

Salt Identification from Seismic Images

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Background Information

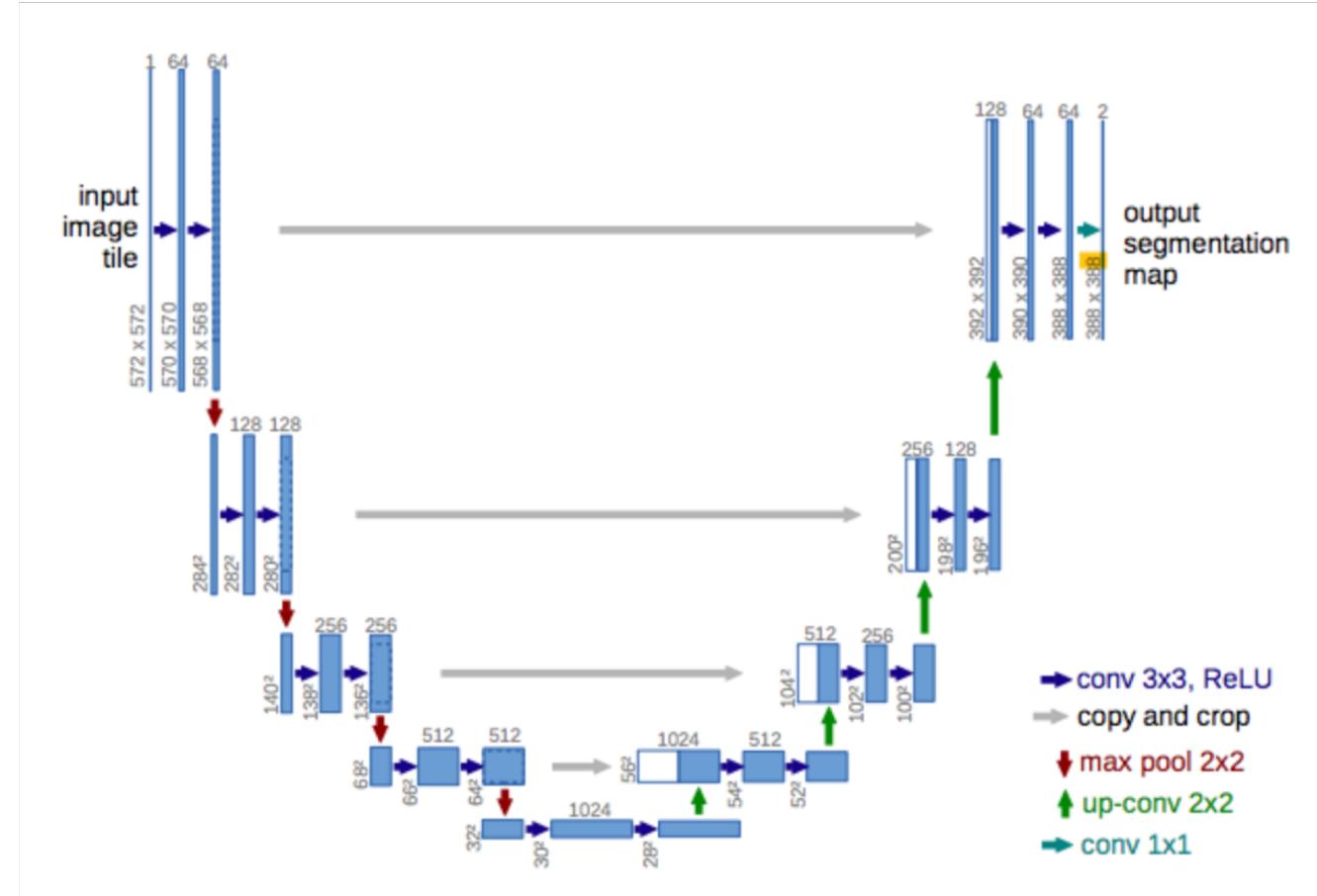
- Seismic survey is critical for exploring oil and gas assets
- Salt bodies are important for the hydrocarbon industry, as they usually form nice oil traps
- Many prolific oil and gas reservoirs in proximity to salt features
 - Gulf of Mexico
 - Offshore Brazil

