```

- Enter its Password :

```
nvidia@192.168.55.1's password:
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 4.9.253-tegra aarch64)
```

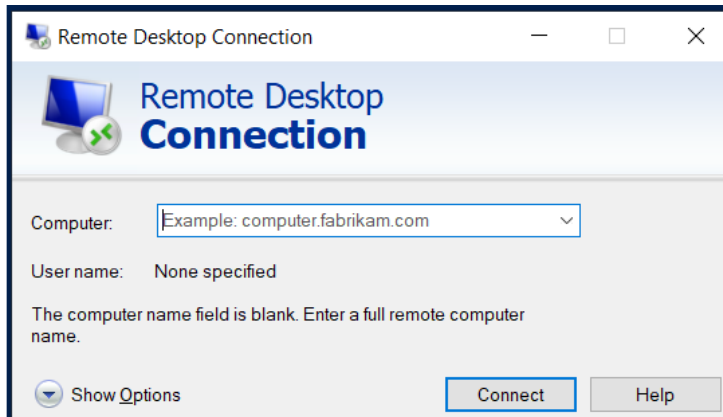
- Connect wifi using this command :
sudo nmcli device wifi connect "_____" password "_____"
- Type ifconfig to obtain the ip address

```
See https://ubuntu.com/esm or run: sudo apt update
Last login: Thu Jan  9 22:20:20 2025 from 192.168.55.100
nvidia@nvidia-desktop:~$ ifconfig
```

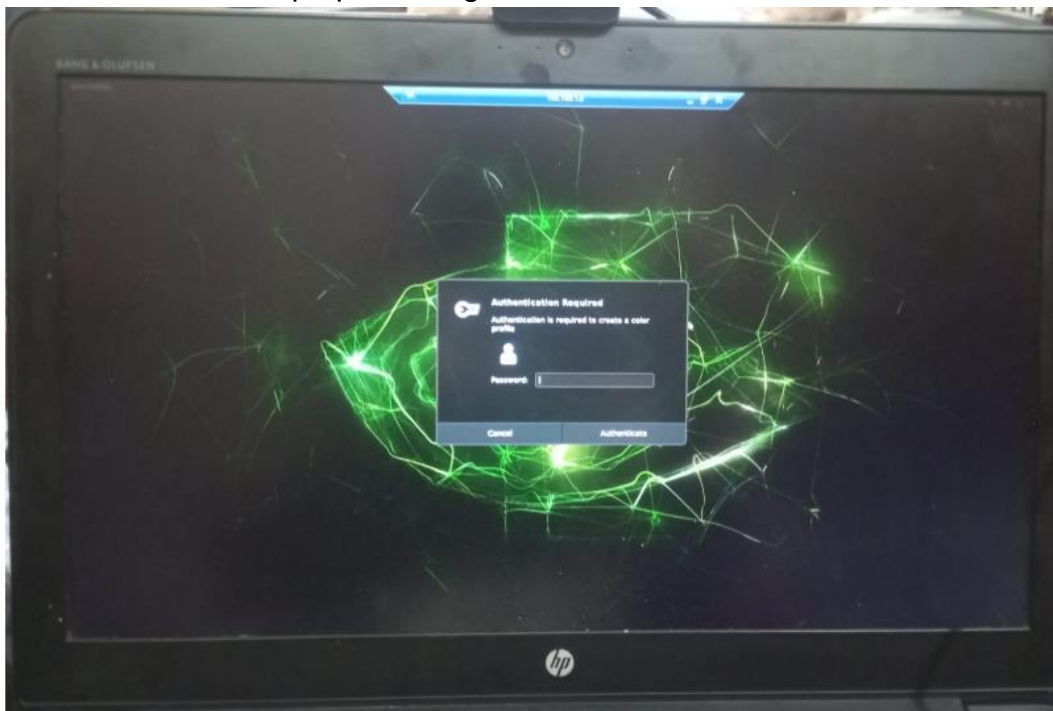
- Copy ip address

```
wlan0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.1.8 netmask 255.255.255.0 broadcast 192.168.1.255
    inet6 fe80::f59c:53cf:3b5d:e133 prefixlen 64 scopeid 0x20<link>
    ether d0:37:45:9e:3e:18 txqueuelen 1000 (Ethernet)
    RX packets 226 bytes 147980 (147.9 KB)
    RX errors 0 dropped 79 overruns 0 frame 0
    TX packets 223 bytes 36178 (36.1 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

- Enter it in Remote Desktop



- Headless mode at laptop is configured



- **Install Vscode and python libraries in it**

Libraries :

To Build AI based attendance system we need to install python and some of its libraries on jetson nano

- Open cv
- Pillow

OpenCV

Opencv is a huge open-source library for computer vision, machine learning, and image processing. Now, it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even the handwriting of a human.

