# Mid Term Presentation for Capstone Project

Attendance Assistant using Deep Learning

Final Year B. Tech CSE (CSF)

Presented to:

Dr. Sharmishta Desai

# Content

# Previous Results

| Algorithm | Robust to Lighting? | Handles Occlusions? | Works in Real-Time? | Accuracy |
|---|---|---|---|---|
| **LBPH** | ✅ Yes | ❌ No | ✅ Yes | ⭐⭐⭐ |
| **HOG + SVM** | ✅ Yes | ❌ No | ✅ Yes | ⭐⭐⭐⭐ |
| **PCA (Eigenfaces)** | ❌ No | ❌ No | ✅ Yes | ⭐⭐ |
| **LDA (Fisherfaces)** | ✅ Yes | ❌ No | ✅ Yes | ⭐⭐⭐ |
| **SIFT** | ✅ Yes | ✅ Yes | ❌ No | ⭐⭐⭐⭐⭐ |

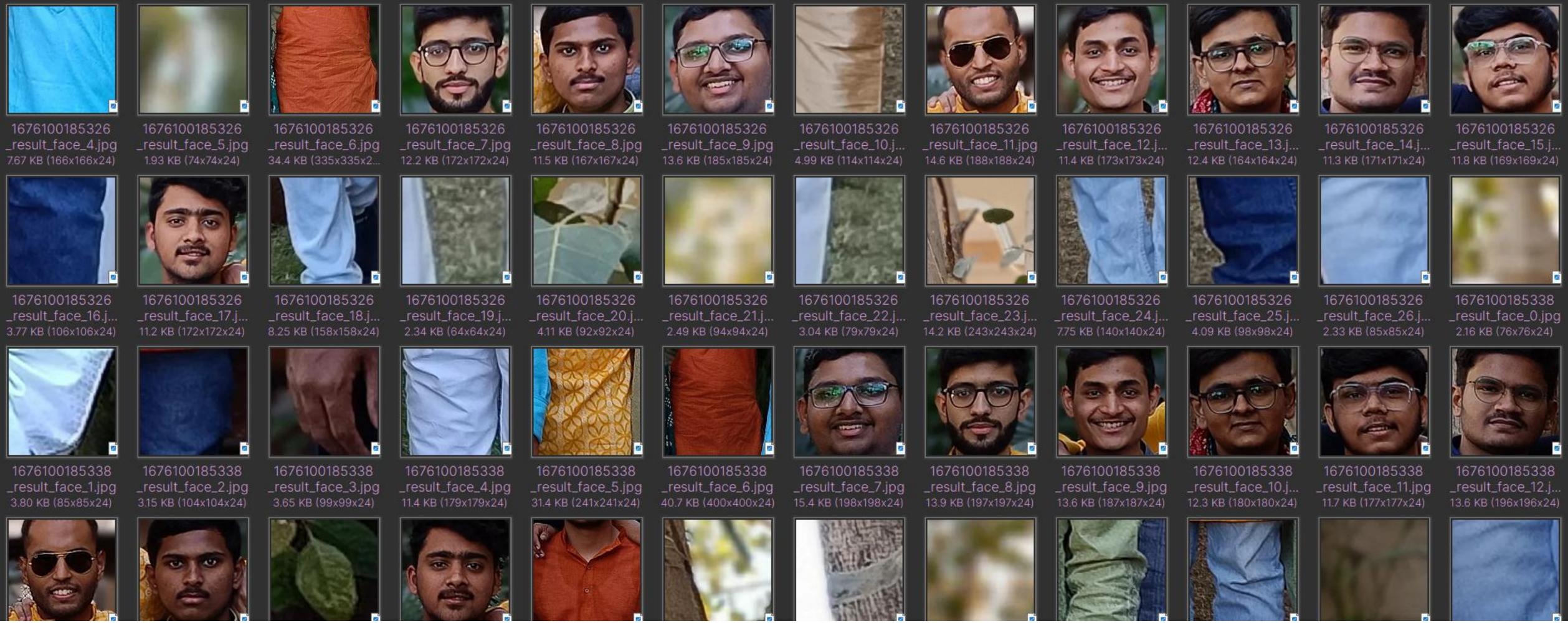
# Creation of Dataset for Training

Multiple images from the past 4 years Involving a group of 15 people were Taken.