Background Information

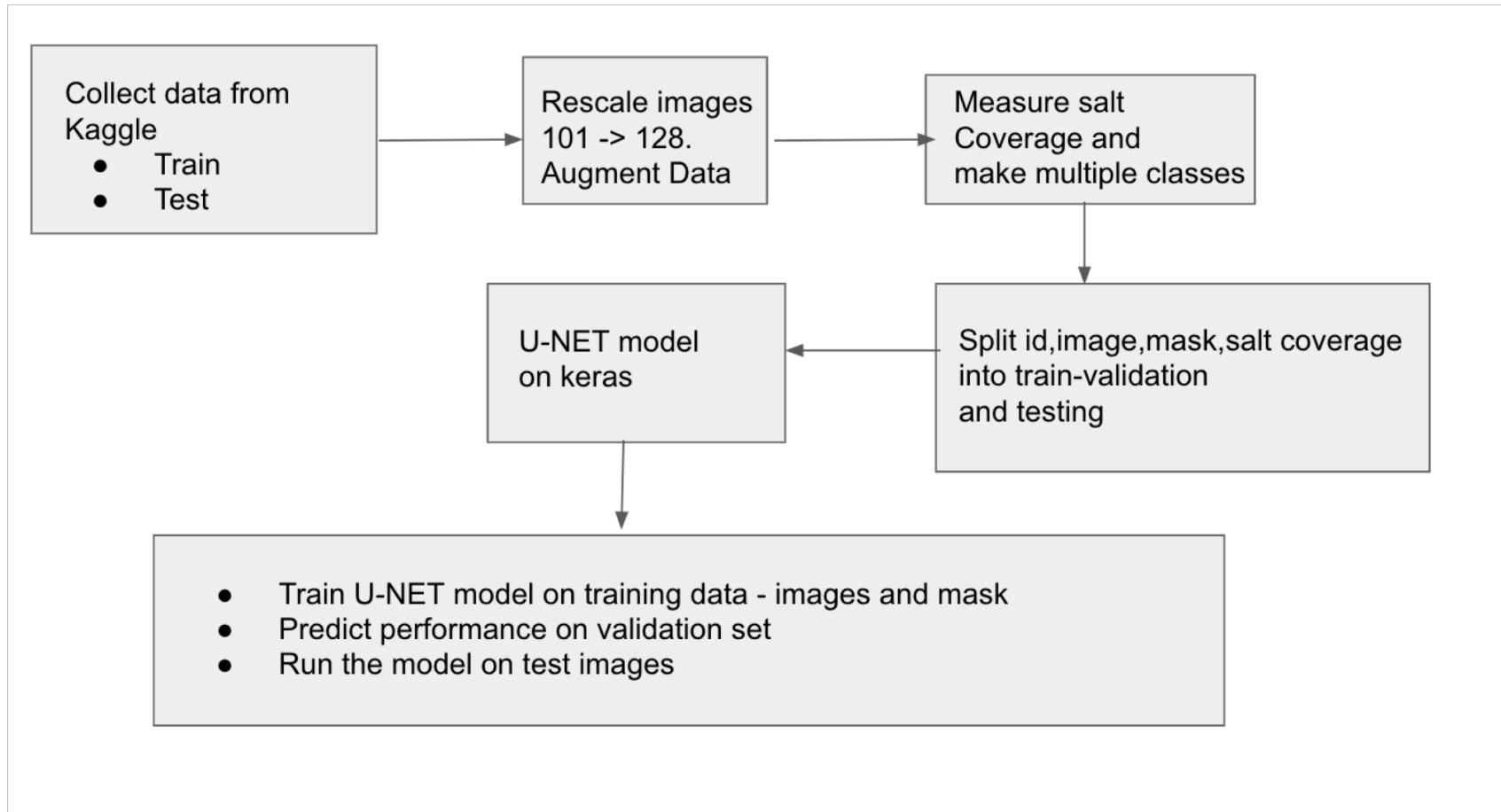
- Unfortunately, knowing where large salt deposits are precisely is very difficult
- Human interpretation as the current practice
 - Highly subjective image rendering
 - Risk in exploratory drilling
- Opportunity for computer vision !

