Semantic Segmentation using U-Net

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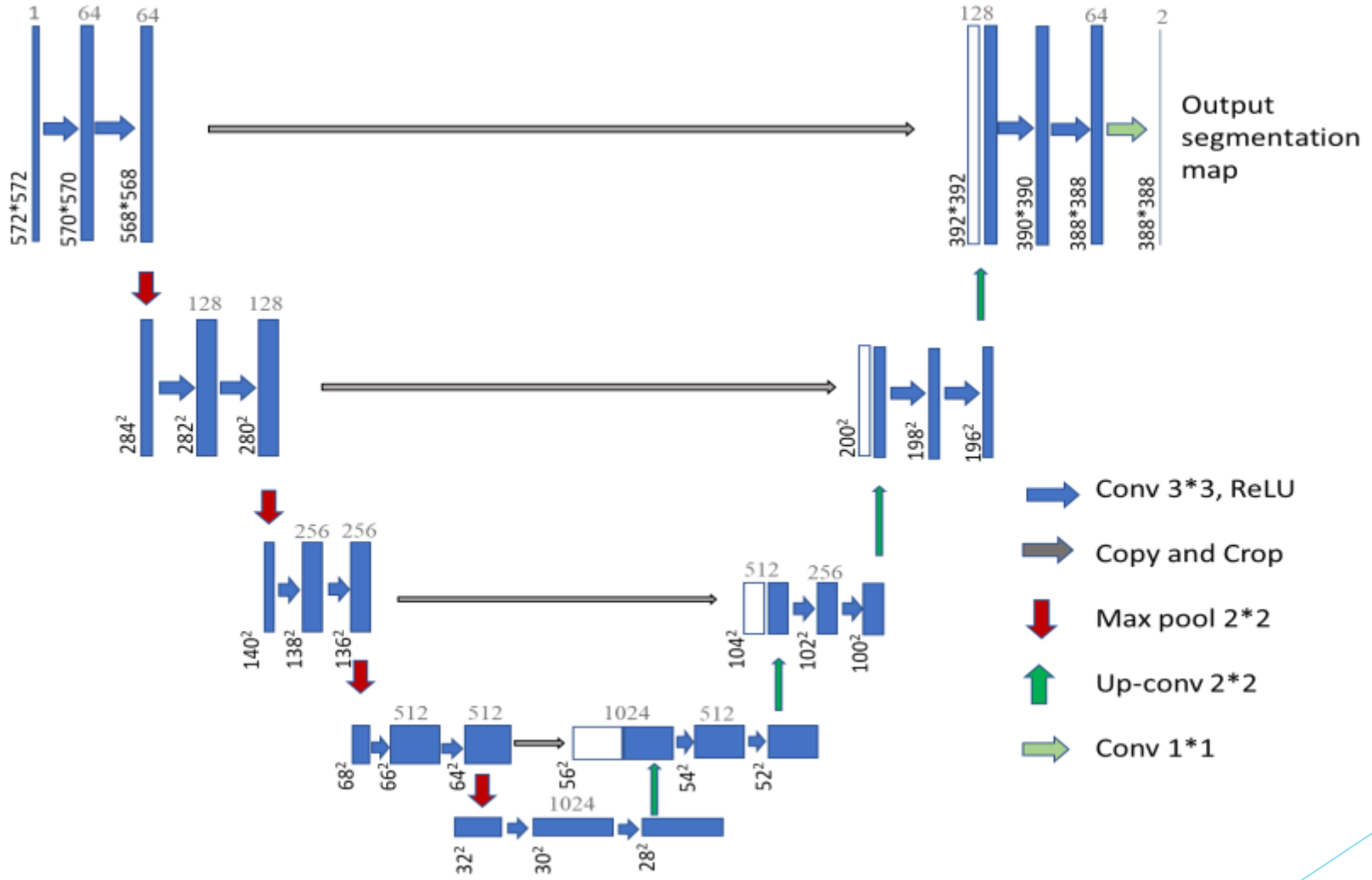
Abstract

- We present a straightforward, adaptive, and versatile U-Net-based technique for picture segmentation utilizing the TGS salt identification dataset, which is a commonly used benchmark dataset for object recognition and segmentation tasks.
- The purpose of approaching the U-net model is to train the TGS salt identification dataset with pre-processor to generate input images.
- Our experimental results show that our U-Net-based technique outperforms competitors on the TGS salt identification dataset.

