

Human Identification using Humanoid Vision



Current Features

Face finding

Model capable of finding individual faces

Real Time

Model is capable of working in real time camera input

Identification

Identifies faces and display their names when detected and recognized

Easy Database record

Easy method of acquiring dataset required for training

REQUIREMENTS

- Python
- OpenCV: A strong library used for machine learning
- Haar Cascade: Object Detection Algorithm used to identify faces in an image or frames of a video.
- LBPH: Recognizer to train data and create metadata.
- Numpy: Used for Scientific Computing. Image is stored in a numpy array
- OS: For creating/ altering files

ALGORITHMS

HAAR CASCADE

Haar-like features are digital image features used in object detection.

The haar calculation is done by finding out the difference of the average of the pixel values at the darker region and the average of the pixel values at the lighter region. If the difference is close to 1, then there is an edge detected by the haar feature.

LOCAL BINARY PATTERNS HISTOGRAMS

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.

A dataset with the facial images of the people we want to recognize is assigned an ID for each image, so the algorithm will use this information to recognize an input image and give you an output.

Phases

The project has been implemented within three distinct phases:

- Face Detection and Data Gathering
- Training the Recognizer
- Face Recognition

Face Detection and Data Gathering

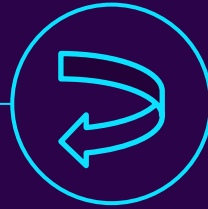
- OpenCV's Haar cascades is used to find a face in a given frame
- Dataset used for face detection consists of frontal face info, and is provided within the OpenCV package
- Dataset used to face recognition consists of 200 images of a user's face

FACE DETECTION AND DATA GATHERING



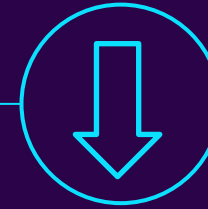
Face detection

Haar cascade is used to detect any face in the current frame from the livestream



Conversion

Images of the face extracted are then converted to grayscale for easier training



Storage

Grayscale images are then stored according to the ID of the user

Training the Recognizer And Face Recognition

- LBPH will be used to train the dataset gathered
and create a meta-data
- Meta-data will be used by LBPH to detect the face
Haar cascade identifies

- TRAINING THE RECOGNIZER



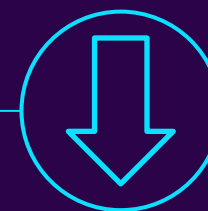
Read

The dataset collected in the previous step is now collected and fed to LBPH trainer



