Computer Vision Based Attendance System

By: Denesh Kumar Manoharan

(dzm5964@psu.edu)

Introduction

- Traditionally, Students attendance are marked manually by teachers and make sure correct attendance is marked for respective students. This process wastes a considerable amount of time from teaching process
- The RFID card system, each student assigns a card with their corresponding identity but there is chance of card loss or unauthorized person misuse the card for fake attendance.
- Biometrics such as fingerprint, iris, or voice recognition are expensive to install in all classrooms. This system requires to collect students personal data which is also a privacy concern

Introduction

- Using CV-based Attendance System will reduce the cost of traditional biometric systems, punching machines, and procurement and maintenance of smart card.
- It will reduce any option of duplicity for attendance monitoring as the Person's individual face marks his/her attendance
- The system is simpler compared to old methods and saves time and effort in logging attendance thereby increasing productivity.

Why it is hard?

The model faces challenges as images obtained from real time CCTV are mostly occluded, rotated or zoomed out faces, which would require image correction measures

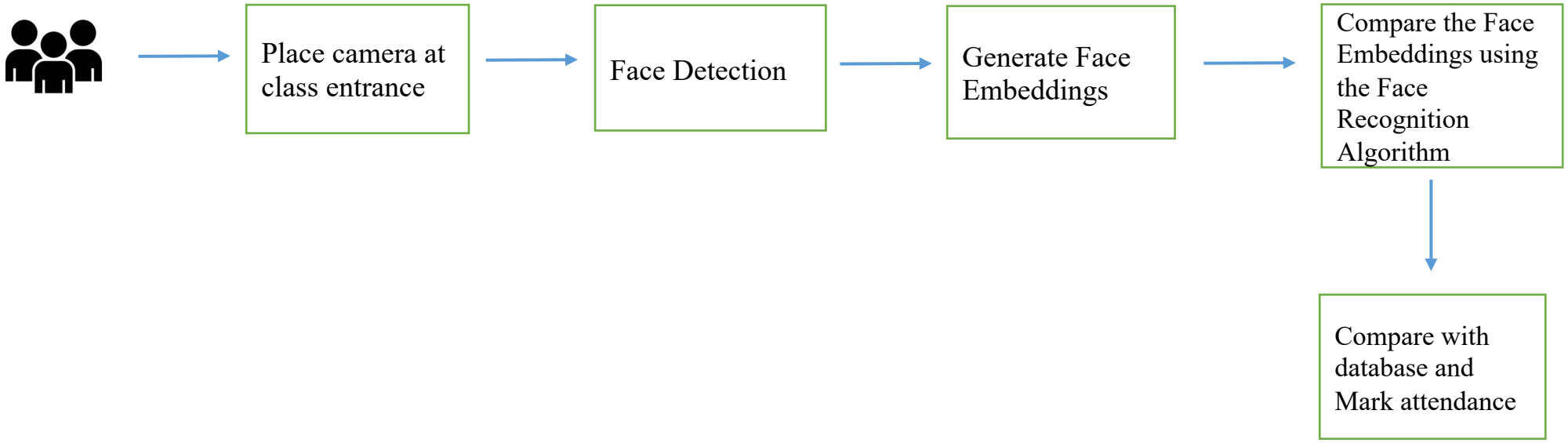
Literature Survey

- Sunaryono, Dwi, Joko Siswantoro, and Radityo Anggoro. "An android based course attendance system using face recognition." *Journal of King Saud University-Computer and Information Sciences* 33, no. 3 (2021): 304-312.

- Hartanto, Rudy, and Marcus Nurtiantoro Adji. "Face recognition for attendance system detection." In *2018 10th International Conference on Information Technology and Electrical Engineering (ICITEE)*, pp. 376-381. IEEE, 2018.

- Wagh, Priyanka, Roshani Thakare, Jagruti Chaudhari, and Shweta Patil. "Attendance system based on face recognition using eigen face and PCA algorithms." In *2015 International Conference on Green Computing and Internet of Things (ICGCIoT)*, pp. 303-308. IEEE, 2015.

Methodology



Literature Survey

- Padilla, Rafael, C. F. F. Costa Filho, and M. G. F. Costa. "Evaluation of haar cascade classifiers designed for face detection." *World Academy of Science, Engineering and Technology* 64 (2012): 362-365.

