

Sprint 3

# FROM PIXELS TO PREDICTIONS

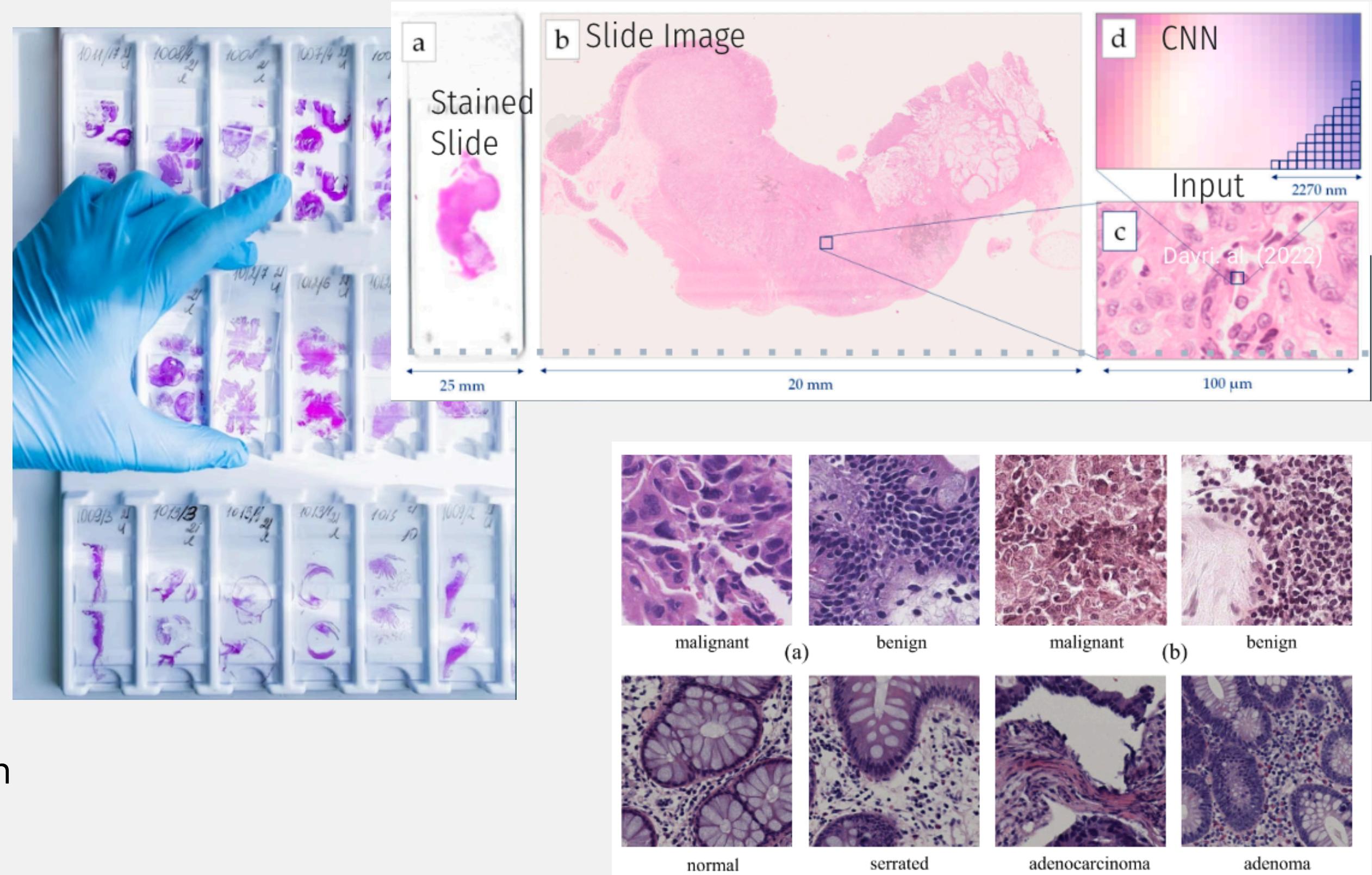
Colon Tissue Image Classification

# The Journey



# In a nutshell:

# Colon Tissue Image Classification



# Chaoyang Dataset

|

512 x 512

labels in .json file

4 labels: 0,1,2,3

Pre-Split: Train = 4021 Test = 2139 images

# MHIST Dataset

|

224 x 224

labels in .csv file

MHIST dataset has 2 labels

Only 977 images



# Key Insights – Preprocessing

## Data Pre-processing

- Import images and respective annotated files
- Combine files and annotations
- Create data dictionary