U-Net for Image Segmentation

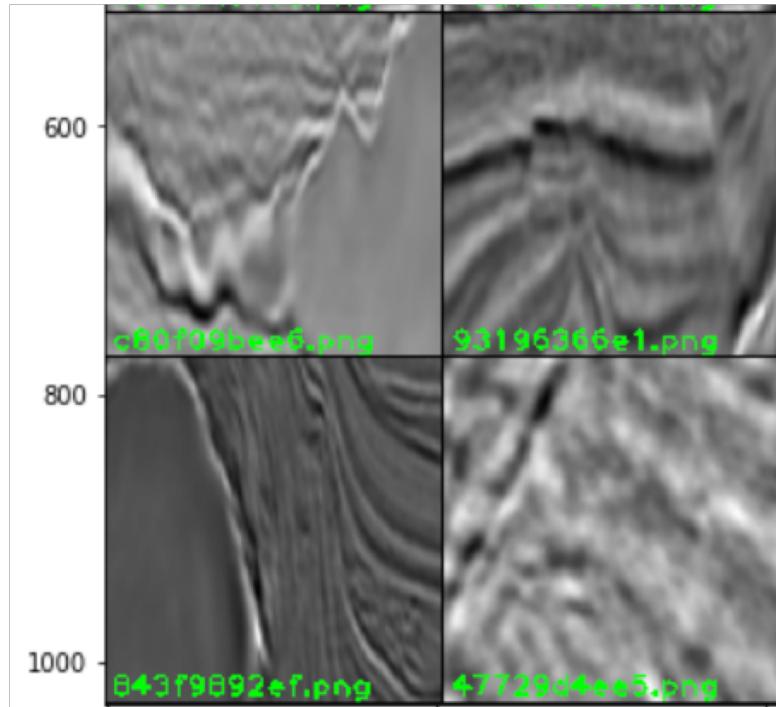
- Developed in 2015 for biomedical industry
- Computationally efficient
- Works with small datasets
- Perfect for image segmentation
 - Semantic segment



