Breast Cancer Image Classification

Author: Aaron Cherry

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01

Introduction

“About 1 in 8 U.S. women (about 13%) will develop invasive breast cancer over the course of her lifetime.”

“The overall death rate from breast cancer decreased by 1% per year from 2013 to 2018. These decreases are thought to be the result of treatment advances and earlier detection through screening.”

— BREASTCANCER.ORG

Digital Pathology

- Digitize Biopsy Slide
- Present analytics reports
- Pinpoint key features
- Natural next steps?

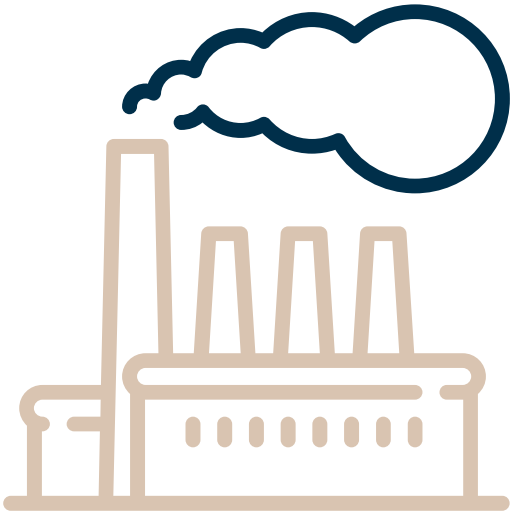
Benefit of Prediction Models

- Predict in bulk
- Cut time/cost of testing
- Sometimes more accurate than trained eye
- Augmenting current practices

02

Modeling

Data



Kaggle (Case Western Base Study)

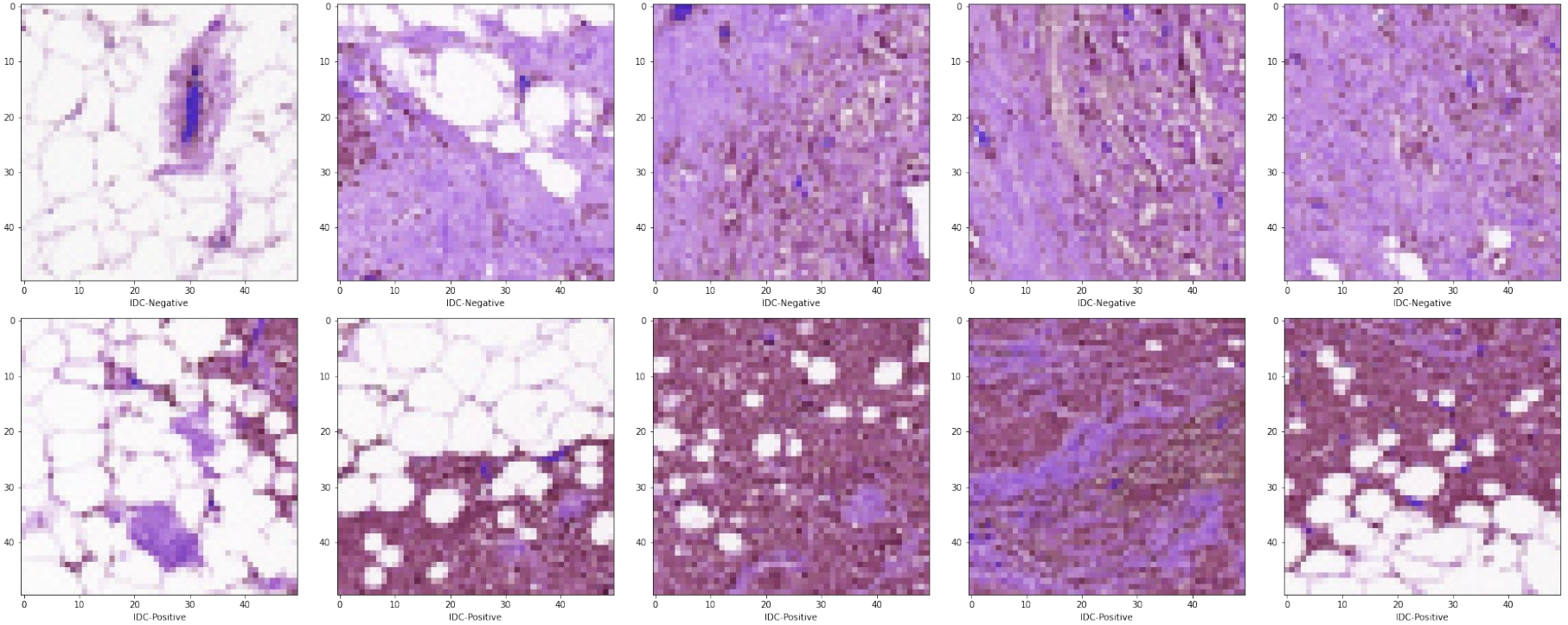
- Invasive Ductal Carcinoma (Breast Cancer)
- 837 whole slide scans
- 50x50 pxl images (~280k)

