

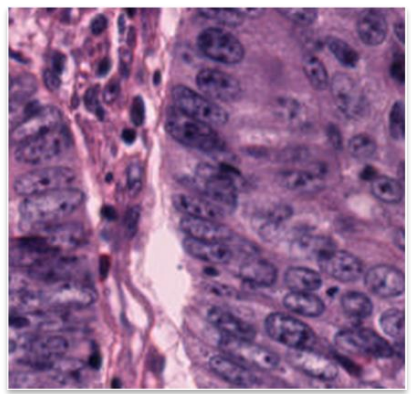
Data Source

- Our data source is a microscopic whole slide image.
- The thumbnail image in this section shows one of the microscopic image from TCGA cohort, colon adenocarcinoma organ.
- The highest Magnification of this image is 40x

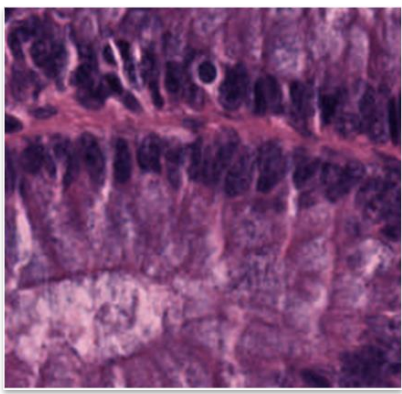


Patch Extraction

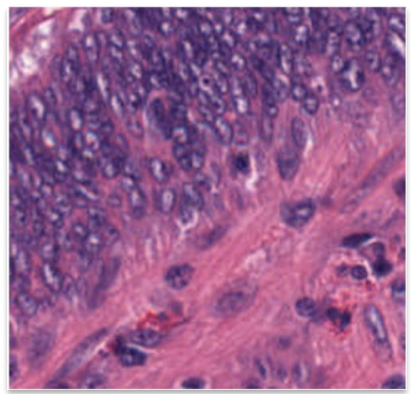
- For training a neural network model, we had to extract patch from the previous pathology image.
- We have extracted each patch using 40x magnification
- Each training patch has a dimension of 400x400
- We have extracted 5 types of patch from pathology image
- These 5 types are – Epithelium, Stroma, Tumor, Necrosis and Dysplasia



