

Case Level Decision Method Testing

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Patch to Case-Level Decision Method Recap (SVM)

- Start with using trained model to produce predicted probabilities by patch
- Group probabilities by case, and use the k-highest predicted probabilities to create a dataframe where rows correspond to cases, columns correspond to the ordered predicted probabilities
- Train Support Vector Classifier using probabilities as predictors and case labels as response variables
- Use classifier to convert predicted test probabilities into case class outputs

SVM Decision Method Function (Uploaded to GitHub)

Function: `case_level_pred_svc(model, df_train, df_test, train_loader, test_loader, k=25, tune_svc=False, return_pred = False)`

- Takes in trained model, train and test metadata dataframes, train and test dataloaders, k-value, option to tune svc, and optional return predictions on test data
- Function produces train and test probabilities for patches by case and trains LinearSVC (SVC if tuning) on k-largest probabilities
- Output: train + test metrics and confusion matrix at case level
- **Also created case_level_pred_top_k function to use tuned decision threshold based on average of top predicted probabilities*

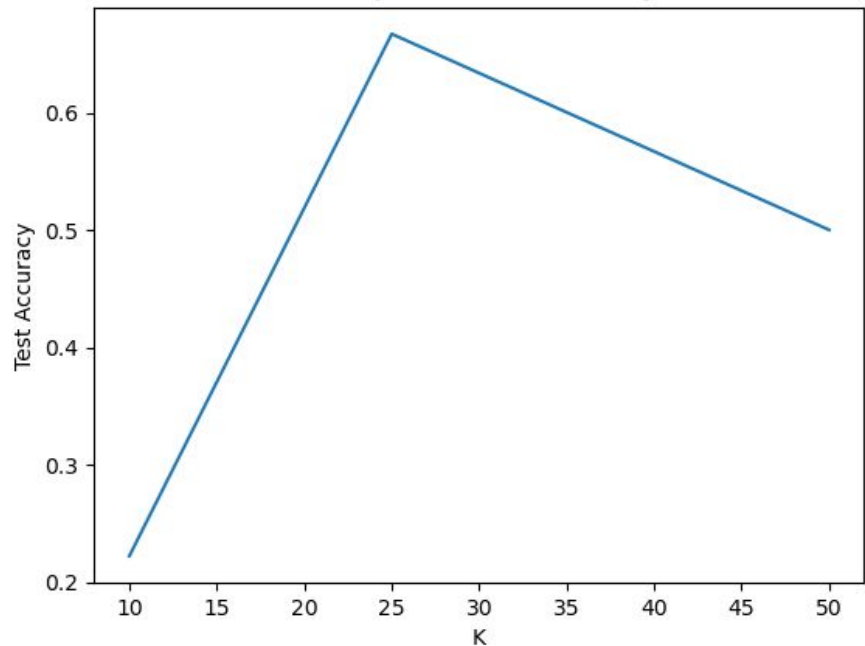
Testing

Testing Specifications

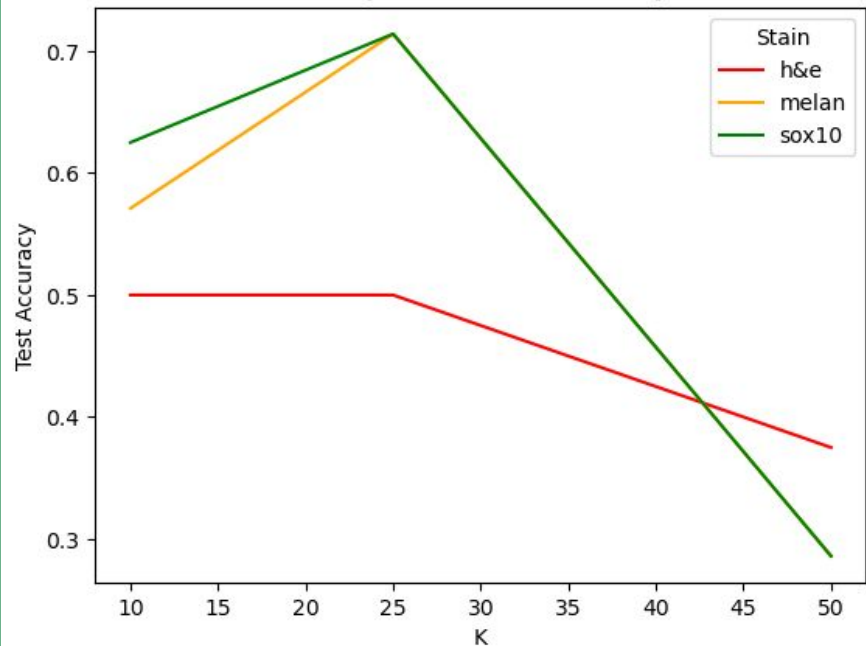
- Used pretrained AlexNet model with training one fully-connected layer from last quarter for speed
- Used as many cases as possible: ~40 train cases, ~10 test cases (Varied depending on test)
 - ~5100 train patches, ~2100 test patches
- Focused on tuning k-value, testing with different subsets of stains, and tuning/not tuning SVC