- Guo, Guanjun, Hanzi Wang, Yan Yan, Jin Zheng, and Bo Li. "A fast face detection method via convolutional neural network." *Neurocomputing* 395 (2020): 128-137.

- Nyein, Thida, and Aung Nway Oo. "University classroom attendance system using facenet and support vector machine." In *2019 International conference on advanced information technologies (ICAIT)*, pp. 171-176. IEEE, 2019.

- Mehta, Preeti, and Pankaj Tomar. "An efficient attendance management sytem based on face recognition using Matlab and Raspberry Pi 2." *International Journal of Engineering Technology Science and Research IJETSR* 3, no. 5 (2016): 71-78.

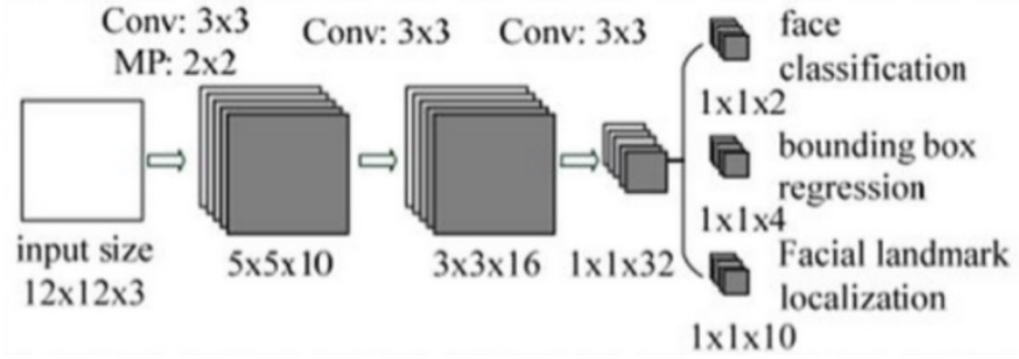
Comparison of Face Detection Algorithm

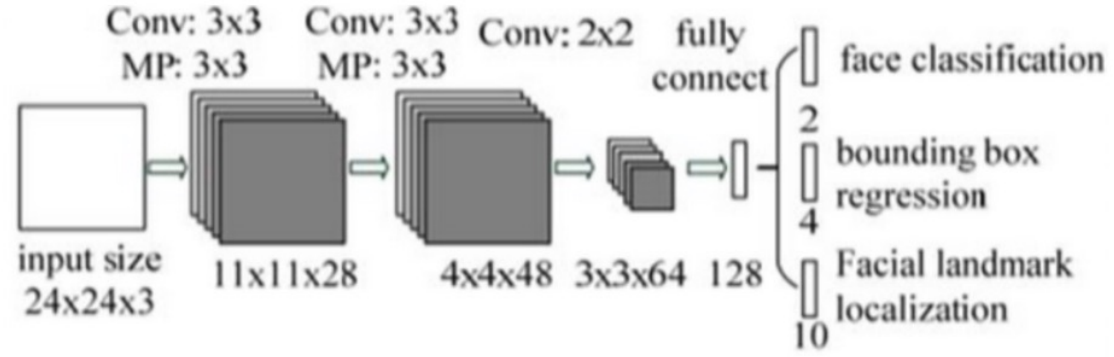
Methods	Accuracy	Drawback
Eigenface algorithm, PCA and ANN	80%	High computational cost due to combining PCA and ANN
LBP, HOG and SVM	92%	Light sensitivity issues because of LBP
CNN, FaceNet and SVM	95.40%	High computational cost due to combining SVM and CNN
Viola-Jones and CNN	80%	Initial performance on lookalike faces was poor because of the self-learning feature
Haar cascade and LBPH	98.20%	Light sensitivity issues because of LBPH, and Accuracy of 98.20% at 24 lx light and distance of 40 cm
KNN and LBP	95%	Low accuracy in low lighting as pixels change the value with light

