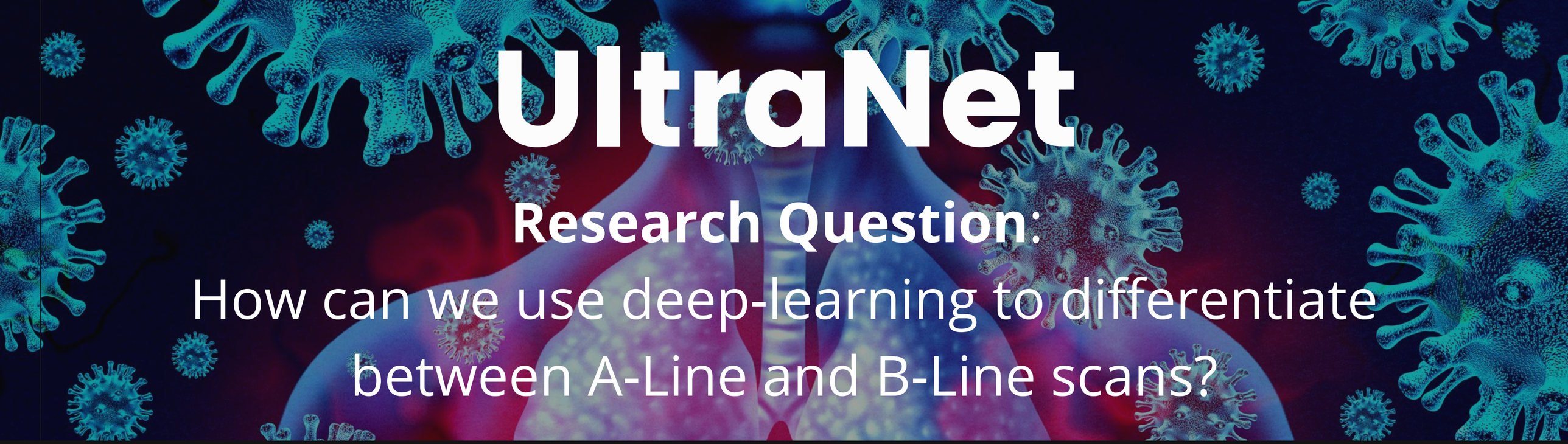


UltraNet

Research Question:

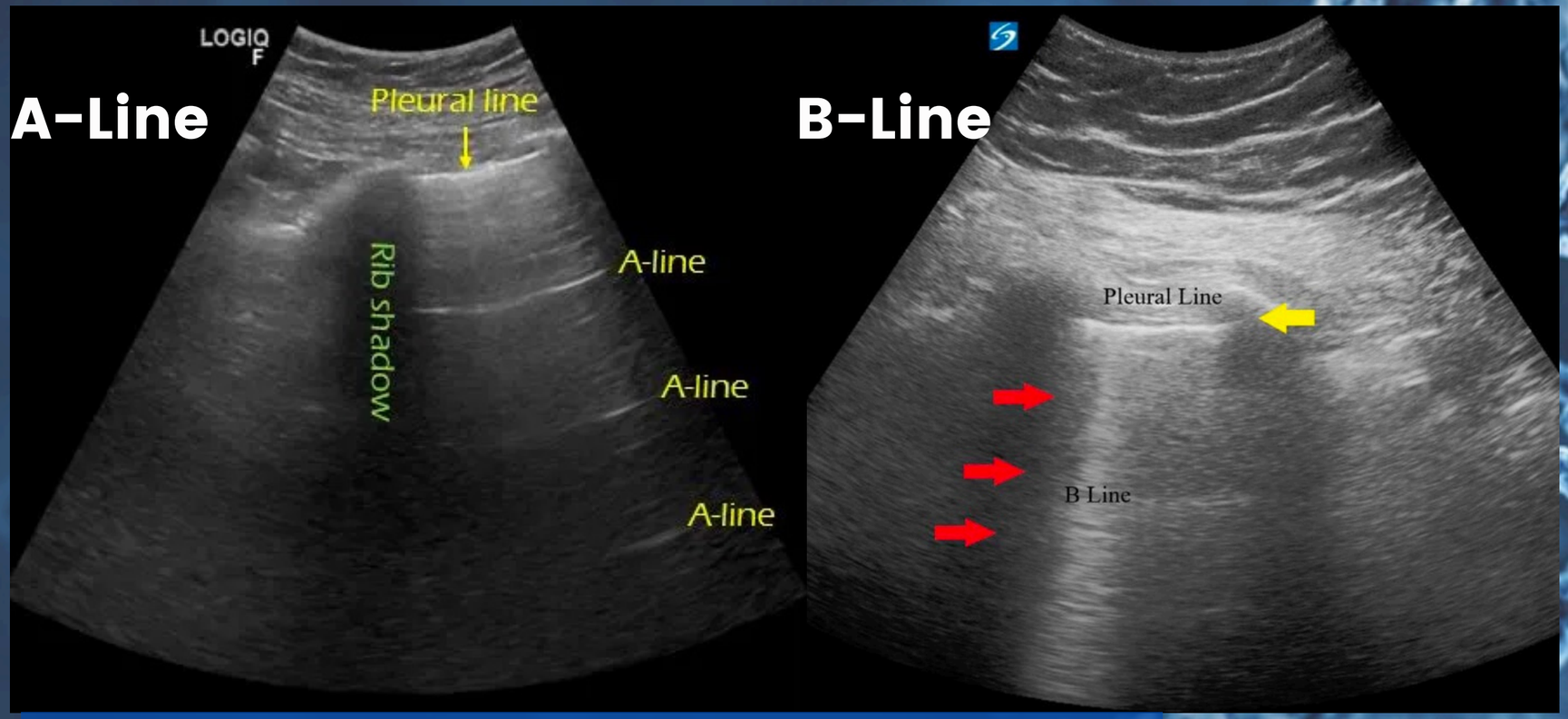
How can we use deep-learning to differentiate between A-Line and B-Line scans?