Pillow:

Pillow Formerly known as PIL, Pillow is an open source library specifically designed for image processing via Python. A veritable goldmine for image file manipulation, let's take a look at some of the basic features of this benchmark library.

Libraries installation steps :

Open the **Command line**(search for **cmd** in the Run dialog(+ R). Now run the following command:

```
python --version
```

To check if PIP is already installed on your system, just go to the command line and execute the following command:

```
pip -V
```

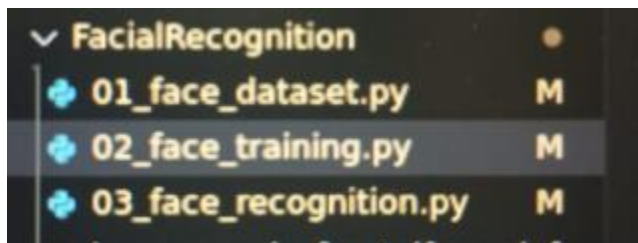
OpenCV can be directly downloaded and installed with the use of pip (package manager). To install OpenCV, just go to the command-line and type the following command:

```
pip install opencv-python
```

Steps :

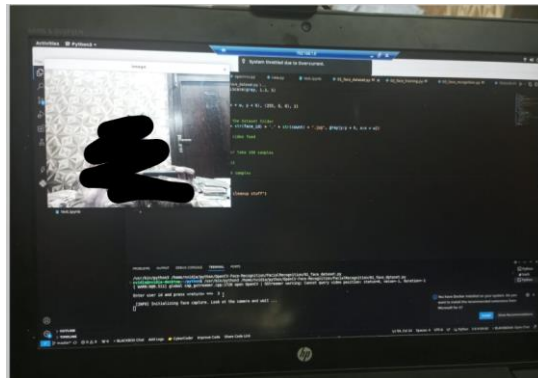
Typically this process can be divided into three stages,

1. **Dataset Creation**
2. **Face Detection**
3. **Face Recognition**



1. Dataset Creation :

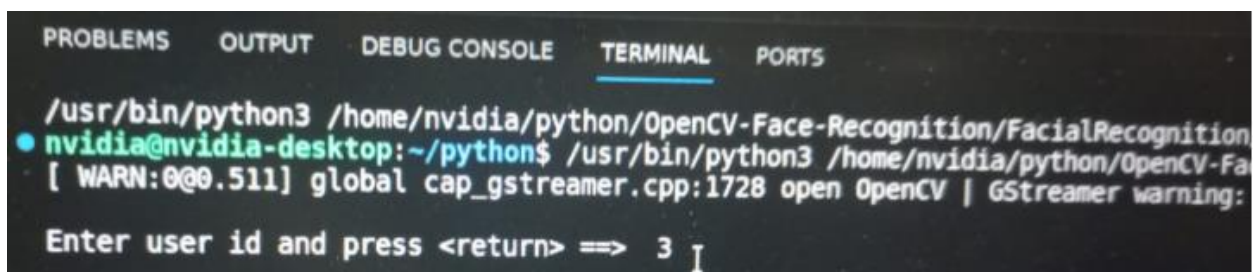
In the provided programs first run the dataset program . This program is able to capture images of students using a web cam. Web cam is connected to jetson nano .After running a program assign an id to the student (say.1,2,3) look at the camera and wait until the data set has prepared it will take some time to process your face id .



Multiple images of a single student will be acquired with varied gestures and angles. These images undergo pre-processing. The images are cropped to obtain the Region of Interest (ROI) which will be further used in the recognition process. Next step is to resize the cropped images to a particular pixel position. Then these images will be converted from RGB to grayscale images. And then these images will be saved as the names of respective students in a folder.

2. Face Detection:

After creating the data set now we have to train the data . Run data training file to train the model



Face detection here is performed using Haar-Cascade Classifier with OpenCV. The Haar Cascade algorithm needs to be trained to detect human faces before it can be used for face detection. This is called feature extraction.

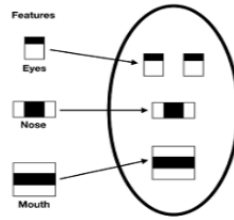
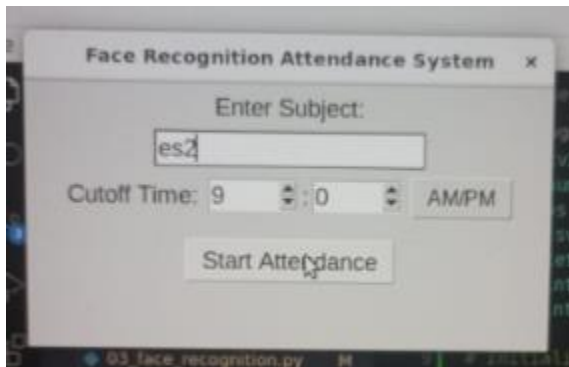


