

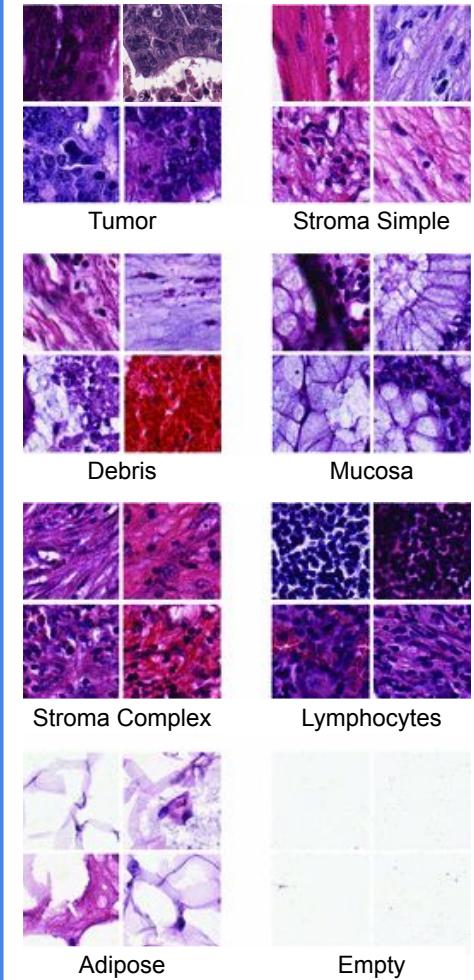
EN.601.482/682 Deep Learning

Modeling A Transferable Histopathological Image Analysis System

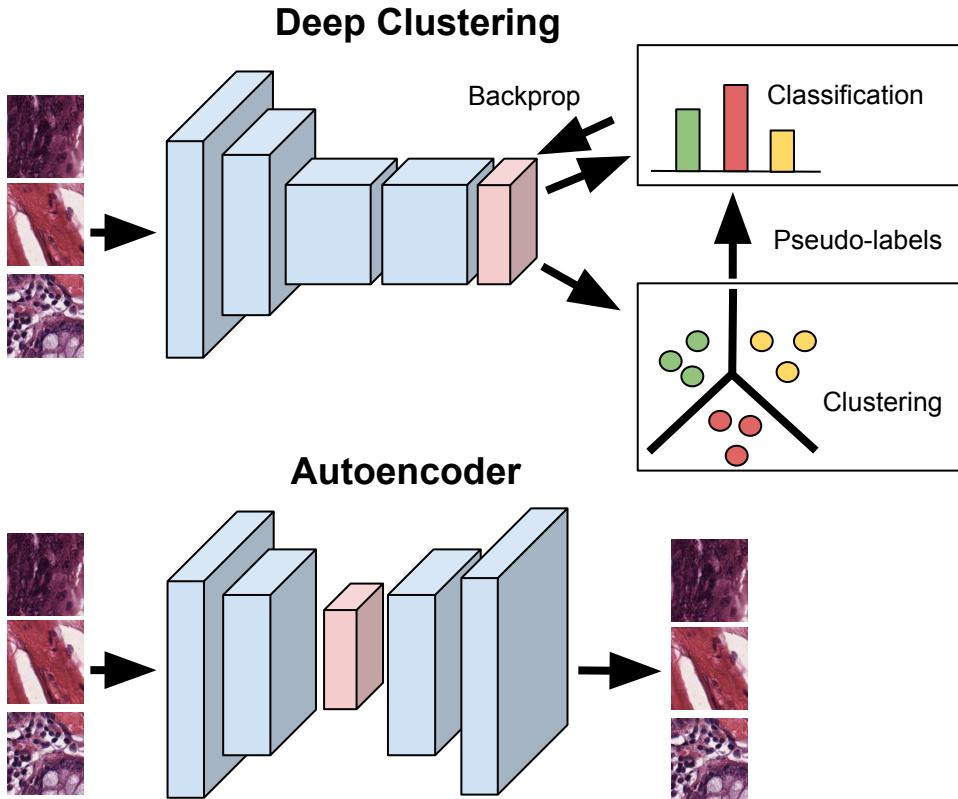
Hadley VanRenterghem, Matt Figdore, Max Xu, Taha Baig