Classes

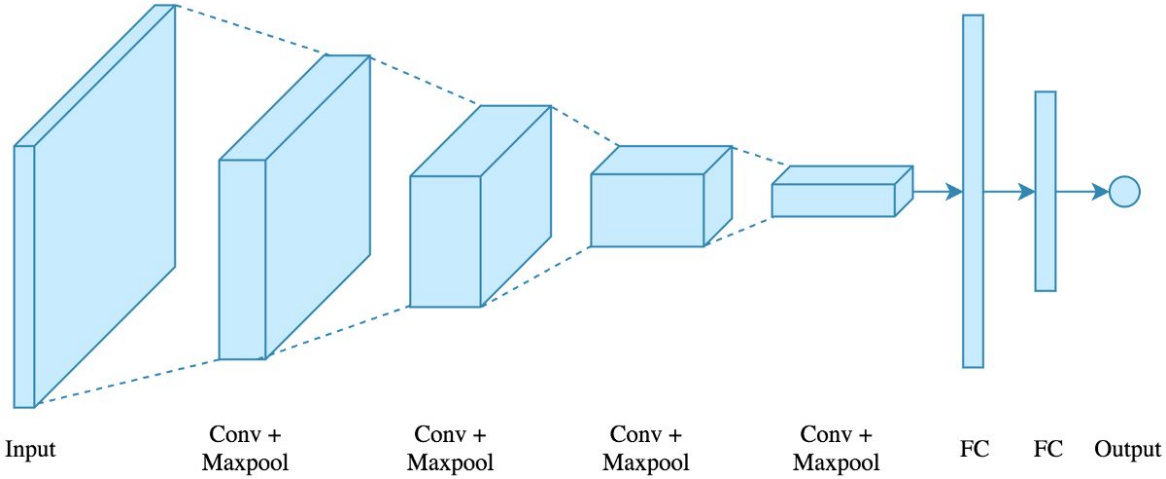
- IDC - Positive
- IDC- Negative

https://spie.org/Publications/Proceedings/Paper/10.1117/12.2043872?SSO=1

Example Slide Patches



Model



INPUT

50x50 pixel Patch

OUTPUT

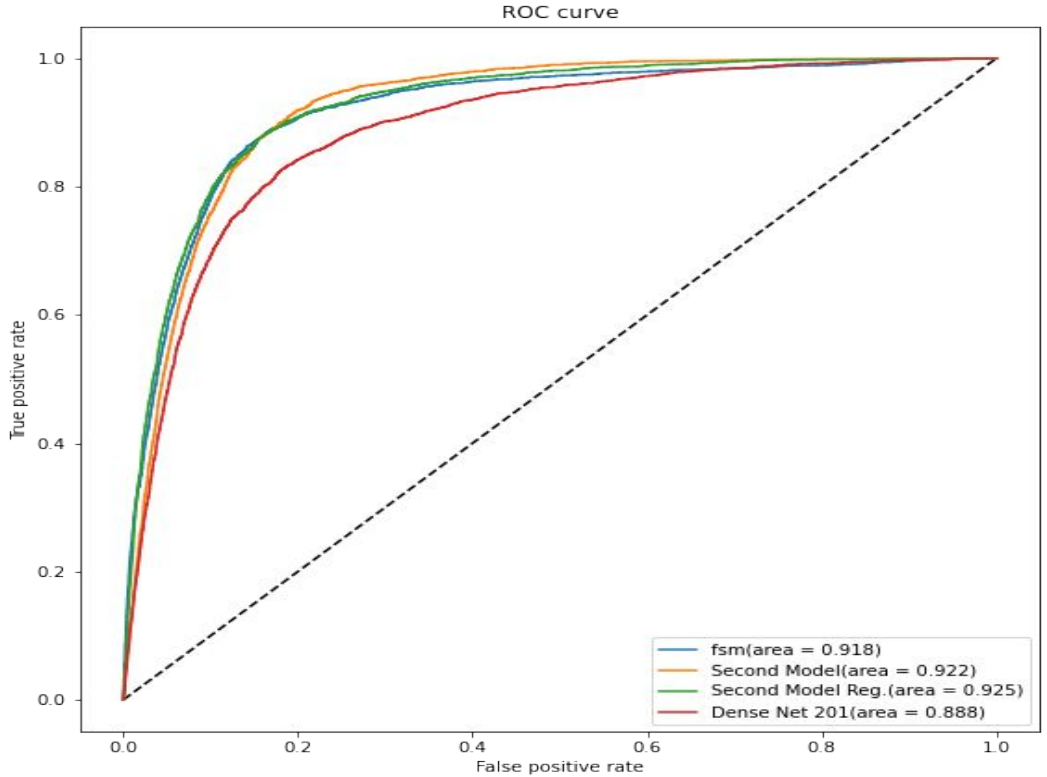
Probability of IDC (+)

