Report Project X: Blank Template

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*Abstract* — Abstract.

Keywords — Keywords

# Introduction

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# Theory

Theory.

# Methodology

## Dataset Preparation

The dataset used for training and testing comprised of:

* 32 face images used for training
* 44 face images used for testing
* 7 non-face images used for testing

From each collection of face and non-face images that can be used for testing, only half of them respectively are chosen at random and used for testing. This entails that 22 face images and 4 non-face images are present in the testing dataset.

## Vectorization

All images are sized 640x480 pixels and are all vectorized to a 1D array. To try and achieve the best results the images used before vectorization are taken both in RGB color format and converted to a greyscale format. This leads with the following vector sizes depending if greyscale or color images are used:

* Color images:
* Greyscale images:

This is done consistently in two different processes.

## Mean Faces

To center the data before applying PCA, the mean face normalization vector is computed by averaging all training image vectors:

The training and testing datasets are then normalized by subtracting the mean:

## Principal Component Analysis

PCA is applied to center the data and to obtain the eigenvectors which are used to form the basis of the eigenface space. In order to retrieve only the most important eigenfaces to be used for testing, an explained cumulative variance of at least is retained. This is done by choosing the first values of that satisfy this formula:

where, is the minimum number of necessary to retain at least of the information, and is the total number of found using PCA.

The final eigenfaces found to represent the eigenface space are represented by:

## Face Recognition

Both the training and testing images are projected onto the eigenface space to obtain lower-dimensional feature representations.

To determine whether an image is a face, the reconstruction error is calculated by projecting the image back to the original space:

The error is defined as:

If the error exceeds a predefined threshold of 15000, the image is classified as “NON-FACE” image, if it is lower than that it is classified as “FACE” image.

For recognized “FACE” images, the Euclidean distance between the projected test vector and all projected training vectors is calculated:

The closest match is determined by finding the minimum distance, and the corresponding training image is considered the best match.

# Results

Results.

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# Conclusion

Conclusion.

##### References

1. References.