

### January 18th, 2022

- Met with Dr. Akbas and the team to discuss semester goals for the project.
- Decided to use machine learning to map the applicable significant landmarks on a patient's face.

### January 23rd, 2022

- Researched possible solutions for automatically mapping facial landmarks.
- Found plenty of resources for mapping landmarks on 2D images, but very few resources for 3D objects.
- Wrote a python script to convert a 3D .obj file into a depth map of the face elements.



```

pixel_graph = np.full((2500, 2500), 0)
blur_scale = 5

for coordinate in test_array:
    pixel_graph[int(coordinate[0]), int(coordinate[1])] = coordinate[2]
    for i in range(blur_scale):
        pixel_graph[int(coordinate[0]) + i, int(coordinate[1])] = coordinate[2]
        pixel_graph[int(coordinate[0]) - i, int(coordinate[1])] = coordinate[2]
        pixel_graph[int(coordinate[0]), int(coordinate[1]) + i] = coordinate[2]
        pixel_graph[int(coordinate[0]), int(coordinate[1]) - i] = coordinate[2]











plt.figure(figsize=(12,12), dpi=80)
plt.imshow(pixel_graph, interpolation='nearest')
plt.show()

```

January 30th, 2022

- Wrote a python script to create clusters of similar looking faces.
- Created groups based on each patient's 10 most similar looking faces, allowing overlap.
- Created 10 groups of 8 faces without overlap

face_group1	12/6/2021 6:17 PM	File folder
face_group2	12/6/2021 6:17 PM	File folder
face_group3	12/6/2021 6:17 PM	File folder
face_group4	12/6/2021 6:17 PM	File folder
face_group5	12/6/2021 6:17 PM	File folder
face_group6	12/6/2021 6:17 PM	File folder
face_group7	12/6/2021 6:17 PM	File folder
face_group8	12/6/2021 6:17 PM	File folder
face_group9	12/6/2021 6:17 PM	File folder
face_group10	12/6/2021 6:17 PM	File folder
face_group11	12/6/2021 6:17 PM	File folder
face_group12	12/6/2021 6:17 PM	File folder
face_group13	12/6/2021 6:17 PM	File folder
face_group14	12/6/2021 6:17 PM	File folder
face_group15	12/6/2021 6:17 PM	File folder
face_group16	12/6/2021 6:17 PM	File folder
face_group17	12/6/2021 6:17 PM	File folder
face_group18	12/6/2021 6:17 PM	File folder
face_group19	12/6/2021 6:17 PM	File folder
face_group20	12/6/2021 6:17 PM	File folder
face_group21	12/6/2021 6:17 PM	File folder









 face_group1	1/30/2022 9:18 PM	File folder
 face_group2	1/30/2022 9:18 PM	File folder
 face_group3	1/30/2022 9:18 PM	File folder
 face_group4	1/30/2022 9:18 PM	File folder
 face_group5	1/30/2022 9:18 PM	File folder
 face_group6	1/30/2022 9:18 PM	File folder
 face_group7	1/30/2022 9:18 PM	File folder
 face_group8	1/30/2022 9:18 PM	File folder
 face_group9	1/30/2022 9:18 PM	File folder
 face_group10	1/30/2022 9:18 PM	File folder