Classification Cutoff: 25%

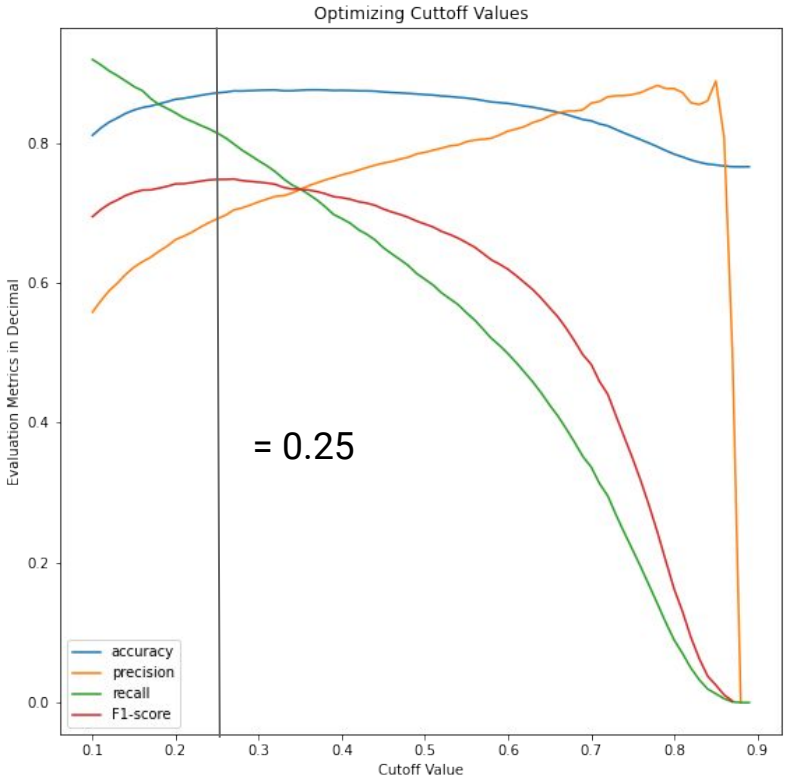
03

Results

