

**Credit Hours System**

**Cairo University**

**Faculty of Engineering**

**Image Processing and Computer Vision**

**Project Report**

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# Used Algorithms:

* Face Detection: Viola Jones algorithm: [Paper](https://www.cs.cmu.edu/~efros/courses/LBMV07/Papers/viola-cvpr-01.pdf)
* Face Recognition: Eigenfaces algorithm: [Paper](Face%20recognition%20using%20eigenfaces%20-%20Computer%20Vision%20and%20Pattern%20Recognition,%201991.%20Proceedings%20CVPR%20'91.,%20IEEE%20Computer%20Society%20Confer%20(ucsb.edu))

# Experiment Results and Analysis

## Face Detection:

* + 98% accuracy on the Olivetti dataset
  + Trained on 837 upfront-face images each of size 24x24 pixels

### Points of Strength:

Very high accuracy and only one run over the dataset is required.

### Points of weaknesses:

Training takes a lot of time. Also, it needs upfront-close face images dataset which is hard to find on the internet.

### Correct Example:

### 

### Incorrect Example:

### 

## Face Recognition:

* + 97% accuracy on the Olivetti Dataset
  + 400 images of 40 people
  + Each image is pixels
  + 320 images are used for training
  + 80 images are used for testing

Graphical user interface, application

Description automatically generatedExample of two correct recognitions

Graphical user interface, application

Description automatically generated

Example of an incorrect recognition

Graphical user interface, text, application

Description automatically generated

Text

Description automatically generatedAccuracy:

Accuracy is calculated as 1000 trials

* Points of strength: The algorithm does not need much time to train because it sees the training data only once (1 epoch)
* Points of weakness: The images must be close-ups of faces. The algorithm did not perform well for Datasets where faces were not the main element in the image (15% accuracy for the LFW Dataset).

This is expected of the Eigenfaces algorithm because it does not try to extract certain features from the images that would make the difference between one face and the other. Rather, it makes the assumption that the face distribution over the whole image space (which is all possible combinations of pixels all possible images) is not random. Based on this assumption, the algorithm aims to calculate the Eigenvectors (called Eigenfaces) that best describe the distribution of face images over the images space.