

# STUDENT ATTENDANCE MONITORING USING FACIAL RECOGNITION IN A CLASSROOM

Team members

- 1) K CHANDRASEKARAN RA1711004040028
- 2) S AATHITH RA1711004040030

# Existing problem

- Student's attendance in the classroom is a very important task
- The existing method of taking attendance consumes a finite amount of time which can be used for other productive action.
- We are focused on addressing this problem on schools and universities only.

# Motivation

- We found this problem in many universities
- We want a reliable system which identifies which student is present in the classroom and gives the attendance based on his presence
- This system must not be complex and very easy to interact with it

# Existing Recognition systems

- The systems can be broadly classified :
  - Systems that uses human characteristics like fingerprint
  - Systems that uses unique objects that the person carries like ID card

# Fingerprint based recognition system

- Distracts the attention of students during lecture time
- Queuing takes place

# RFID based recognition

- Possibilities that Fraudulent may occur
- Cheat the system by giving proxy (for example a student misuse it by wearing another student's ID card )

# IRIS based recognition system

- Cant use a regular camera
- Visible light must be minimized for maximum accuracy

# Proposed work

- Attendance is monitored and marked present or absent depending upon the presence of the student inside the class at the particular time of lecture
- Our solution uses a camera that takes photo of a group of students, and then uses facial recognition for marking attendance for a student
- We found that facial recognition overcomes some of the problems that exist in the previously mentioned attendance systems
- Our solution makes sure that there is a minimal interaction between students and the attendance monitoring system