Problem

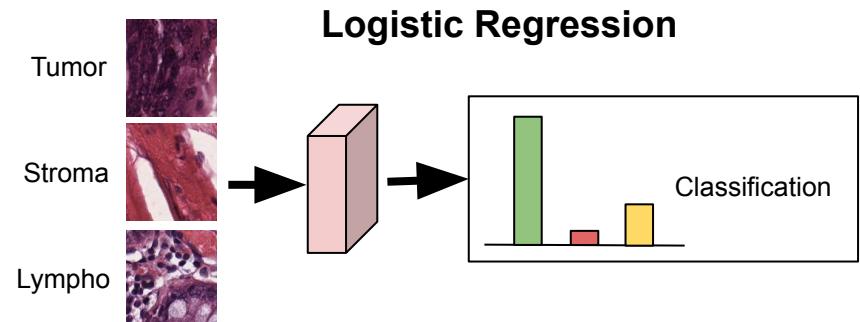
Colorectal Cancer Histology



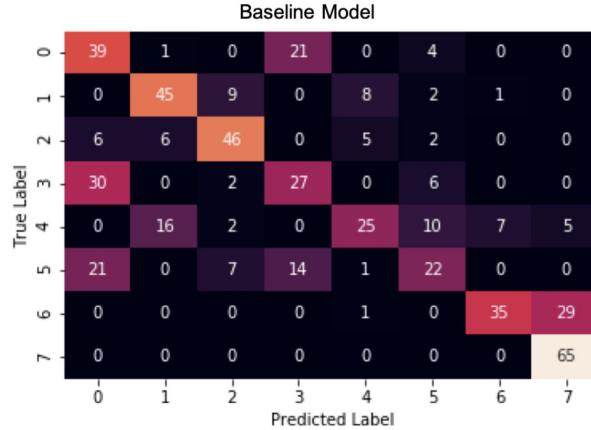
Unsupervised Approach



Evaluation Approach

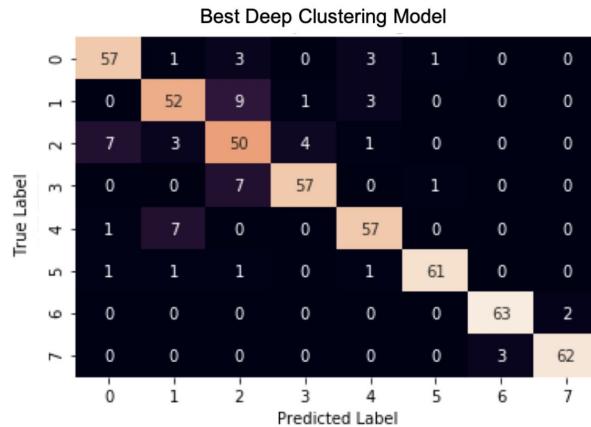


Confusion Matrix

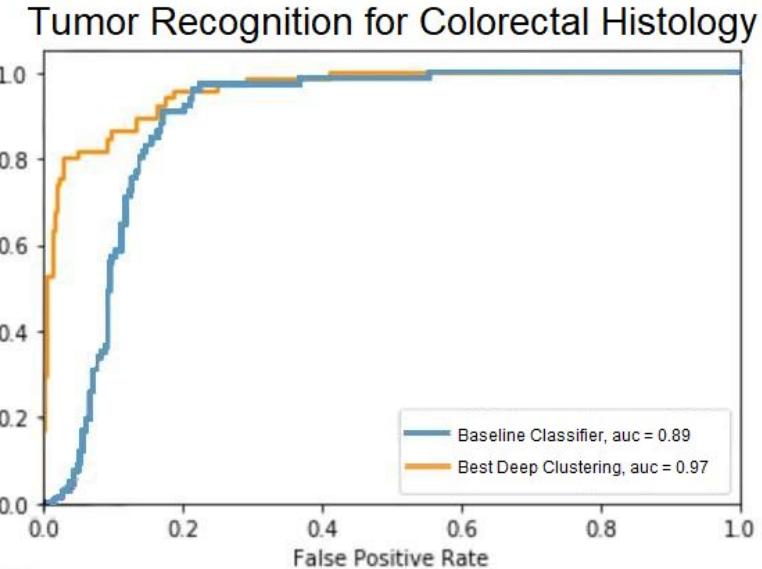


Legend

- 0 : Tumor
- 1 : Stroma
- 2 : Complex
- 3 : Lympho
- 4 : Debris
- 5 : Mucosa
- 6 : Adipose
- 7 : Empty