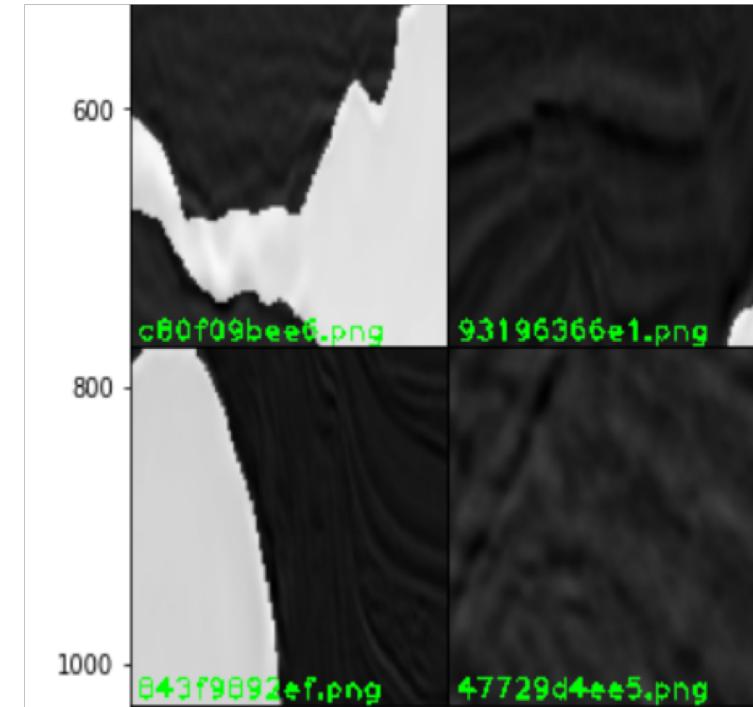
Project Methodology



Sample Training Images

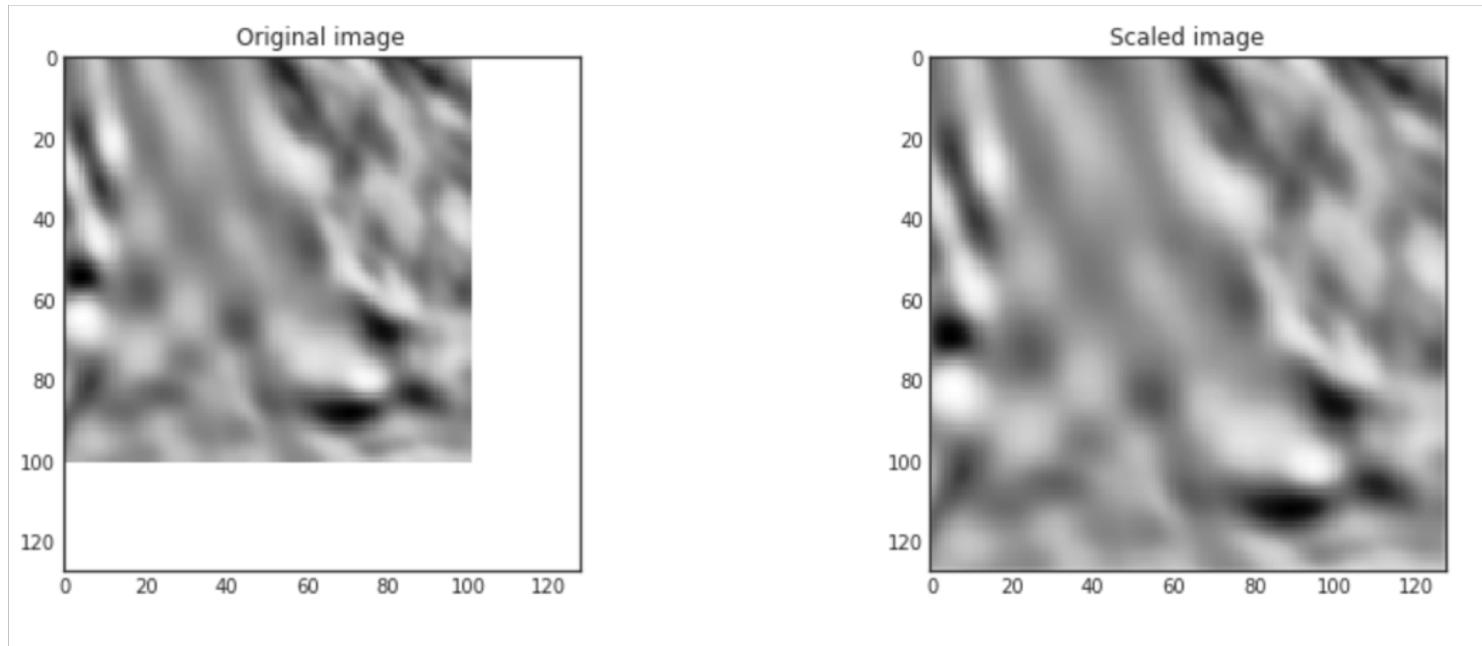


Training images



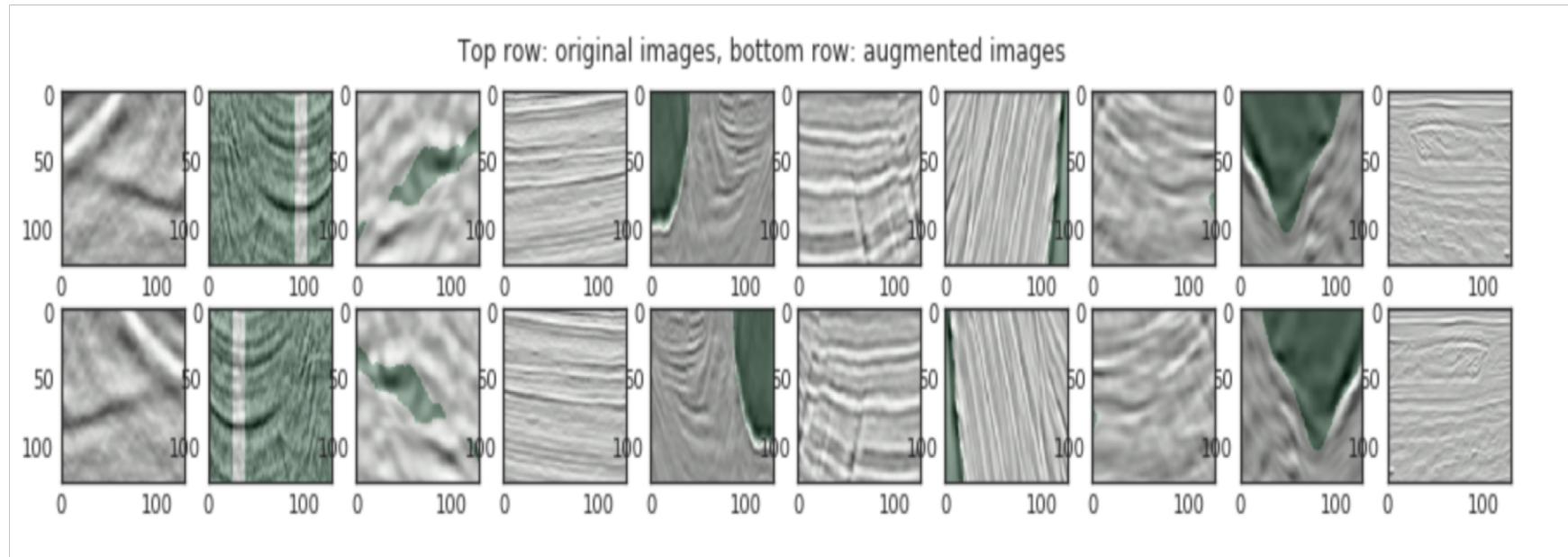
Training masks

Upscaling the Images



Upscale the 101*101 image to 128*128 image for architecture requirement

