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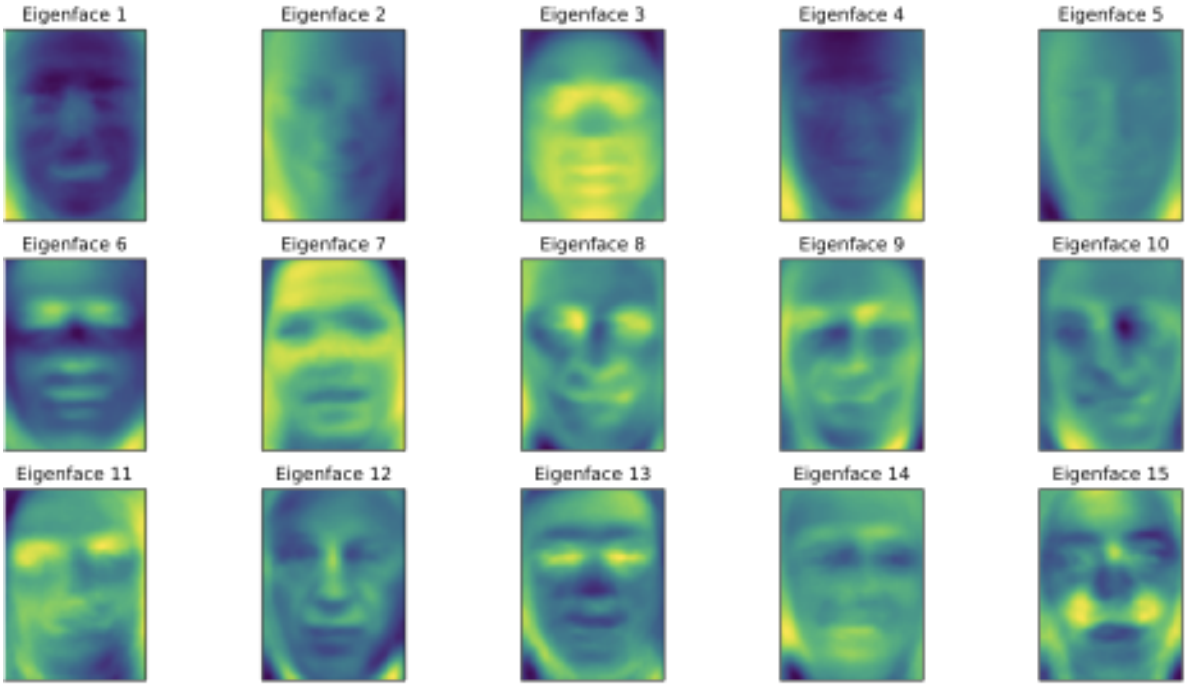
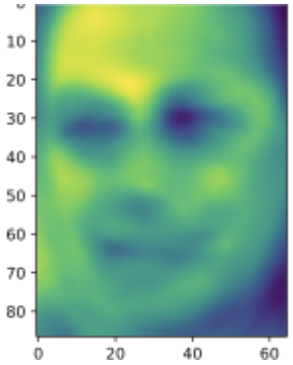
COS 314 Assignment 1 report

Eigenfaces

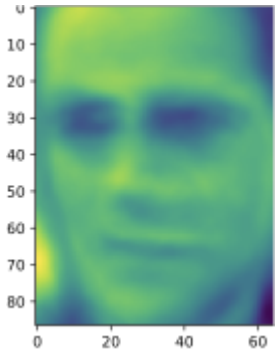
Below are the top 15 eigenfaces



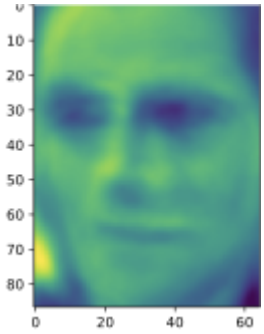
Below is an example of a face at 10 components. I am using 1face as an example instead of all 15. However, the same effects that happen to this image happen to the top 15 faces as well.



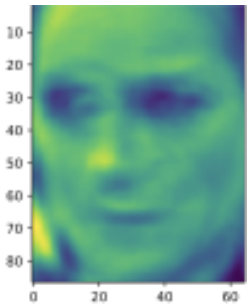
Below is an example of the same face at 30 components



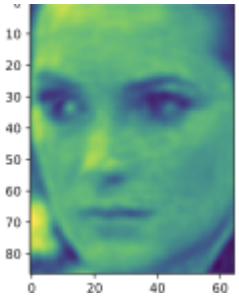
Below is an example of the same face at 50 components



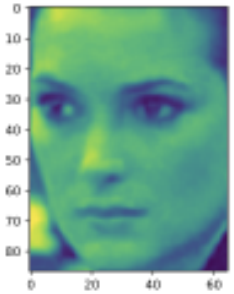
Below is an example of the same face at 100 components



Below is an example of the same face at 500 components



Below is an example of the same face at 500 components



My observations. As you can see, as the number of components increases, the overall picture sharpness and quality increases and you are able to see more and more details. This is because the variance is getting less and less as the number of components increase Eventually the number of components will reach a plateau and become more constant, which indicates that past a certain number of components, the quality will not increase that much as the variance becomes very small and shows little to no difference in the image quality.

The number of components were chosen by finding the point where the variance starts to plateau. In my case, that is where
`np.where(pca.explained_variance_ratio_.cumsum() > 0.95)`

Classification

The number of hidden layers is two. The activation functions used were the tanh function, the sigmoid function and the gran_tanh function. The learning rules that I used were not different to those in class.

Conclusion

You can improve the accuracy of the neural network by adding more hidden layers, increasing the number of neurons and scaling the data.(which i did). You can also increase your dataset and train your model with more data. My neural network was on average, 90% accurate. This is a decent result but can definitely be improved. The PCA function worked well and python is a great tool to handle all the math 'behind the scenes' with it's libraries.