ROC Curve



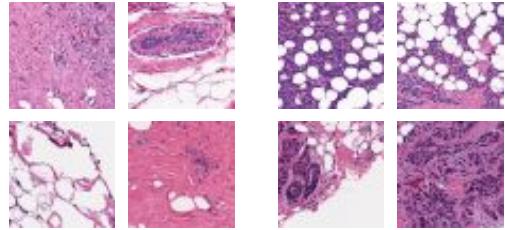
Classification Accuracy

Baseline Classifier: 58%
Best Deep Clustering: 88%
Best Autoencoder: 35%



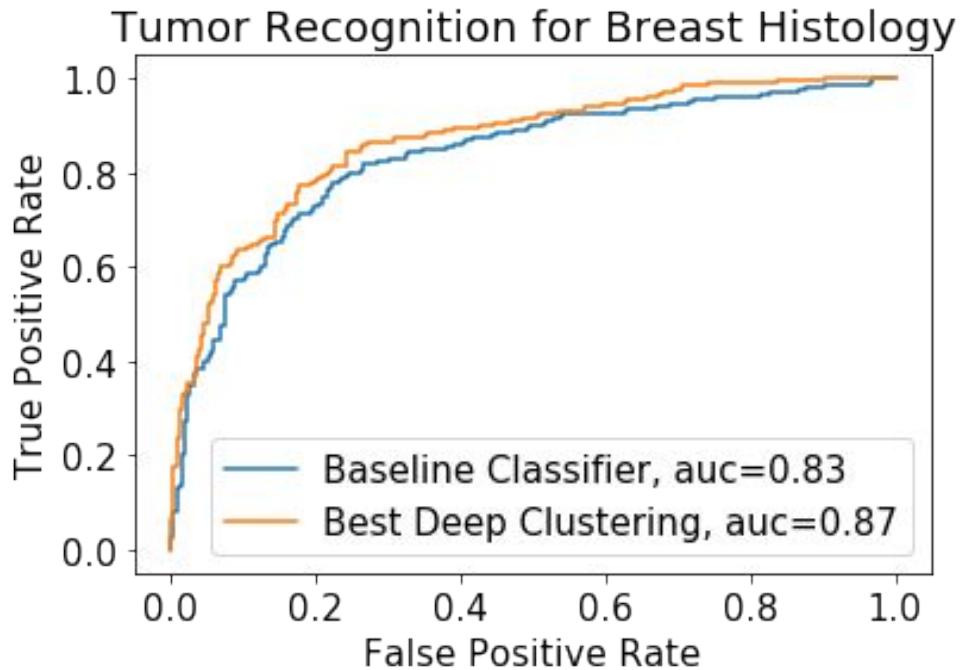
Transfer Learning Results

Breast Cancer Histology



No Tumor

Tumor



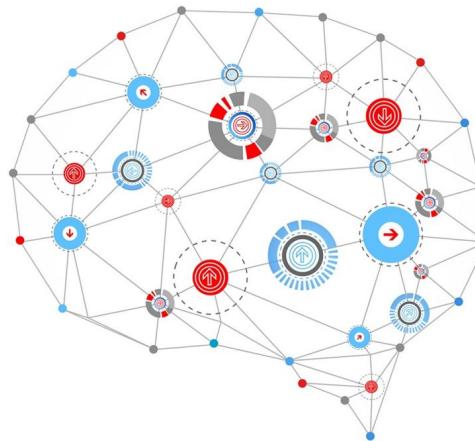
Next Steps

Deep Clustering

- Scale up training dataset
- Combine k-means loss and cluster prediction loss
- Explore various CNN architectures (e.g. VGG16)

Autoencoder

- Integrate deep clustering technique



Domain Transfer

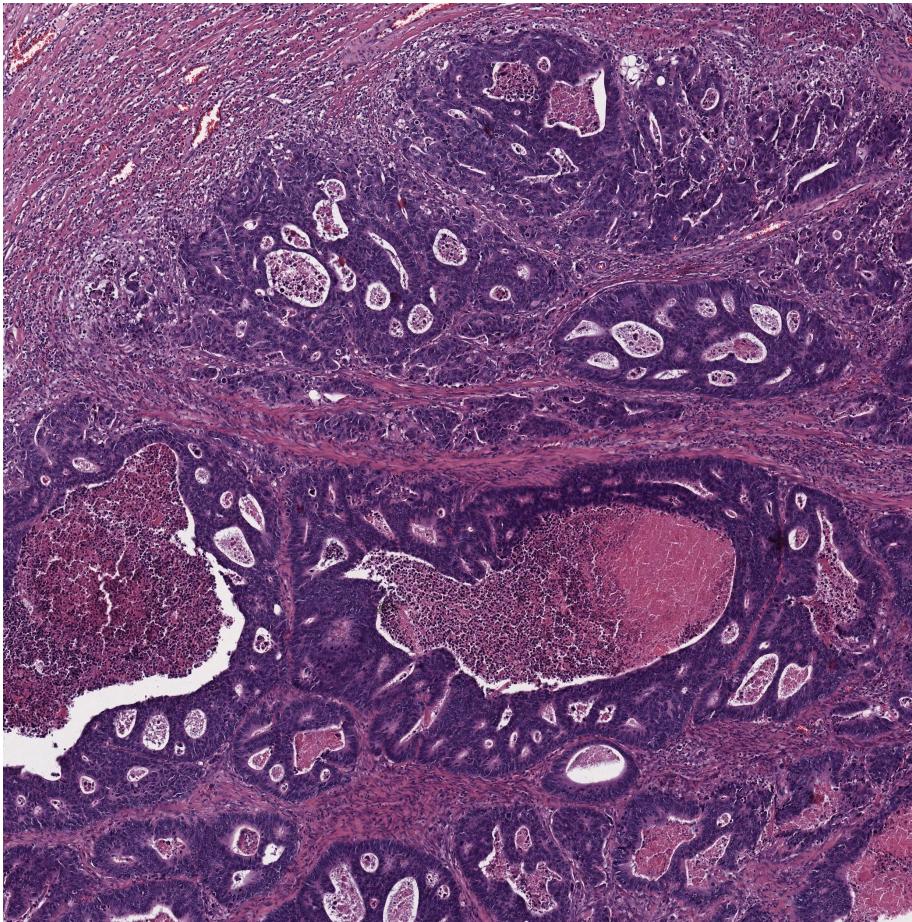
- Include greater variety of histology images
- Introduce better stain normalization



