Face Recognition System

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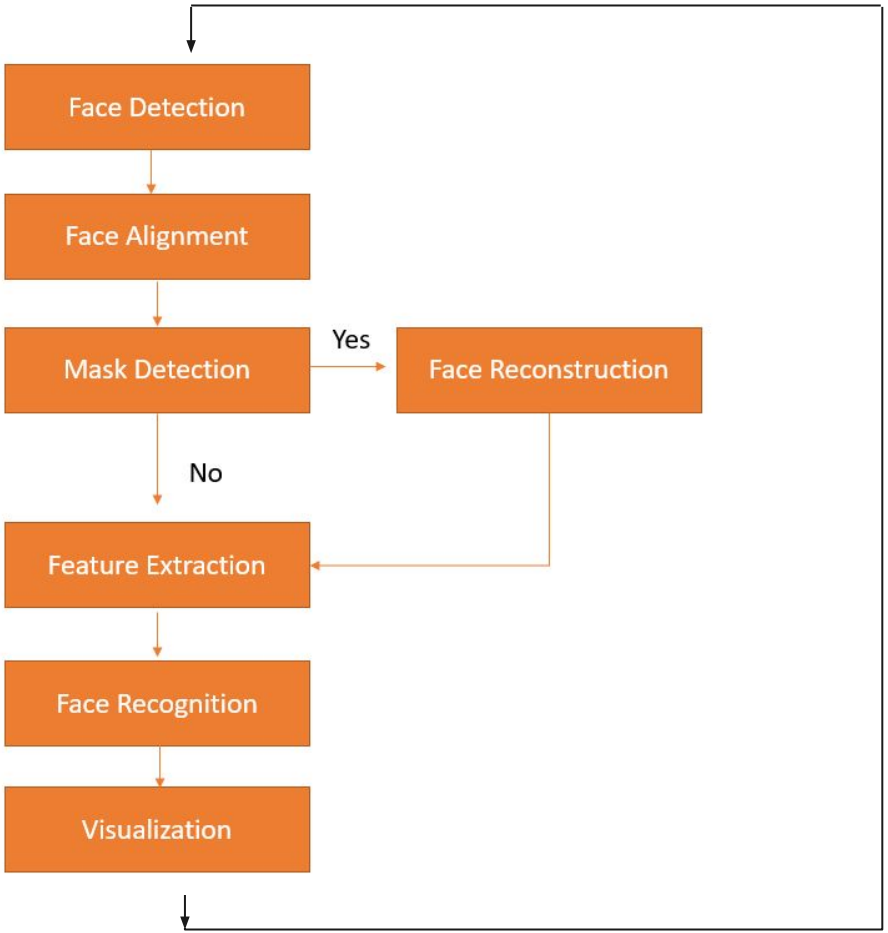
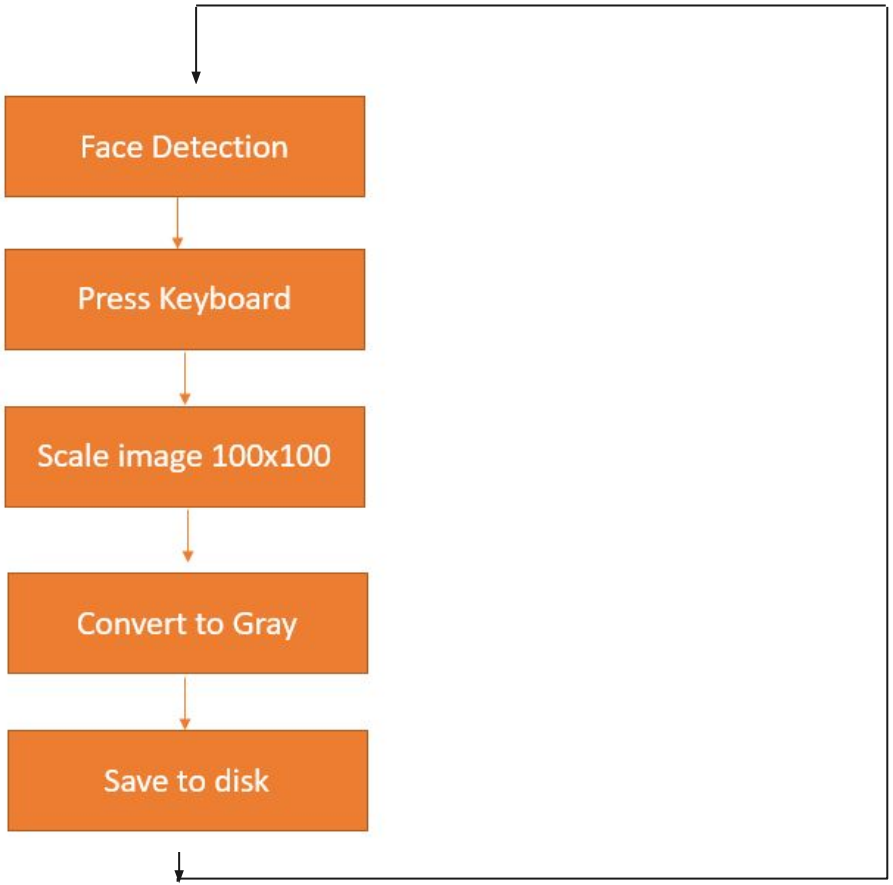
Overall System



