Sunny

32°

Hi, Ali

What is the stage of my cancer? 😟😟😟

Find out more at brainstation.io

BrainStation

MACHINE-LEARNING APPROACHES FOR ULTRASOUND-BASED BREAST CANCER DETECTION

PRESENTED BY
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Data Science Diploma Capstone

Agenda

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Cancer Tomorrow

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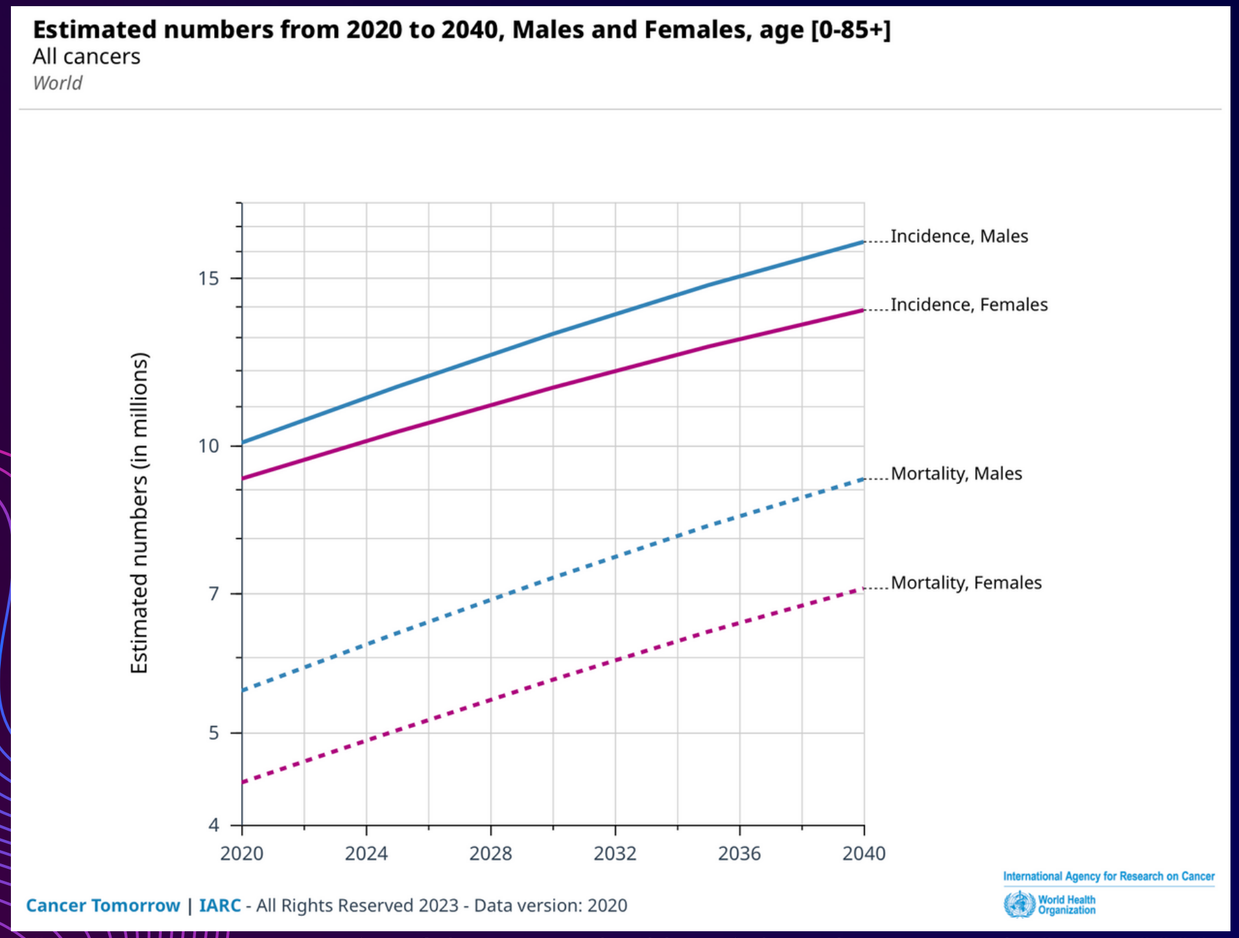
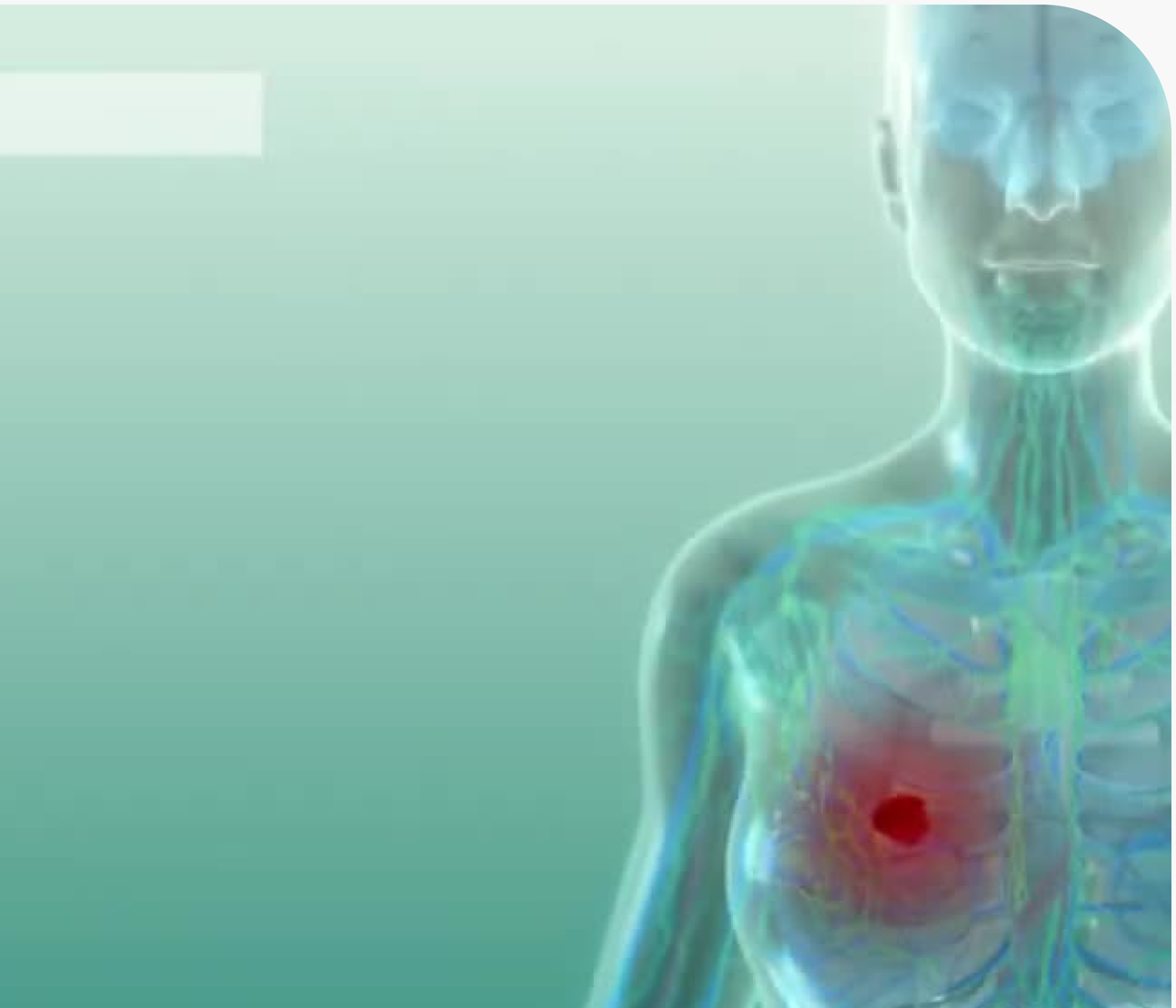


Cancer Tomorrow, gco.iarc.fr/tomorrow/en/dataviz/trends. Accessed 18 Aug. 2023

- In **2020**, there were **19,292,789** cancer cases.
- In 2040, the projected number of cancer cases is **30,226,151**.
- The number of cancer cases might increase by around **10,933,362 (56.7%)** between 2020 and 2040.



