Department of Computer Science and Engineering
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AUTOMATED ATTENDANCE MARKER

FACE DETECTION AND RECOGNITION USING OPENCV

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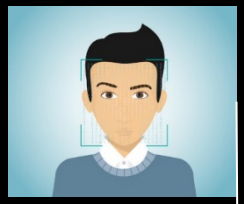
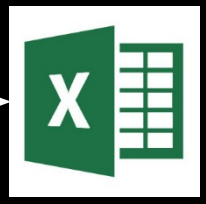
OBJECTIVE

- Our main objective is to detect and recognize the human face by using LBPH algorithm and Haar cascade classifier. We build an automated attendance system by using this technology and mark the attendance in an excel sheet. This mode of attendance system is more secure and easier than the manual as well as other means of attendance system.



Detect Face

Recognize face



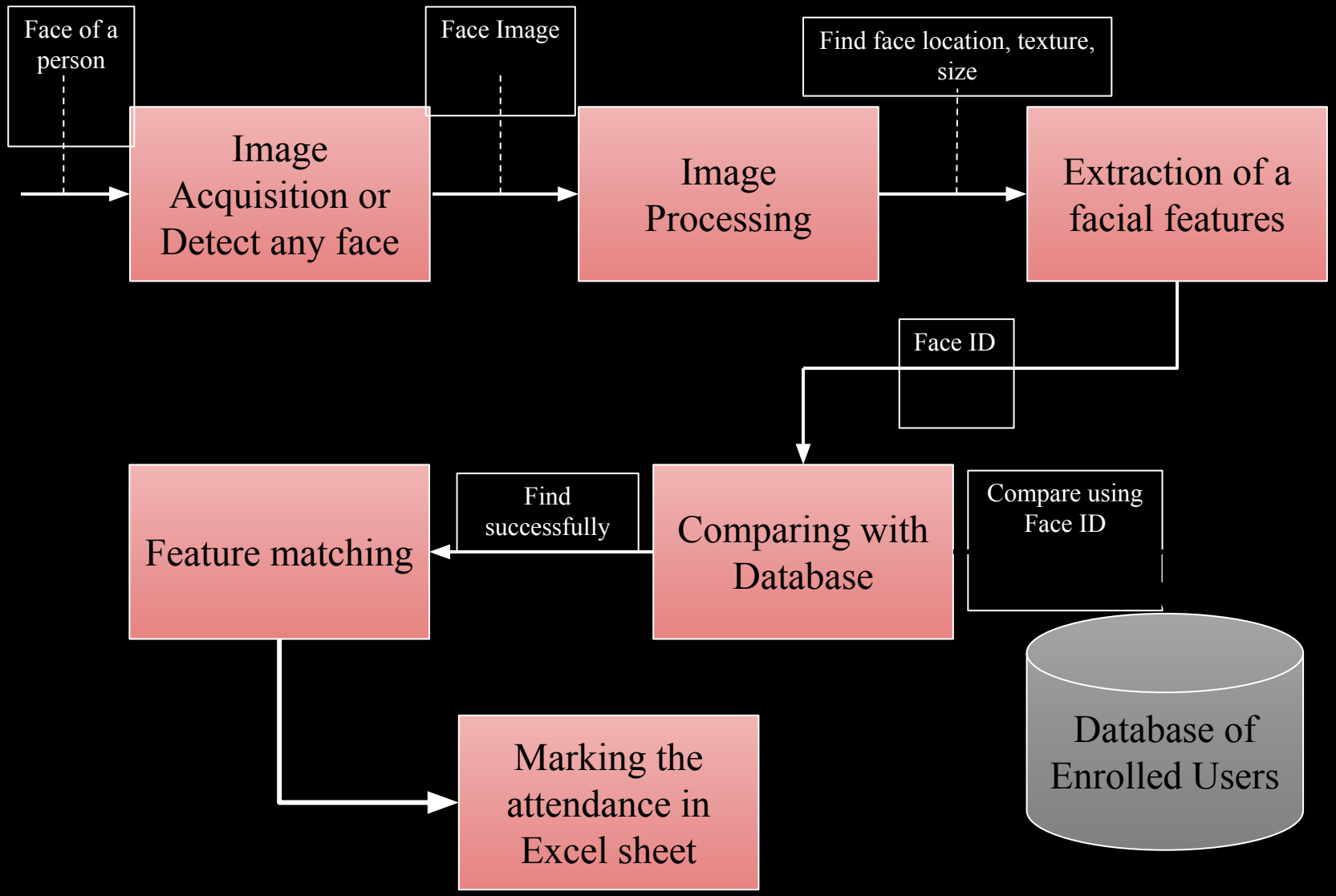
Mark the attendance in an excel sheet

PROBLEM DEFINITION

- Nowadays, in most of the schools and colleges, student's attendance is taken by manually by using attendance sheet in classroom, which is time consuming as well as it increase the workload of a teacher.

- Moreover, it is very difficult to verify one by one student in a large classroom whether the authenticated students are actually responding or not.

BLOCK DIAGRAM



IMPLEMENTATION OF FACE RECOGNITION

- Image acquisition
- Image Processing
- Facial Image classification
- Recognize face

IMAGE ACQUISITION

- Image acquisition can accomplished by capturing real-time images of any object using a high-optical camera and generates images of a sufficient quality and resolution.
- High quality image is necessary for detecting any facial characteristics, which can used in further face recognition process.

