INTERNSHIP STUDIO TRAINING AND INTERNSHIP

**DOMAIN:(ARTIFICIAL INTELLIGENCE)**

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**IMPLEMENTATION OF PCA WITH ANN ALGORITHM FOR FACE RECOGINITION**

**CODE:**

https://colab.research.google.com/drive/1RzojdIt5gi5yjhuyV5JNFKOvQkJJjEtC#scrollTo=3cd6d0ef&line=9&uniqifier=1

**!pip install opencv-python**

import matplotlib.pyplot as plt

from sklearn.model\_selection import train\_test\_split

from sklearn.datasets import fetch\_lfw\_people

from sklearn.decomposition import PCA

from sklearn.discriminant\_analysis import LinearDiscriminantAnalysis

from sklearn.neural\_network import MLPClassifier

import numpy as np

import os,cv2

def plot\_gallery(images, titles, h, w, n\_row=3, n\_col=4):

"""Helper function to plot a gallery of portraits"""

plt.figure(figsize=(1.8 \* n\_col, 2.4 \* n\_row))

plt.subplots\_adjust(bottom=0, left=.01, right=.99, top=.90, hspace=.35)

for i in range(n\_row \* n\_col):

plt.subplot(n\_row, n\_col, i + 1)

plt.imshow(images[i].reshape((h, w)), cmap=plt.cm.gray)

plt.title(titles[i], size=12)

plt.xticks(())

plt.yticks(())

dir\_name= "/dataset/faces"

y=[];X=[];target\_names=[]

person\_id=0;h=w=300

n\_samples=0

class\_names=[]

for person\_name in os.listdir(dir\_name):

# print(person\_name)

dir\_path = dir\_name+person\_name+"/"

class\_names.append(person\_name)

for image\_name in os.listdir(dir\_path):

# formulate the image path

image\_path = dir\_path+image\_name

# Read the input image

img = cv2.imread(image\_path)

# Convert into grayscale

gray = cv2.cvtColor(img, cv2.COLOR\_BGR2GRAY)

# resize image to 300\*300 dimension

resized\_image= cv2.resize(gray,(h,w))

# convert matrix to vector

v = resized\_image.flatten()

X.append(v)

# increase the number of samples

n\_samples =n\_samples+1

# Addinng th categorical label

y.append(person\_id)

# adding the person name

target\_names.append(person\_name)

# Increase the person id by 1

person\_id=person\_id+1

#

# transform list to numpy array

y=np.array(y)

X=np.array(X)

target\_names =np.array(target\_names)

n\_features = X.shape[1]

print(y.shape,X.shape,target\_names.shape)

print("Number of sampels:",n\_samples)

# Download the data, if not already on disk and load it as numpy arrays

# lfw\_people = fetch\_lfw\_people(min\_faces\_per\_person=70, resize=0.4)

# # introspect the images arrays to find the shapes (for plotting)

# n\_samples, h, w = lfw\_people.images.shape

# print(n\_samples, h, w)

# # for machine learning we use the 2 data directly (as relative pixel

# # positions info is ignored by this model)

# X = lfw\_people.data

# n\_features = X.shape[1]

# print(X.shape)

# # the label to predict is the id of the person

# y = lfw\_people.target

# print(y)

# if 0 in y:

# print("yes")

# target\_names = lfw\_people.target\_names

# print(target\_names)

n\_classes = target\_names.shape[0]

print("Total dataset size:")

print("n\_samples: %d" % n\_samples)

print("n\_features: %d" % n\_features)

print("n\_classes: %d" % n\_classes)

**OUTPUT:**

**(463,) (463, 90000) (463,)**

**Number of sampels: 463**

**Total dataset size:**

**n\_samples: 463**

**n\_features: 90000**

**n\_classes: 463**

# Split into a training set and a test set using a stratified k fold

# split into a training and testing set

X\_train, X\_test, y\_train, y\_test = train\_test\_split(

X, y, test\_size=0.25, random\_state=42)

#

# Compute a PCA (eigenfaces) on the face dataset (treated as unlabeled

# dataset): unsupervised feature extraction / dimensionality reduction

n\_components = 150

print("Extracting the top %d eigenfaces from %d faces"% (n\_components, X\_train.shape[0]))

# Applying PCA

pca = PCA(n\_components=n\_components, svd\_solver='randomized', whiten=True).fit(X\_train)

# Generating eigenfaces

eigenfaces = pca.components\_.reshape((n\_components, h, w))

# plot the gallery of the most significative eigenfaces

eigenface\_titles = ["eigenface %d" % i for i in range(eigenfaces.shape[0])]

plot\_gallery(eigenfaces, eigenface\_titles, h, w)

plt.show()

print("Projecting the input data on the eigenfaces orthonormal basis")

X\_train\_pca = pca.transform(X\_train)

X\_test\_pca = pca.transform(X\_test)

print(X\_train\_pca.shape,X\_test\_pca.shape)

# %%Compute Fisherfaces

lda = LinearDiscriminantAnalysis()

#Compute LDA of reduced data

lda.fit(X\_train\_pca, y\_train)

X\_train\_lda = lda.transform(X\_train\_pca)

X\_test\_lda = lda.transform(X\_test\_pca)

print("Project done SUCESSFULLY...")



Projecting the input data on the eigenfaces orthonormal basis

(347, 150) (116, 150)

Project done SUCESSFULLY...