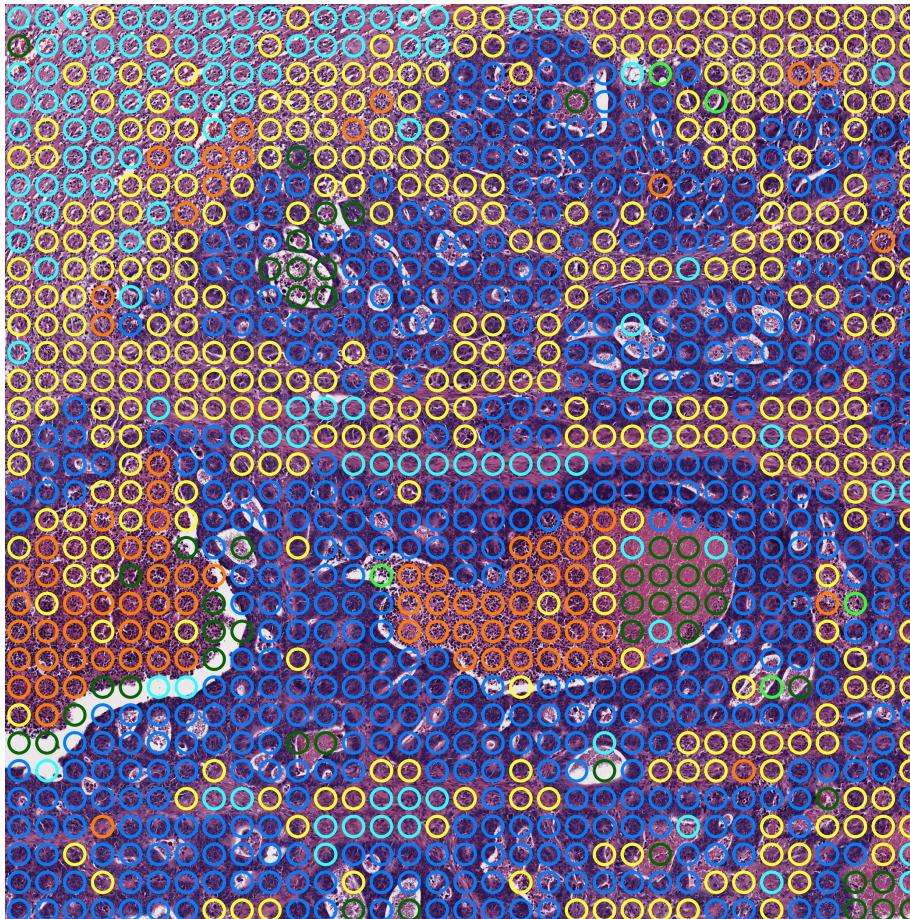
Whole Slide Demo



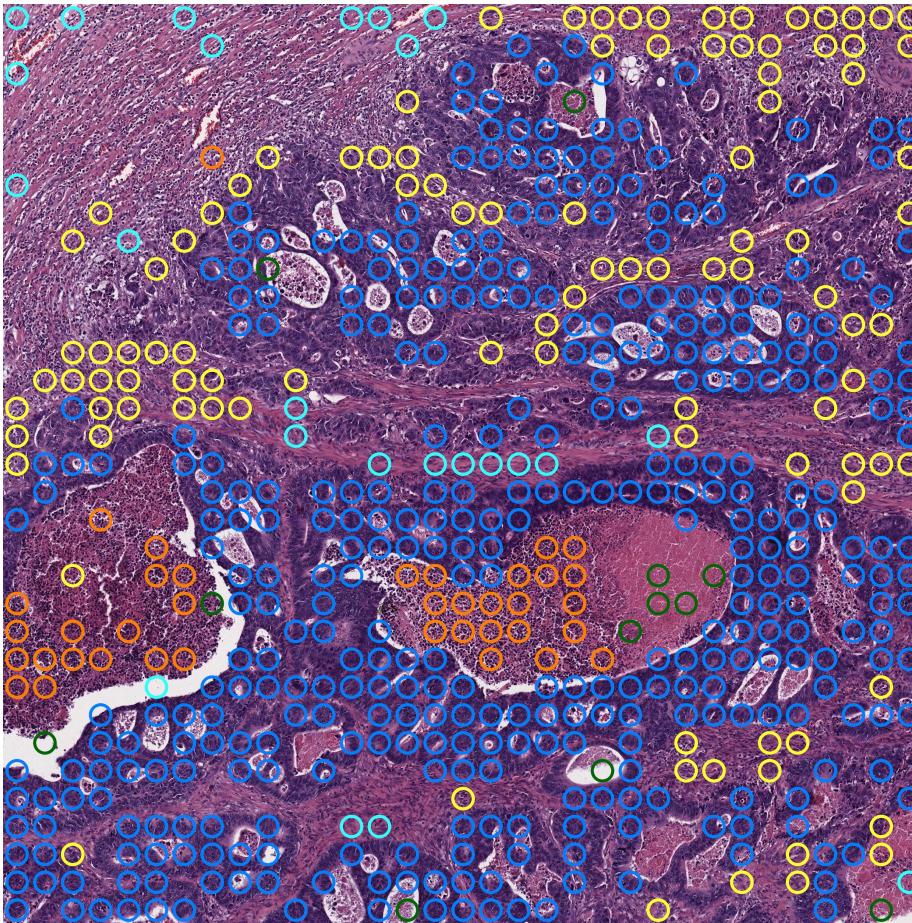
Original Image



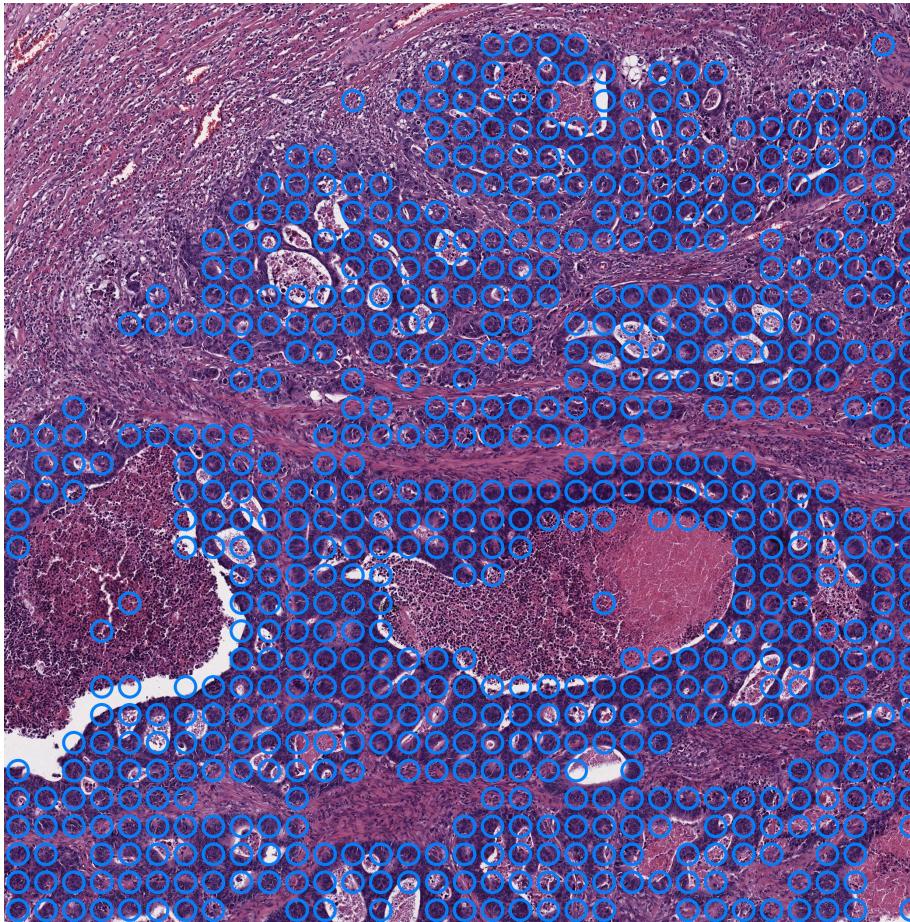