About Me:

- Name: Rushil Srirambhatla
- First-Year Student at Johns Hopkins University
- Majoring in Neuroscience with a concentration in Computational Neuroscience
- 5 Years of experience in AI/ML

UltraNet's Aim

To develop an effective automated method to charecterize A-Line and B-Line Scans



Why Do These Differences Matter?

- Indicate different lung pathologies
- Relevant after the pandemic
- Accurate diagnosis and treatment

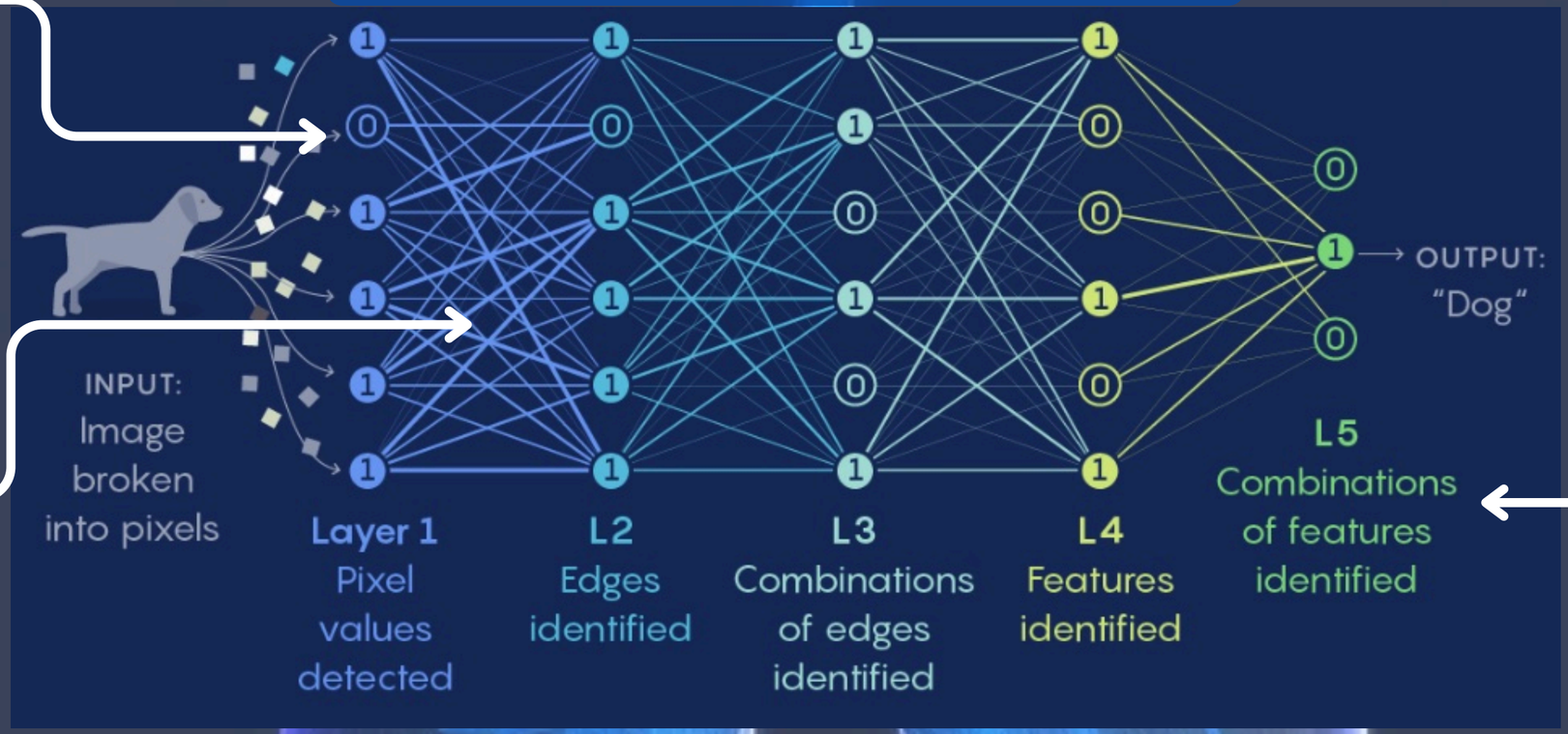
Problems with Current Methods:

- Shortage of professionals who interpret ultrasound scans
- Interpreting scans is time-consuming

Neural Networks

Neurons

Channels



Layers

What are Neural Networks?

- Identify patterns using algorithms.
- Input, Hidden, and Output Layers
- Neurons receive information and layers perform computations.

How does it work?

- Takes in data, trains to recognize patterns, and predicts the output
- Neuron with the highest value predicts the outcome

Data and UltraNet Construction

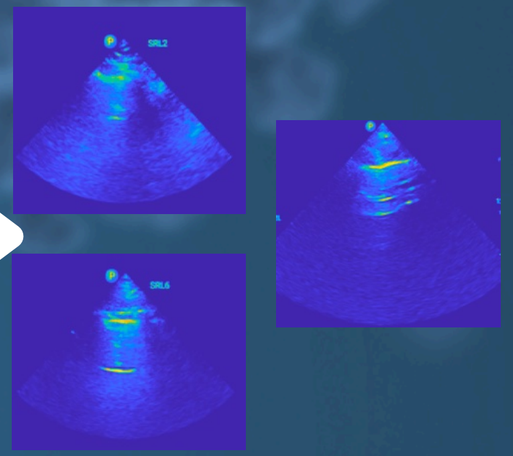
Data Retrieval

- Lung Ultrasound DICOM 3-D Files