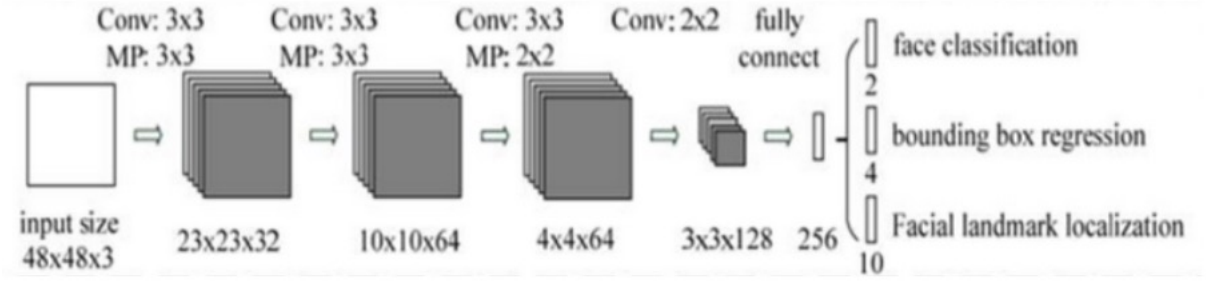
Comparison of Face Recognition Algorithm

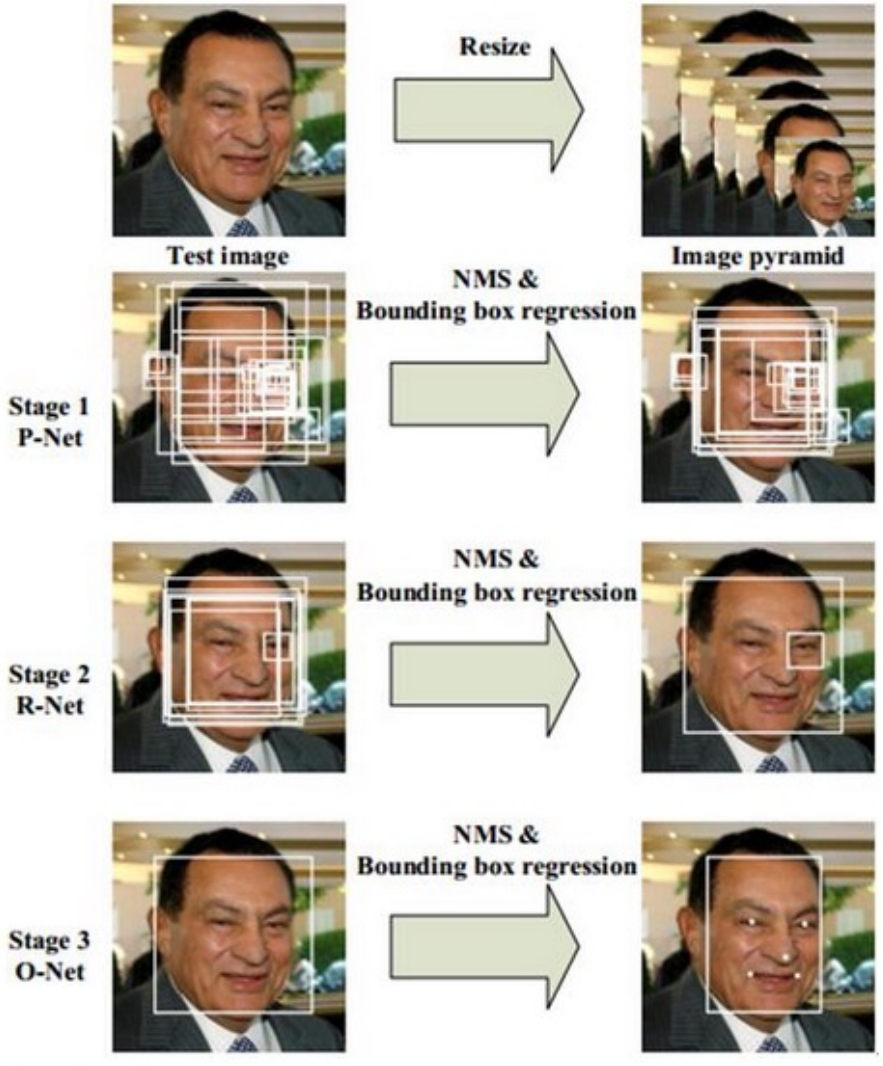
Methods	Accuracy	Drawbacks
Eigenface and PCA	90%	Sensitive to variation in lighting, pose, and expression
Fisherface	95%	Sensitive to light and pose change
LBP	85%	Sensitive to change in illumination and face expression
CNN	98%	Requires large amount of data and computation power
Siamese network	96%	Computationally complex and take more time to compute