Classification



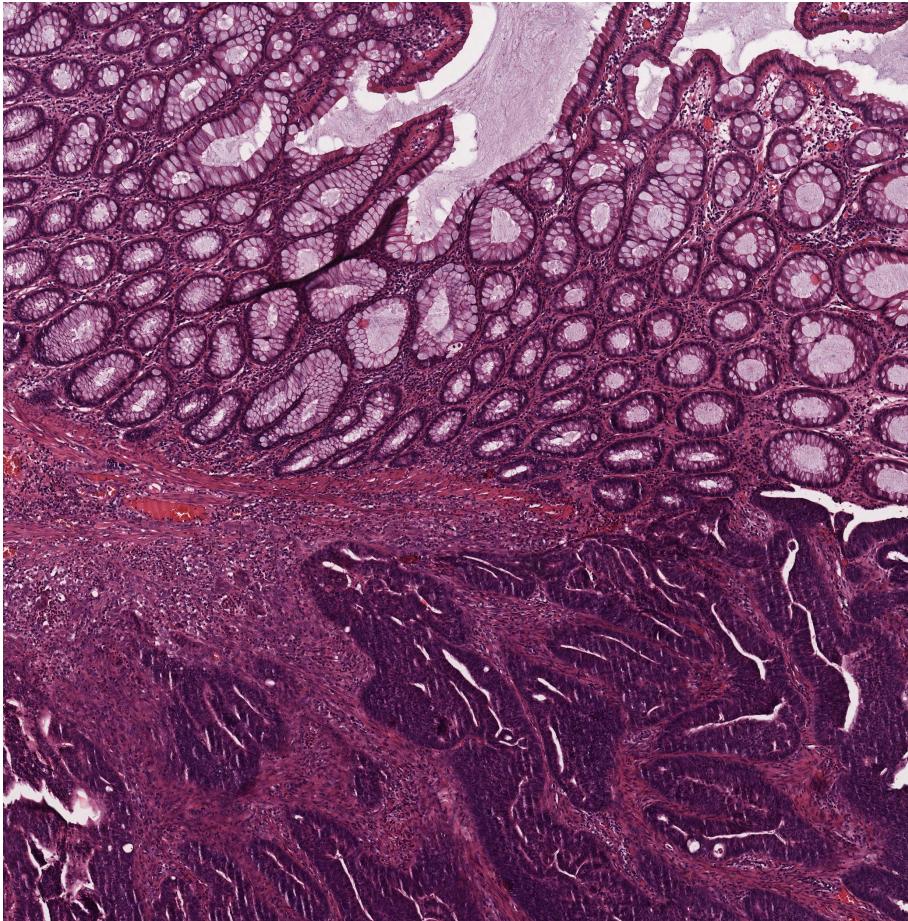
.80+ Score



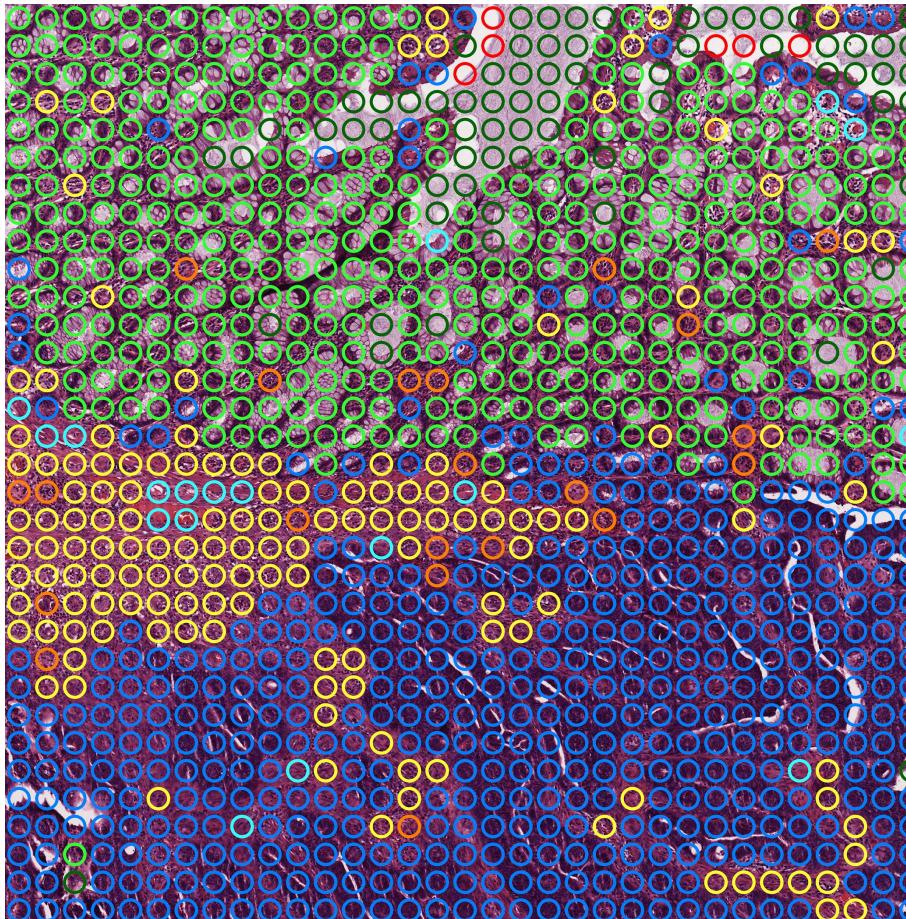
.125+ Tumor



Original Image