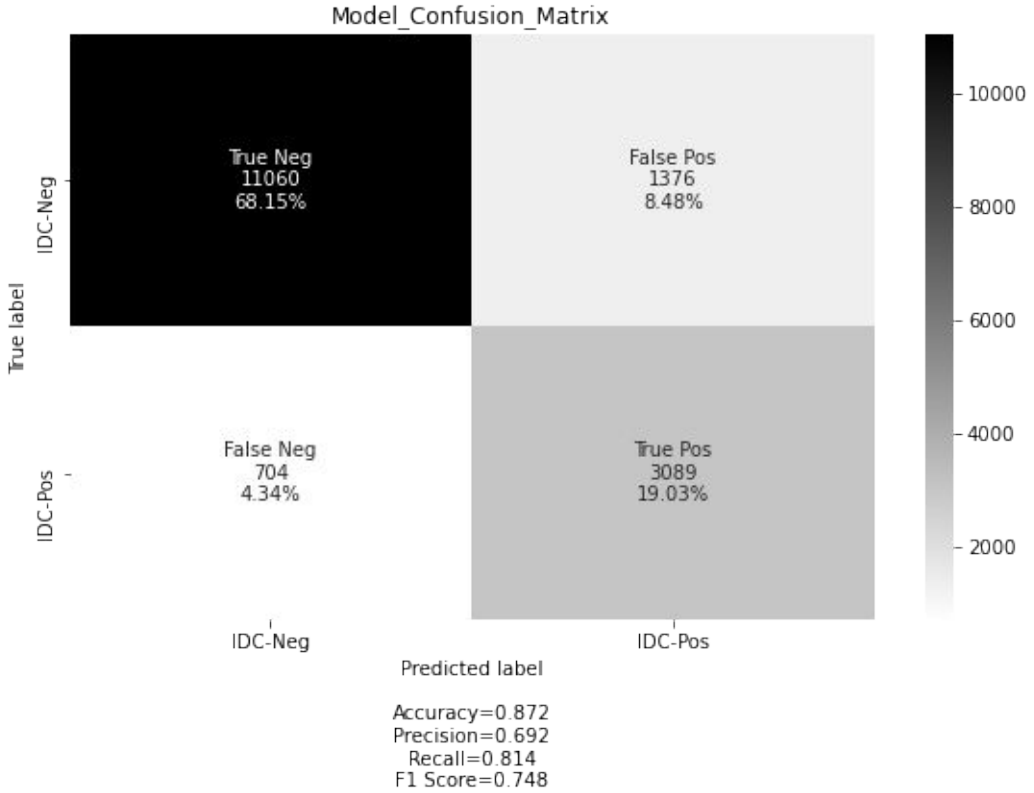
Model Comparisons



Probability of Detection



Results