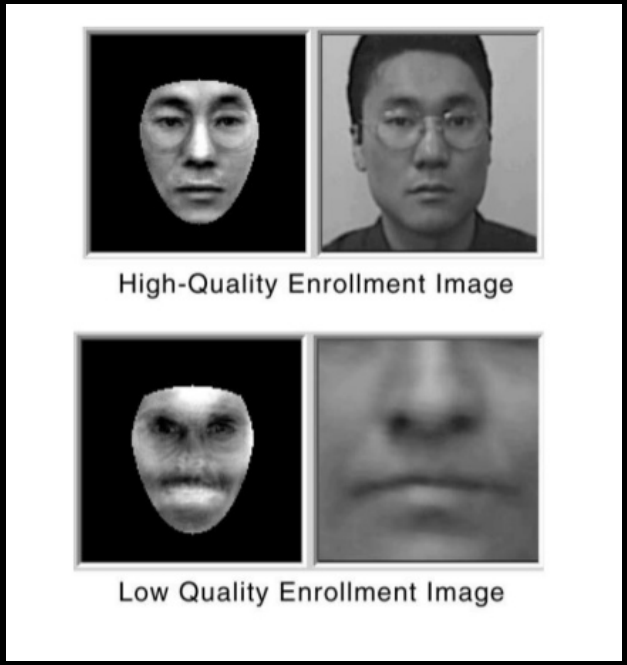


IMAGE PROCESSING

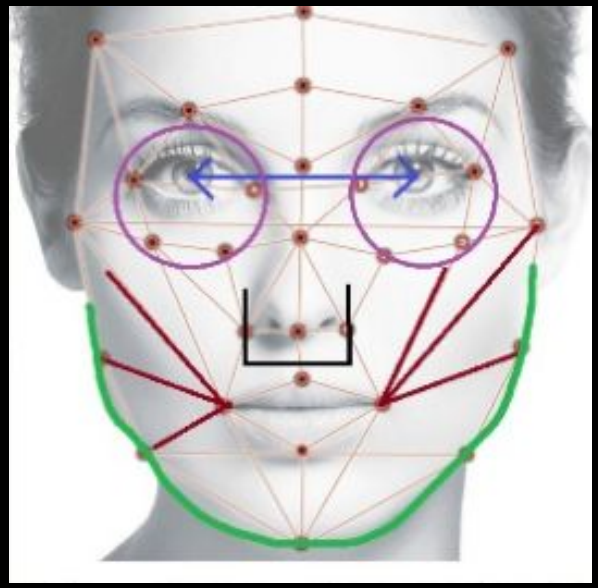
- Image processing is the process of performing certain operations on an image to improve its quality or to extract features of that image. This can be used for further analysis and decision making.

- When the camera detects a face and converts it into an image, the image will be cropped and converted from RGB to grayscale because it is easy to detect faces in grayscale.

EXTRACTION OF FACIAL FEATURES

- This module is responsible for extracting a features that is well enough to identify as the face image. The goal of this module is to extract relevant data from the capture image.

- Features:
  - Distance between the eyes
  - Width of the nose
  - Length of Jaw line
  - Chin



FEATURE MATCHING OR FACE RECOGNITION

- The last step is to compare the image with a database of known faces.

- In the automatic attendance system, registered student faces are trained and stored in the database. Therefore, when the camera captures the face of any student, it will compare it with the known face database by using the student ID, and this process will return matches or potential matches close to the image in the database. Then, the attendance is automatically marked in the excel worksheet.

What are Haar Cascades?

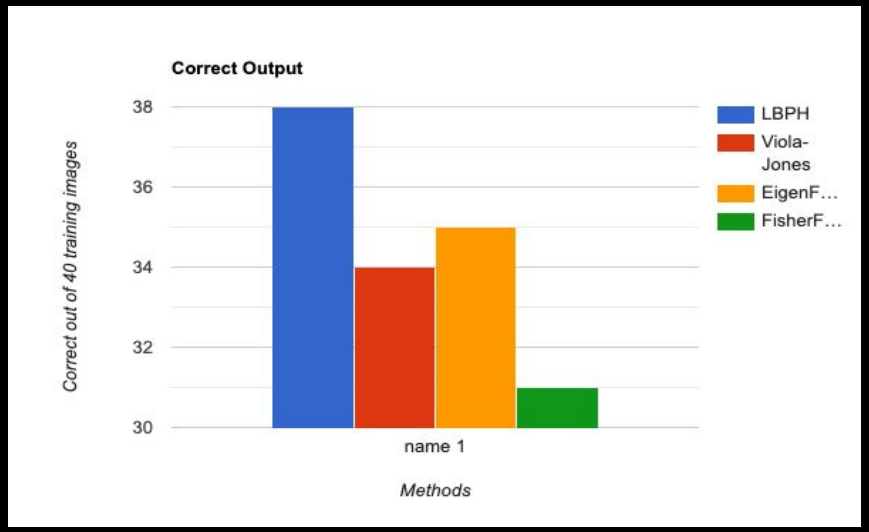
Haar Cascade classifiers are an effective way for object detection. Haar Cascade is a machine learning-based approach where a lot of positive and negative images are used to train the classifier.