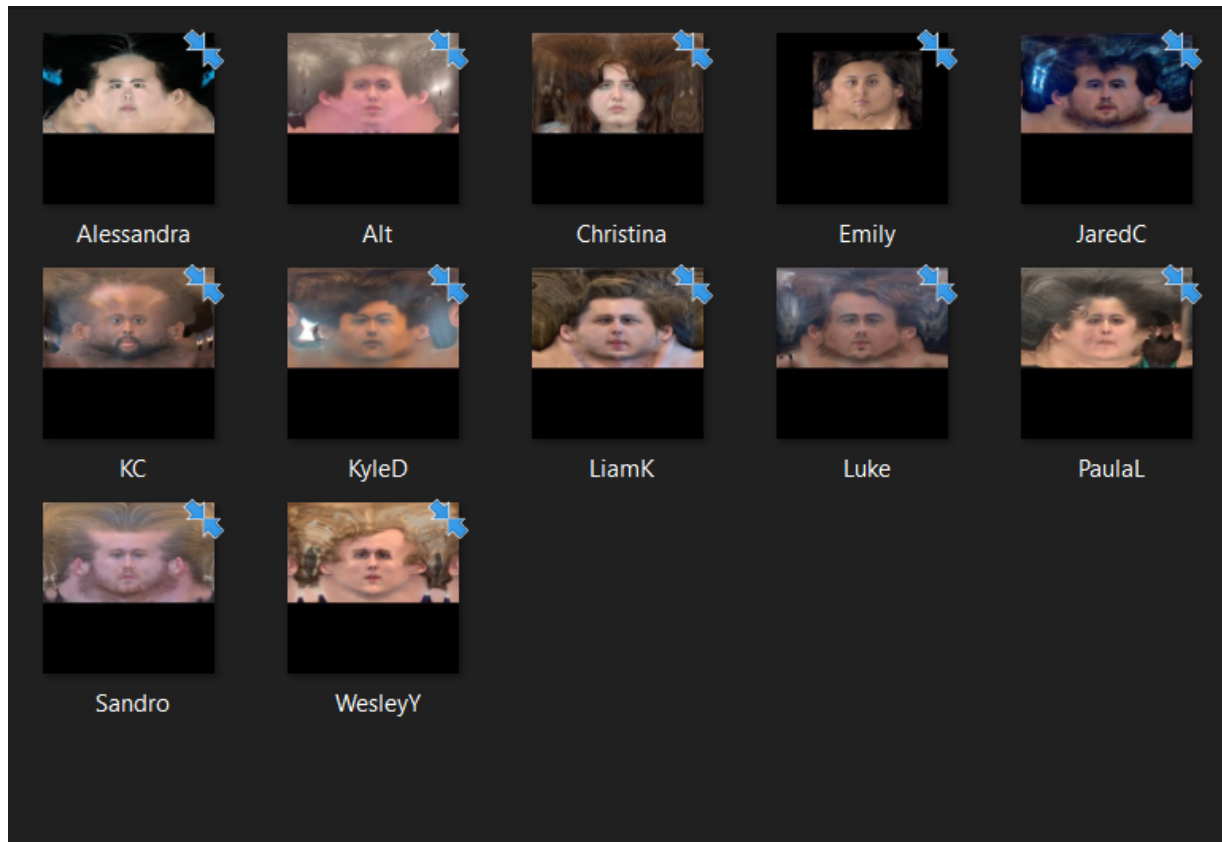
## February 2nd, 2022

- Worked with Alessandra to complete sections 1 and 2 of the SRS and SDD documents

## February 6th, 2022

- Wrote python script to create face clusters using a k-means algorithm
- Created 8 clusters containing varying amount of patients

 face_group0	2/7/2022 6:05 PM	File folder
 face_group1	2/7/2022 6:05 PM	File folder
 face_group2	2/7/2022 6:05 PM	File folder
 face_group3	2/7/2022 6:05 PM	File folder
 face_group4	2/7/2022 6:05 PM	File folder
 face_group5	2/7/2022 6:05 PM	File folder
 face_group6	2/7/2022 6:05 PM	File folder
 face_group7	2/7/2022 6:05 PM	File folder



### February 13th, 2022

- Reached out to GANFit database owners: the MICC, in order to download the dataset and generate a larger data pool. However, they were unable to help me and we had to scrap GANFit.

### February 20th, 2022

- Researched different clustering algorithms to implement in order to optimize the face clusters.
- Decided upon 5 others in addition to Kmeans: affinity propagation, BIRCH, agglomerative, spectral, and Gaussian mixture clustering

March 2nd, 2022

- Wrote python script to generate clusters using multiple different clustering algorithms, including, affinity propagation, BIRCH, agglomerative, spectral, and Gaussian mixture.

```
def gaussian_mixture():
    df = pd.read_csv('database.csv')
    ratios = df.drop(['patient', 'class'], axis=1)

    gaussian = GaussianMixture(n_components=7).fit(ratios).predict(ratios)

    df['gaussian'] = gaussian

    newpath = r'C:\Users\jared\Documents\DigitizedRhinoPlasty\DigitizedRhinoPlasty-main\face_group_gaussian'
    if os.path.exists(newpath):
        shutil.rmtree(newpath)

    os.makedirs(newpath)

    for i in range(len(gaussian)):
        folder_location = (newpath + '\\face_group' + str(df.loc[i, 'gaussian']))
        file_location = "C:\\Users\\jared\\Documents\\DigitizedRhinoPlasty\\DigitizedRhinoPlasty-main\\ScanI

        if not (os.path.exists(folder_location)):
            os.makedirs(folder_location)

        try:
            shutil.copy(file_location, folder_location)
        except (FileNotFoundError):
            pass

gaussian_mixture()
spectral()
agglomerative()
birch()
affinity_propagation()
kmeans()
```

face_group_affinity	3/2/2022 6:43 PM	File folder
face_group_agglomerative	3/2/2022 6:43 PM	File folder
face_group_birch	3/2/2022 6:43 PM	File folder
face_group_gaussian	3/2/2022 6:43 PM	File folder
face_group_kmeans	3/2/2022 6:43 PM	File folder
face_group_spectral	3/2/2022 6:43 PM	File folder

- Each folder contains a varying number of clusters depending on the settings of the algorithm.

March 6th

- Updated the SRS and SDD documents to align with new goals for the 3rd Sprint.

## March 16th

- Created sprint 3 demo presentation.
- Identified all the nose points to plot and manipulate

### Nose Points

- Alar base junction - ac\_l ac\_r
- Alar rim's highest point - armax\_l armax\_r
- Alar flare - al\_l al\_r
- Anterior point of nostril - stn\_l stn\_r
- Columellar break point - cb
- Columellar rim - cmin\_l cmin\_r
- Maxilloanteriorale - ma\_l ma\_r
- Maxillofrontale - mf\_l mf\_r
- Nasal parenthesis - np\_l np\_r
- Posterior point of nostril - itn\_l itn\_r
- Pronasale - prn
- Rhinion - r
- Sellion - se
- Sill-base junction - sbj\_l sbj\_r
- Subalare - sbal\_l sbal\_r
- Subnasale - sn\_l sn\_r
- Supratip break point - s
- Tip defining point - td\_l td\_r