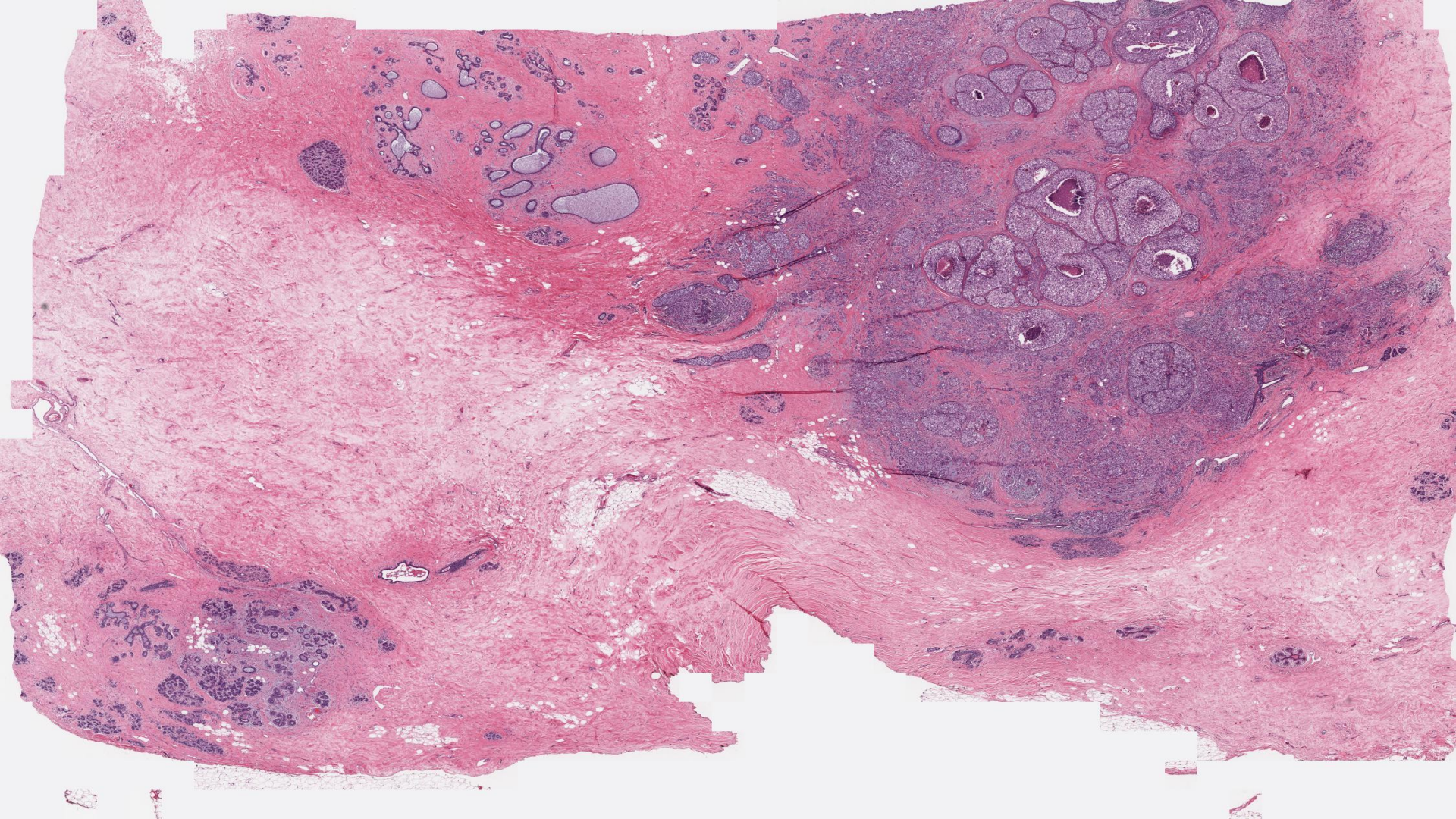


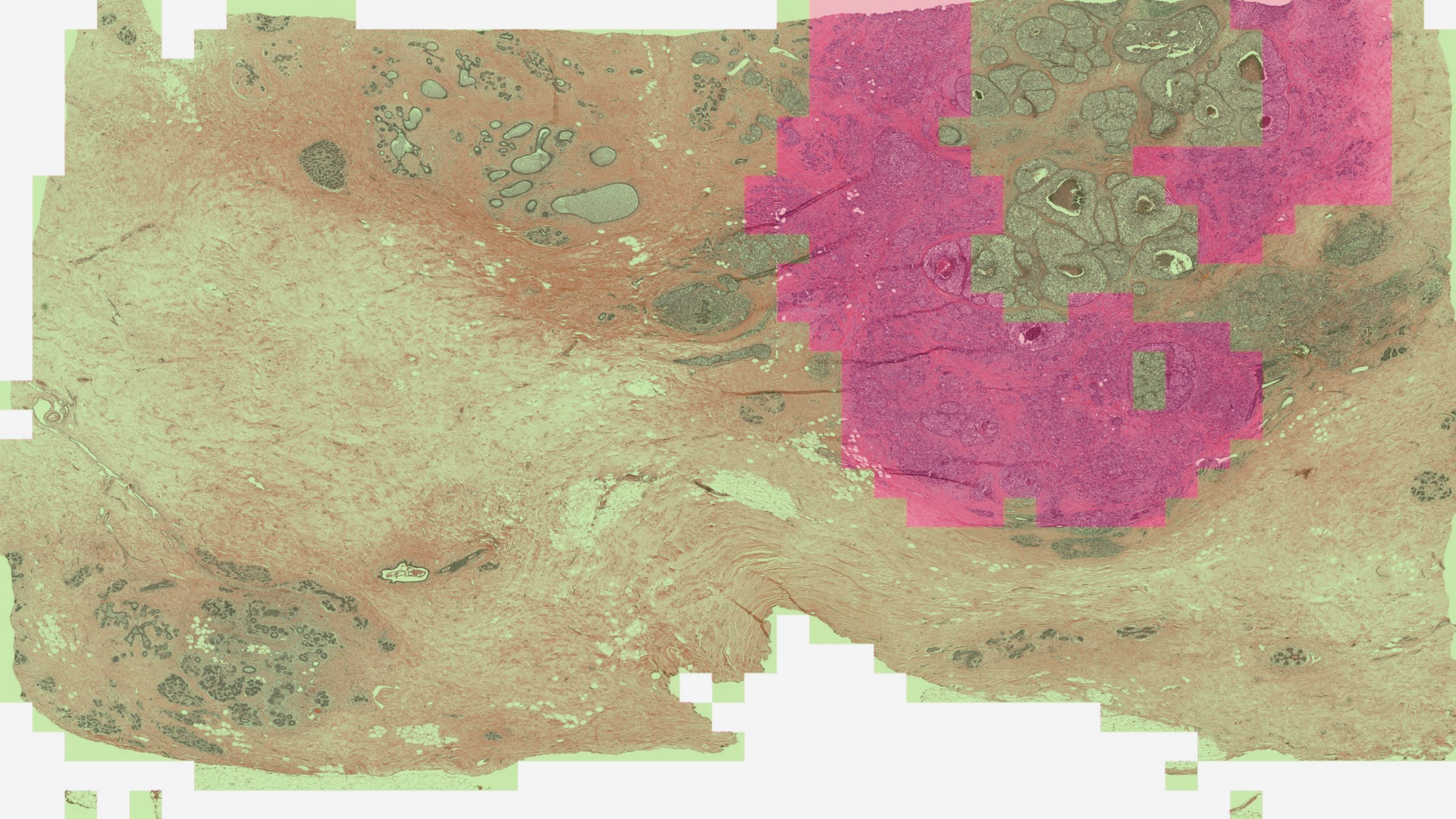