Project Goal

- Using machine learning and ultrasound to estimate the mass of cancer and help practitioners for diagnosing cancer and its stags.

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Proposed Steps

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Step # 1

Data Collection and Preprocessing

Step # 2

Model Architecture

Step # 3

Model Training and Optimization

Step #4

Validation and Evaluation

Step #5

Fine-Tuning and Iteration

Step #6

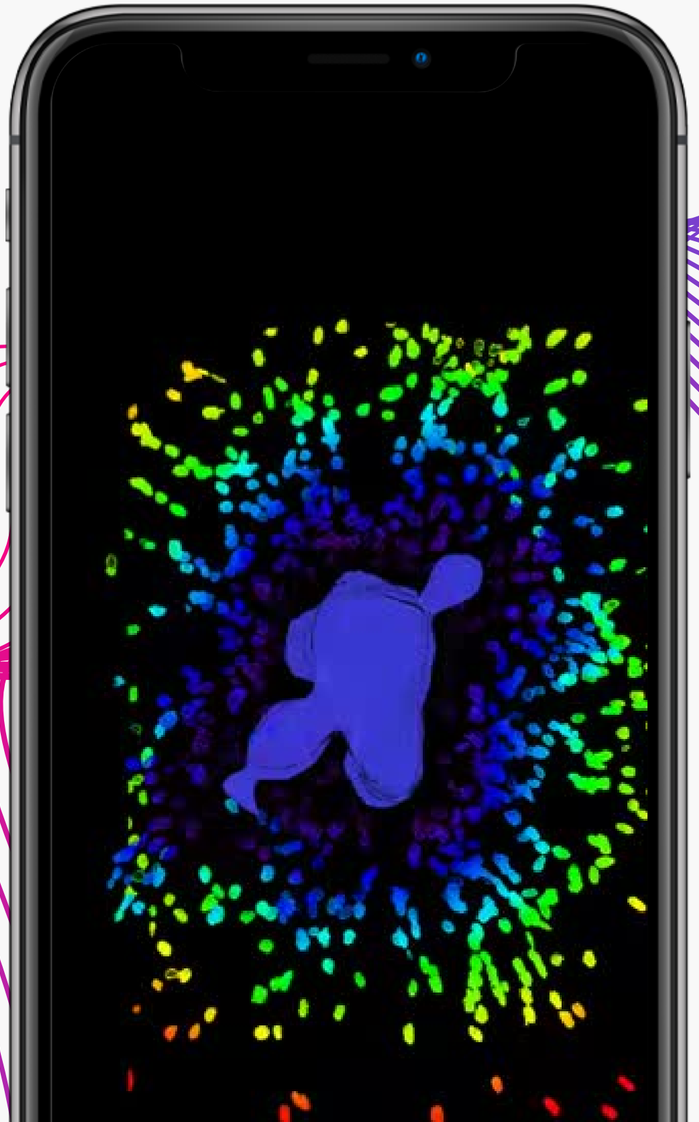
Clinical Validation and Integration

Step #7

Ethical Considerations and Privacy

Step #8

Documentation and Communication



Objectives

Brief elaboration on what objectives for using machine learning breast ultrasound

