CMP304

Project Report

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Human Emotion Recognition

Instructions:

- This is a template that you will fill to complete your assignment report.

- Please read the assessment brief document before attempting this.

- The gray text is meant as guidelines. You are to replace it with your own.

- Delete the instructions part and any gray text before submission.

- After you complete this report, save it as pdf, and submit it along with the compressed folder of your application.

# Introduction

*Relevant overview properly setting the context of the project.*

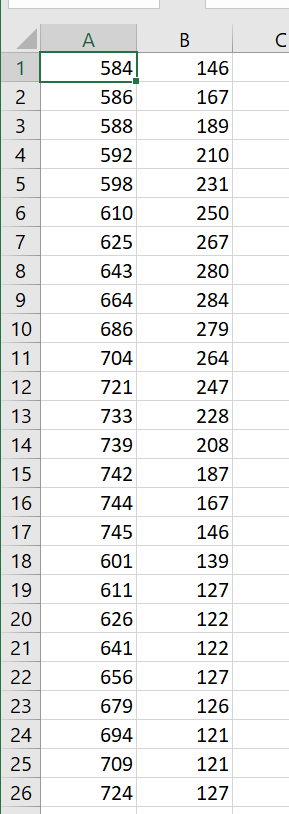
The project is based on the [face\_recognition](https://github.com/ageitgey/face_recognition) python library, one of its python example applications called ‘find\_facial\_features\_in\_picture’ (with my changes to save the results in .csv files) and my own C++ application which uses extracted facial features, saved into .csv files, to learn an emotion and to recognize an emotion from a picture.

# Methodology

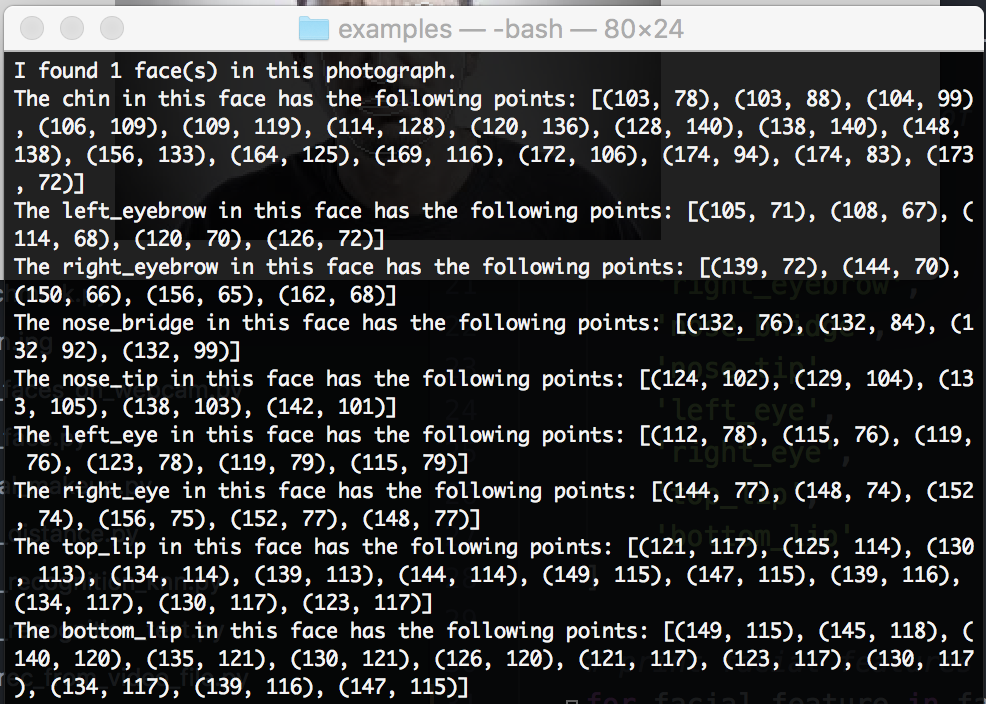
*Description of the steps followed and methods used including a complete explanation and rationale for the techniques and features chosen. You should also acknowledge the tools you used.*