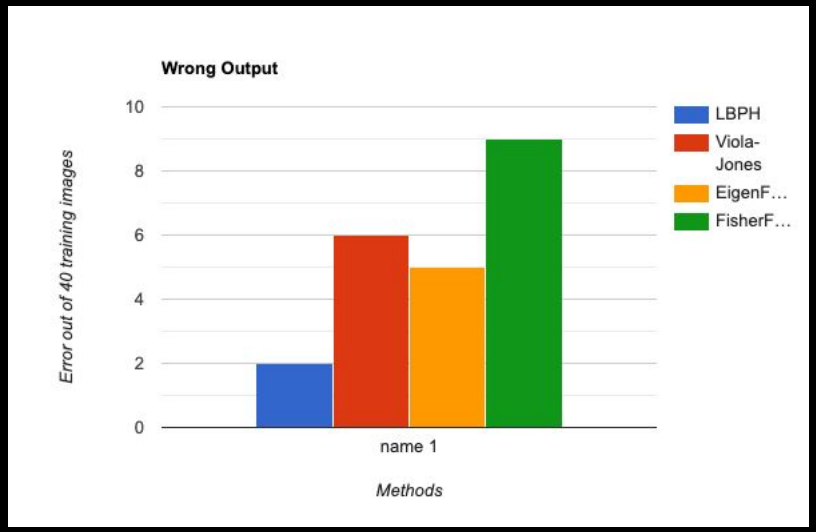
- **Positive images –** These images contain the images which we want our classifier to identify.
- **Negative Images –** Images of everything else, which do not contain the object we want to detect.

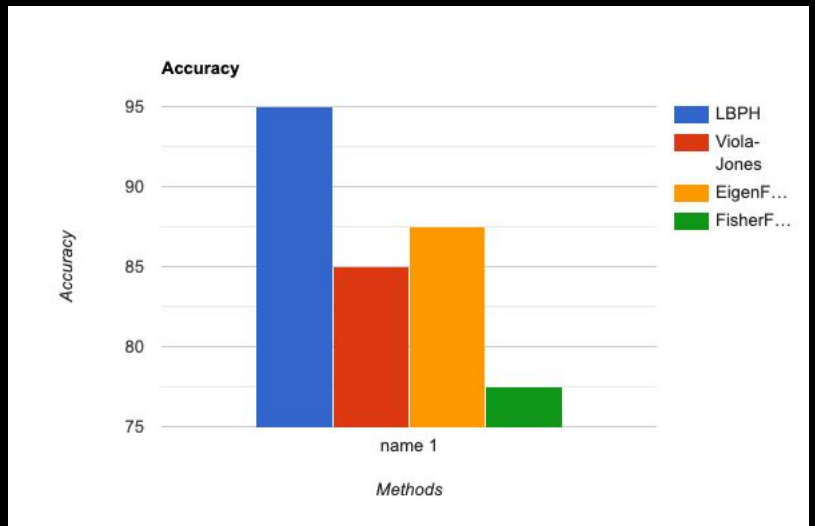
LOCAL BINARY PATTERN HISTOGRAM (LBPH) ALGORITHM

- Local Binary Pattern (LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighborhood of each pixel and considers the result as a binary number.
- LBP is one of the efficient algorithm for texture classification and it further combined with Histogram, which improves the detection performance on datasets.
- The Local Binary Pattern Histogram(LBPH) algorithm is a simple solution on face recognition problem, which can recognize both front face and side face.

WHY WE CHOOSE LBPH ?

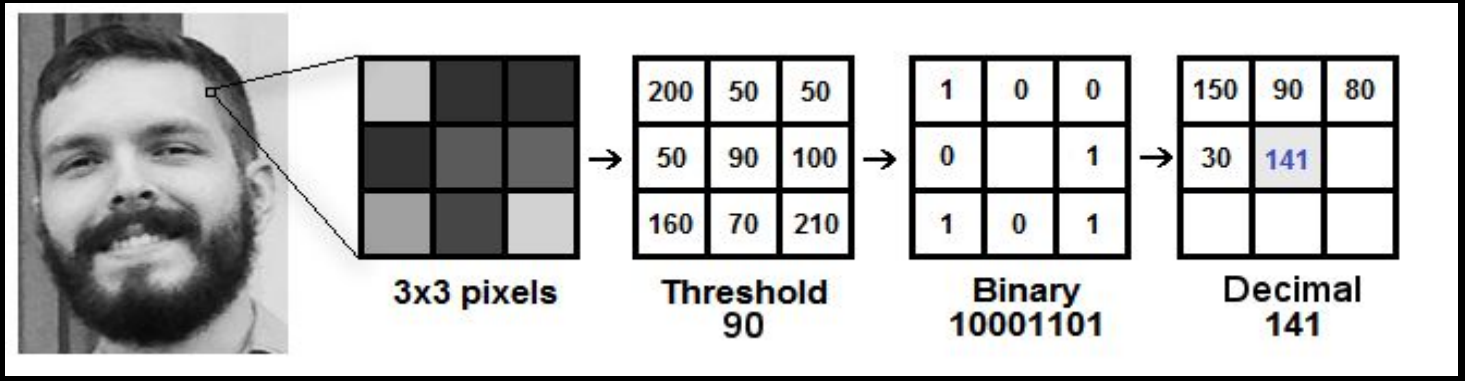






COMPUTATIONAL STEPS OF THE LBPH ALGORITHM

- The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics.