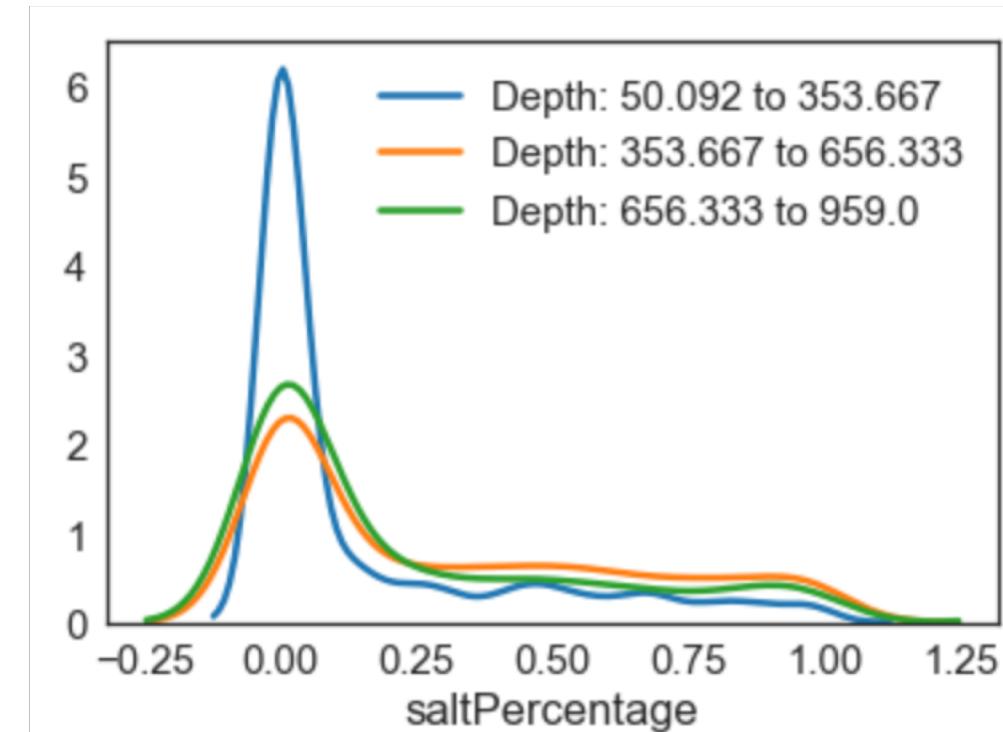
Data Augmentation



Data augmentation to add more features and increase model generalization

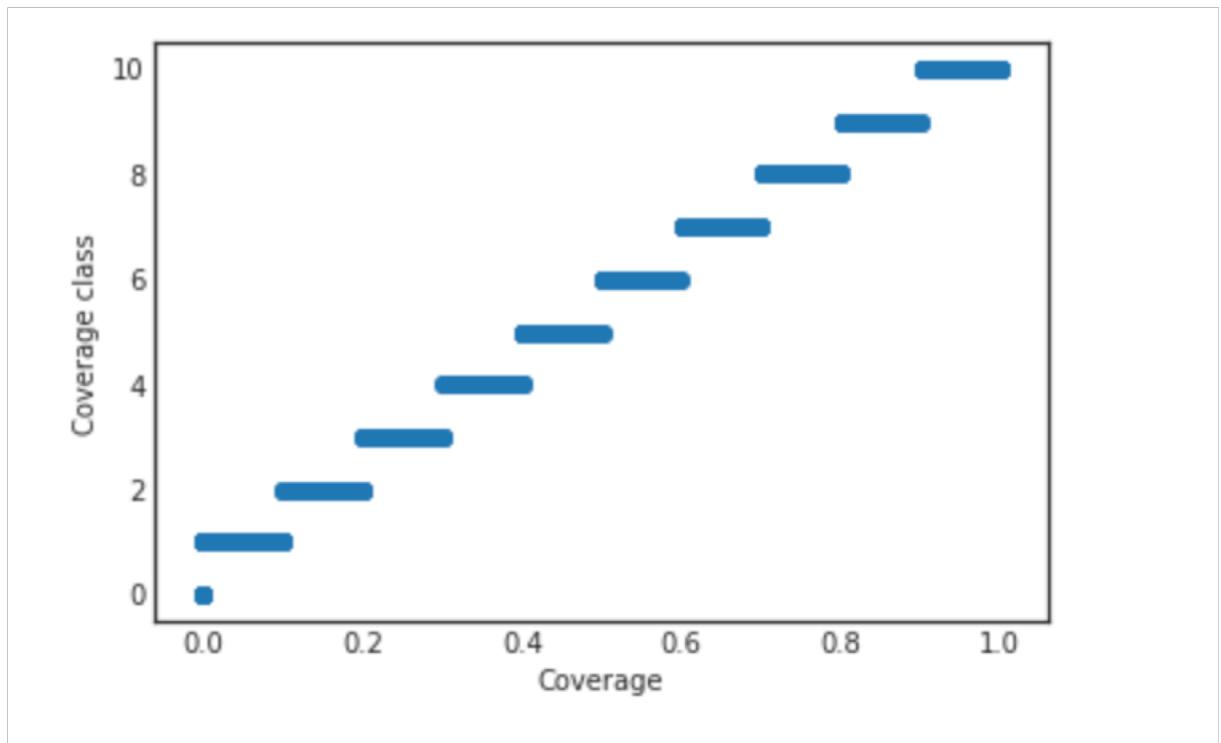
Does Saltiness increase with depth ?

- Most salt percentage in 353 – 656 ft range
- Least salt percentage in 50ft – 353ft range
- Salt does not increase with depth



Coverage Classes

- Evaluate salt concentration in images
- Divide the images into multiple classes based on % salt
- Used as a feature for segmentation