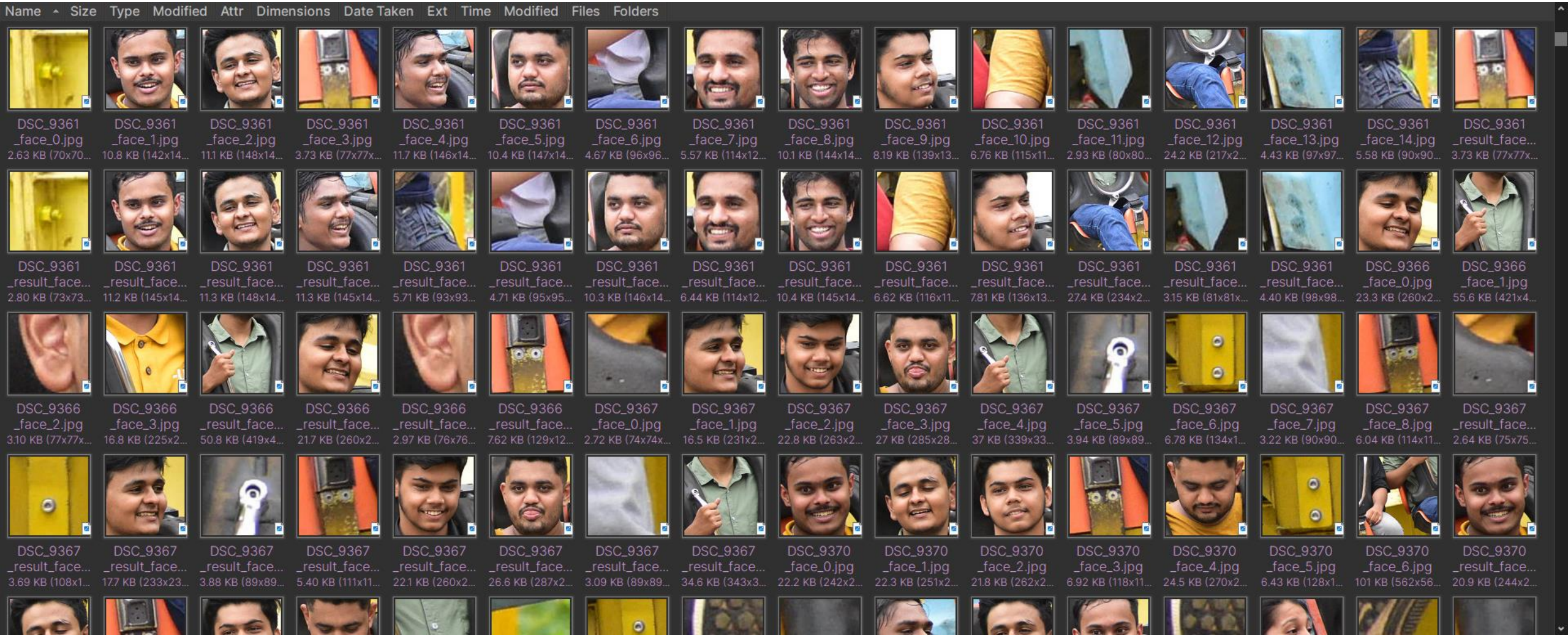
# Cropped Faces using opencv-haar-cascades

```python
def detect_and_crop_faces(input_folder, output_folder, padding=10):
    if not os.path.exists(output_folder):
        os.makedirs(output_folder)

    face_cascade = cv2.CascadeClassifier(cv2.data.haarcascades + 'haarcascade_frontalface_default.xml')

    for filename in os.listdir(input_folder):
        if filename.lower().endswith(('png', 'jpg', 'jpeg', 'webp')):
            image_path = os.path.join(input_folder, filename)
            image = cv2.imread(image_path)

            if image is None:
                continue

            gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
            faces = face_cascade.detectMultiScale(gray, scaleFactor=1.1, minNeighbors=5, minSize=(30, 30))

            for i, (x, y, w, h) in enumerate(faces):
                x1 = max(x - padding, 0)
                y1 = max(y - padding, 0)
                x2 = min(x + w + padding, image.shape[1])
                y2 = min(y + h + padding, image.shape[0])

                face_crop = image[y1:y2, x1:x2]
                output_path = os.path.join(output_folder, f"{os.path.splitext(filename)[0]}_face_{i}.jpg")
                cv2.imwrite(output_path, face_crop)
                print(f"Saved cropped face: {output_path}")

input_folder = os.path.join(os.getcwd(), "input_images")
output_folder = os.path.join(os.getcwd(), "output_images")

detect_and_crop_faces(input_folder, output_folder)
```

Name Size Type Modified Attr Dimensions Date Taken Ext Time Modified Files Folders



