

# Week 3: Summer Internship

7 June 2021- 13 June 2021



# Tasks

The task in this week was to extract features from the image using Non-Negative Matrix Factorisation technique (NMF Technique).

The next task was to do image search on the output that highlights the features to get the original image.

# Plan

The tasks was planned to be done in 3 steps.

- Get faces from the images.
- Apply the algorithm to get eigenfaces and NMF features.
- Search with the output on various engines.

# Face extraction

This step is required as a pre-processing step before executing the NMF algorithm.

This step takes images as input and gives the faces as the output in .npz format using deep learning.

# Output

Extracted faces from  
images of the dataset.



# Extracting images using NMF Technique

The output we are expecting is the NMF components and the eigenfaces.

This output represents the features corresponding to the images in the dataset.

The idea to use this features to search for the images in the search engines.

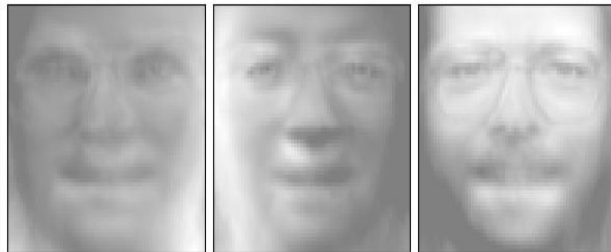
# Output

Eigenfaces - PCA using randomized SVD



Eigenfaces corresponding  
to the dataset

Non-negative components - NMF



NMF components  
corresponding to the  
images in the dataset

# Output from NMF features



Tested at:  
<https://images.google.com/>

A screenshot of a Google Images search for 'hair design'. The search bar at the top shows the query 'hair design' and a small thumbnail of a person's face. Below the search bar, the results show 'About 2 results (3.11 seconds)'. The first result is a small thumbnail of a person's face with the text 'Image size: 194 x 192' and 'No other sizes of this image found.' Below this, there is a section for 'Possible related search: hair design' with two links to YouTube videos. The first link is 'https://www.youtube.com &gt; watch' followed by 'hair style girl || hairstyle || natural hair styles || simple hairstyle ...' and the second link is 'https://www.youtube.com &gt; watch' followed by 'easy and beautiful hairstyle || new hairstyle || hairstyles 2018 ...'. At the bottom, there is a section for 'Visually similar images' showing a grid of 10 small thumbnails of various people's faces.



# Output from eigenfaces



Tested at:  
<https://images.google.com/>


Google

Scree....44.53.png X hair design

X Camera Voice Search

Q All Images Maps Shopping More Settings Tools


About 2 results (1.65 seconds)


 Image size: 194 x 198  
No other sizes of this image found.

Possible related search: **hair design**

[https://www.youtube.com > watch](https://www.youtube.com/watch?v=36Ju7W4BBlack)  
**hair style girl || hairstyle || natural hair styles || simple hairstyle ...**  
04-Apr-2018 — Medium Brown Hair Dummy - <https://amzn.to/36Ju7W4Black> Hair Dummy ...  
natural hair styles || simple hairstyle || hairstyles || **hair design**.

[https://www.youtube.com > watch](https://www.youtube.com/watch?v=36Ju7W4BBlack)  
**easy and beautiful hairstyle || new hairstyle || hairstyles 2018 ...**  
15-Mar-2018 — Medium Brown Hair Dummy - <https://amzn.to/36Ju7W4Black> Hair ... hairstyle ||  
new hairstyle || hairstyles 2018 || **hair design** || hair style girl.

 **Visually similar images**



# Inference from the output of google images

One of the main observation about the behaviour of google images is that it only looks for visually similar images and text in the image and give the output accordingly.

Although it might do that in some cases, but it is not meant for deep fake detection, retrieving the original etc.

Restricted search is available only for text in Google search engine and not for images.

# Output from NMF features



Tested at:  
<https://pimeyes.com/en>

*PimEyes*

2 results in 0.75s  
0 archival results so far

NMF - Train time 0.1s

<https://sklearn.apache...>

[Open image](#) [Open website](#)

[Copy link](#) [Add to Guard](#)

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Indexed at November 27, 2020

# Output from eigenfaces



Tested at:  
<https://pimeyes.com/en>

*PimEyes*

190 results in 1.02s  
2 archival results so far

<http://sciencedocbox....>

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# Inference from the output of pimeyes

Reverse search engines such as pimeyes are more successful than google images in getting the source where this image (or similar image) appears.

It however did not return the original image, but it gave the source where the eigenfaces/NMF faces were present.

# References

Link: <https://ieeexplore.ieee.org/document/6364801>

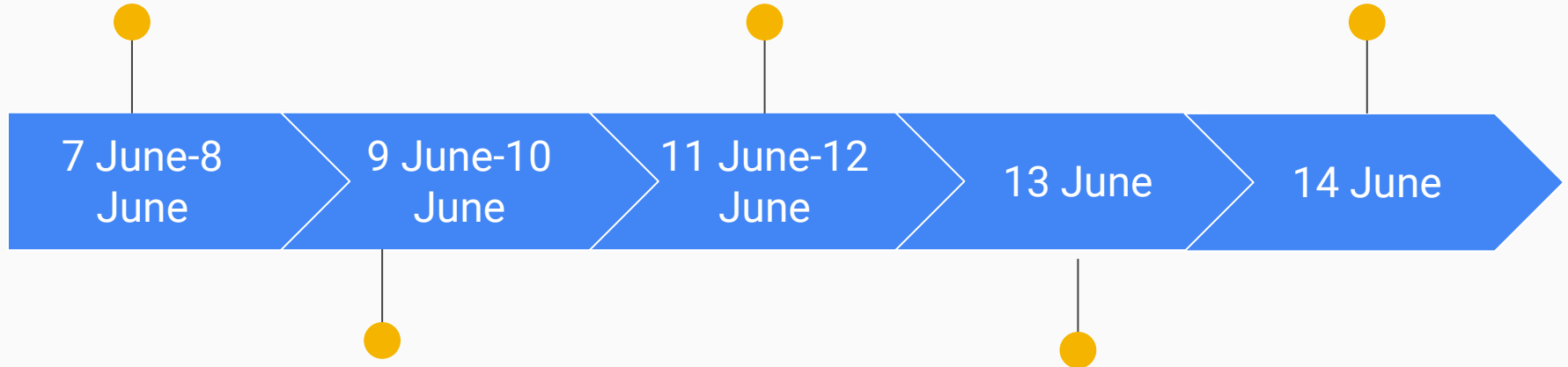
This paper talks about the technique used in extraction of features. The code for the same is pushed in the repository.

Link to the repository: <https://github.com/Deepanshu-Rohilla/intern>

Working on face  
extraction algorithm

Found eigenfaces  
concept and coded  
that up

Report work +  
Summarising



NMF algorithm  
reading and code work

Testing the output on  
various search engines