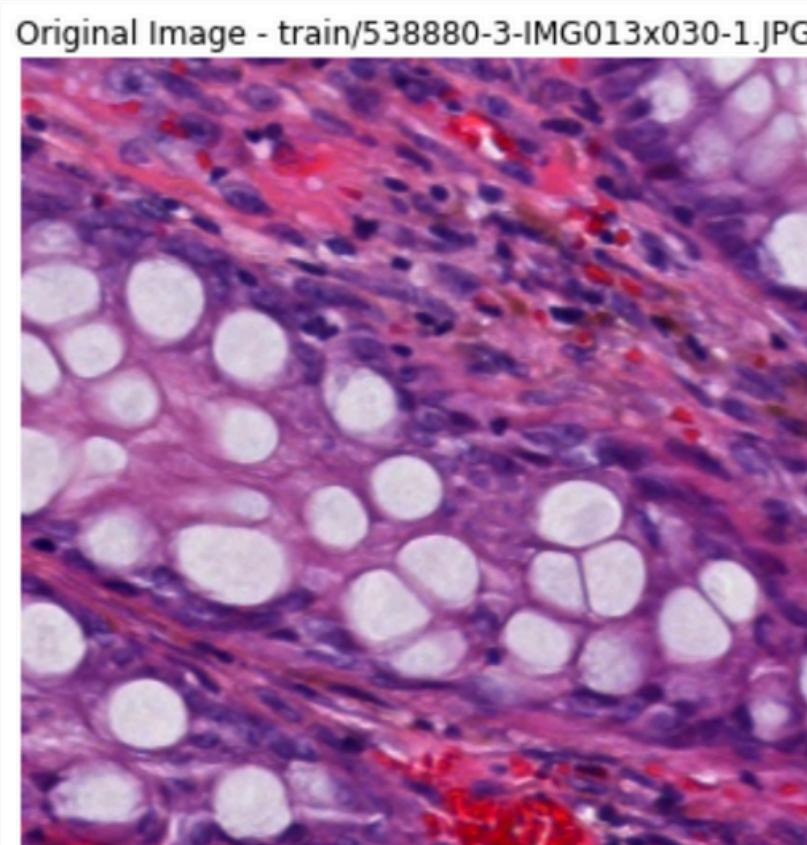


## Image Pre-processing

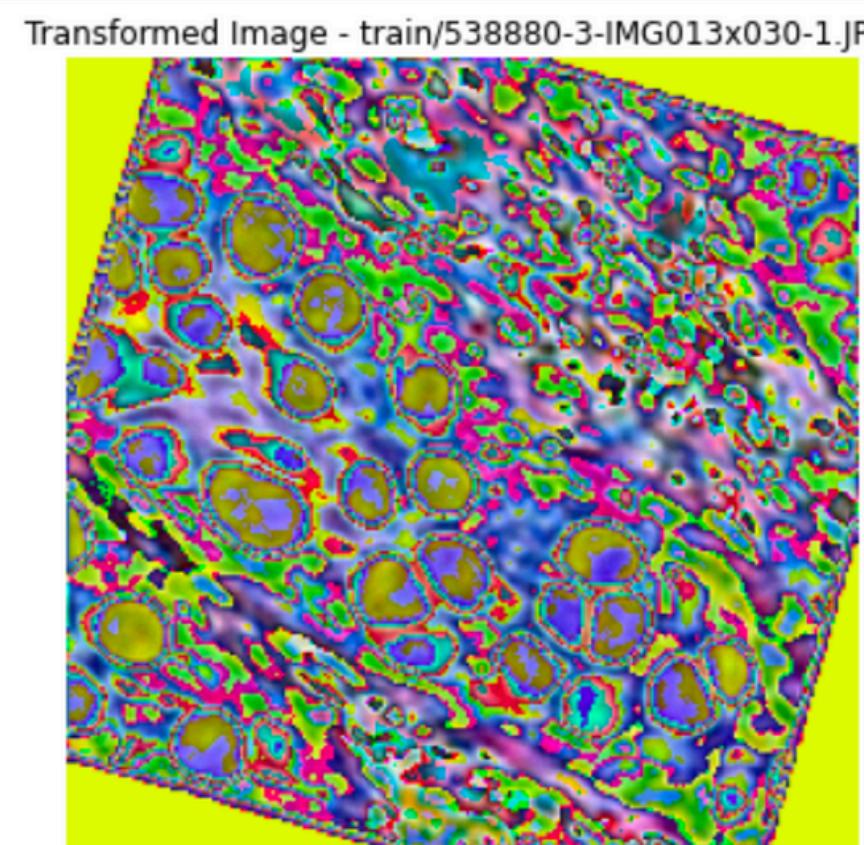
- Resize
- Data augmentation
  - flip and rotate
- Noise reduction
  - Gaussian blur
- Edge detection
- Transform into Tensor
- Pixel value scaling