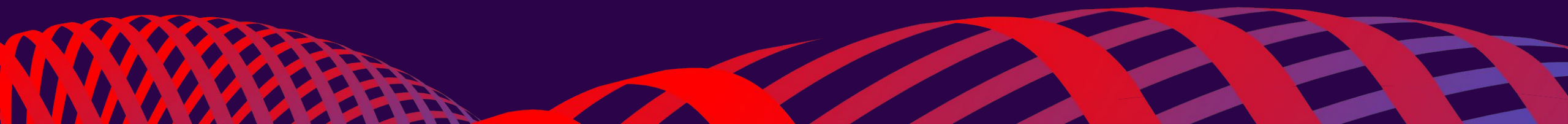
Conversion

Trainer converts grayscale images into histogram meta-data according to user ID



Store

The meta-data formed in a run is stored in a yaml file



- FACE RECOGNITION



Face detection

Haar cascade detects any face in the current frame from the real time feed



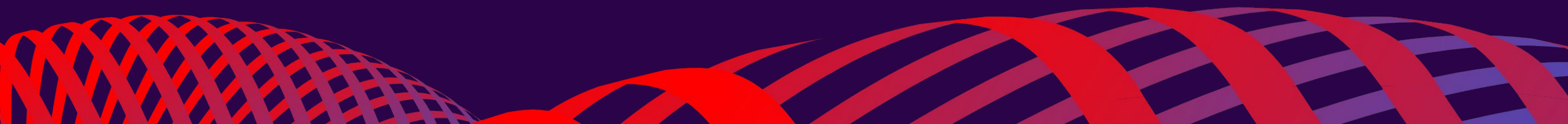
Conversion

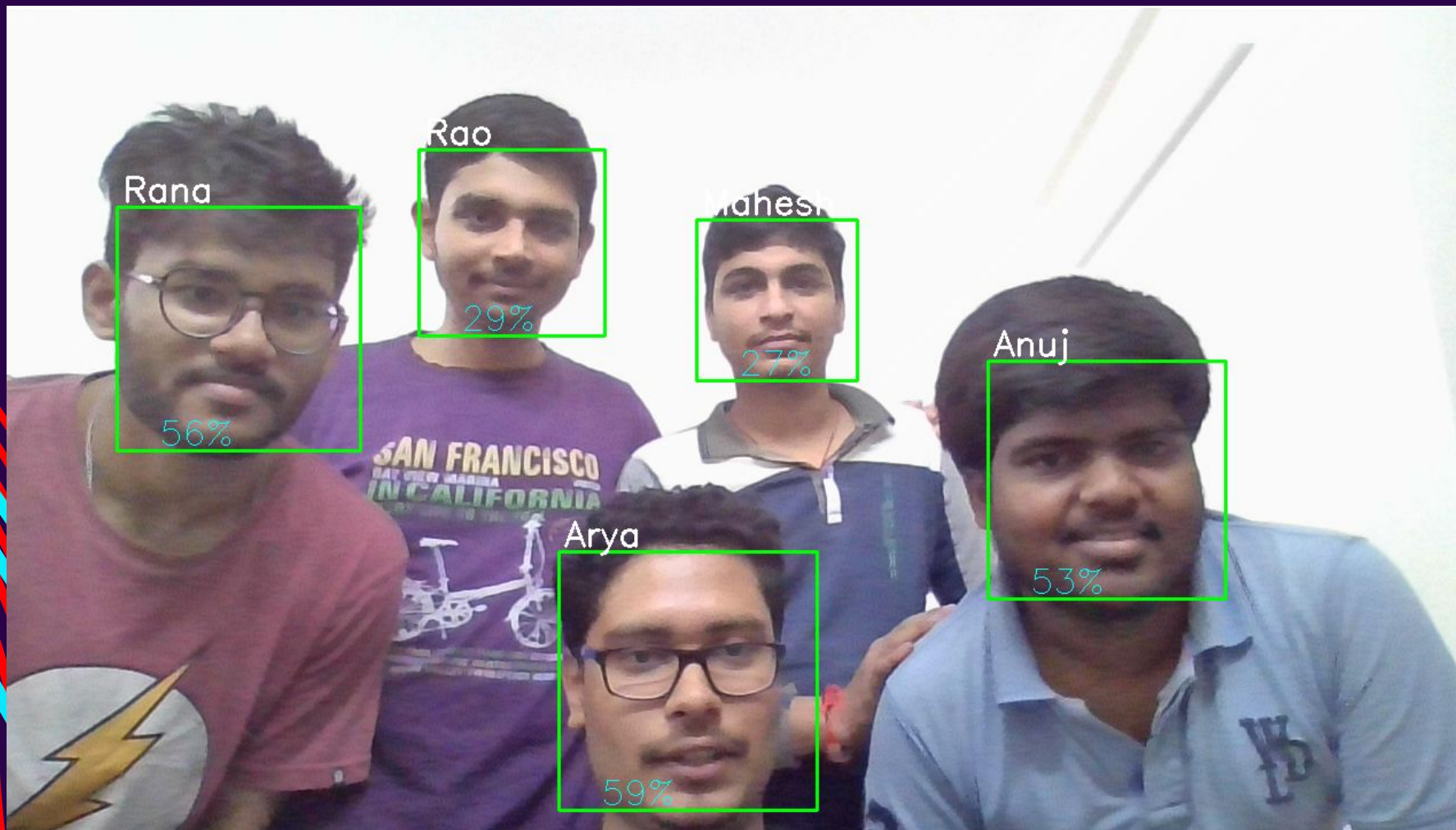
Faces extracted are then converted to grayscale



Identification

Grayscale images are compared using meta-data and predicts the user accordingly





LIMITATIONS

ACCURACY

During testing there were a lot of misidentifications which resulted from issues such as lighting

PERFORMANCE

Increase in data results in more meta-data, resulting in longer processing times

ANGLES

Haar cascade uses frontal face data so it makes detecting side profiles an issue

LITERATURE

DOCUMENTS

Machine Learning Based Approach for Person Identification in Group Photos

10.1109/ICCUBE.2018.8697683

Weakly and Semi supervised Human Body Part-parsing via Pose-guided Knowledge Transfer

10.1109/CVPR.2018.00015

Human Object Identification for Human-Robot Interaction by using Fast R-CNN

10.1109/IRC.2018.00043

Pedestrian detection using quaternion histograms of oriented gradients

10.1109/ICPICS50287.2020.9202071

LBPH Algorithm for Frontal and Side Profile Face Recognition on GPU

10.1109/ICSSIT48917.2020.9214228

A real-time face recognition system based on the improved LBPH algorithm

10.1109/SIPROCESS.2017.8124508

Face Detection Using Haar Cascade in Difference Illumination

10.1109/ISEMANTIC.2018.8549752

LBPH based improved face recognition at low resolution

10.1109/ICAIBD.2018.8396183

THANK YOU

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