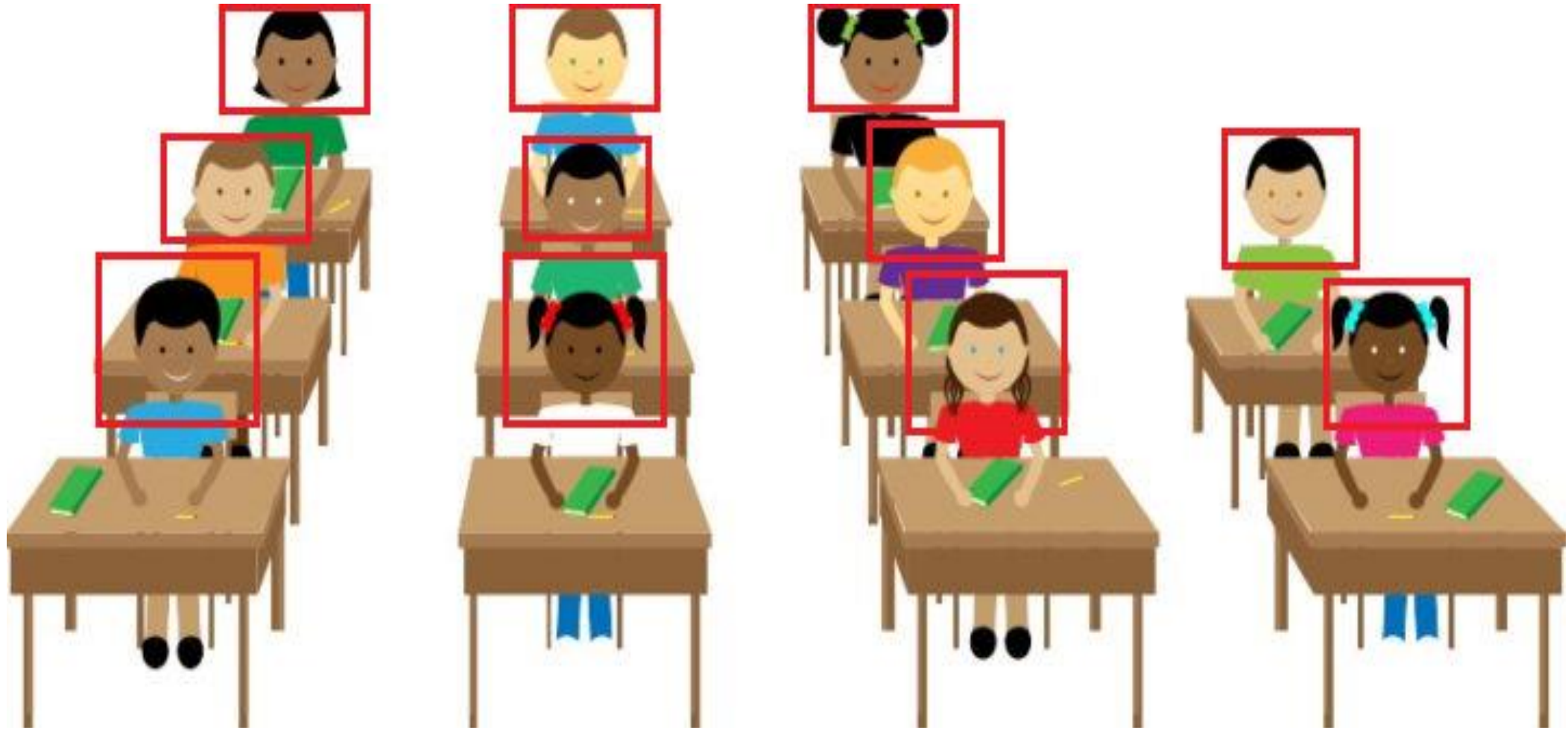
# Facial recognition

- Any facial recognition has 2 steps
  - Facial detection – the process of finding a face in a given image
  - Facial recognition – the process of identifying the person from the image of a face (example : face id in apple )
- The process of facial recognition occurs in a separate computer as the burden on the camera system must be reduced

# Hardware

- Camera is installed on the classroom
- The role of the camera is just to take pictures
- But the process of facial recognition takes place in another computer

# Facial recognition in class – an idea



Sub Systems

# Major Sub systems

- System Attached in the class to take photos (Image processing)
- System that marks the attendance against the face in the photos(ML/DL)

# System that takes photo

Contains the following systems inside it

- Camera
- System that signals the camera
- System that transports the photo to next system for processing the photos

# System that marks the attendance

Contains the following systems inside it

- System that receives the photo
- System that runs the face detection algorithm that outputs “m” detected faces
- System that outputs a descriptor for “m” faces
- System that iterates through “m” descriptor and marks the attendance

More explanation about a few systems that is inside the sub systems



System that marks the attendance -

System that outputs a descriptor for “m” faces

- System that iterates through the “m” detected faces and calls the following sub systems
- System that outputs a descriptor(fixed size) for one face (Facial recognition)
- System that stores these “m” descriptors

System that marks the attendance –

System that iterates through “m” descriptors and marks the attendance

- System that iterates through the database containing “n” descriptors
- System that checks whether 2 descriptors are same
- System that gives the register number of a given descriptor
- System that marks the attendance against the register number

# Mathematical Modelling

System that takes photo - System that signals the camera

```
output = signal to camera
begin:
    if (5 minutes elapsed):
        signal to camera
        recieve the photo
        store it
        hand over to next sys
```

System that marks the attendance - System that outputs a descriptor(fixed size) for one face (Facial recognition)

```
input = photo-of-face  
output = vector(size =  $d \times 1$ )  
begin:  
    pre_processing(photo-of-face)  
    vector = CNN(photo-of-face-processed)  
end
```

System that marks the attendance - System that checks whether 2 descriptors are same

```
n[i] descriptor of size (1 x d) from the database
m[j] descriptor of size (d x 1) from the detected face

input = n[i] and m[j]
output = True or False
begin:
    M = m[j]
    N = n[i]
    theta = MN #cosine similarity
    if (theta > 0.5):
        output = True
    else
        output = False
end
```

# Objectives

# 1<sup>ST</sup> Objective

- One camera
- One person to stand before the camera
- Detect the face in the image and run the face recognition



## 2<sup>nd</sup> Objective

- One person
- A group of people
- Run a face detection model to find the faces in the picture and face recognition algorithm against it

## 3<sup>rd</sup> Objective

- Try different face detection algorithms
- Select the algorithm which has lowest false negatives
- Note down other metrics like
  - The least dimension of the facial image that is required for the face detection algorithm