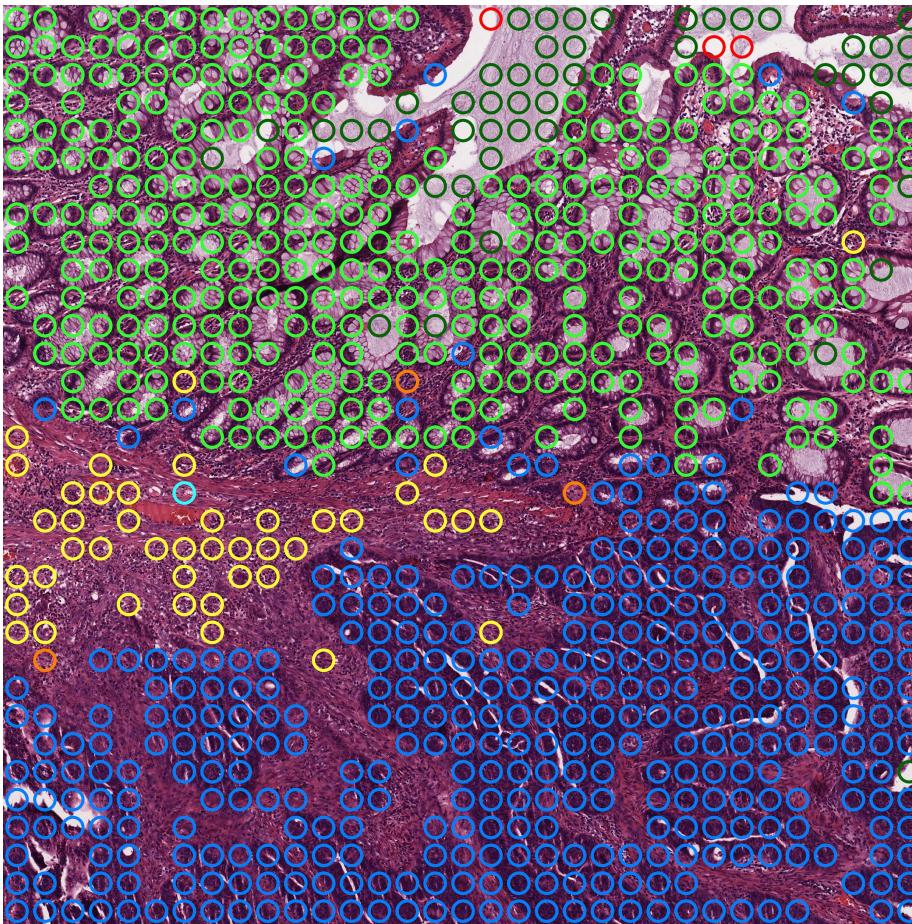
Classification



tumor	blue
stroma	cyan
complex	yellow
lympho	orange
debris	dark green
mucosa	light green
adipose	red
empty	black