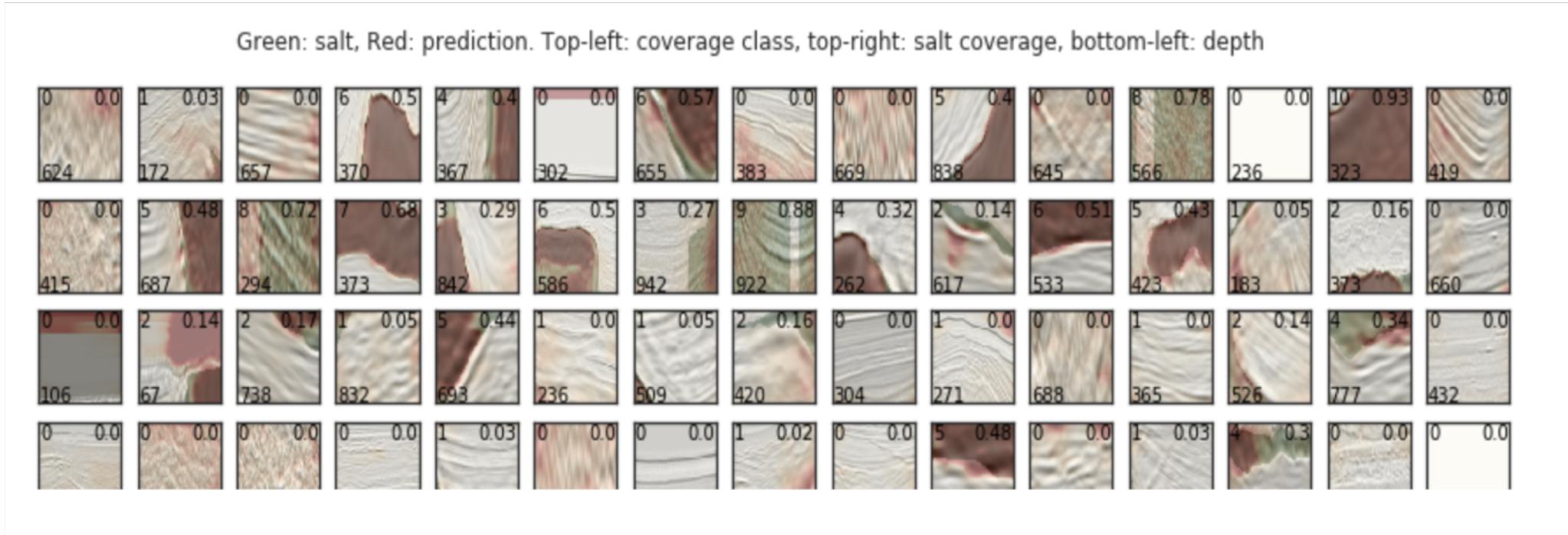


Model Performance

- Model epochs limited to 5 for faster completion
- Scope of use of GPU to enhance performance
- Training accuracy of 87.88% with just 5 epochs

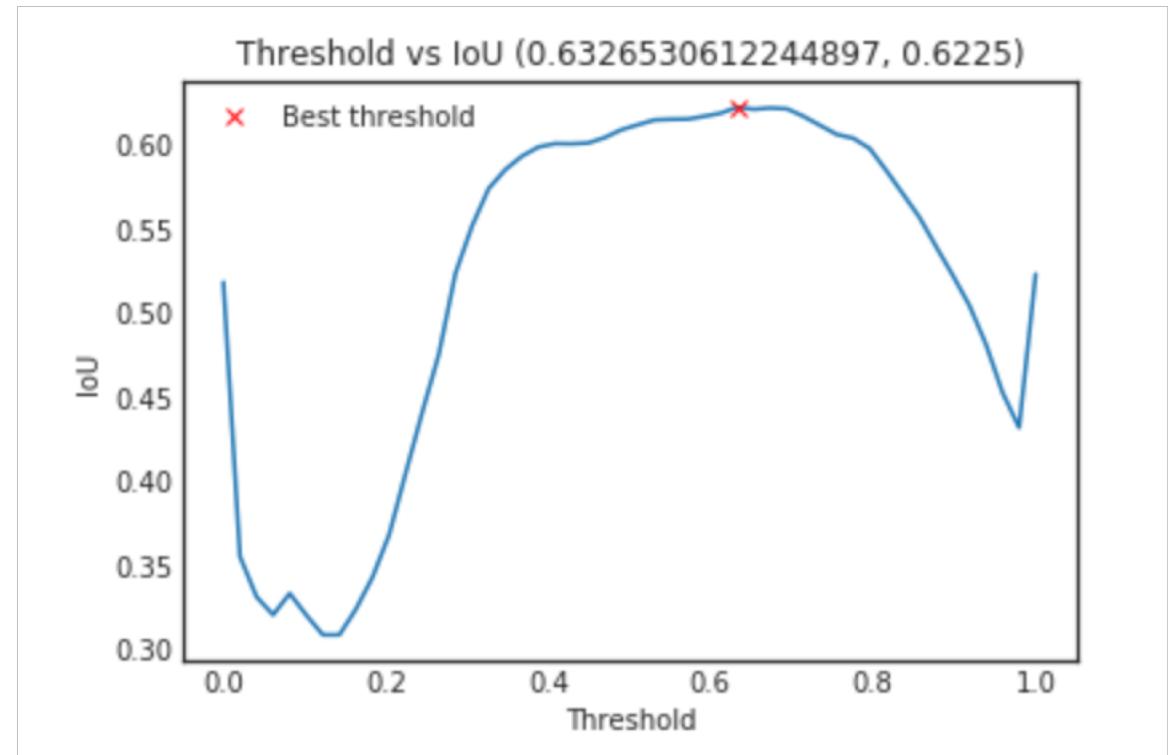
```
Epoch 00004: val_loss improved from 0.34075 to 0.32827, saving model to ./keras.model
Epoch 5/5
6400/6400 [=====] - 42s 6ms/step - loss: 0.3012 - acc: 0.8788 - val_loss: 0.2834 - val_acc: 0.8843
```

Performance on Validation Samples



Score of Model Performance

- Perform thresholding to group the predictions
- IOU metric appropriate for segmentation use case
- Current model accuracy (with 5 epochs) is 63 %



Conclusion

- A U-Net implementation for semantic segmentation that aims to delineate salts in the seismic images is developed.
- This developed model will be iteratively improved by incorporating ResNet blocks in the future.
- This project has been shared on the Kaggle and to the curators of the data, TGS, for feedback. Results pending.