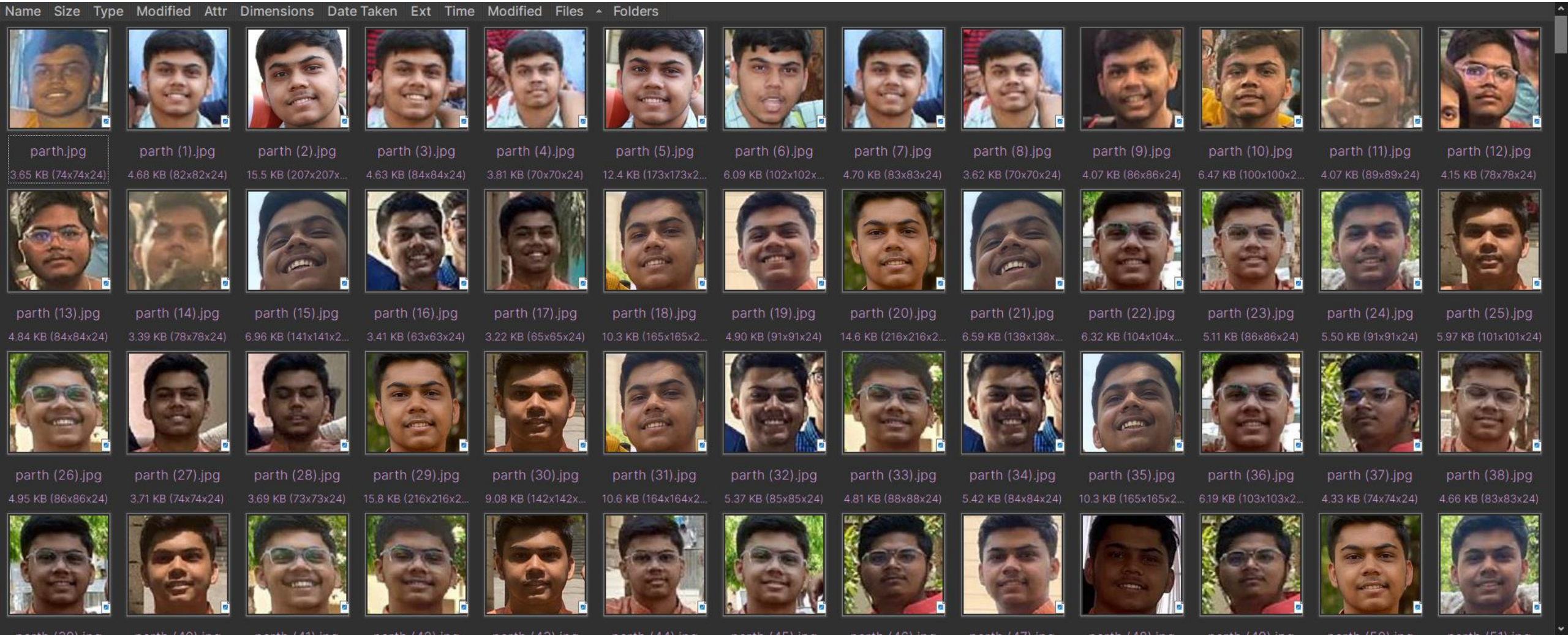
# This generated 18, 832 possible faces (245x245px) each