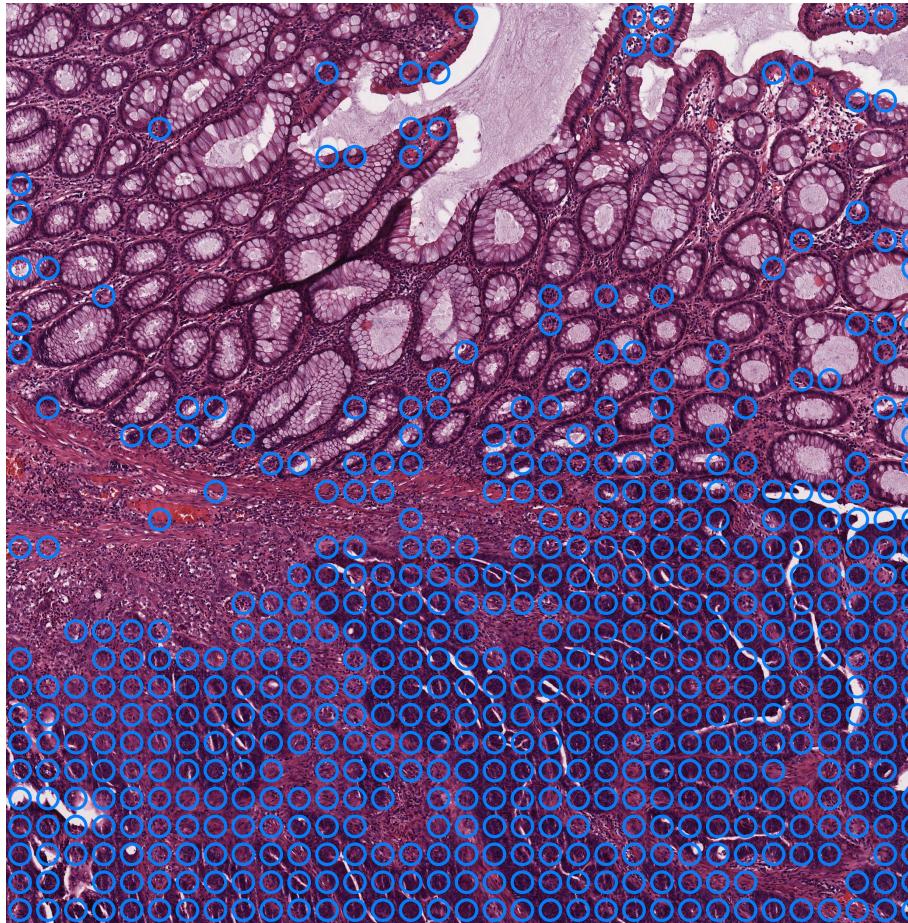
.80+ Score



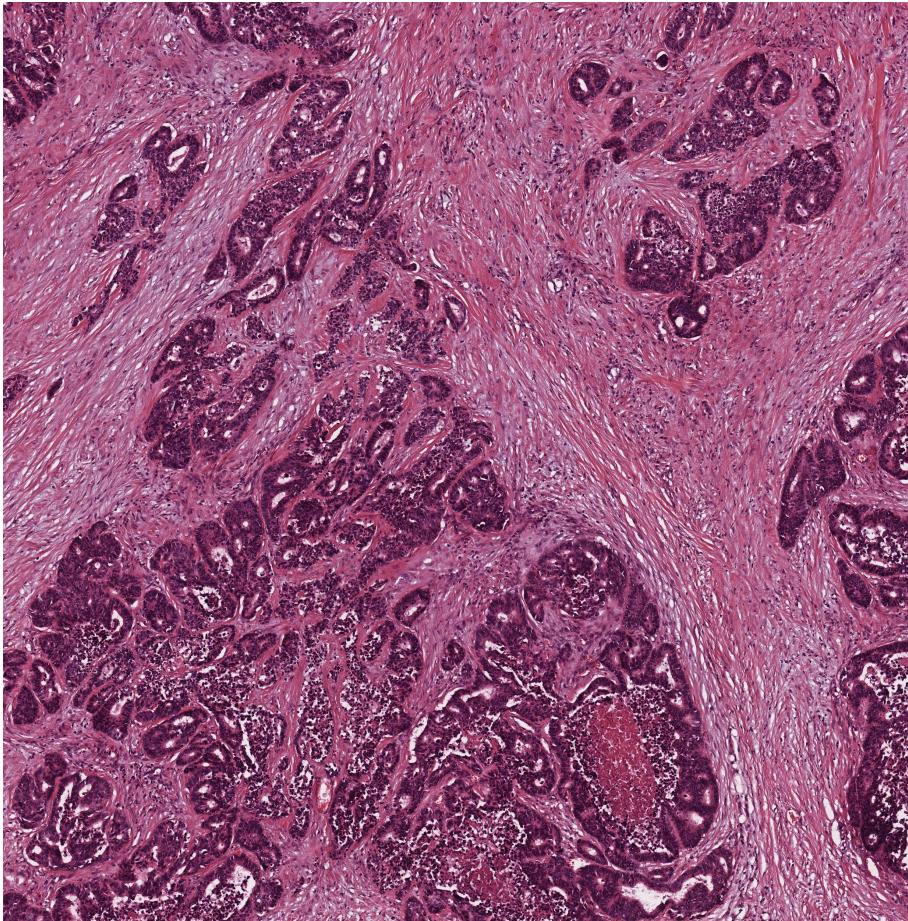
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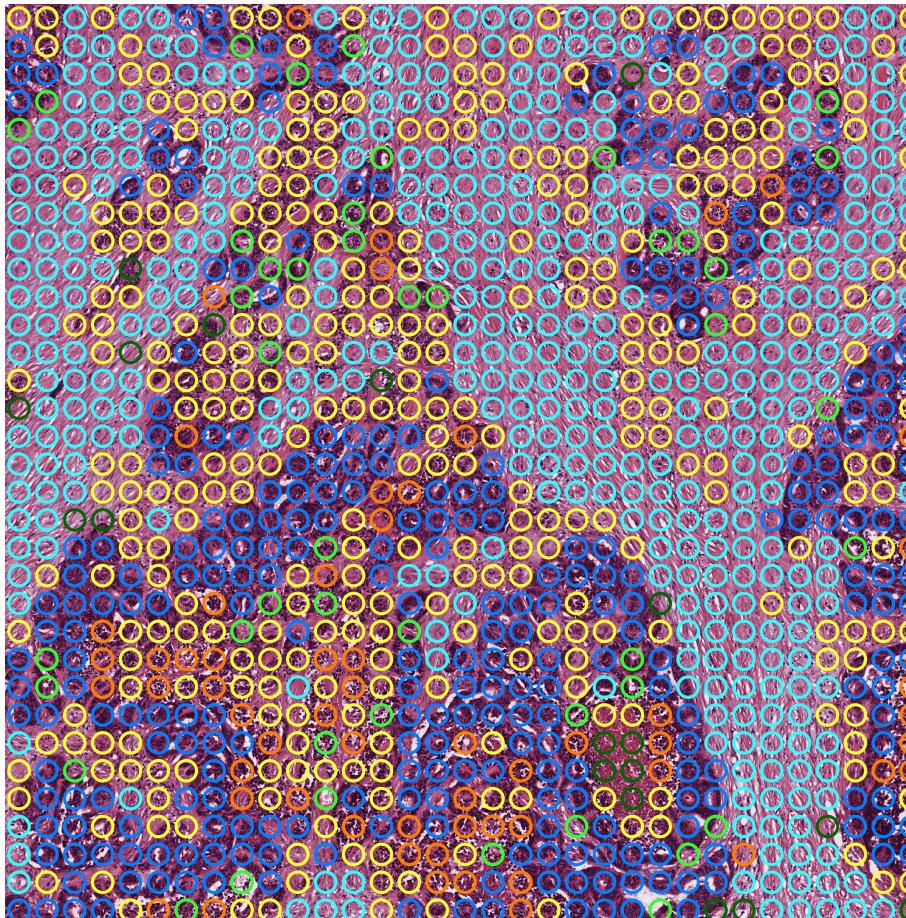
.125+ Tumor



