

**Faces Recognition Using**

**Eigenfaces and SVMs**

**Introduction**

The provided code implements a facial recognition system using eigenfaces and Support Vector Machines (SVMs). The dataset used is a preprocessed excerpt of the "Labeled Faces in the Wild" (LFW) dataset, which is commonly used for facial recognition tasks. The LFW dataset consists of labeled facial images collected from the wild, making it suitable for training and evaluating facial recognition algorithms.

**Dataset Information**

The dataset can be downloaded from the following link: “http://vis-www.cs.umass.edu/lfw/lfw-funneled.tgz” (233MB). The dataset is preprocessed, and a subset is used in this example. Each image in the dataset is associated with a person, and the goal is to train a model to recognize individuals based on facial features.

**Code Overview**

The code is structured as follows:

1. **Loading and Preprocessing Data:**

* The LFW dataset is fetched using the “fetch\_lfw\_people” function from scikit-learn.
* The dataset is then split into training and testing sets, and standard scaling is applied.

1. **Principal Component Analysis (PCA):**

* PCA is used for unsupervised feature extraction and dimensionality reduction.
* The top eigenfaces are extracted from the training set.

1. **Support Vector Machine (SVM) Training:**

* An SVM classifier is trained on the PCA-transformed training data.
* Randomized search is employed for hyperparameter tuning.

1. **Model Evaluation:**

* **The trained model is evaluated on the test set using classification metrics such as precision, recall, and F1-score.**
* **A confusion matrix is displayed to visualize the performance of the model.**

1. **Qualitative Evaluation:**

* Predictions on a portion of the test set are visualized, showing both predicted and true labels.
* The most significant eigenfaces are displayed to provide insight into the features the model considers important.

**Conclusion**

This code serves as a comprehensive example of using eigenfaces and SVMs for facial recognition. The combination of dimensionality reduction with PCA and classification with SVMs allows for effective feature extraction and model training on facial data. The provided visualizations offer insights into the model's predictions and highlight the importance of eigenfaces in facial recognition.

[**Confusion Matrix Display**](https://scikit-learn.org/stable/modules/generated/sklearn.metrics.ConfusionMatrixDisplay.html#sklearn.metrics.ConfusionMatrixDisplay.from_estimator)**:**

A chart of a group of people

Description automatically generated with medium confidence

[**Classification Report**](https://scikit-learn.org/stable/modules/generated/sklearn.metrics.classification_report.html#sklearn.metrics.classification_report)**:**

A screenshot of a test

Description automatically generated

**plot the result of the prediction:**

A collage of different facial expressions

Description automatically generated A collage of images of a person's face

Description automatically generated

plot the result of the prediction on a portion of the test set plot the gallery of the most significative eigenfaces

**Team Members:**

1. **Ahmed Talat Abd El Mohsen 221101084**
2. **Omar Emadeldin AbdElrohman 221101037**
3. **Maged Mohamed Beltagy 221101048**
4. **Amr Tamer Abdelazim 221101037**