MTCNN (Face Detection)

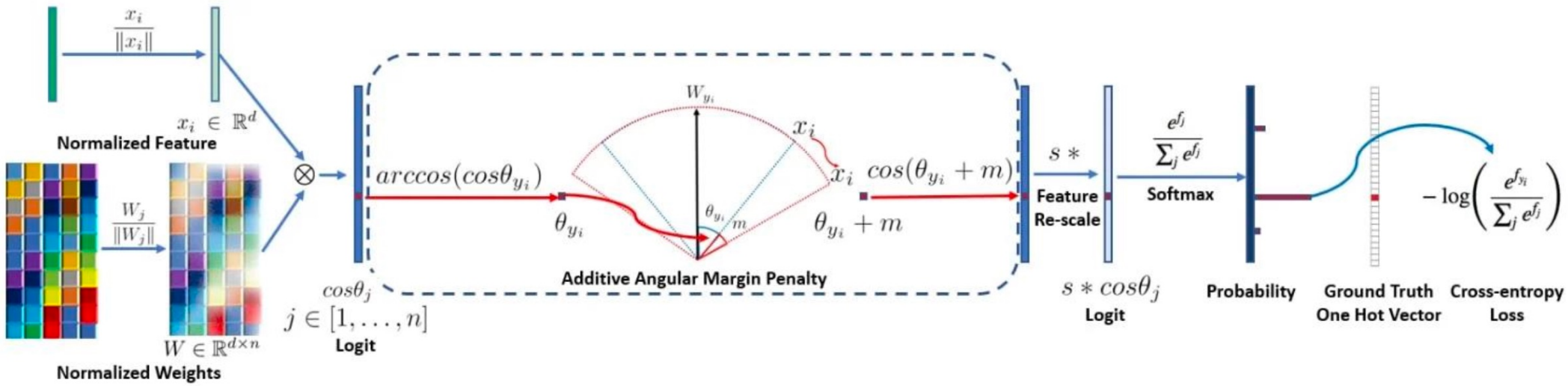








ArcFace (Face Recognition)



Softmax Loss Function

$$L_1 = -\log \frac{e^{W_{y_i}^T x_i + b_{y_i}}}{\sum_{j=1}^{N} e^{W_j^T x_i + b_j}}$$

ArcFace Loss Function

$$L_3 = -\frac{1}{N}\sum_{i=1}^{N} log \frac{e^{s(\cos(\theta+m))}}{e^{s(\cos(\theta+m)) + \sum_{j=1, j\neq y_i}^{n} e^{s\cos\theta_j}}}$$

DATASET

Face Detection

WIDER FACE

Contains 32,203 images and labels 393,703 faces with a high degree of variability in scale, pose and occlusion