# Image Preprocessing Results

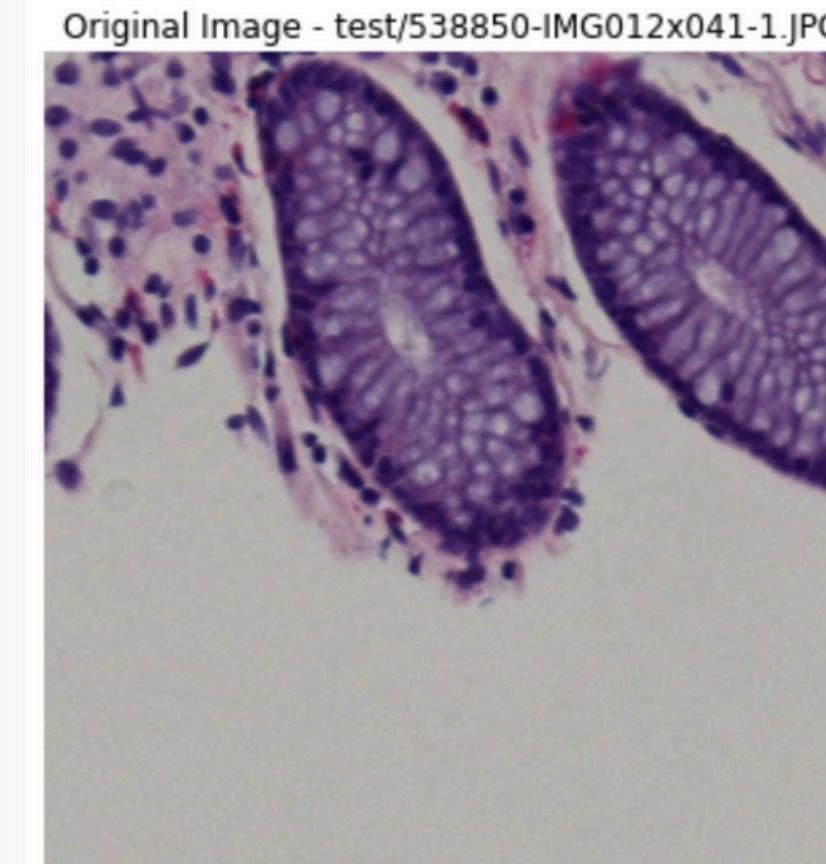
**Train Set**  
**BEFORE**



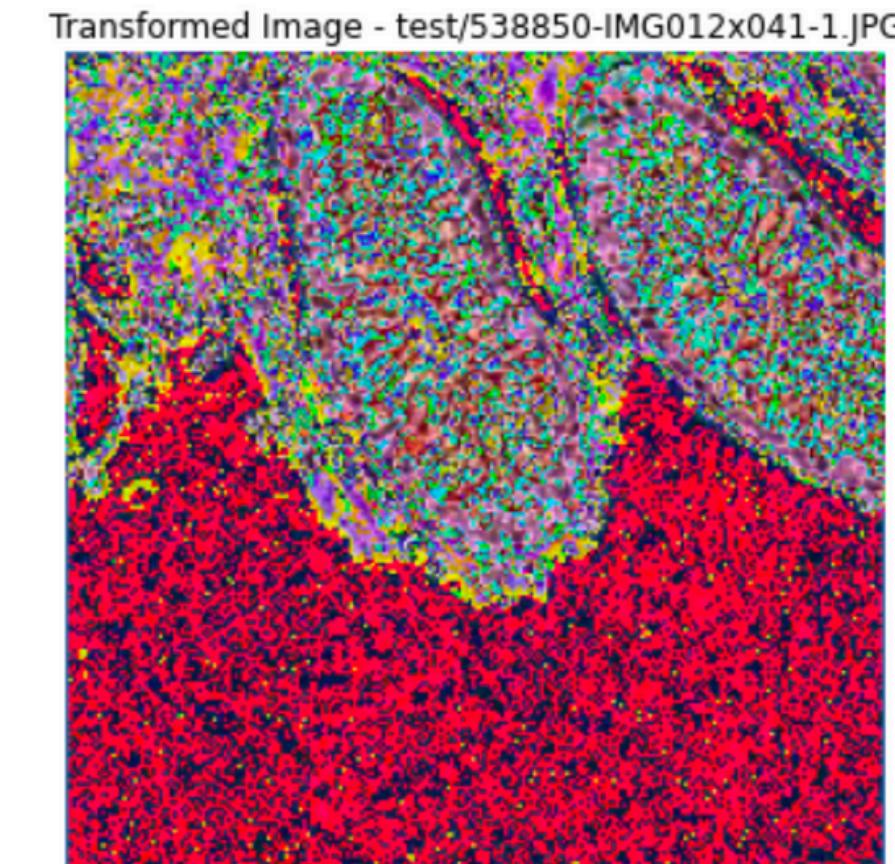
**AFTER**



**Test Set**  
**BEFORE**