Iteration 1, loss = 2.81319740

Iteration 2, loss = 2.76742366

Iteration 3, loss = 2.72234448

Iteration 4, loss = 2.67995822

Iteration 5, loss = 2.63803956

Iteration 6, loss = 2.59783662

Iteration 7, loss = 2.55952291

Iteration 8, loss = 2.52207617

Iteration 9, loss = 2.48723798

Iteration 10, loss = 2.45301112

Iteration 11, loss = 2.41991120

Iteration 12, loss = 2.38863906

Iteration 13, loss = 2.35823897

Iteration 14, loss = 2.32878047

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Iteration 24, loss = 2.08586882

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Iteration 484, loss = 0.02695758

Iteration 485, loss = 0.02681307

Iteration 486, loss = 0.02668384

Iteration 487, loss = 0.02653856

Iteration 488, loss = 0.02640072

Iteration 489, loss = 0.02626679

Iteration 490, loss = 0.02613012

Iteration 491, loss = 0.02599938

Iteration 492, loss = 0.02587395

Iteration 493, loss = 0.02572792

Iteration 494, loss = 0.02560445

Iteration 495, loss = 0.02545826

Iteration 496, loss = 0.02533640

Iteration 497, loss = 0.02520856

Iteration 498, loss = 0.02508469

Iteration 499, loss = 0.02496328

Iteration 500, loss = 0.02483322

Iteration 501, loss = 0.02470211

Iteration 502, loss = 0.02457548

Iteration 503, loss = 0.02444331

Iteration 504, loss = 0.02432756

Iteration 505, loss = 0.02419577

Iteration 506, loss = 0.02406536

Iteration 507, loss = 0.02395399

Iteration 508, loss = 0.02381383

Iteration 509, loss = 0.02371545

Iteration 510, loss = 0.02358057

Iteration 511, loss = 0.02346010

Iteration 512, loss = 0.02332960

Iteration 513, loss = 0.02322699

Iteration 514, loss = 0.02310160

Iteration 515, loss = 0.02298387

Iteration 516, loss = 0.02287020

Iteration 517, loss = 0.02276060

Iteration 518, loss = 0.02265121

Iteration 519, loss = 0.02253039

Iteration 520, loss = 0.02241725

Iteration 521, loss = 0.02230558

Iteration 522, loss = 0.02219262

Iteration 523, loss = 0.02208288

Iteration 524, loss = 0.02195613

Iteration 525, loss = 0.02187422

Iteration 526, loss = 0.02175719

Iteration 527, loss = 0.02163709

Iteration 528, loss = 0.02153218

Iteration 529, loss = 0.02142490

Iteration 530, loss = 0.02132744

Iteration 531, loss = 0.02123132

Iteration 532, loss = 0.02111407

Iteration 533, loss = 0.02102968

Iteration 534, loss = 0.02090158

Iteration 535, loss = 0.02081800

Iteration 536, loss = 0.02070123

Iteration 537, loss = 0.02060770

Iteration 538, loss = 0.02051741

Iteration 539, loss = 0.02041041

Iteration 540, loss = 0.02031025

Iteration 541, loss = 0.02020838

Iteration 542, loss = 0.02012444

Iteration 543, loss = 0.02002556

Iteration 544, loss = 0.01991838

Iteration 545, loss = 0.01983134

Iteration 546, loss = 0.01973029

Iteration 547, loss = 0.01965025

Iteration 548, loss = 0.01954647

Iteration 549, loss = 0.01944774

Iteration 550, loss = 0.01936264

Iteration 551, loss = 0.01926989

Iteration 552, loss = 0.01917658

Iteration 553, loss = 0.01908253

Iteration 554, loss = 0.01899711

Iteration 555, loss = 0.01890794

Iteration 556, loss = 0.01882094

Iteration 557, loss = 0.01872905

Iteration 558, loss = 0.01863732

Iteration 559, loss = 0.01855573

Training loss did not improve more than tol=0.000100 for 10 consecutive epochs. Stopping.

Model Weights:

[(9, 10), (10, 10), (10, 10)]

y\_pred=[];y\_prob=[]

for test\_face in X\_test\_lda:

prob = clf.predict\_proba([test\_face])[0]

# print(prob,np.max(prob))

class\_id = np.where(prob == np.max(prob))[0][0]

# print(class\_index)

# Find the label of the mathed face

y\_pred.append(class\_id)

y\_prob.append(np.max(prob))

# Transform the data

y\_pred = np.array(y\_pred)

prediction\_titles=[]

true\_positive = 0

for i in range(y\_pred.shape[0]):

# print(y\_test[i],y\_pred[i])

# true\_name = target\_names[y\_test[i]].rsplit(' ', 1)[-1]

# pred\_name = target\_names[y\_pred[i]].rsplit(' ', 1)[-1]

true\_name = class\_names[y\_test[i]]

pred\_name = class\_names[y\_pred[i]]

result = 'pred: %s, pr: %s \ntrue: %s' % (pred\_name, str(y\_prob[i])[0:3], true\_name)

# result = 'prediction: %s \ntrue: %s' % (pred\_name, true\_name)

prediction\_titles.append(result)

if true\_name==pred\_name:

true\_positive =true\_positive+1

print("Accuracy:",true\_positive\*100/y\_pred.shape[0])

# # Plot results

plot\_gallery(X\_test, prediction\_titles, h, w)

plt.show()

Accuracy: 69.82758620689656

****