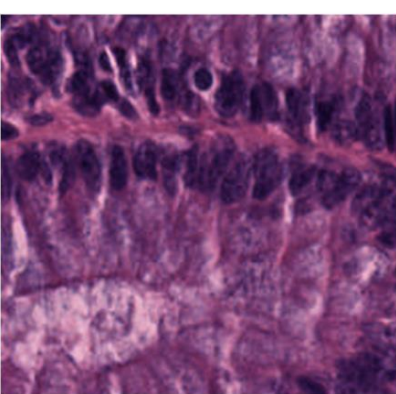
Tumor



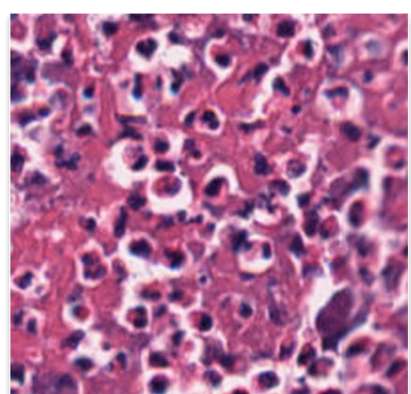
Stroma



Dysplasia



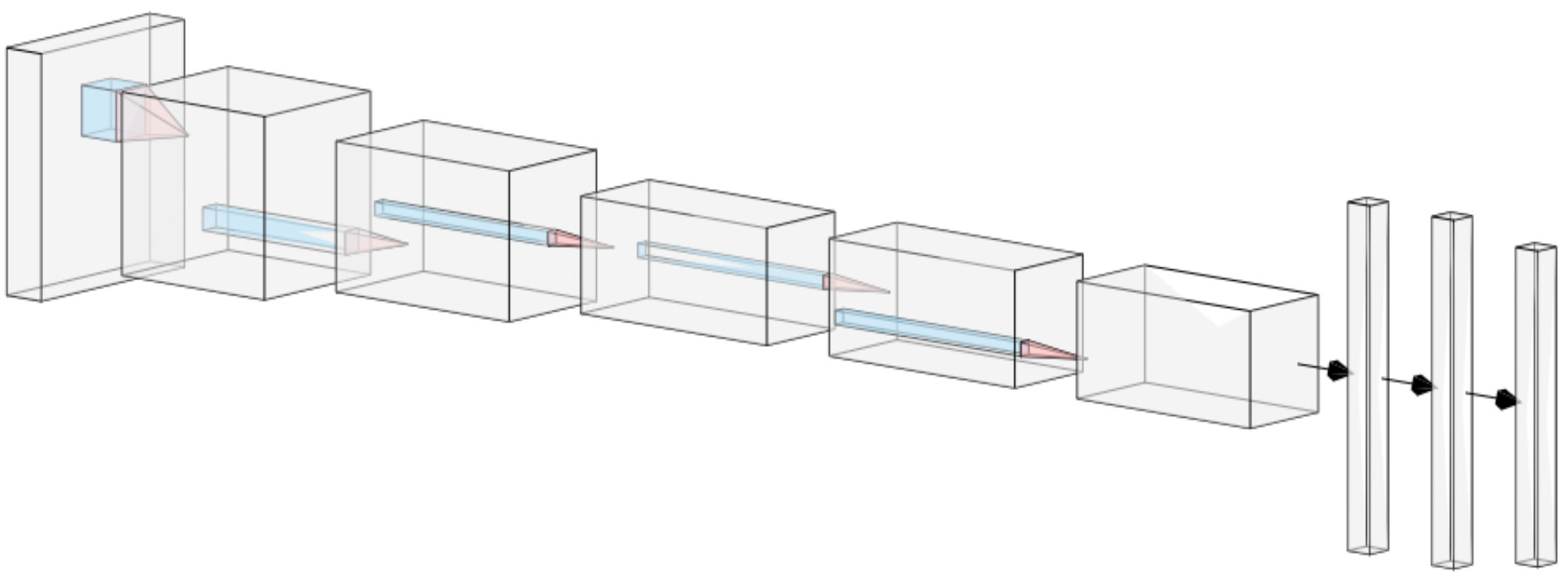
Epithelium



Necrosis

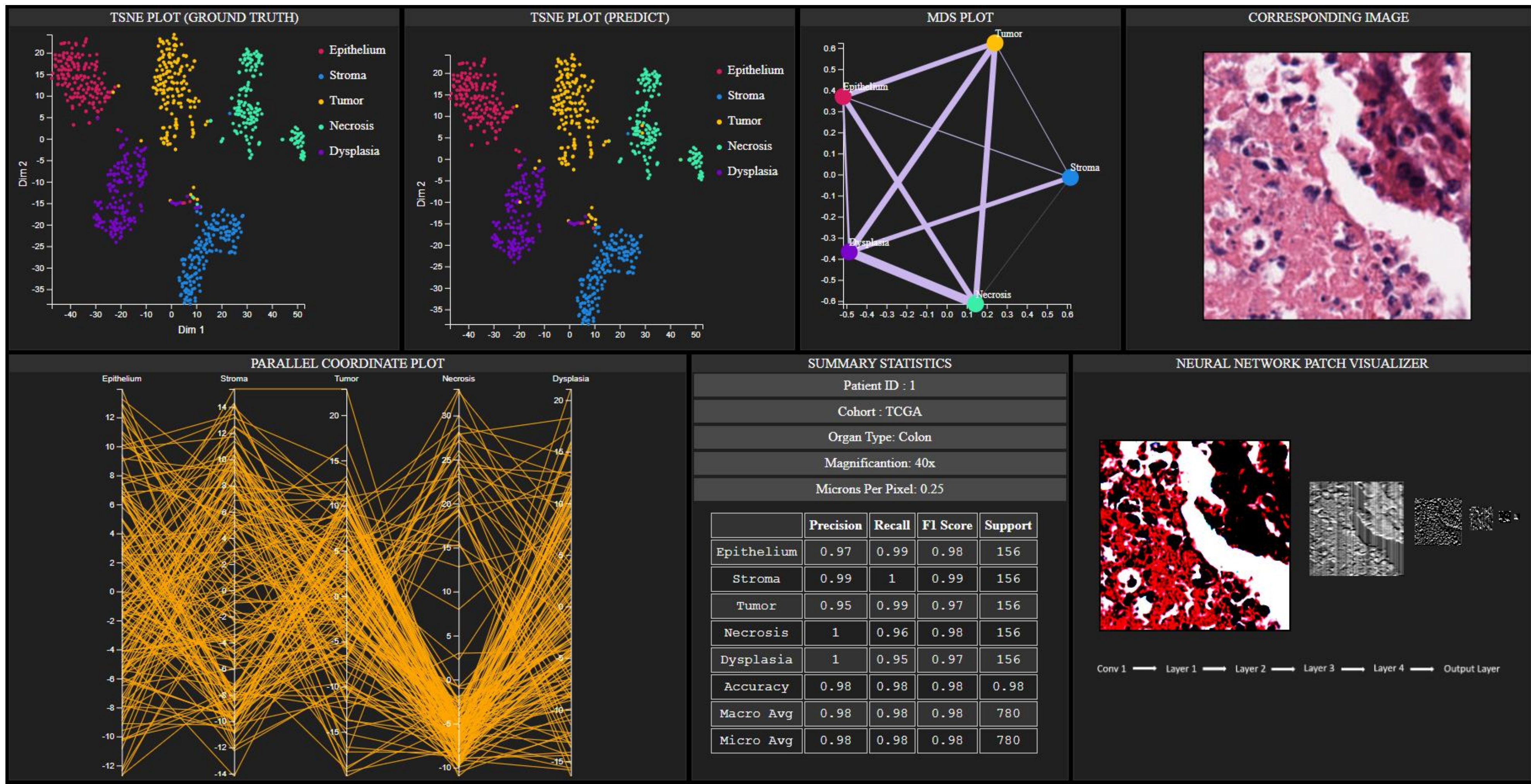
Training and Testing

- Training patches are extracted from 200 WSIs
- Total Number of Training Patches is 925260
- Tumor Patches – 234,679 (25.36%)
- Dysplasia Patches – 7,205 (0.78%)
- Epithelium Patches – 128,610 (13.68%)
- Stroma Patches – 550,858 (59.53%)
- Necrosis Patches – 3,908 (0.42%)
- Train, Validation, Test Split – 80:10:10
- We have used test set in our visualization dashboard
- The Neural Network Architecture we have used is ResNet34
- Test sets are patches are equally distributed. Each type contains 156 patches