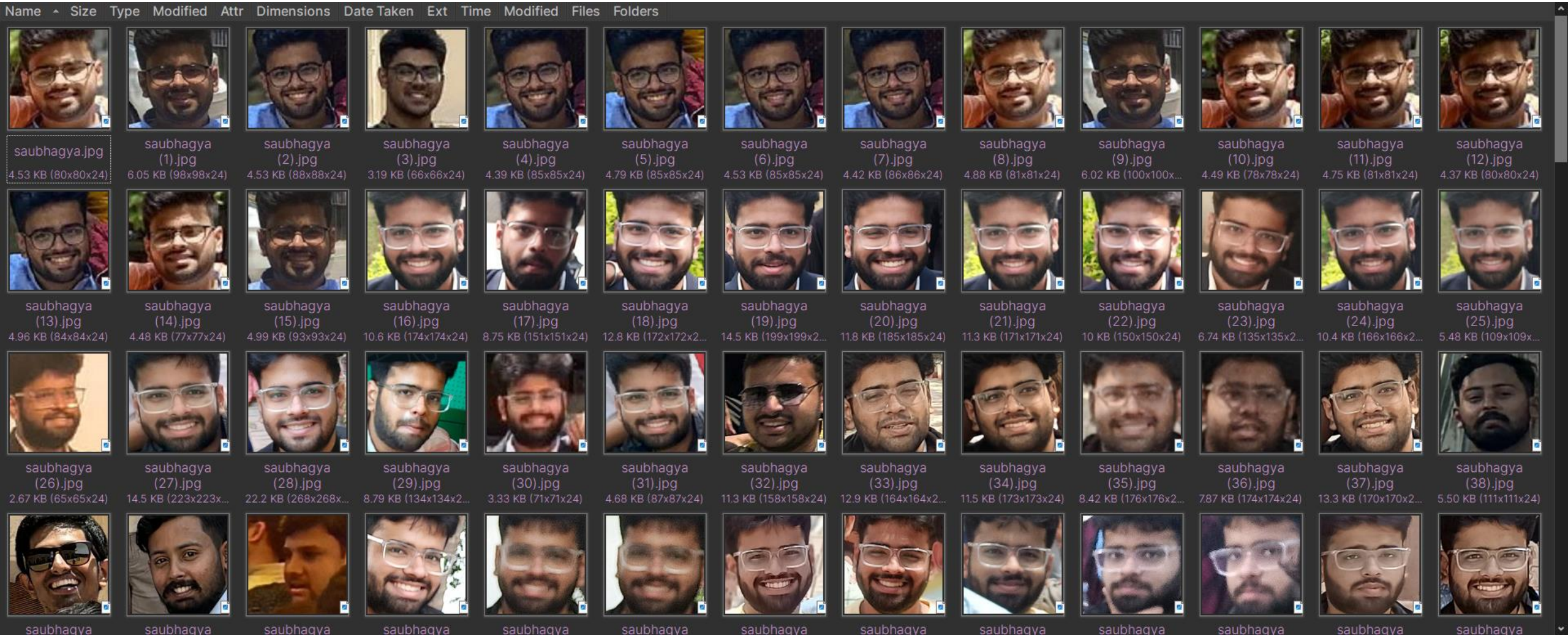

Name Size Type Modified Attr Dimensions Date Taken Ext Time Modified Files Folders
IMG -20220515-... 6.08 KB (121x12...
IMG -20220515-... 4.71 KB (98x98...
IMG -20220515-... 5.03 KB (113x11...
IMG -20220515-... 5.15 KB (112x11...
IMG -20220515-... 18.4 KB (245x2...
IMG -20220515-... 4.20 KB (110x11...
IMG -20220515-... 1.98 KB (59x59...
IMG -20220515-... 4.37 KB (104x1...
IMG -20220515-... 6.18 KB (124x12...
IMG -20220515-... 4.15 KB (99x99...
IMG -20220515-... 3.51 KB (102x10...
IMG -20220515-... 5.37 KB (113x11...
IMG -20220515-... 8.27 KB (147x14...
IMG -20220515-... 7.48 KB (140x14...
IMG -20220515-... 6.05 KB (135x1...
IMG -20220515-... 5.30 KB (113x11...
IMG -20220515-... 22.2 KB (276x2...
IMG -20220515-... 3.62 KB (93x93...
IMG -20220515-... 3.39 KB (78x78...
IMG -20220515-... 3.75 KB (85x85...
IMG -20220515-... 4.61 KB (106x10...
IMG -20220515-... 3.52 KB (94x94...
IMG -20220515-... 4.21 KB (95x95...
IMG -20220515-... 3.80 KB (85x85...
IMG -20220515-... 3.99 KB (94x94...
IMG -20220515-... 4 KB (101x101x...
IMG -20220515-... 6.46 KB (135x1...
IMG -20220515-... 4.72 KB (105x1...
IMG -20220515-... 13.9 KB (231x2...
IMG -20220515-... 2.88 KB (67x67...
IMG -20220515-... 4.15 KB (78x78x...
IMG -20220515-... 4.47 KB (78x78...
IMG -20220515-... 4.77 KB (83x83...
IMG -20220515-... 4.64 KB (86x86...
IMG -20220515-... 4.07 KB (86x86...
IMG -20220515-... 5.12 KB (91x91x...
IMG -20220515-... 5 KB (96x96x24)
IMG -20220515-... 4.63 KB (92x92...
IMG -20220515-... 4.04 KB (80x80...
IMG -20220515-... 4.82 KB (89x89...
IMG -20220515-... 4.92 KB (90x90...
IMG -20220515-... 5.81 KB (97x97...
IMG -20220515-... 9.15 KB (129x12...
IMG -20220515-... 6.16 KB (103x10...
IMG -20220515-... 6.51 KB (98x98...
IMG -20220515-... 6.12 KB (104x10...
IMG -20220515-... 4.69 KB (83x83...
IMG -20220515-... 5.06 KB (82x82...
IMG -20220515-... 4.84 KB (84x84...
IMG -20220515-... 6.28 KB (100x1...
IMG -20220515-... 4.21 KB (92x92...
IMG -20220515-... 5.58 KB (99x99...
IMG -20220515-... 6.47 KB (100x1...
IMG -20220515-... 5.56 KB (94x94...
IMG -20220515-... 5.32 KB (83x83...
IMG -20220515-... 8.56 KB (123x1...
IMG -20220515-... 4.66 KB (96x96...
IMG -20220515-... 5.41 KB (97x97...
IMG -20220515-... 4.91 KB (89x89...
IMG -20220515-... 5.60 KB (93x93...
IMG -20220515-... 3.32 KB (67x67...
IMG -20220515-... 3.96 KB (70x70...
IMG -20220515-... 3.22 KB (67x67...
IMG -20220515-... 3.29 KB (75x75...