- 156 patients & 201,087 2-D slices

3D LUS



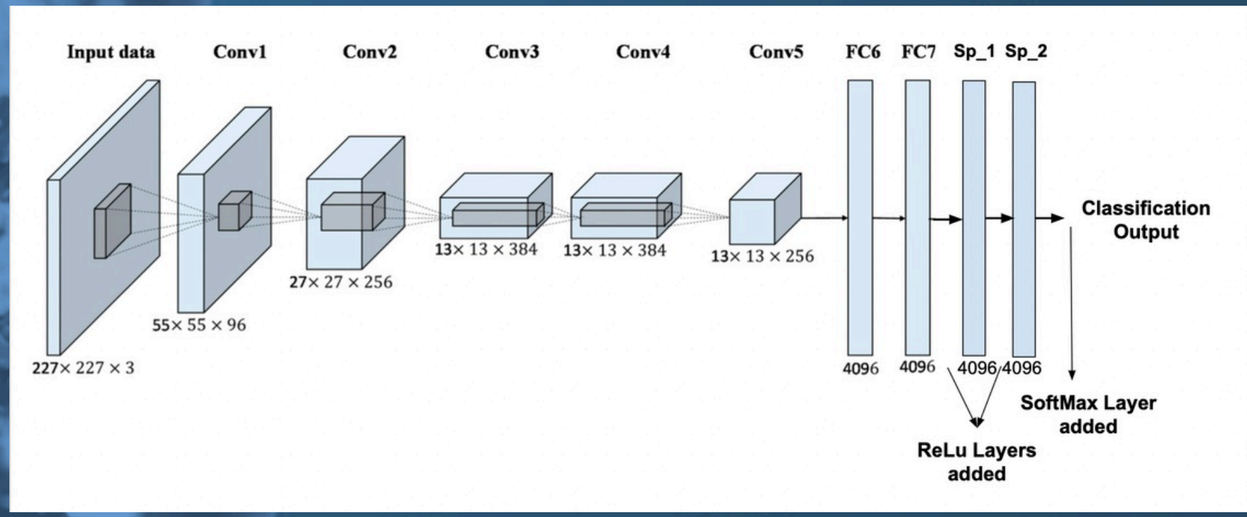
2D Slices



Improved AlexNet Architecture

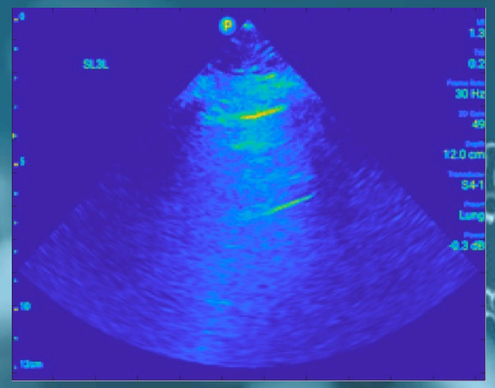
- Additional Feature Extraction Layers using RBA (Nearest Neighbor Approach)
- Optimization (Decreased Batch Size and Learning Rate)

UltraNet Architecture



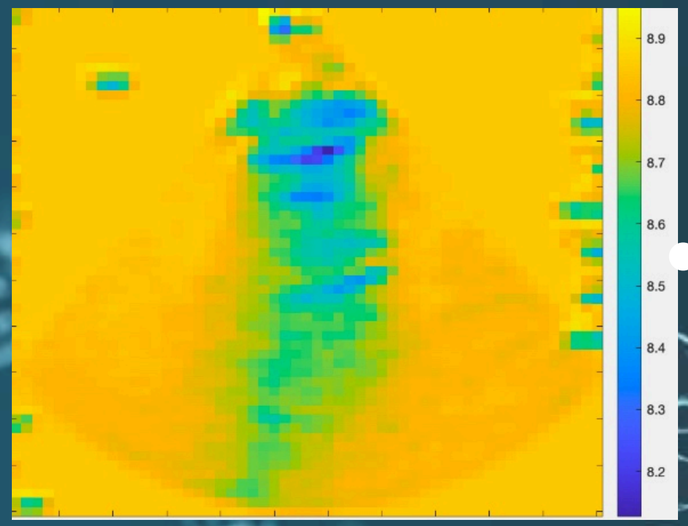
Creating Class Activation Maps

A-Line Scan Slice

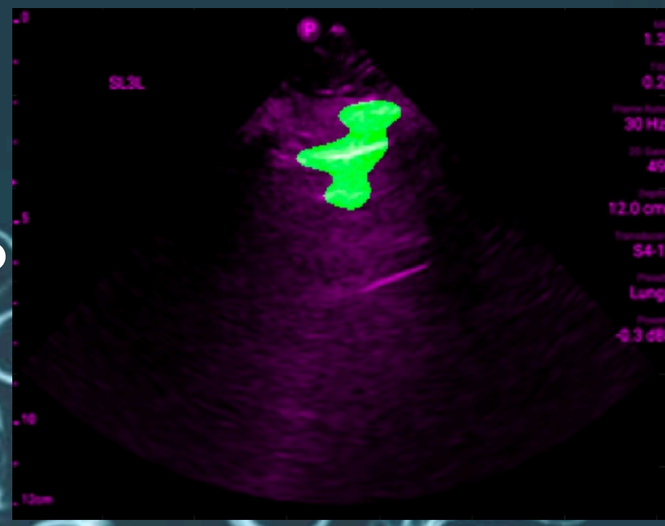


UltraNet

Channel-Specific CAM



Segmented LUS



What are Class Activation Maps (CAMs)