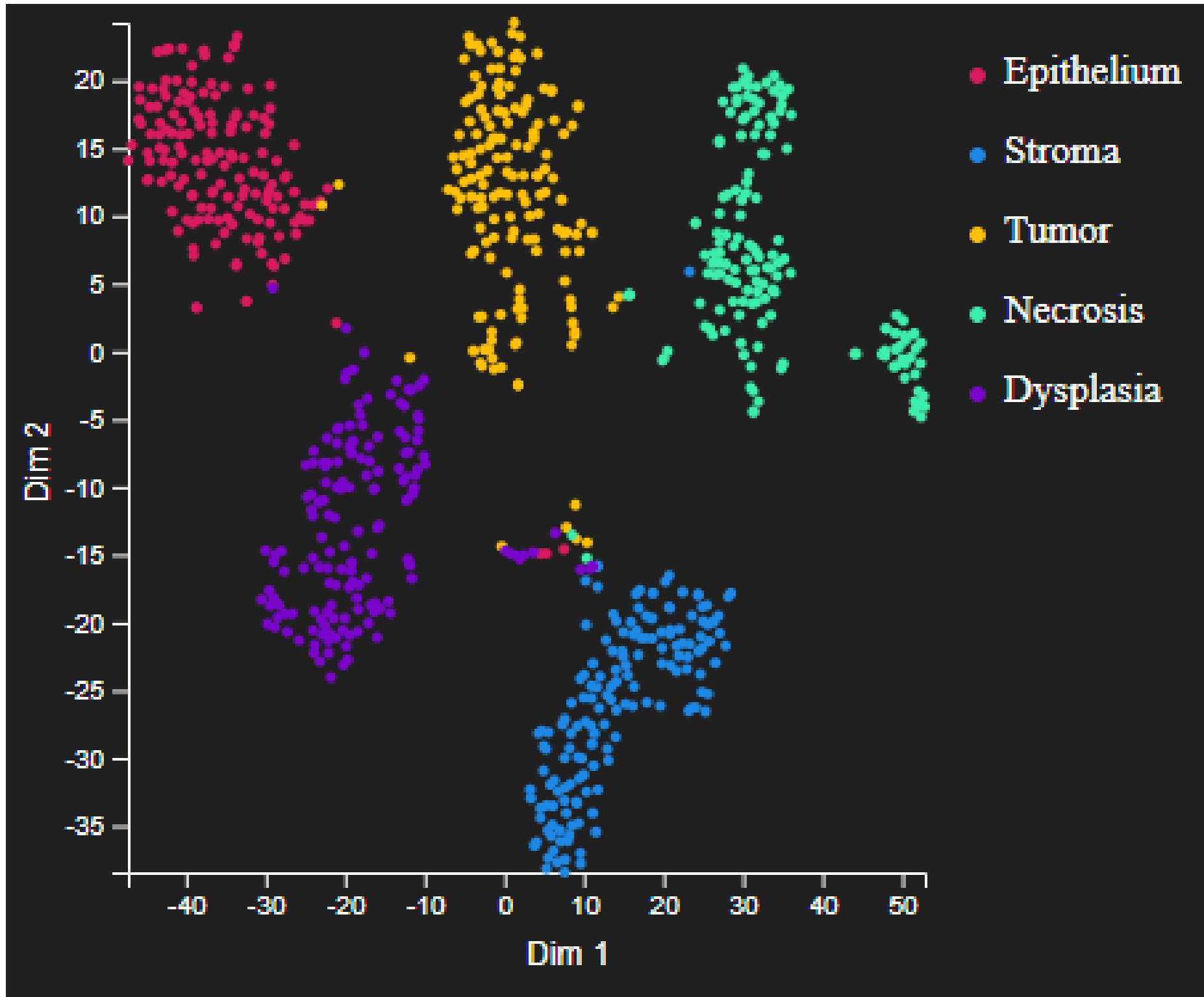
Final Dashboard

- Our Final Dashboard Contains 7 Panel Containing two TSNE Plot, Corresponding Patch Image from TSNE Plot, MDS Plot, PCP Plot, Summary Statistics and Neural Network's each layer's image.
- Two TSNE plot are two types. One is for ground truth, and another is prediction.