K-Value Tuning (Tested $k = 10, 25, 50$)

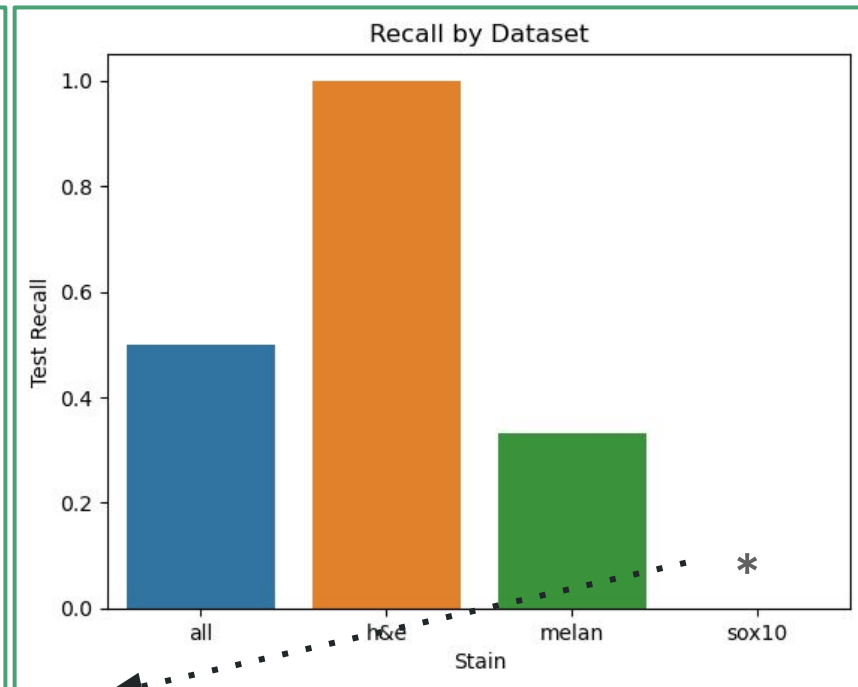
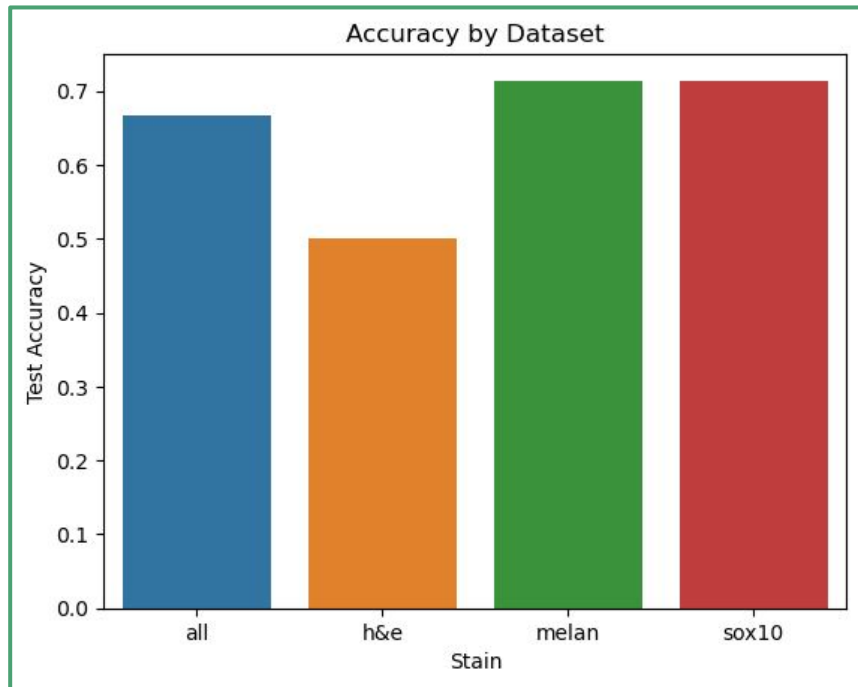
Case Accuracy for All Stain Data by K-Value







Case Accuracy for Individual Data by K-Value



Test Accuracy & Recall for $k = 25$



Effect of Tuning SVC

	<u>Untuned Accuracy</u>		<u>Tuned Accuracy</u>
All Stains	0.667		0.778
h&e	0.5		0.429
melan	0.714		0.714
sox10	0.714		0.571

Primary Takeaways + Next Steps

Takeaways:

- Best to use $k = 25$ for SVC at case-level
- Roughly similar results for all stains, melan, sox10; lower quality results for h&e
- Tuning classifier helps accuracy in some cases, harms in others

Next Steps:

- Will test with different models to better understand results
- Can focus on implementing Grad-CAM based decision method