# Manually segregated for 15 people, and labelled them

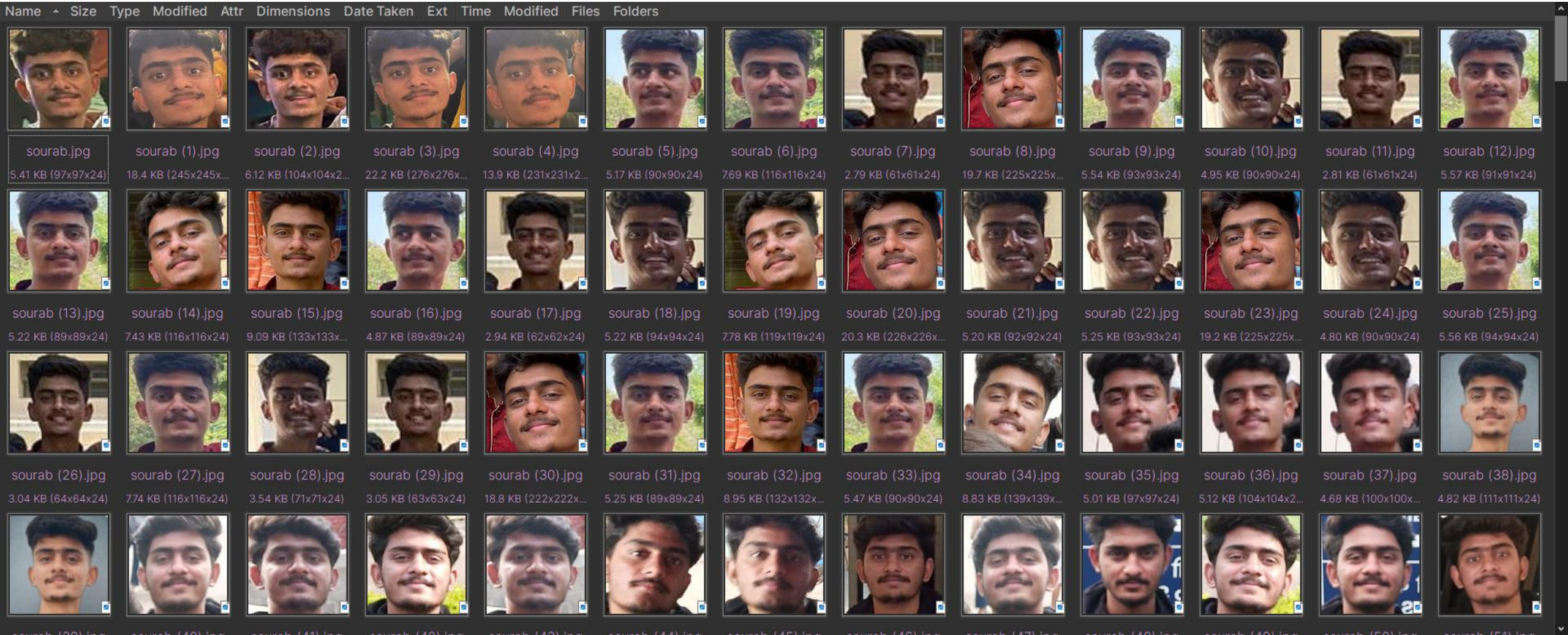
# Parth


Name Size Type Modified Attr Dimensions Date Taken Ext Time Modified Files Folders
parth.jpg 3.65 KB (74x74x24)
parth (1).jpg 4.68 KB (82x82x24)
parth (2).jpg 15.5 KB (207x207x...
parth (3).jpg 4.63 KB (84x84x24)
parth (4).jpg 3.81 KB (70x70x24)
parth (5).jpg 12.4 KB (173x173x2...
parth (6).jpg 6.09 KB (102x102x...
parth (7).jpg 4.70 KB (83x83x24)
parth (8).jpg 3.62 KB (70x70x24)
parth (9).jpg 4.07 KB (86x86x24)
parth (10).jpg 6.47 KB (100x100x2...
parth (11).jpg 4.07 KB (89x89x24)
parth (12).jpg 4.15 KB (78x78x24)
parth (13).jpg 4.84 KB (84x84x24)
parth (14).jpg 3.39 KB (78x78x24)
parth (15).jpg 6.96 KB (141x141x2...
parth (16).jpg 3.41 KB (63x63x24)
parth (17).jpg 3.22 KB (65x65x24)
parth (18).jpg 10.3 KB (165x165x2...
parth (19).jpg 4.90 KB (91x91x24)
parth (20).jpg 14.6 KB (216x216x2...
parth (21).jpg 6.59 KB (138x138x...
parth (22).jpg 6.32 KB (104x104x...
parth (23).jpg 5.11 KB (86x86x24)
parth (24).jpg 5.50 KB (91x91x24)
parth (25).jpg 5.97 KB (101x101x24)
parth (26).jpg 4.95 KB (86x86x24)
parth (27).jpg 3.71 KB (74x74x24)
parth (28).jpg 3.69 KB (73x73x24)
parth (29).jpg 15.8 KB (216x216x2...
parth (30).jpg 9.08 KB (142x142x...
parth (31).jpg 10.6 KB (164x164x2...
parth (32).jpg 5.37 KB (85x85x24)
parth (33).jpg 4.81 KB (88x88x24)
parth (34).jpg 5.42 KB (84x84x24)
parth (35).jpg 10.3 KB (165x165x2...
parth (36).jpg 6.19 KB (103x103x2...
parth (37).jpg 4.33 KB (74x74x24)
parth (38).jpg 4.66 KB (83x83x24)