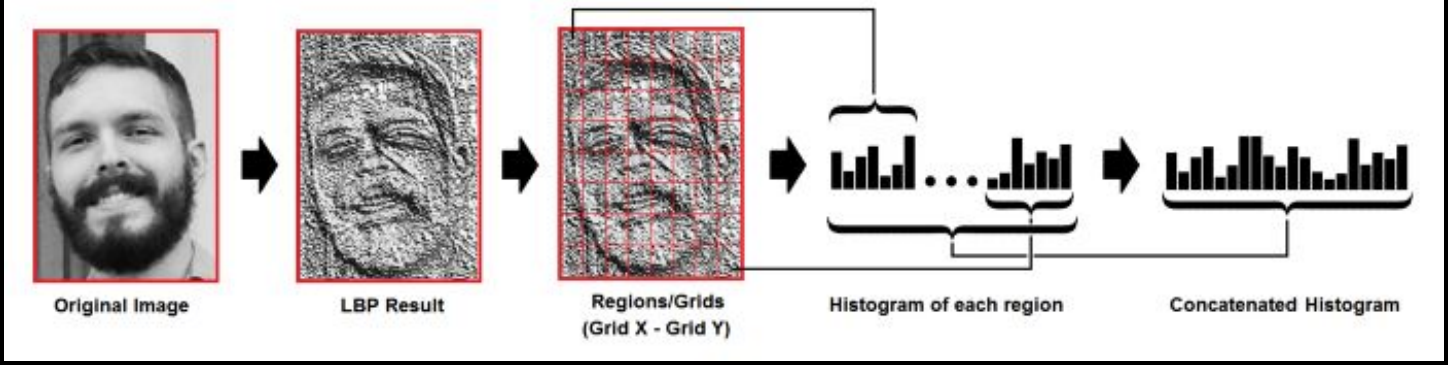
- For each neighbours, condition is:

  put 1 when central value <= neighbour value

  put 0 when central value > neighbour value

COMPUTATIONAL STEPS OF THE LBPH ALGORITHM (CONT…)

- The matrix will contain only binary values and convert that binary value into a decimal value as a clockwise direction.
- The decimal value we get is set to the central value of the matrix, which is actually a pixel from the original image.
- Now using that image, we use grind x and grind y parameters to divide the image into multiple grids.



COMPUTATIONAL STEPS OF THE LBPH ALGORITHM (CONT…)

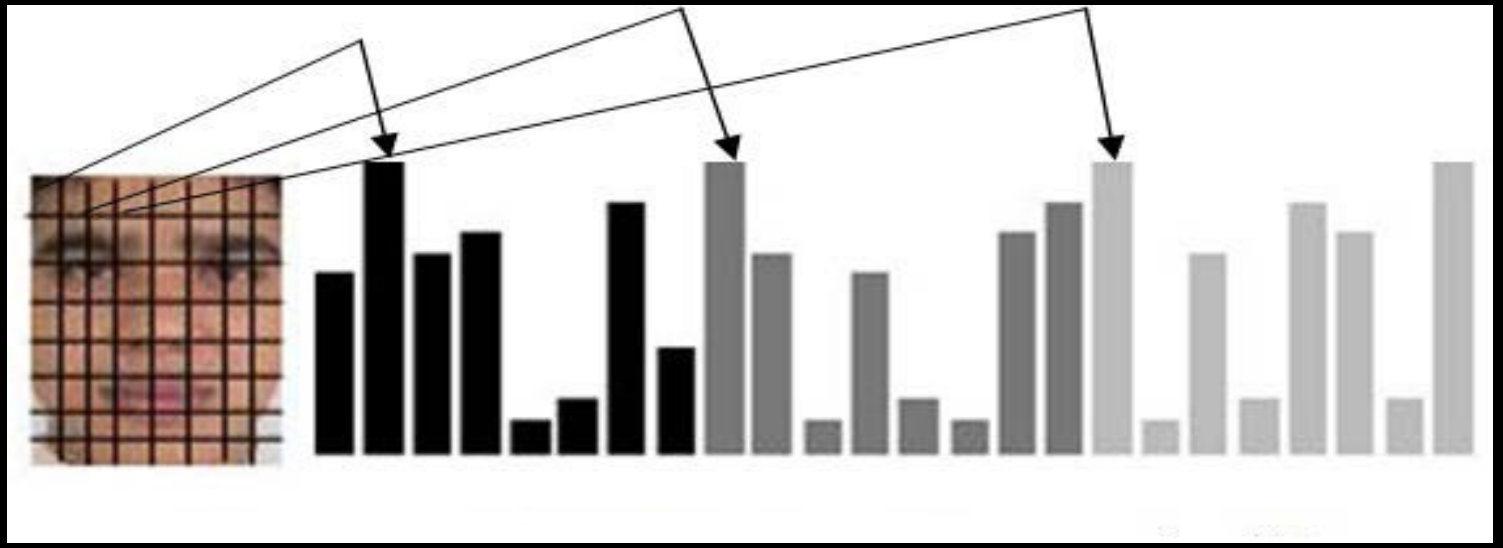
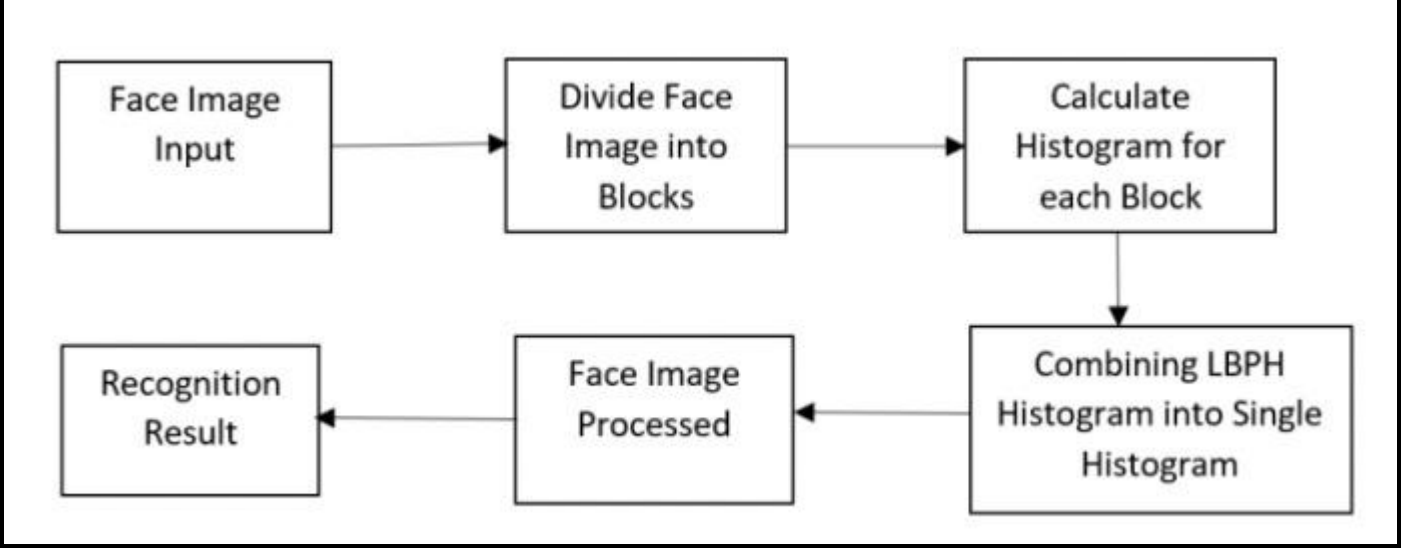