Original Image



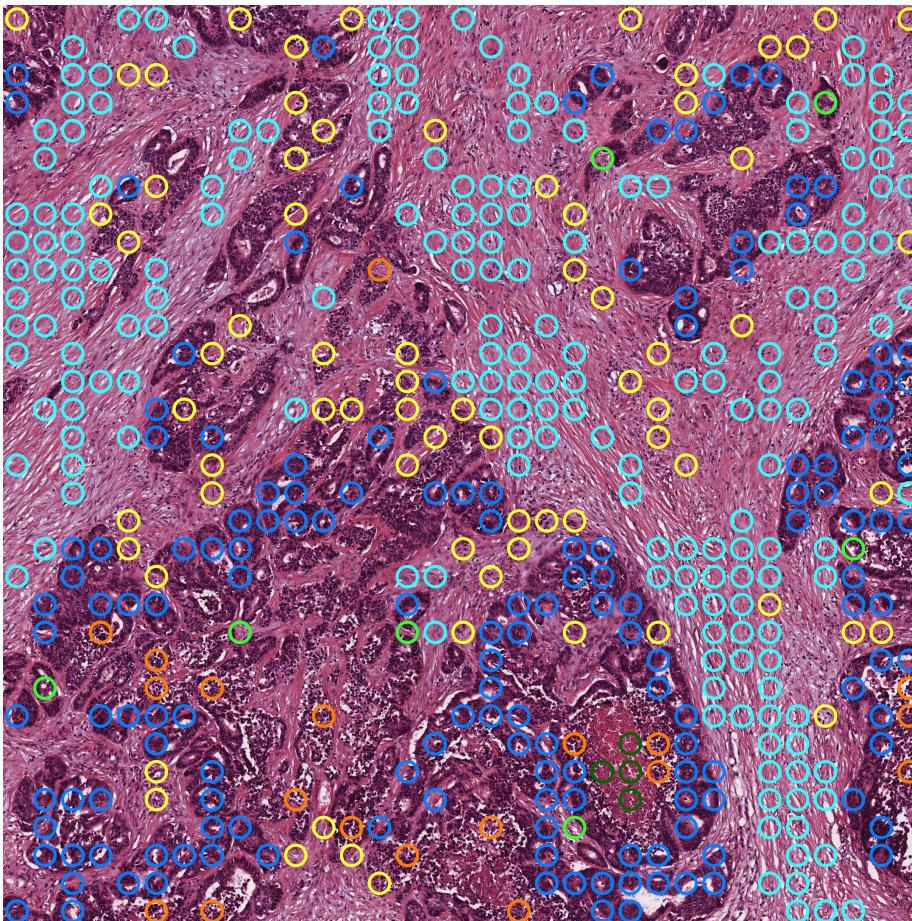
Classification



tumor
stroma
complex
lympho
debris
mucosa
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.80+ Score



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.125+ Tumor