Accuracy Improvement

TARGET/OBJECTIVE # 1
Enhance the precision of size measurements

Staging Enhancement

TARGET/OBJECTIVE # 2
Provide more accurate cancer staging information

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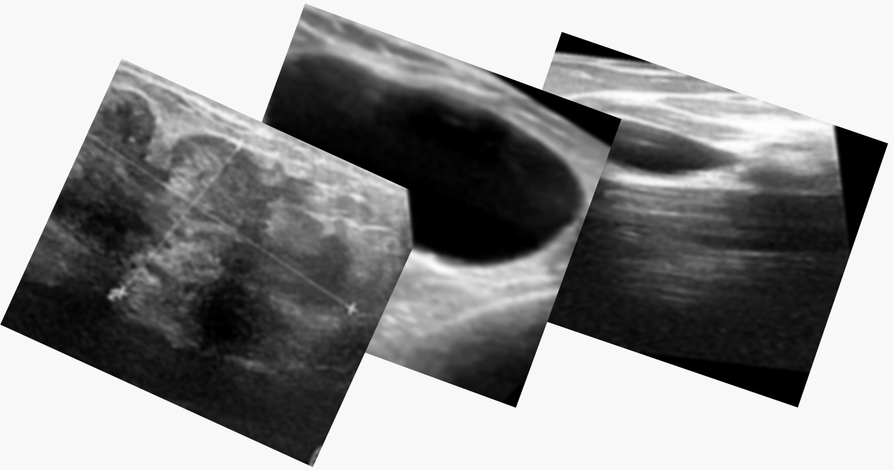
EDA Approaches

Brief elaboration of on what approaches happened in EDA



Resizing

Adjusting the dimensions or proportions of an image.

Augment

Applying various transformations or modifications to data,

Denoised

Removed unwanted or random noise

Balanced

Class of images is equally represented, promoting fairness

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Proposed Models

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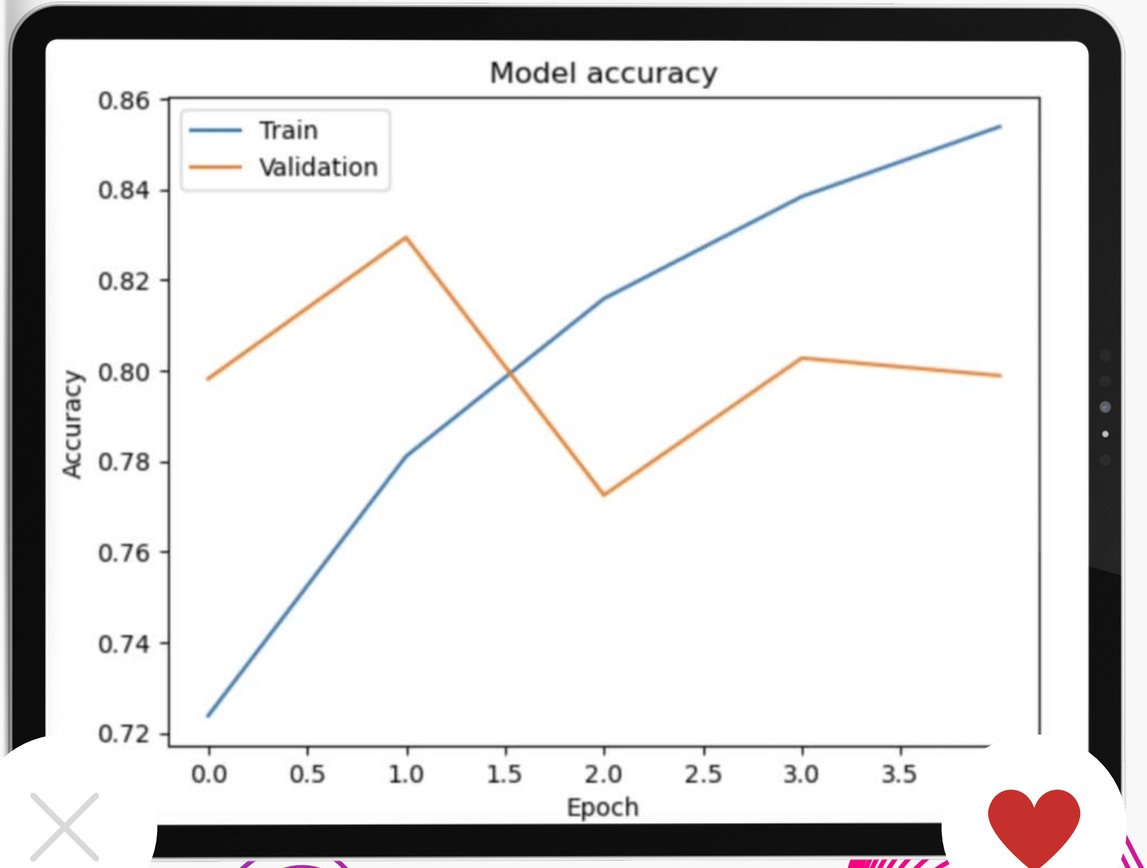
Epoch 5/5
Validation Loss: 0.2338
Validation Accuracy: 0.9092