Fig. Face image divided into 64 regions, with for every region a histogram

LBPH ALGORITHM (CONT…)

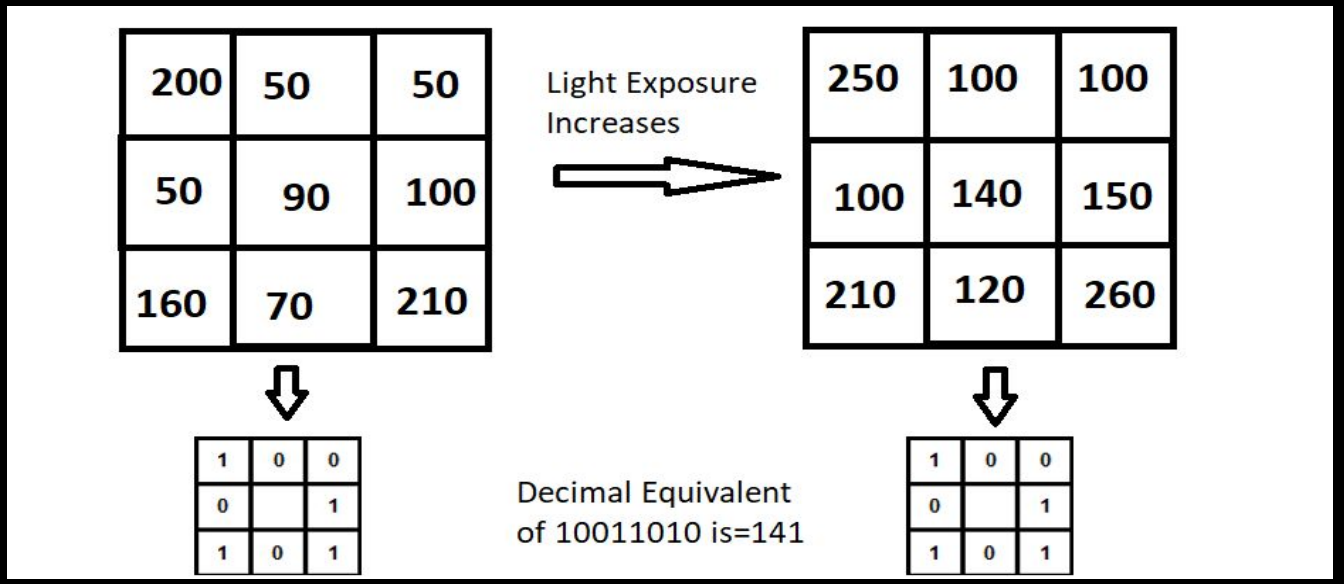
- **Performing the face recognition:**
  - Each histogram created is used to represent each image from the training dataset.
  - So, given an input image, we perform the steps again for this new image and creates a histogram which represents the image.
  - So to find the image that matches the input image we just need to compare two histograms and return the image with the closest histogram.



LBPH ALGORITHM ADVANTAGES

- **Illumination Invarient**

  - The difference in the exposure of light on the image, either partial or full, will have no effect in its recognition as the local binary pattern will remain the same.