## Python application

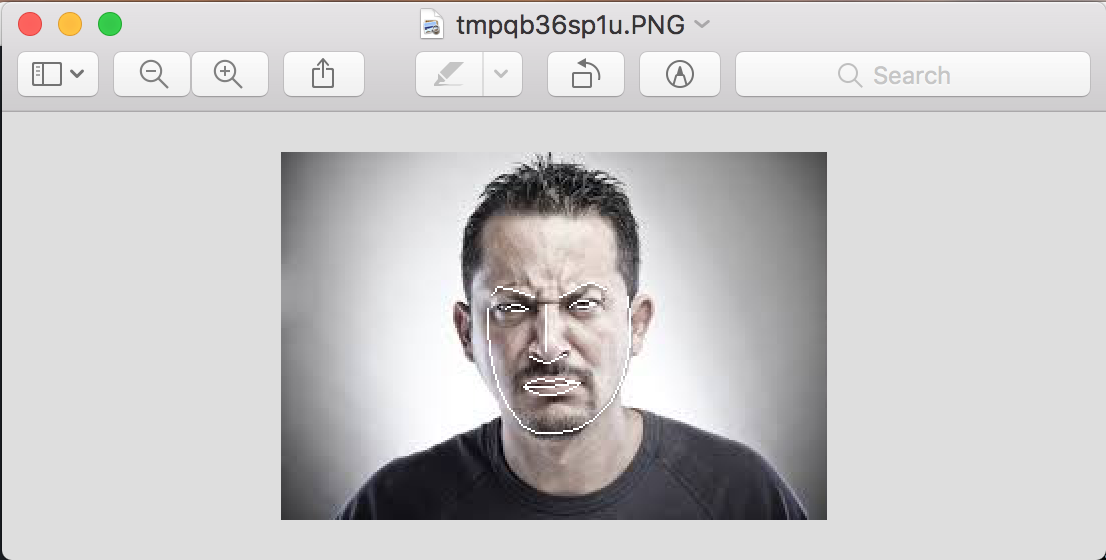
[face\_recognition](https://github.com/ageitgey/face_recognition) python library allows for extracting facial features from a picture. It basically just gives a position (relevant to the picture) of the chin, left eyebrow, right eyebrow, nose bridge, nose tip left eye, right eye, top lip, bottom lip. These positions are saved in a .csv file that look like this:



And this is how the facial features extraction of the python application look like in macOS terminal ([face\_recognition](https://github.com/ageitgey/face_recognition) library works only on Linux and macOS):



Terminal results



Extracted facial features

The python application saves facial features in .csv files that are later used for machine learning of each individual emotion and emotion recognition from a picture, e.g.: 3 smiley faces will be examined by the python application and the results (positions of the extracted facial features) will be saved in one .csv file, e.g.: ‘smile.csv’. Then 4th picture with a smiley face will be examined and the results will be then saved in a .csv file, e.g. ‘smile\_test\_1’.

## C++ application

The C++ application takes the ‘smile.csv’ file which contains all the results for smiley faces, and uses these results to learn from and create weighted results for a ‘smiley’ face (Similarly for ‘angry.csv’, ‘sad.csv’ ect. to learn different emotions). Then ‘smile\_test\_1’ will be examined in the same way (weighted results will be created for ‘smile\_test\_1.csv’) but without specifying what emotion it is. Then the application will compare all the weighted results for different emotions with the weighted results from a picture, that we want to recognize an emotion from, and see which emotion the examined picture fits the best.

## Weighted results

The C++ learning algorithm takes advantage of the fact that after reading the ‘\*.csv’ file into a vector (which is converted into a 1D vector from a 2D .csv file) the size of all facial features form one picture, combined, will be 144 (CHIN = 34, LEFT\_EYEBROW = 10, RIGHT\_EYEBROW = 10, NOSE\_BRIDGE = 8, NOSE\_TIP = 10, LEFT\_EYE = 12, RIGHT\_EYE = 12, TOP\_LIP = 24, BOTTOM\_LIP = 24; += 144). This allows for calculating weighting results for all the pictures in, e.g.: ‘smile.csv’ and then use these results to compare with the picture that we want to recognize an emotion from.