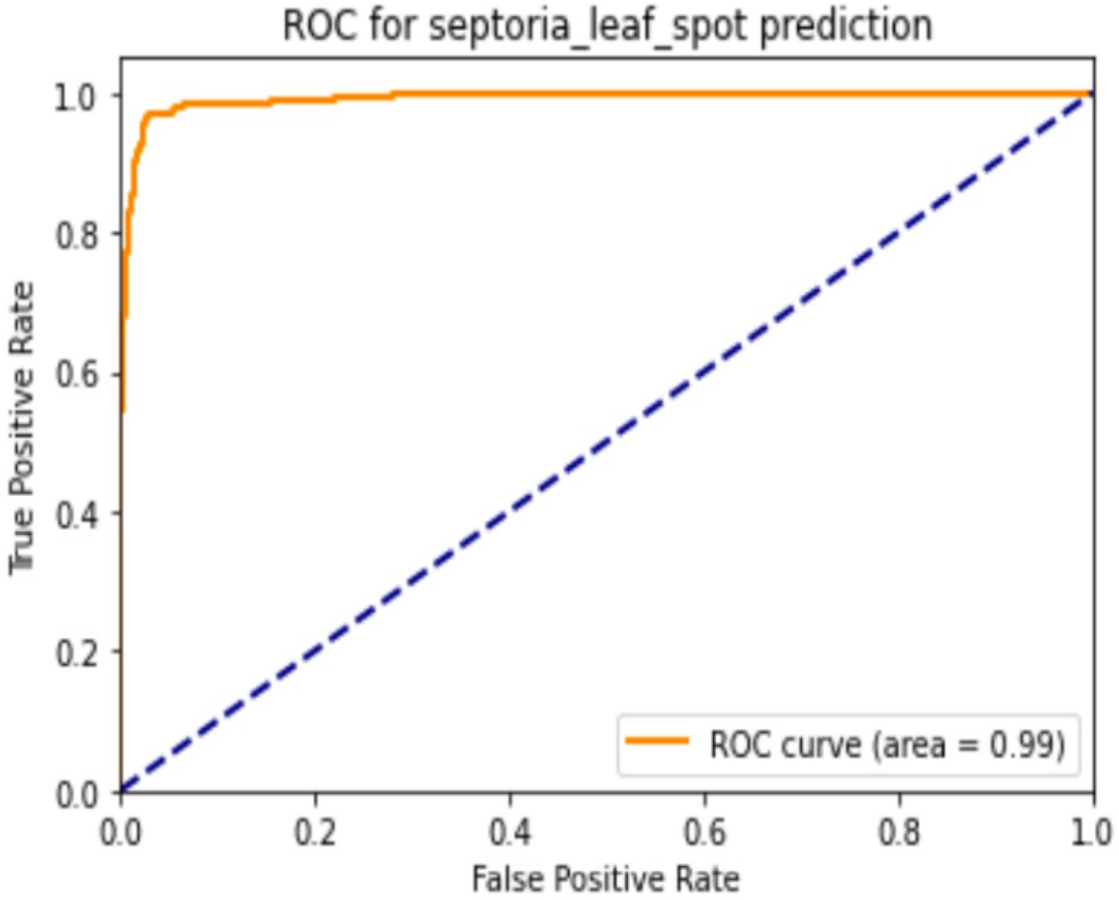
Face Recognition

VGGFace2

3.31 million images divided into 9131 classes, each representing a different person identity