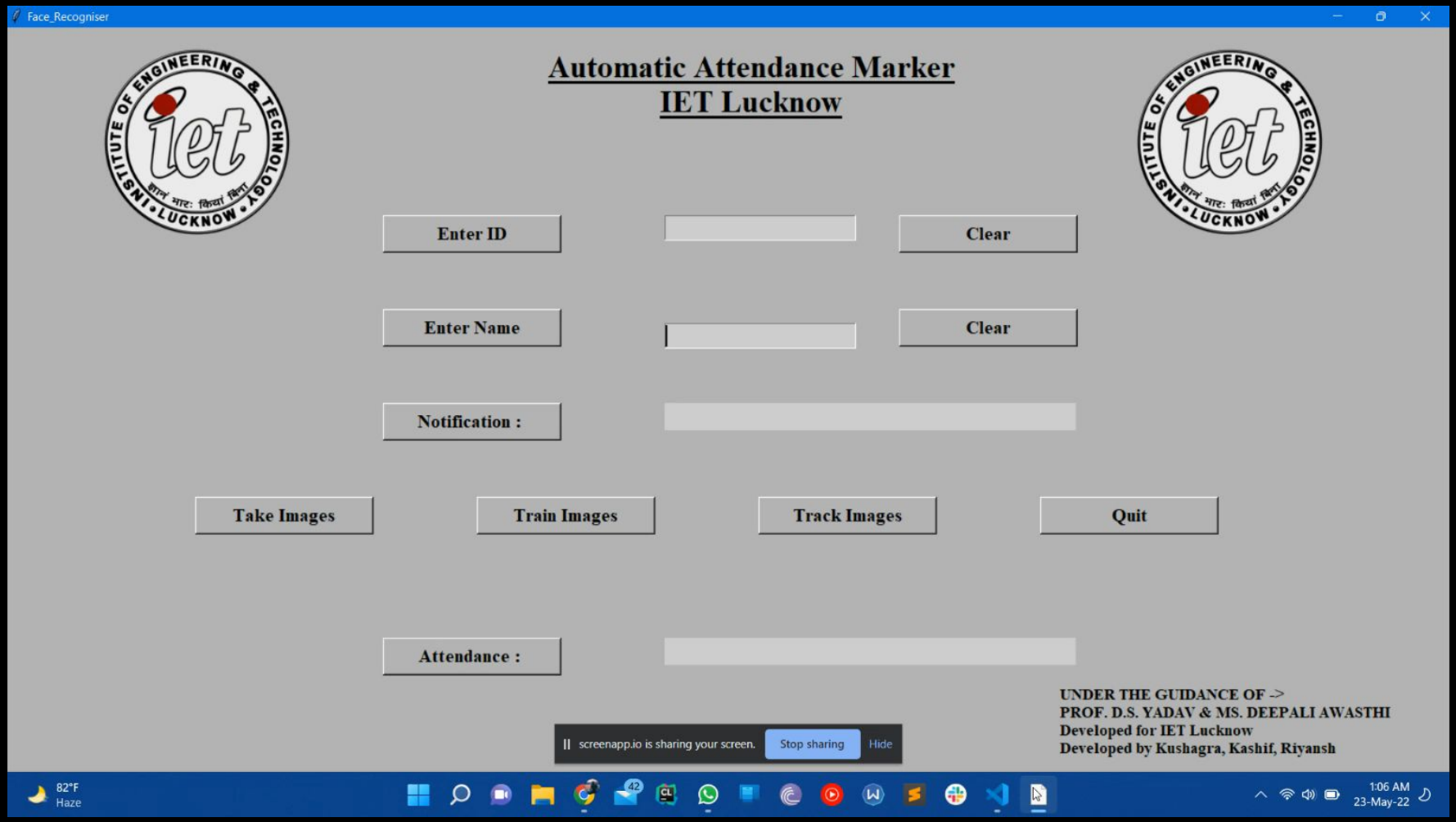
LBPH ALGORITHM ADVANTAGES

- **Rotation Invariant**
  - The LBP value which is considered and added to the histogram is the minimum among all possible 8 values obtained by doing circular bit shift, hence a slight rotation in the image will not alter the final LBP value.