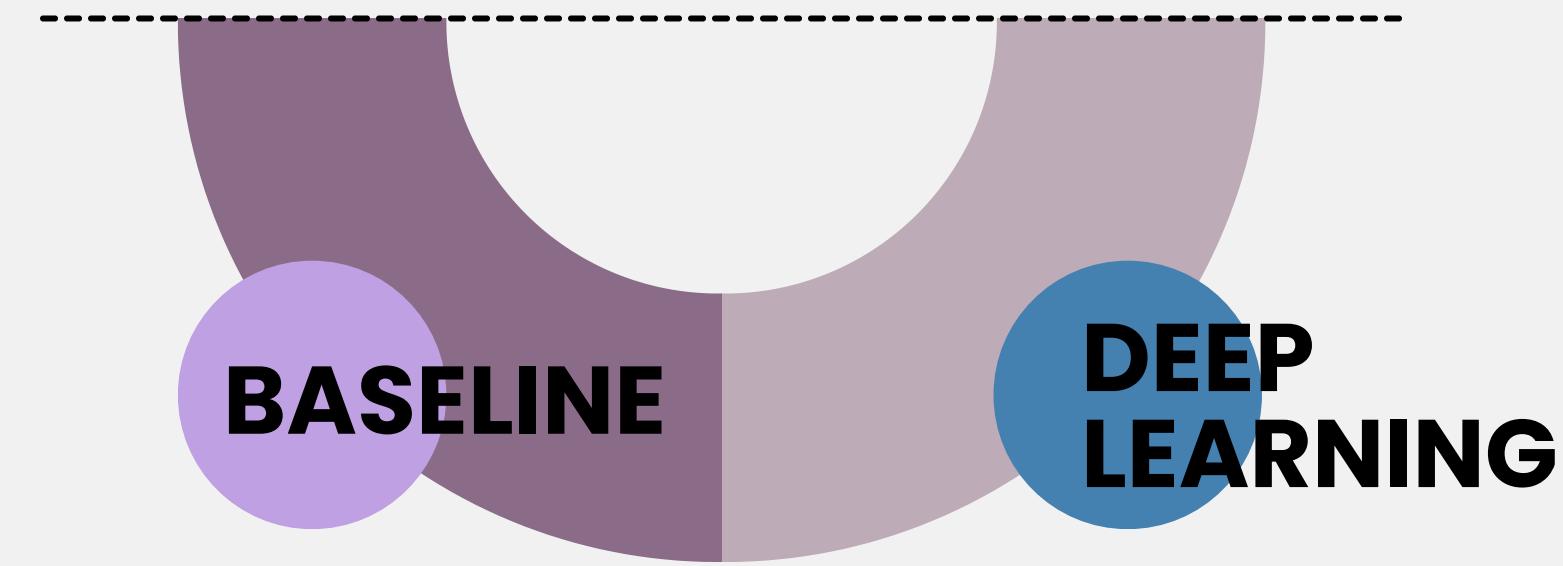


**AFTER**



# Key Insights - Modeling

- Baseline Model**
- Multi-class Logistic Regression
    - 10 iterations
    - 20 iterations