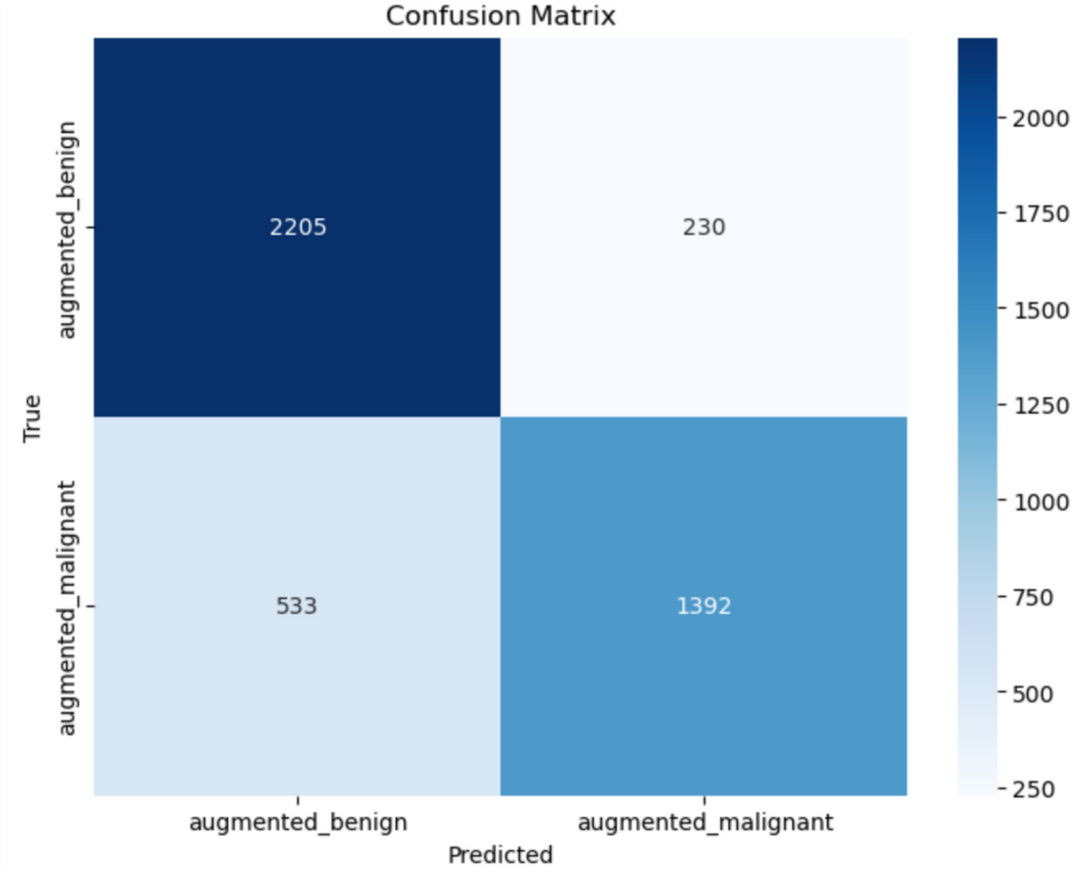
- **Lower** validation **loss** ------> Model's **predictions** are **closer** to the **actual labels** on average

- **Higher** validation **accuracy** ------> **Larger** proportion of the **validation set** was correctly **classified** by the model.



Swipe Left

Is our Prediction Correct Or Incorrect per class?