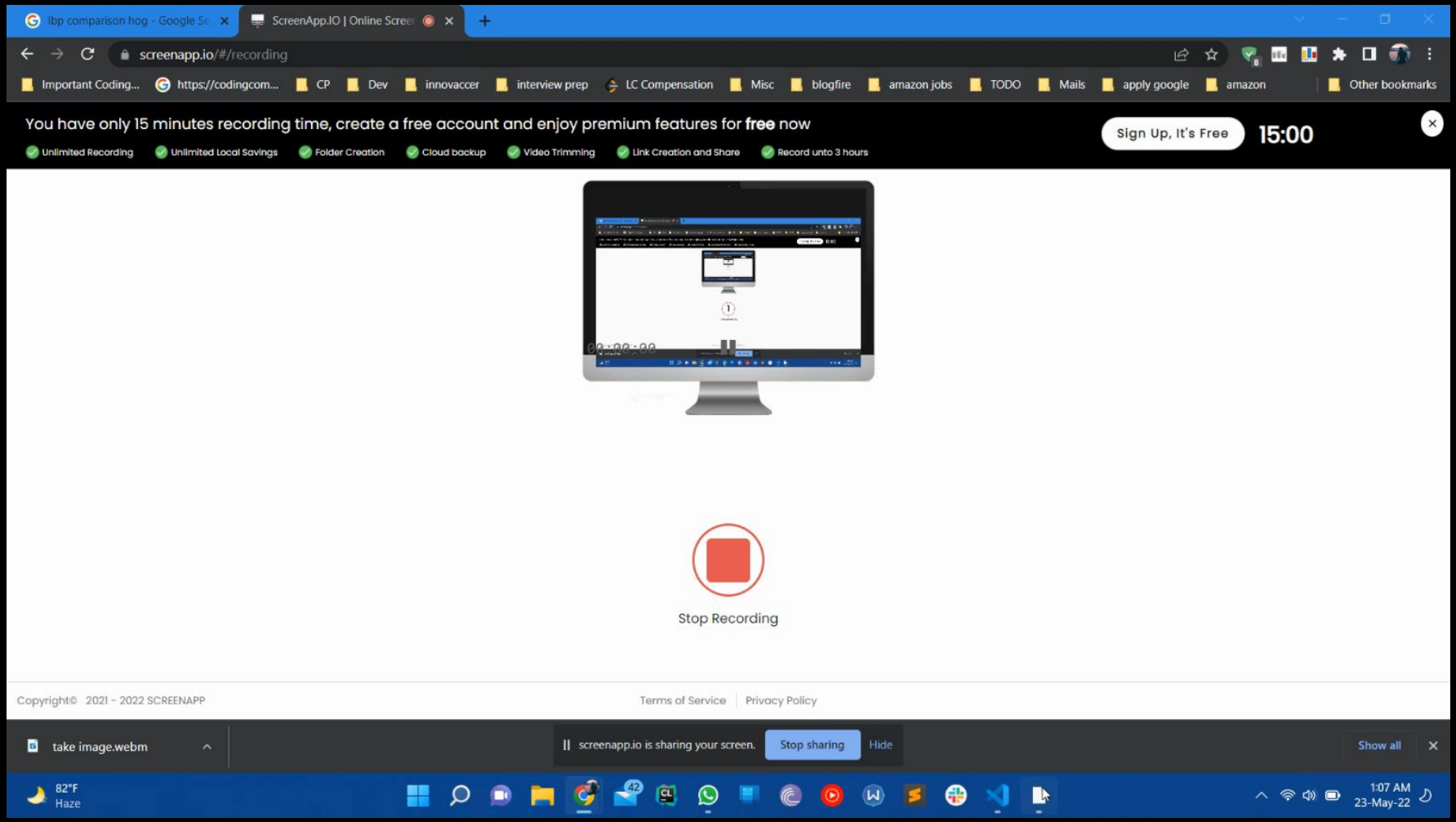
IMPLEMENTATION OF THE PROJECT

- **Step 1:** Install necessary libraries by using pip command
- **Step 2:** import necessary libraries required to run the program.
- **Step 3:** Detect human faces by using sensors (camera) then converted from RGB to grayscale image and stored it into the located database.
- **Step 4:** Train the dataset by using LBPH algorithm and create one trainer.yml file.
- Step 5: Using that trainer file, recognize the person face by using unique ID in our datasets.
- Step 6: When the face is found, it will automatically mark the attendance in an excel sheet along with the name of the person and current date.