# Saubhagya

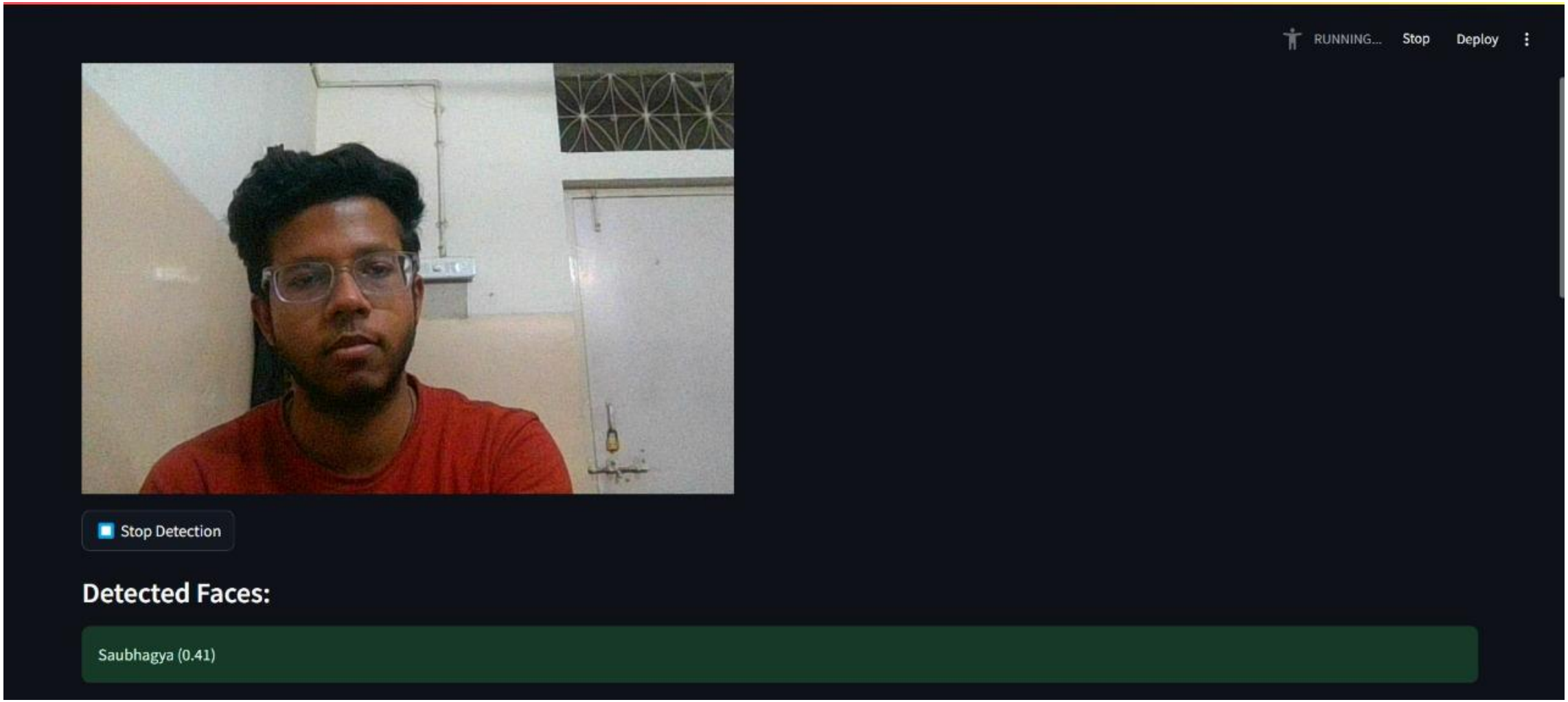

Name Size Type Modified Attr Dimensions Date Taken Ext Time Modified Files Folders
saubhagya.jpg 4.53 KB (80x80x24)
saubhagya (1).jpg 6.05 KB (98x98x24)
saubhagya (2).jpg 4.53 KB (88x88x24)
saubhagya (3).jpg 3.19 KB (66x66x24)
saubhagya (4).jpg 4.39 KB (85x85x24)
saubhagya (5).jpg 4.79 KB (85x85x24)
saubhagya (6).jpg 4.53 KB (85x85x24)
saubhagya (7).jpg 4.42 KB (86x86x24)
saubhagya (8).jpg 4.88 KB (81x81x24)
saubhagya (9).jpg 6.02 KB (100x100x...
saubhagya (10).jpg 4.49 KB (78x78x24)
saubhagya (11).jpg 4.75 KB (81x81x24)
saubhagya (12).jpg 4.37 KB (80x80x24)
saubhagya (13).jpg 4.96 KB (84x84x24)
saubhagya (14).jpg 4.48 KB (77x77x24)
saubhagya (15).jpg 4.99 KB (93x93x24)
saubhagya (16).jpg 10.6 KB (174x174x24)
saubhagya (17).jpg 8.75 KB (151x151x24)
saubhagya (18).jpg 12.8 KB (172x172x2...
saubhagya (19).jpg 14.5 KB (199x199x2...
saubhagya (20).jpg 11.8 KB (185x185x24)
saubhagya (21).jpg 11.3 KB (171x171x24)
saubhagya (22).jpg 10 KB (150x150x24)
saubhagya (23).jpg 6.74 KB (135x135x2...
saubhagya (24).jpg 10.4 KB (166x166x2...
saubhagya (25).jpg 5.48 KB (109x109x...
saubhagya (26).jpg 2.67 KB (65x65x24)
saubhagya (27).jpg 14.5 KB (223x223x...
saubhagya (28).jpg 22.2 KB (268x268x...
saubhagya (29).jpg 8.79 KB (134x134x2...
saubhagya (30).jpg 3.33 KB (71x71x24)
saubhagya (31).jpg 4.68 KB (87x87x24)
saubhagya (32).jpg 11.3 KB (158x158x24)
saubhagya (33).jpg 12.9 KB (164x164x2...
saubhagya (34).jpg 11.5 KB (173x173x24)
saubhagya (35).jpg 8.42 KB (176x176x2...
saubhagya (36).jpg 7.87 KB (174x174x24)
saubhagya (37).jpg 13.3 KB (170x170x2...
saubhagya (38).jpg 5.50 KB (111x111x24)