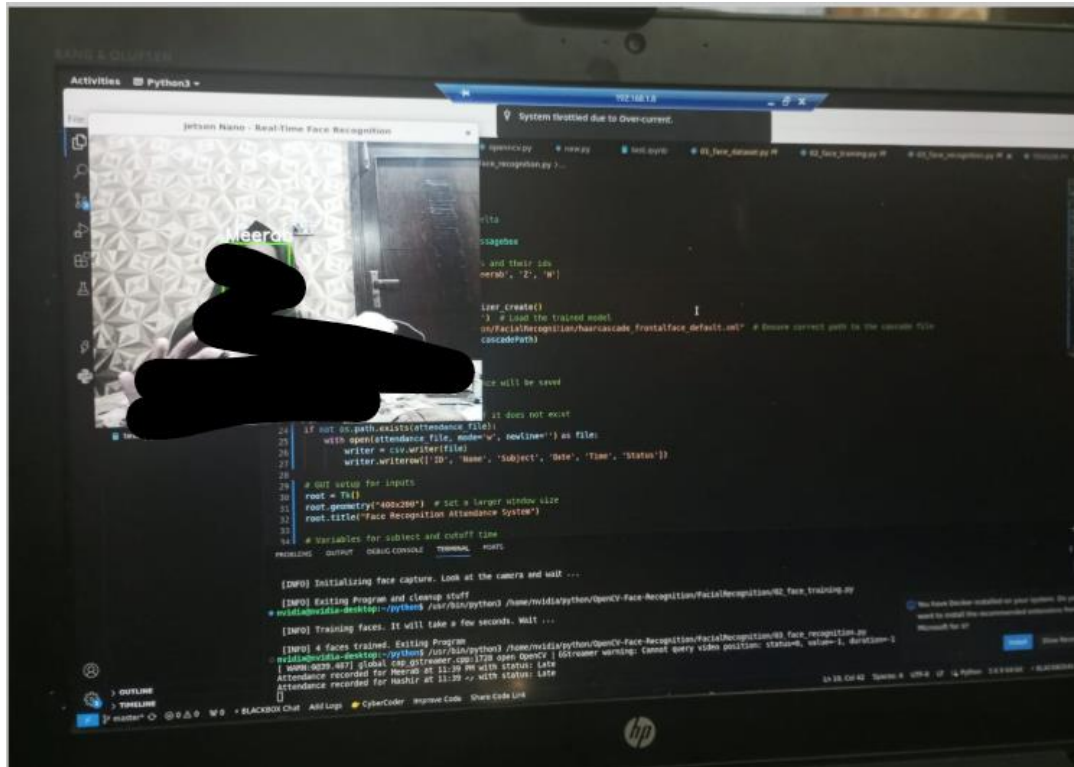
Fig:1.2Theoretical Face Model

3. Face Recognition

At the final step run the face recognition program . Before running it update the list according to the data set i.e. if you assign the user id 3 update your name at location 3 in list .

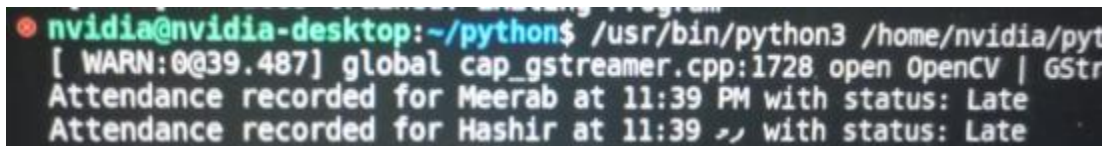


Enter the name of the subject of which attendance is to be marked Also include cut off time . Webcam will initialize . It will compare the person with the available data set and show its name if the name is not listed it will represent unknown



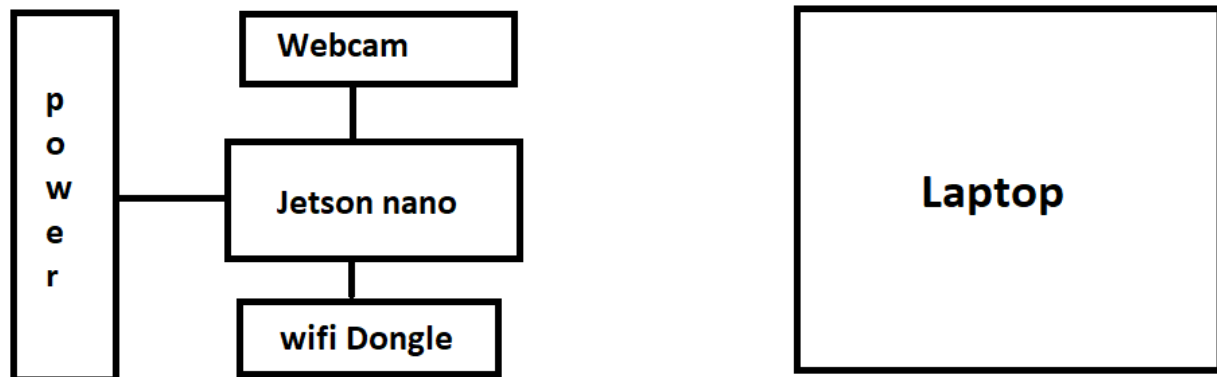
Results :