Metrics

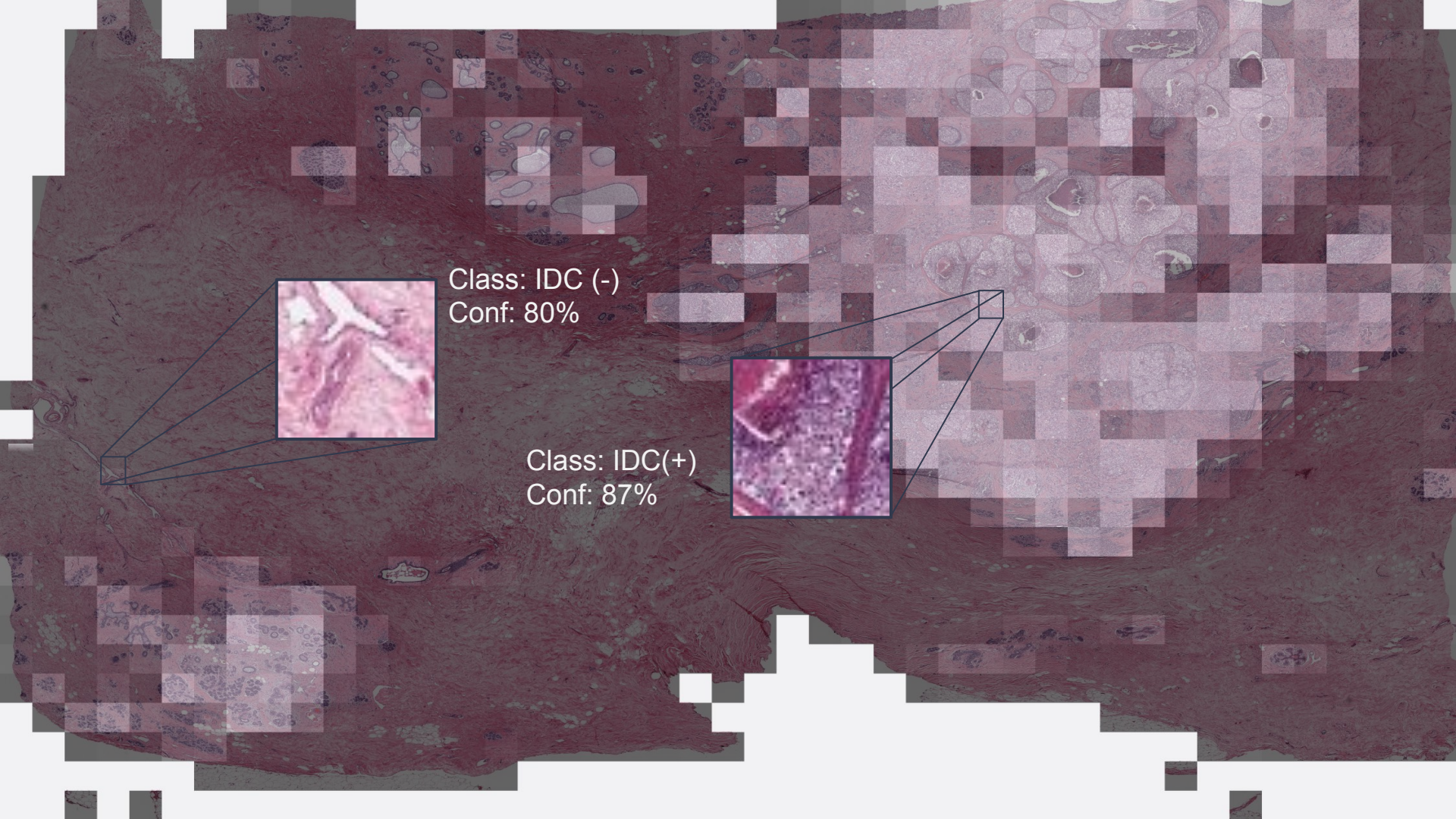
Optimized on Recall
Limit False Negatives