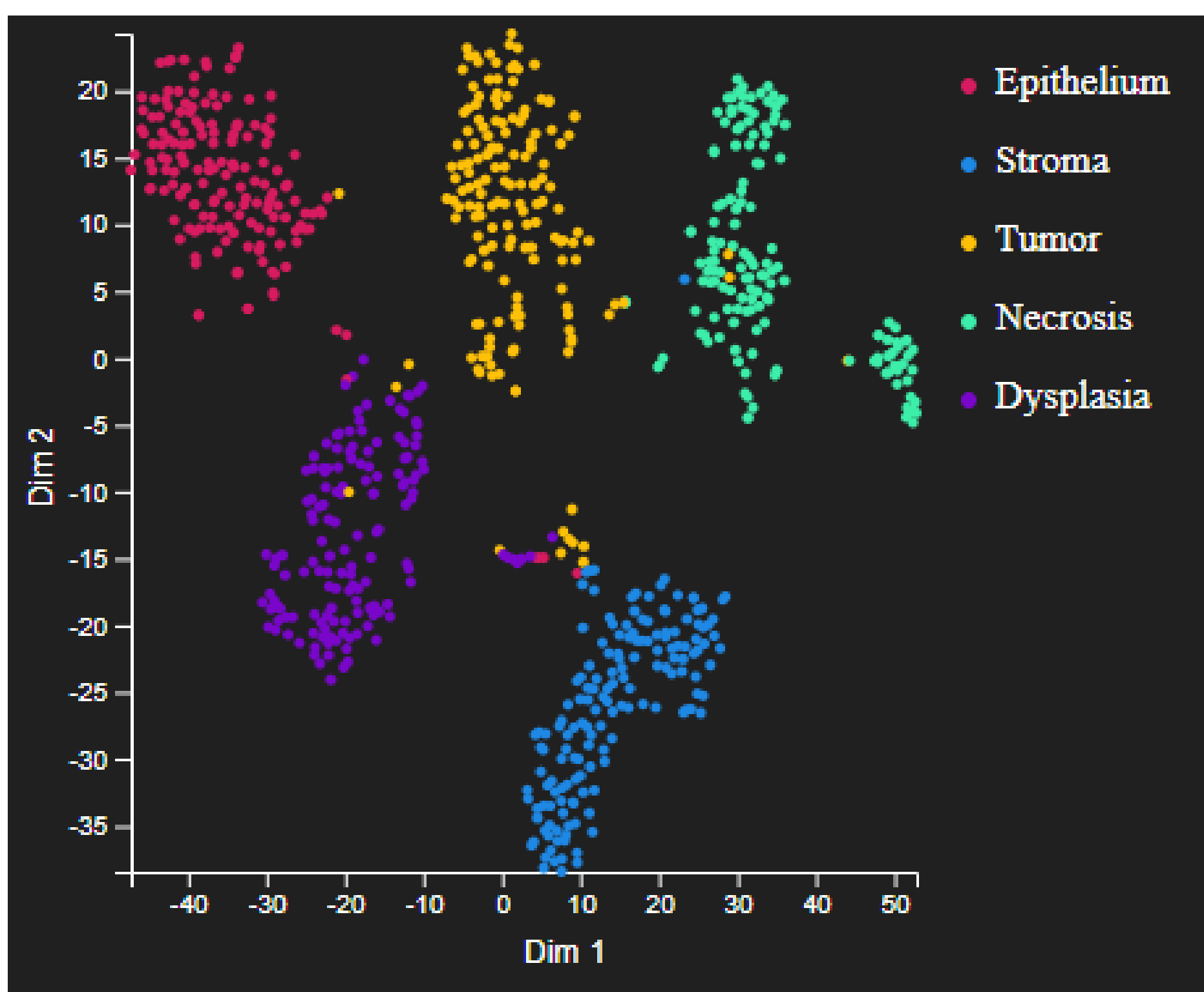
TSNE Plot (Ground Truth)

- TSNE Plot Ground Contains Scatter plot of 780 samples of patches which were embedded into 2-dimensional space using T-sne algorithm.
- The patches are labeled according to their ground truth
- In the Image it can clearly visualized that there is a distinct cluster of each type.
- There is a large gap between clusters, which implicates the model has higher accuracy.
- When we hover one of the point the bubble expands. When we press one of the point from scatter plot, it changes the corresponding image, highlights the type in mds plot, highlight line in parallel coordinate plot and finally, shows different layer images of the neural network. We have also added panning and zoom features in this plot.



TSNE Plot (Predict)

- TSNE Plot Predict also Contains Scatter plot of 780 samples of patches which were embedded into 2-dimensional space using T-sne algorithm.
- The patches are labeled according to their prediction
- Comparing predict TSNE with ground truth TSNE, we can find out where the model has predicted wrong.
- T-sne plot (predict) is linked to other panels.
- When we hover one of the point the bubble expands. When we press one of the point from scatter plot, it changes the corresponding image, highlights the type in mds plot, highlight line in parallel coordinate plot and finally, shows different layer images of the neural network. We have also added panning and zoom features in this plot.