- Deep Learning Models**
- simpleCNN
  - adjusted simpleCNN
    - modifying class weights
    - adding an L2 penalty
    - batch normalization
    - adjusting dropout rate
  - ResNet18

# Multi-class Logistic Regression

Baseline Model Results

- **Poor performance**  
10 Training Iterations yielded a 41% accuracy  
20 Training Iterations yielded a 38% accuracy
- **Metric Fluctuations**  
Sporadic loss fluctuations  
Unstable model
- **Model Complexity**  
Not the right model to use on complex images  
due to it's simplistic nature  
Ignore relationships

# Deep Learning Model Performance

| Model                 | Precision | Recall | F1  | Accuracy |
|-----------------------|-----------|--------|-----|----------|
| simpleCNN             | 70%       | 71%    | 69% | 71%      |
| adjusted<br>simpleCNN | 76%       | 77%    | 76% | 77%      |
| ResNet18              | 29%       | 22%    | 19% | 22%      |

# ResNet with more time...

## Experiment with hyperparameters

- more sophisticated transformations
- learning rate, batch size, and optimizer settings
- grid search

## Ensemble Techniques

- training multiple models or versions of the model under slightly different conditions and then averaging their outputs

## Upgrade to ResNet 50 or ResNet108

- more complex or deeper neural network architectures
- allow the model to capture more nuanced features of the data, potentially leading to better performance.

# Future Directions

as a third party to existing vendors

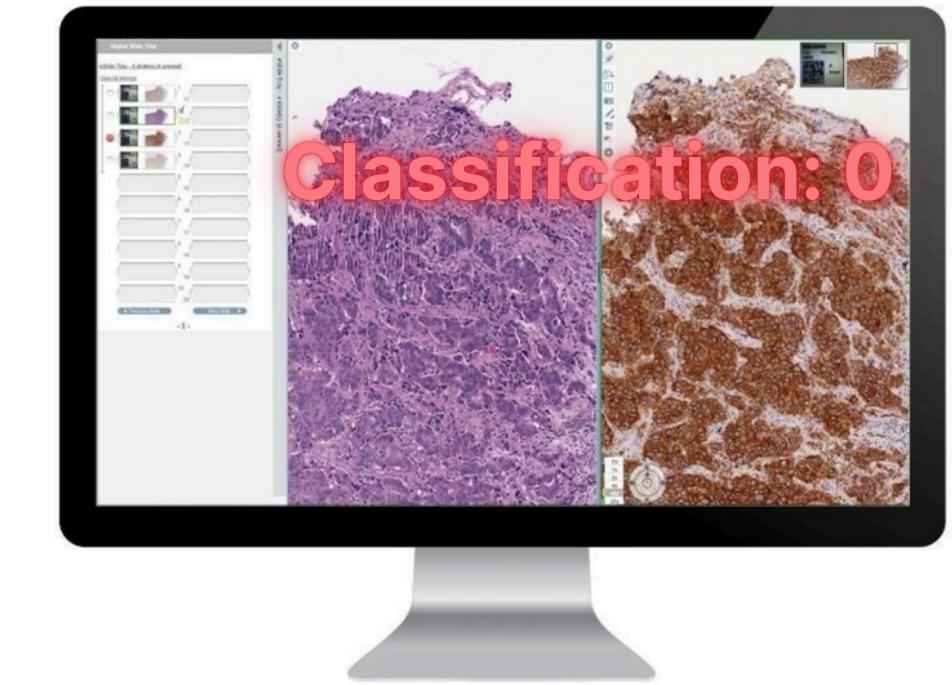


Load stained slides to  
microscope slide scanner



Cloud

Colon Tissue Image  
Classification ML



Existing Vendor Interface



Thank you!