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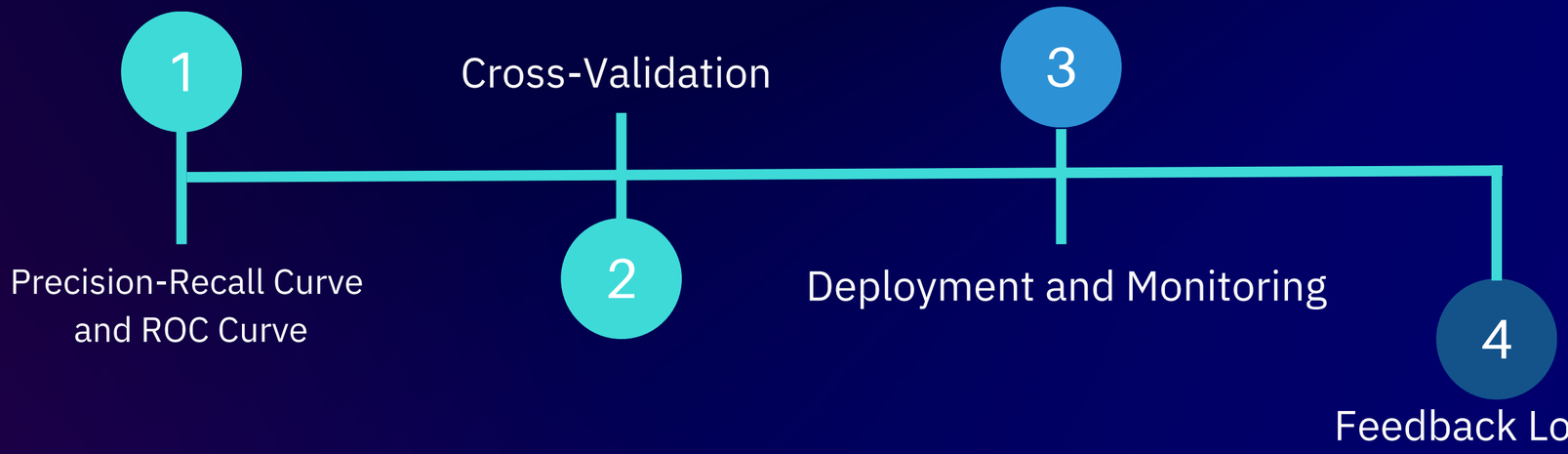
	Statements
True Positives (TP)	Predicted Malignant and True Malignant (1392)
True Negatives (TN)	Predicted Benign and True Benign (2205)
False Positives (FP)	Predicted Malignant but True Benign (230)- Type I error or a “false alarm
False Negatives (FN)	Predicted Benign but True Malignant (533)- Type II error or a “miss“

	Metrics
Accuracy	79.55%
Precision	85.81%
Recall (Sensitivity)	72.36%
Specificity	90.56%

Future Content



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Resource

1.“Breast Cancer Medical Animation by Geometric Medical.” YouTube, 7 Sept. 2020, www.youtube.com/watch?v=3DE6V_xHpVY.Slide 1.

2.Cancer Tomorrow, gco.iarc.fr/tomorrow/en/dataviz/trends. Accessed 18 Aug. 2023.

3.Kalafi, E. Y., Nor, N. A. M., Taib, N. A., Ganggayah, M. D., Town, C., & Dhillon, S. K. (2019). Machine learning and deep learning approaches in breast cancer survival prediction using clinical data. Folia biologica, 65(5/6), 212-220.

4.Wu, G. G., Zhou, L. Q., Xu, J. W., Wang, J. Y., Wei, Q., Deng, Y. B., ... & Dietrich, C. F. (2019). Artificial intelligence in breast ultrasound. World Journal of Radiology, 11(2), 19.

5.Shareef, B., Xian, M., & Vakanski, A. (2020, April). Stan: Small tumor-aware network for breast ultrasound image segmentation. In 2020 IEEE 17th International Symposium on Biomedical Imaging (ISBI) (pp. 1-5). IEEE.

6. Baek, J., O’Connell, A. M., & Parker, K. J. (2022). Improving breast cancer diagnosis by incorporating raw ultrasound parameters into machine learning. Machine Learning: Science and Technology, 3(4), 045013.