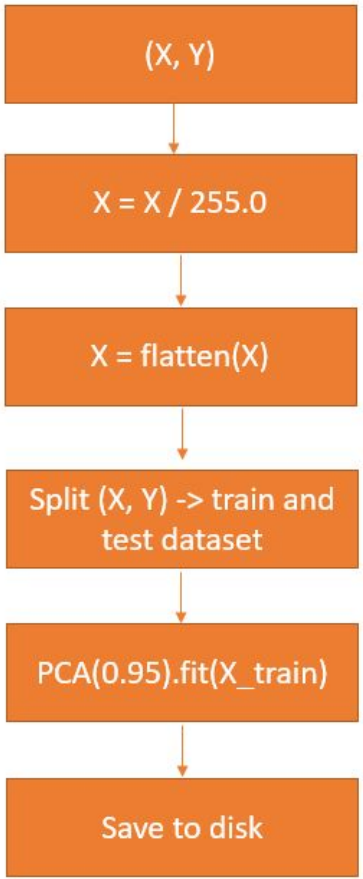
Data Collection

```
__ faces
        |
        | __ thientan
        |                |_0.png
        |                |_1.png
        |                |...
        |__ diana
        |          |_ 0.png
        |          |_ 1.png
        |.....
```

20 people. 5 images for each



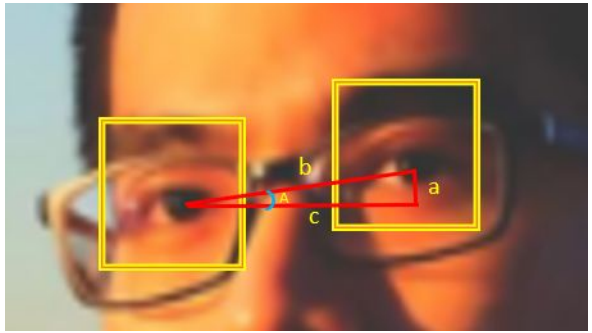
Train PCA

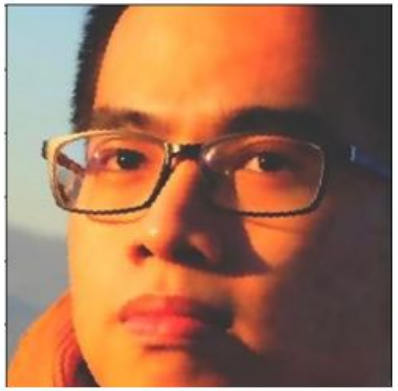

(X, Y)
X = X / 255.0
X = flatten(X)
Split (X, Y) -> train and test dataset
PCA(0.95).fit(X_train)
Save to disk

Face Detection

- OpenCV Cascade Classifier
- Dlib
- MTCNN: Multitask Cascaded Convolutional Networks -> Can detect face with mask