## 4<sup>th</sup> Objective

- Design the camera position , the angle etc.
- The algorithm that was decided on 3<sup>rd</sup> objective to be used here to test the camera angle and other metrics like finding how many persons can be covered

## 5<sup>th</sup> objective

- Find the best camera angle and algorithm (both face detection and face recognition) that has reduced false negatives, is fast etc
- Iterate through 3 and 4 objective to find the best combination of camera and algorithm

# Constraints

# Camera

- Proper lighting should be there
- The position of camera should not be changed as it is fixed (depends on the algorithm )
- As when the distance increases we will reduce the image resolution of detected face

# Face detection and recognition

- The face or faces should not be covered
- There is a maximum distance till which a student can sit for the camera to detect the face beyond that facial recognition wont work
- When the photo is taken if he/she covers their face then the algorithm can miss the attendance of the person in that time frame
- If physical characteristics of people change over time — if they gain weight, lose their hair, grow a beard or start wearing glasses, it is tough for face recognition

# Conceptual Design

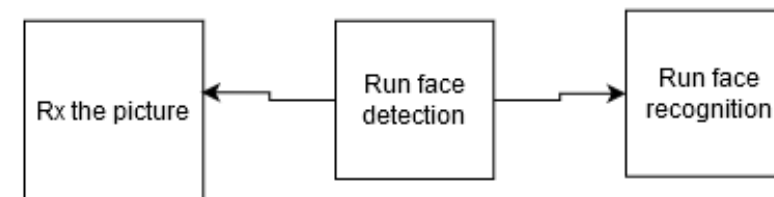
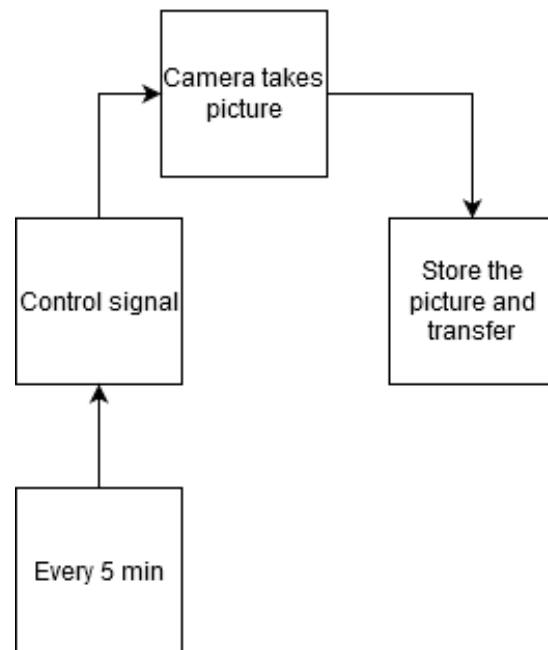
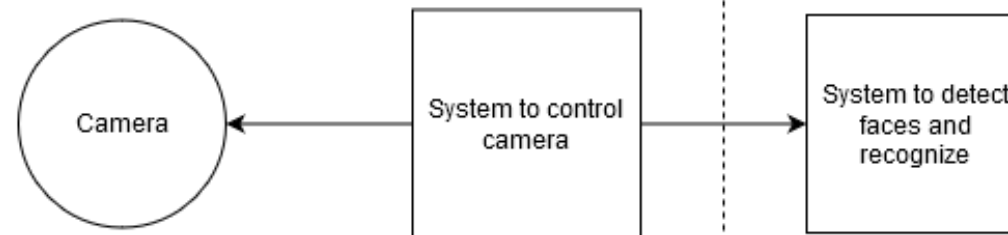


# 3 questions

- What are the needs
  - A reliable system which identifies which student is present in the classroom and gives the attendance based on his presence
- How can the needs be met
  - uses a camera that takes photo of a group of students, and then uses facial recognition for marking attendance for a student
- How well the needs are met
  - found that facial recognition overcomes some of the problems that exist in the previously mentioned bio metric attendance systems subjected to the constraints mentioned in the previous slides

A basic block diagram

Not mandate that below system  
to be present in the same  
location as that of camera



Thank You