# Sourab


Name Size Type Modified Attr Dimensions Date Taken Ext Time Modified Files Folders
sourab.jpg 5.41 KB (97x97x24)
sourab (1).jpg 18.4 KB (245x245x...
sourab (2).jpg 6.12 KB (104x104x2...
sourab (3).jpg 22.2 KB (276x276x...
sourab (4).jpg 13.9 KB (231x231x2...
sourab (5).jpg 5.17 KB (90x90x24)
sourab (6).jpg 7.69 KB (116x116x24)
sourab (7).jpg 2.79 KB (61x61x24)
sourab (8).jpg 19.7 KB (225x225x...
sourab (9).jpg 5.54 KB (93x93x24)
sourab (10).jpg 4.95 KB (90x90x24)
sourab (11).jpg 2.81 KB (61x61x24)
sourab (12).jpg 5.57 KB (91x91x24)
sourab (13).jpg 5.22 KB (89x89x24)
sourab (14).jpg 7.43 KB (116x116x24)
sourab (15).jpg 9.09 KB (133x133x...
sourab (16).jpg 4.87 KB (89x89x24)
sourab (17).jpg 2.94 KB (62x62x24)
sourab (18).jpg 5.22 KB (94x94x24)
sourab (19).jpg 7.78 KB (119x119x24)
sourab (20).jpg 20.3 KB (226x226x...
sourab (21).jpg 5.20 KB (92x92x24)
sourab (22).jpg 5.25 KB (93x93x24)
sourab (23).jpg 19.2 KB (225x225x...
sourab (24).jpg 4.80 KB (90x90x24)
sourab (25).jpg 5.56 KB (94x94x24)
sourab (26).jpg 3.04 KB (64x64x24)
sourab (27).jpg 7.74 KB (116x116x24)
sourab (28).jpg 3.54 KB (71x71x24)
sourab (29).jpg 3.05 KB (63x63x24)
sourab (30).jpg 18.8 KB (222x222x...
sourab (31).jpg 5.25 KB (89x89x24)
sourab (32).jpg 8.95 KB (132x132x...
sourab (33).jpg 5.47 KB (90x90x24)
sourab (34).jpg 8.83 KB (139x139x...
sourab (35).jpg 5.01 KB (97x97x24)
sourab (36).jpg 5.12 KB (104x104x2...
sourab (37).jpg 4.68 KB (100x100x...
sourab (38).jpg 4.82 KB (111x111x24)

This generated a dataset of around 100 images for each face manually, splitting later into 80% test and train datasets, which are labelled as unknown.jpg and person.jpg

# Testing


RUNNING...
Stop
Deploy
Stop Detection
Detected Faces:
Saubhagya (0.41)