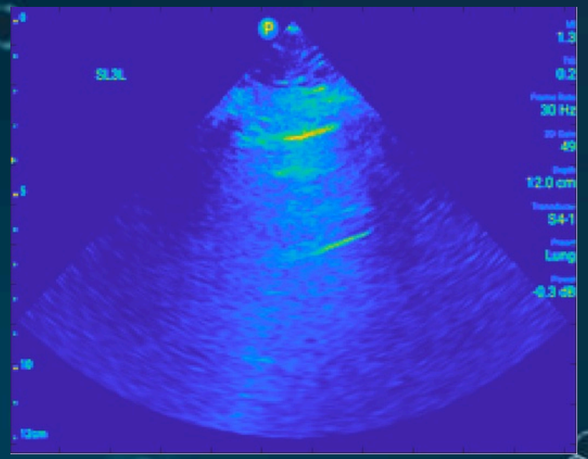
CAMs highlight important parts of a picture that a network uses to predict the class of the image

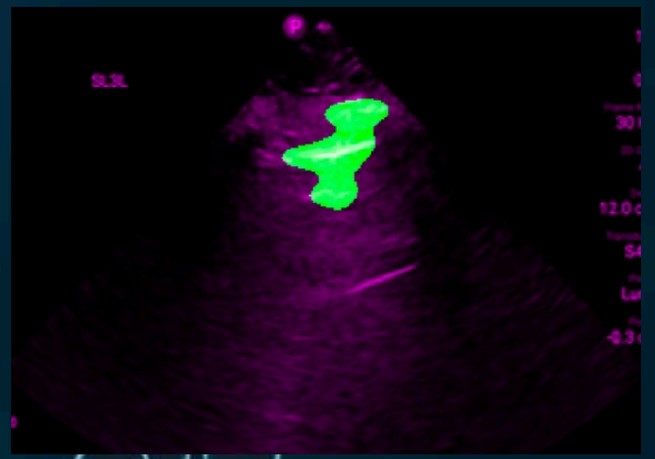
UltraNet Segmentations

LUS Slice

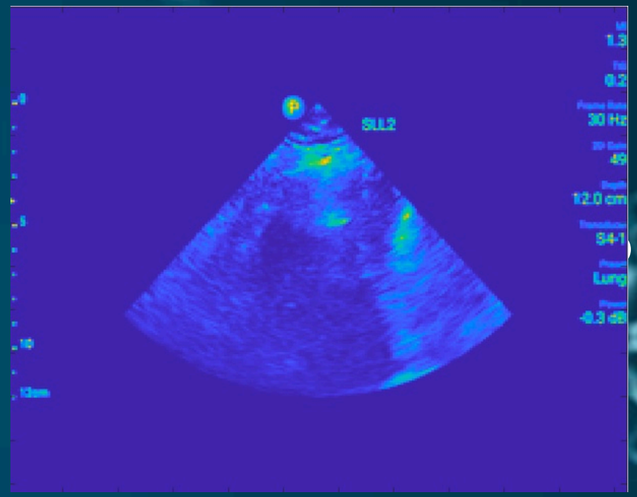
Segmented LUS

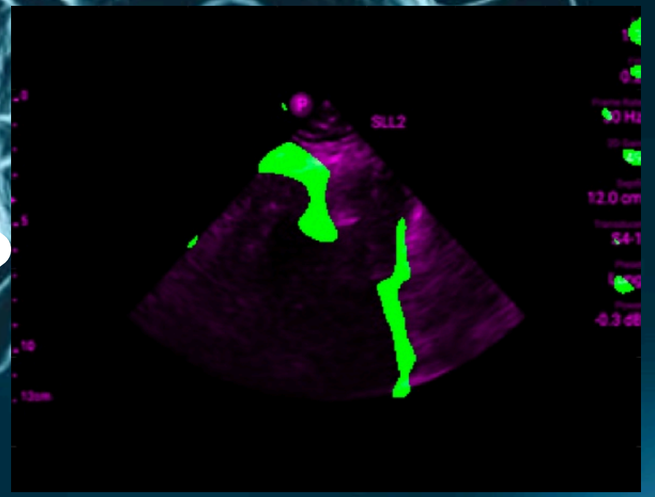
A-Line Scan (Horizontal Lines)