It will update the attendance on the terminal among with its status

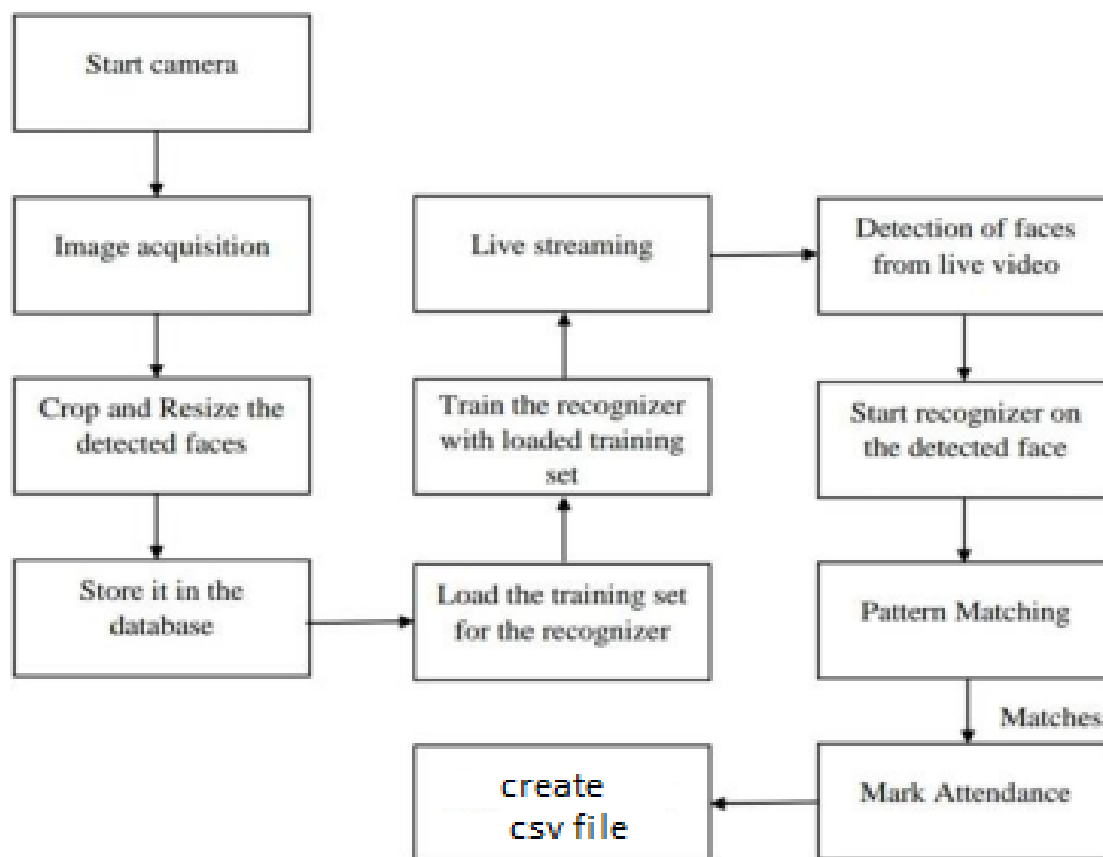


Block Diagram:

Connected via ip addresses in headless Mode



Flow Chart :



Conclusion:

In conclusion, a face recognition attendance system using Jetson Nano is a smart and efficient way to manage attendance. It uses advanced AI to recognize faces quickly and accurately, reducing the need for manual work and minimizing errors. The system is compact, energy-efficient, and cost-effective, making it suitable for schools, offices, and other places. By combining technology with convenience, this system makes attendance tracking easier and more reliable while showcasing the potential of AI in everyday tasks.

References :

- https://www.researchgate.net/publication/341876647_Face_Recognition_based_Attendance_Management_System
- https://www.jetson-ai-lab.com/initial_setup_jetson.html
- <https://chatgpt.com/c/676ecf4c-ea8c-800b-bc38-26106b7cbcb2>
- <https://github.com/Patelrahul4884/Attendance-Management-system-using-face-recognition>