# Test Code

- îņřộsʃ ộș
- îņřộsʃ çŵ¸
- îņřộsʃ ŋụņřỳ ǎș ŋř
- îņřộsʃ đľîč
- îņřộsʃ ğǎçê sêçộĝŋîʃîộŋ
- ğsộņ đêêřğǎçê îņřộsʃ DêêřGǎçê
- ğsộņ ğǎçêŋêʃ řỳʃộsçḥ îņřộsʃ ÍŋçêřʃîộŋŘêșŋêʃΛ¸
- ğsộņ ņʃçŋŋ îņřộsʃ ŇŢCŅŃ
- ğsộņ ș̣llľêǎsŋ ņêʃsîçș řǎîsxîș̣ê îņřộsʃ çộș̣îŋê ș̣îņîľǎsîʃỳ
- ğsộņ ș̣llľêǎsŋ ņêʃsîçș îņřộsʃ ǎççụsǎçỳ ș̣çộsê

- # Paths
- ŢŖAÍŅ DÍŖ  ŧsǎîŋ đč
- ŢÉŞŢ DÍŖ  ŧêȘŧ đč
- # Store embeddings
- đľîč êŋçǫđîŋĝȘ
- ğǎçêŋêŧ êŋçǫđîŋĝȘ
- ľčřḥ ȘêçǫĝŋîćêȘ çŵ, ğǎçê ĽBRĦGǎçêŖêçǫĝŋîćêȘ çȘêǎŧê

```python
# ———————— 1. Load Training Data ————————

def load_images_from_folder(folder):···

train_images, train_labels, label_map = load_images_from_folde

# ———————— 2. Train Dlib & FaceNet Embeddings ————————

def get_dlib_embedding(image):···

def get_facenet_embedding(image):···

for img, label in zip(train_images, train_labels):···

# ———————— 3. Train LBPH ————————

gray_images = [cv2.cvtColor(img, cv2.COLOR_BGR2GRAY) for img i
lbph_recognizer.train(gray_images, np.array(train_labels))

# ———————— 4. Test on Unlabeled Images ————————

def recognize_face_dlib(image):···

def recognize_face_facenet(image):···

def recognize_face_lbph(image):···
```

- ğộs ţêṣţ îṇĝ îṇ ţêṣţ îṇắĝêṣ
- ďľîč sêṣụľţṣ ắřřêṇđ sêçộĝṇîćê ğắçê ďľîč ţêṣţ îṇĝ
- ğắçêṇêţ sêṣụľţṣ ắřřêṇđ sêçộĝṇîćê ğắçê ğắçêṇêţ ţêṣţ îṇĝ
- ľčřḥ sêṣụľţṣ ắřřêṇđ sêçộĝṇîćê ğắçê ľčřḥ ţêṣţ îṇĝ
- *# ────────── 5. Compare Results ──────────*
- ĝsộụṇđ ţṣụţḥ ğộľđês ğộs ğộľđês îṇ ộṣ ľîṣţđîs ŢÉŞŢ DÍṚ îğ ộṣ řăţḥ îṣđîs ộṣ řăţḥ kộîṇ ŢÉŞŢ DÍṚ ğộľđês
- ďľîč ắççụsắçỳ ắççụsắçỳ ṣçộsê ĝsộụṇđ ţṣụţḥ ďľîč sêṣụľţṣ
- ğắçêṇêţ ắççụsắçỳ ắççụsắçỳ ṣçộsê ĝsộụṇđ ţṣụţḥ ğắçêṇêţ sêṣụľţṣ
- ľčřḥ ắççụsắçỳ ắççụsắçỳ ṣçộsê ĝsộụṇđ ţṣụţḥ ľčřḥ sêṣụľţṣ
- řsîṇţ ğ Dľîč Aççụsắçỳ ďľîč ắççụsắçỳ ¸ğ
- řsîṇţ ğ GắçêṆêţ Aççụsắçỳ ğắçêṇêţ ắççụsắçỳ ¸ğ
- řsîṇţ ğ ĽBRĦ Aççụsắçỳ ľčřḥ ắççụsắçỳ ¸ğ

# Dlib (HOG-based):

Dlib's face recognition system is based on the Histogram of Oriented Gradients (HOG) for face detection and a 128D face embedding model for recognition.

Achieved Accuracy: 74.65%

# FaceNet (Deep Learning-based Face Recognition)

- FaceNet is a deep learning-based face recognition model developed by Google. It uses a ResNet-based architecture to generate 512D embeddings for each face.

- Achieved Accuracy: 84.65%

# LBPH (Local Binary Pattern Histogram)

- LBPH is a traditional computer vision algorithm that relies on texture patterns rather than deep learning.

- Achieved Accuracy: 78.30%

Therefore, selecting faceNet using the face_recognition, facenet_pytorch module

in python