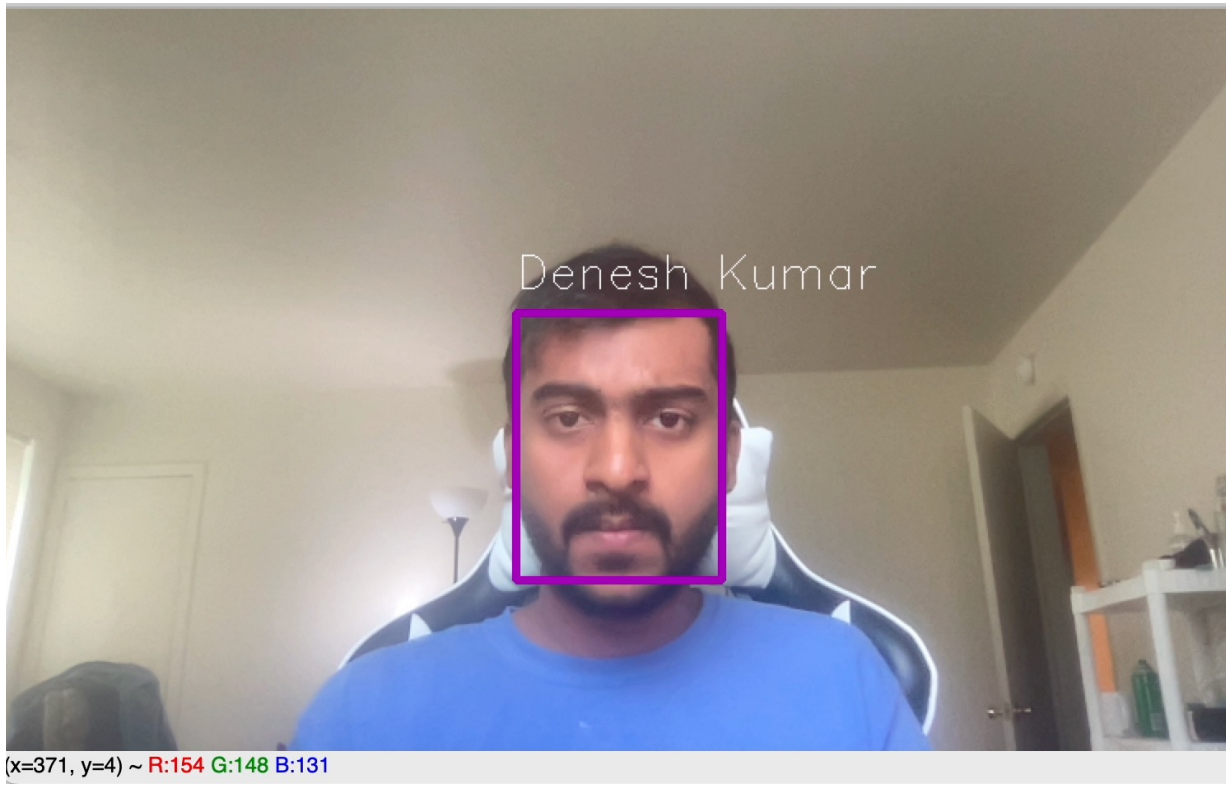
Result

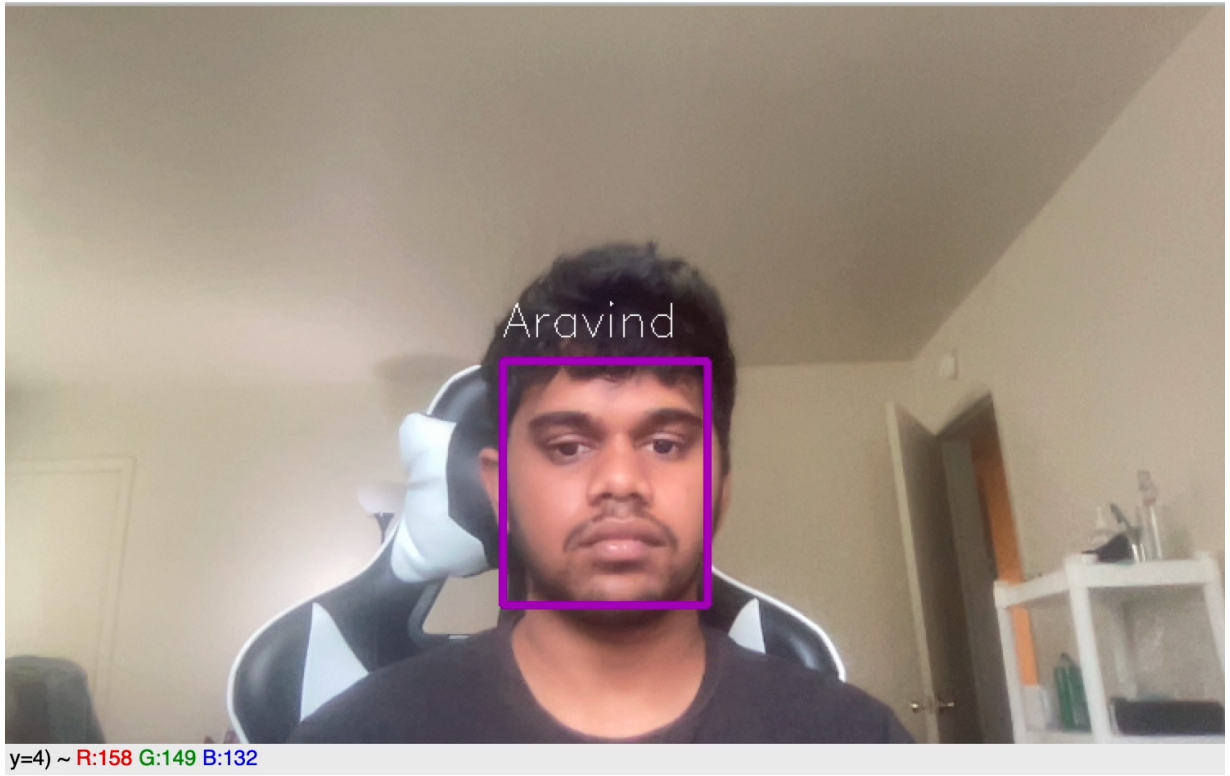
MTCNN



ArcFace

Result


Denesh Kumar
(x=371, y=4) ~ R:154 G:148 B:131


Aravind
y=4) ~ R:158 G:149 B:132

Thankyou