03

Application






Class: IDC (-)
Conf: 80%
Class: IDC(+)
Conf: 87%

Conclusion

04

Conclusions

Benefits

Time
Money
Accuracy

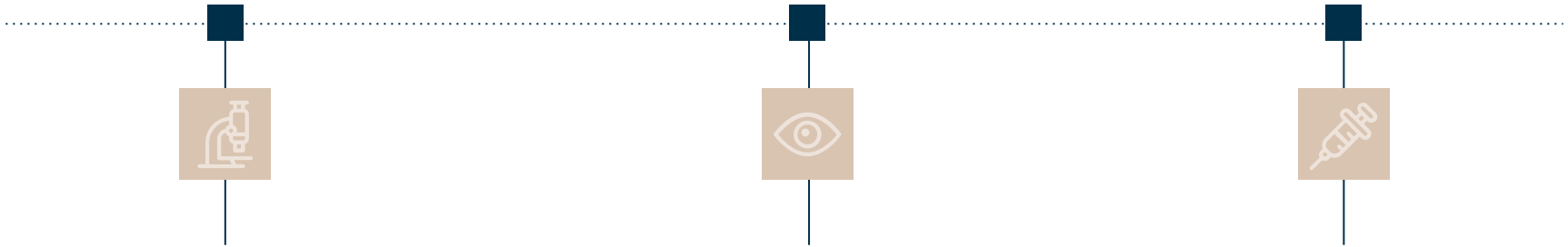
Trained CNN

87.2% accuracy
81.4% recall
0.925 ROC-AUC

Application

WSI Classification
Confidence Map

Next Steps



Optimization

Model Updates
Domain Feedback

Multi-Classing

Benign
Malignant
Generalized Model

Deployment

Application
Endorsement

Thanks!

Contact:

Email: cherrya050@gmail.com

Linkedin: https://www.linkedin.com/in/aaron-cherry-8aa728124/

GitHub: JCherryA050

Graphs

	Model Numbers
Accuracy	bad
Precision	terrible
Recall	worse
Precision	meh

Might be better to have statistics on breast cancer here to compare model predictions with.

Lung

Venus has a beautiful name, but it’s terribly hot

Kidneys

Despite being red, Mars is actually a cold place