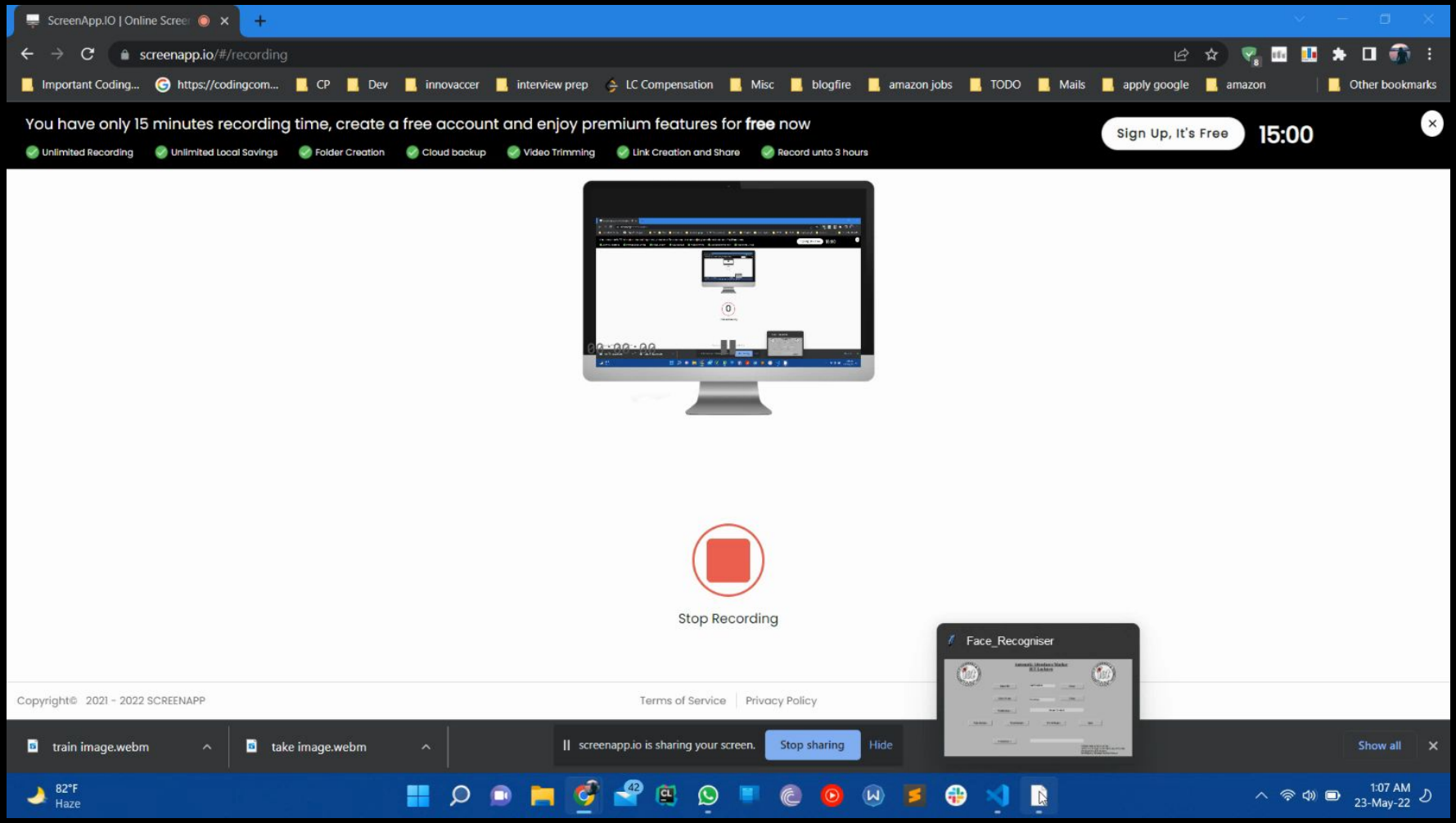
IMPLEMENTATION FOR STEP 2 & 3



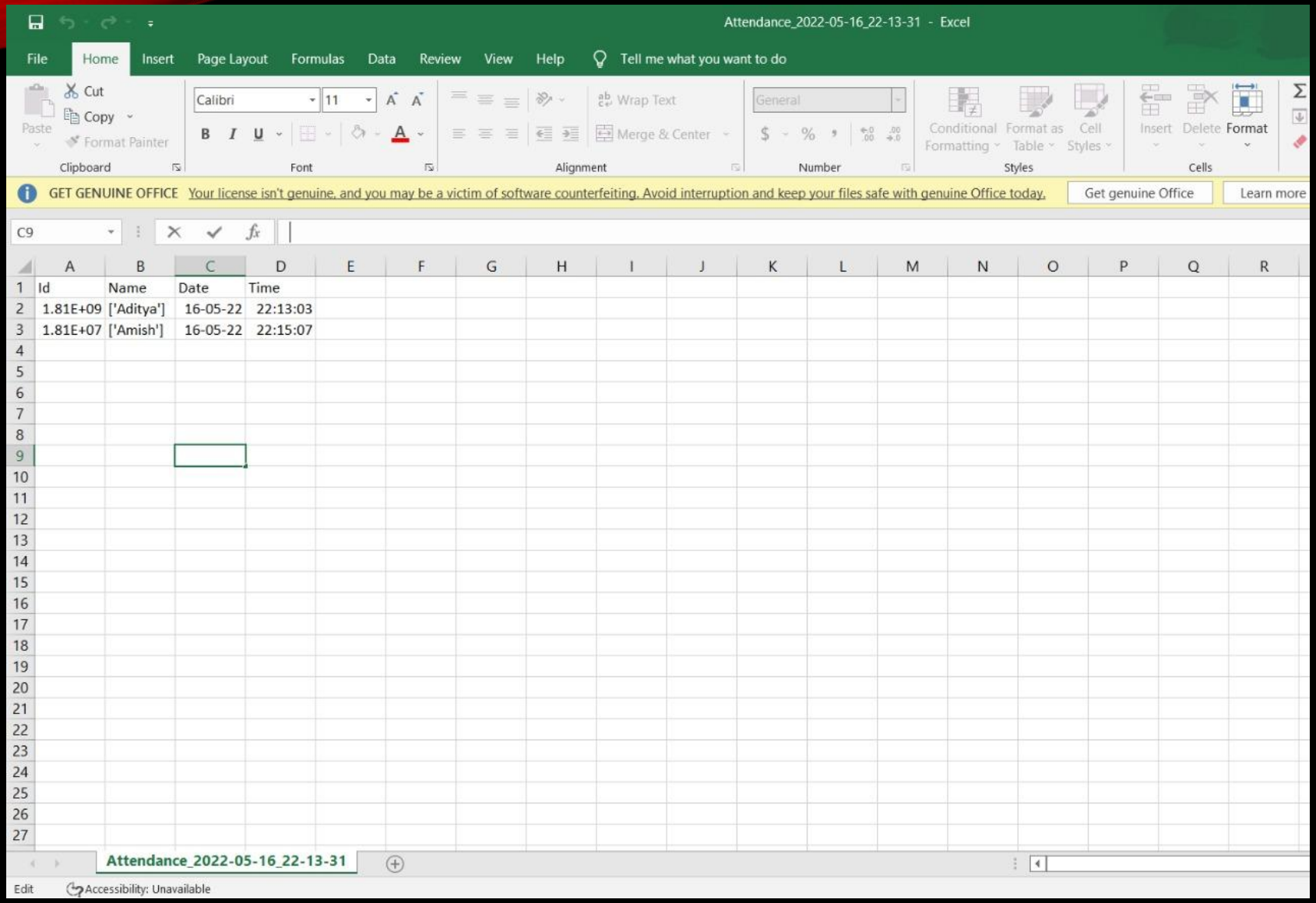
IMPLEMENTATION FOR STEP 4



IMPLEMENTATION FOR STEP 5 & 6



ATTENDANCE FOR STEP 6



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THANK YOU