B-Line Scan (Vertical Lines)

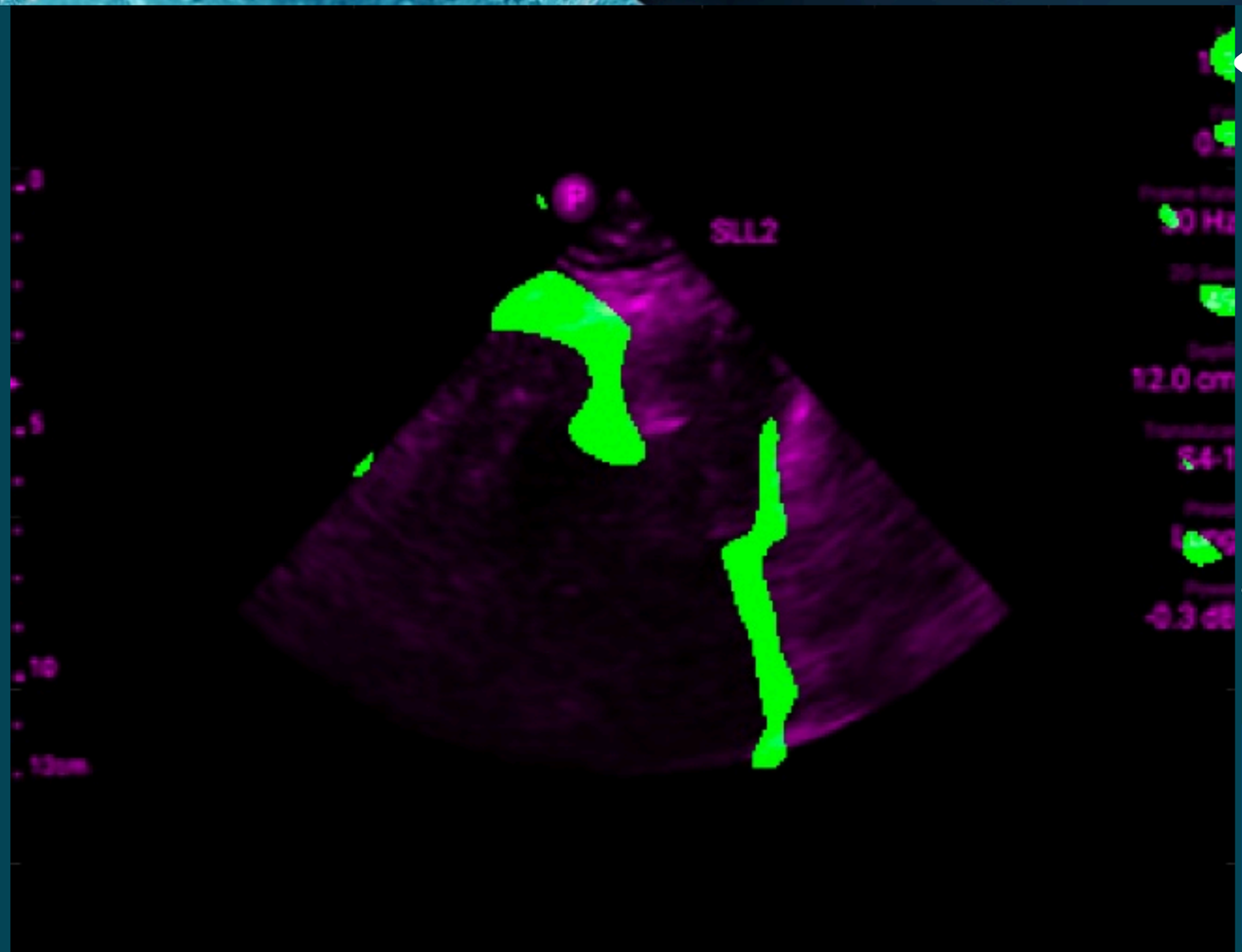




Future Work

UltraNet Improverments

1. Image Cropping
2. Resizing and Rescaling
3. Train on other Neural Networks



Excess Information

Forces UltraNet to do unnecessary work


Thank You!