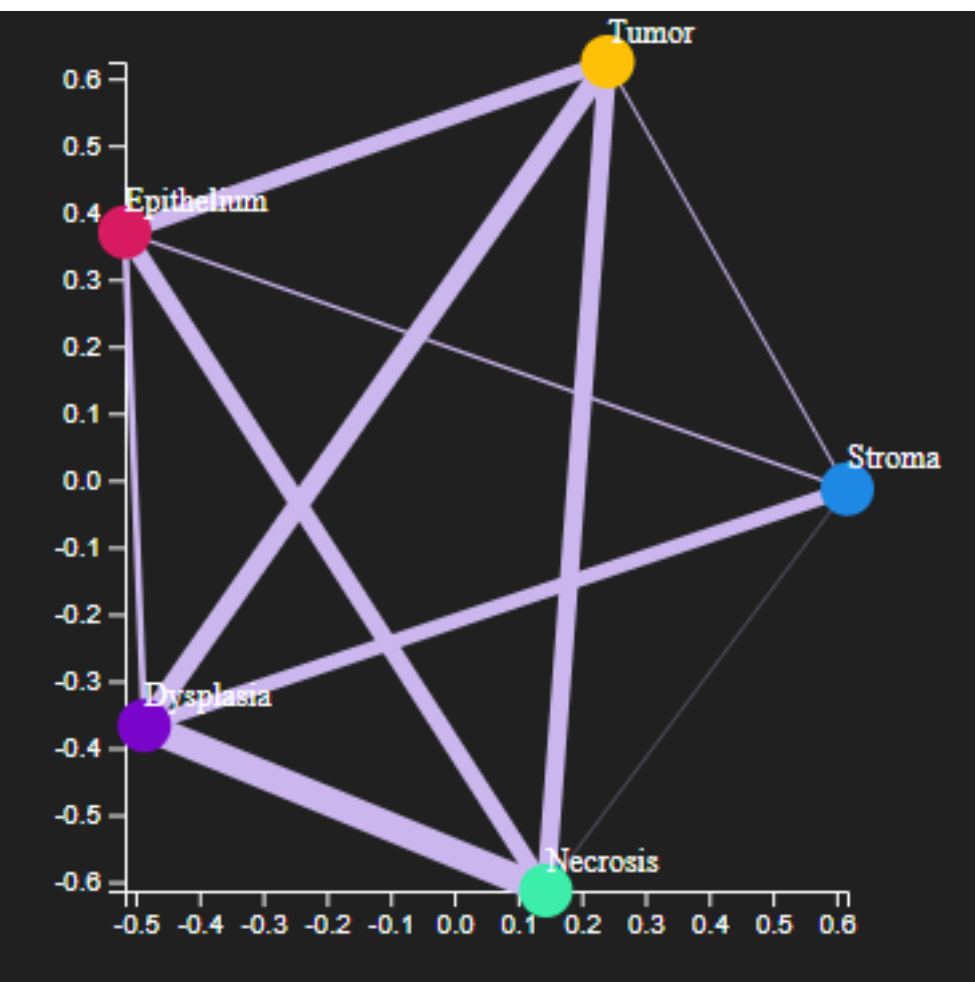


Corresponding Image

- This panel shows images based on the selected point in TSNE.
- In TSNE, Neural Networks final hidden layer's high dimensional vector is reduced into 2d space.
- It is very helpful to see the image where model has predicted wrong.

MDS Plot

- When we hover mouse over to the edges, the edge color changes and shows correlation value.
- When we hover over on the nodes it shows corresponding cluster on TSNE and also shows one of the corresponding rows of summary statistics table.



NN PATCH VISUALIZER

- This panel shows 6 layer's output image of the Neural Network.
- These images changes according the click of TSNE points.

Summary Statistics

- This panel shows information about whole slide image and classification report of the model.
- In classification report we have shown precision, recall, f1 score, support of each type of nuclei along with accuracy, macro and micro average of overall model.
- It highlights one of the row according to the hover of MDS Plot node.

PCP Plot

- In case of PCP, for each sample of each nuclei type, we converted the last hidden layer's vector into 1 dimensional vector and did the visualization.
- This panel's interaction is in both way. When we select a TSNE point according line is selected in PCP. When we filter data using brushing, according points are highlighted in TSNE plots using linking.