## Weighted results – what is it?

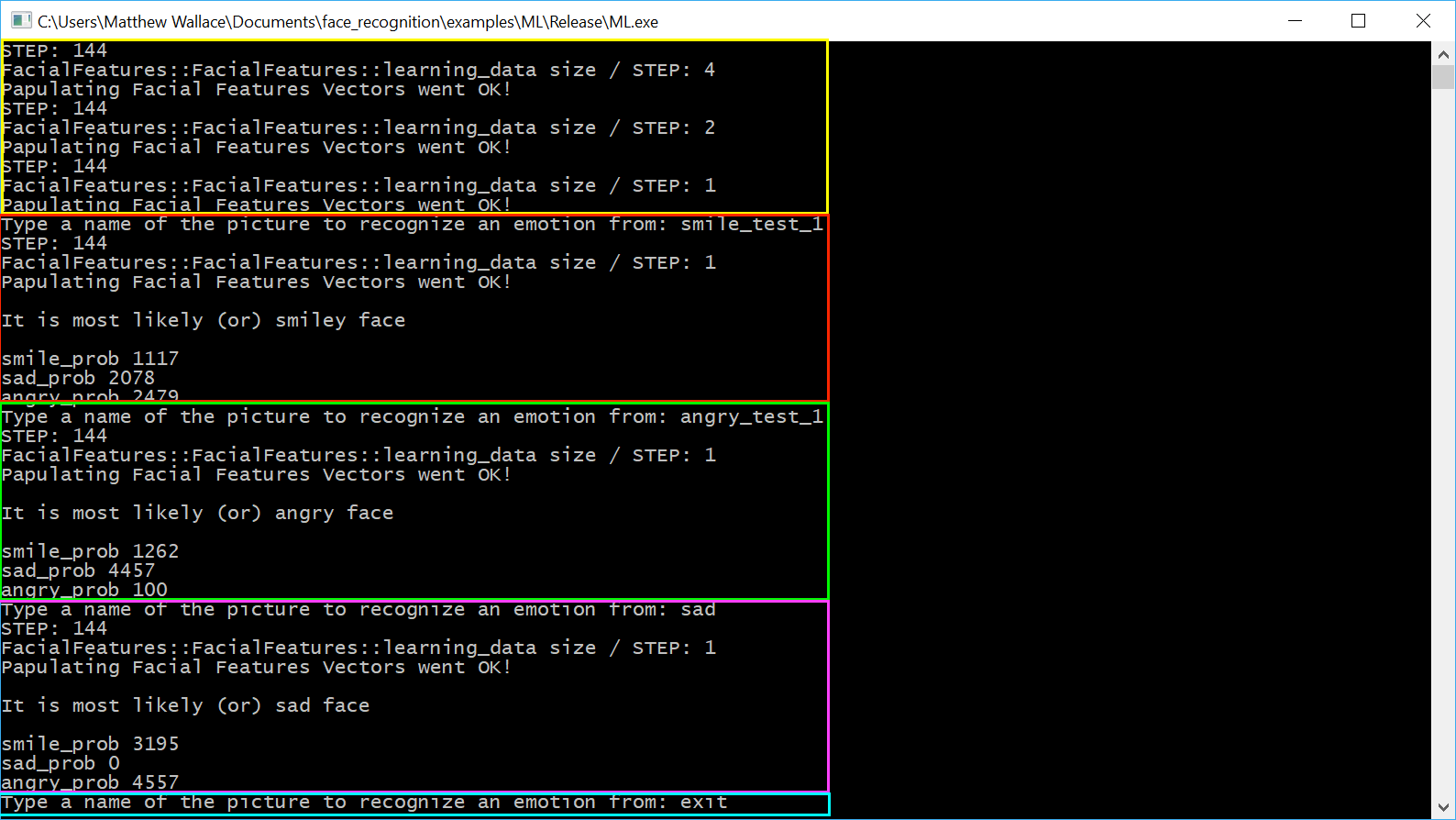
Weighted results are distances between:

* Left eye and left eyebrow
* Right eye and right eyebrow
* Top lip and bottom lip
* Nose bridge and nose tip.

These differences are calculated to later be stored in a vector (There is a weighted vector produced from a learning file, e.g. ‘smile.csv’, and a picture that we want to recognize am emotion from, e.g. ‘smile\_test\_1’).

# Results

*Comment on the performance of your application, including test cases. Tabulate and discuss your results. A quantitative measure of performance must be presented.*



Yellow – Learning, Red – smile\_test\_1 picture emotion recognition, Green – angry\_test\_1 picture emotion recognition, Purple – sad picture emotion recognition, Aqua– exit the application

# Conclusions

*Full analysis and summary of the project.*

# References

*A number of references properly cited in Cite Them Right Harvard style.*