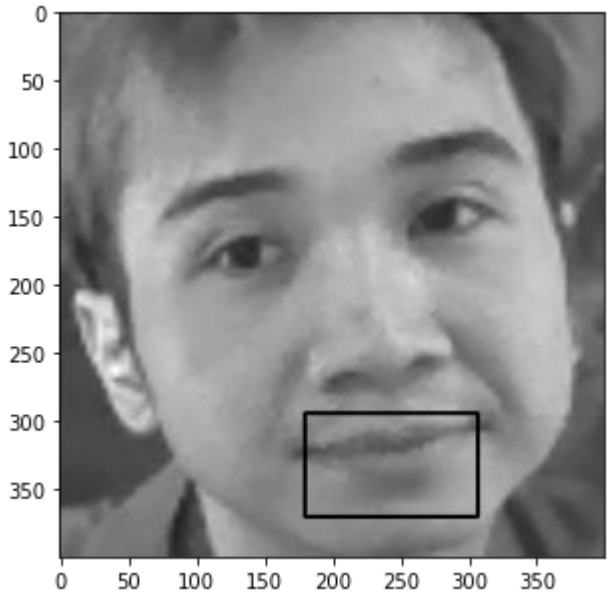
Face Alignment





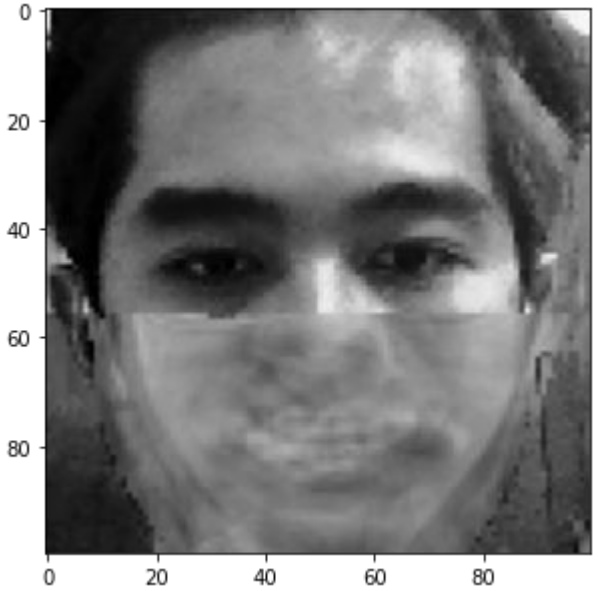
Face Mask Classification

- OpenCV Cascade Classifier for Mouth



Face Reconstruction

- Reimplement algorithm proposed by Malakar



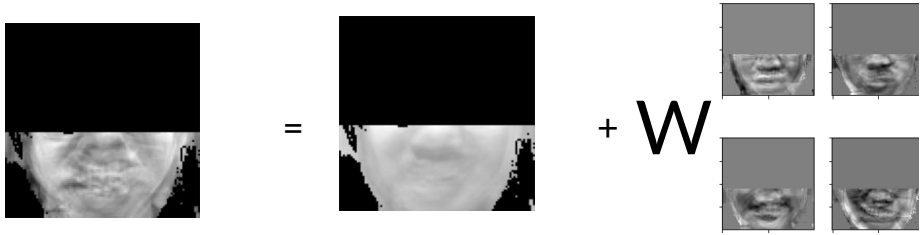
S. Malakar, W. Chiracharit, K. Chamnongthai and T. Charoenpong, "Masked Face Recognition Using Principal component analysis and Deep learning," 2021 18th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON), 2021, pp. 785-788, doi: 10.1109/ECTI-CON51831.2021.9454857.

Face Reconstruction

Face = mean_face + weights*eigenfaces

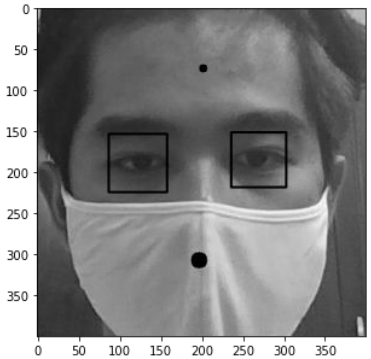
Face Reconstruction

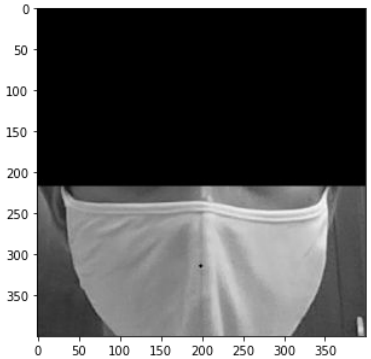
Face = mean_face + weights*eigenfaces

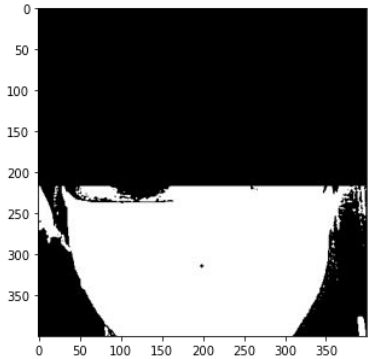


Mask Segmentation

- Get eyes coordinate
- Get skin and mask pixel
- Crop the image
- Apply image thresholding technique
- Threshold value = (3*skin + 7*mask)/10







Classifier

SVM

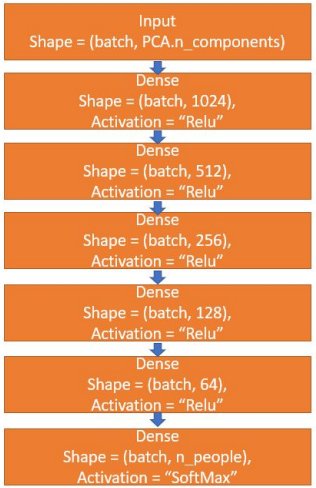
- Accuracy: 82%
- Inference time: 0.001(s)

Artificial Neural Network

- Accuracy: 80%
- Inference time: 0.074(s)

Euclidean Distance

- Accuracy: 80%
- Inference time: 0.001(s)



Conclusion

- Face Alignment
- Mask Classification
- Face Reconstruction
- Face Recognition