INTRODUCTION: Semantic Segmentation

- The U-Net structure is a commonly utilized deep learning model for performing image segmentation tasks.
- The use of semantic segmentation in identifying TGS salt deposits aims to achieve accurate identification by dividing the seismic image into distinct regions that correspond to specific classes.
- Traditional methods for identifying salt deposits rely on manually crafted features, which can be time-consuming and may not be effective in recognizing all types of salt formations.
- As a result, the accuracy and reliability of the identification process can be limited.
- Previous research has investigated the application of deep learning methods, specifically convolutional neural networks (CNNs), for identifying salt deposits in seismic images.
- TGS salt identification improves upon previous studies by utilizing a specialized type of CNN known as U-Net, which is specifically designed for segmentation tasks.
- By working in deep learning and computer vision to improve the accuracy and efficiency of salt deposit identification.

U-NET ARCHITECTURE



SETUP PARAMETERS

- no of channels in inp =1
- no of channels in output =1
- no of levels =3
- Train test split is 85:15
- 15% of dataset used for testing
- rest 85% for training

RESULTS

DATASET USED:

The data is a set of images chosen at various locations chosen at random in the subsurface.

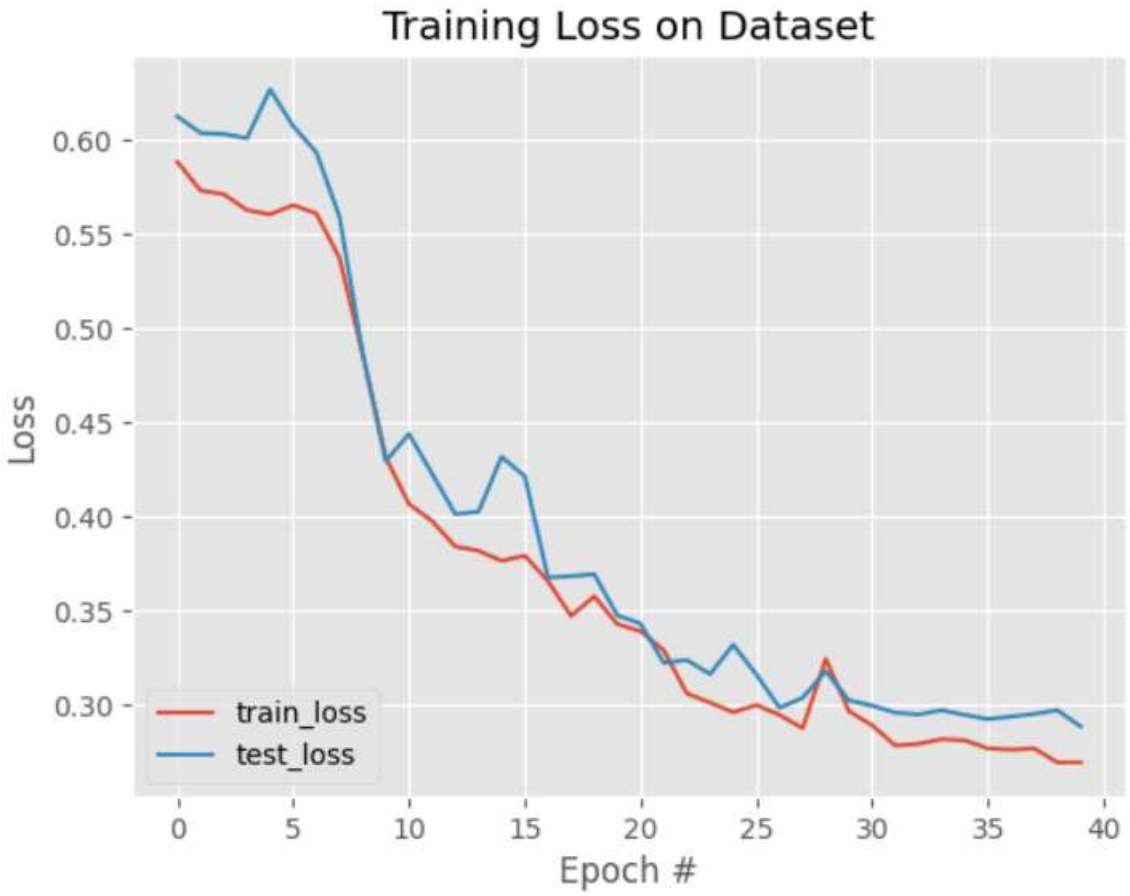
The images are 101 x 101 pixels and each pixel is classified as either salt or sediment. In addition to the seismic images, the depth of the imaged location is provided for each image.

The goal of the project is to segment regions that contain salt.

It is utilized in various computer vision tasks, such as object detection, instance segmentation, image captioning, key points detection, panoptic segmentation, dense pose, and stuff image segmentation.

The dataset provides extensive annotations, including bounding boxes, per-instance segmentation, key points, and per-pixel segmentation masks.

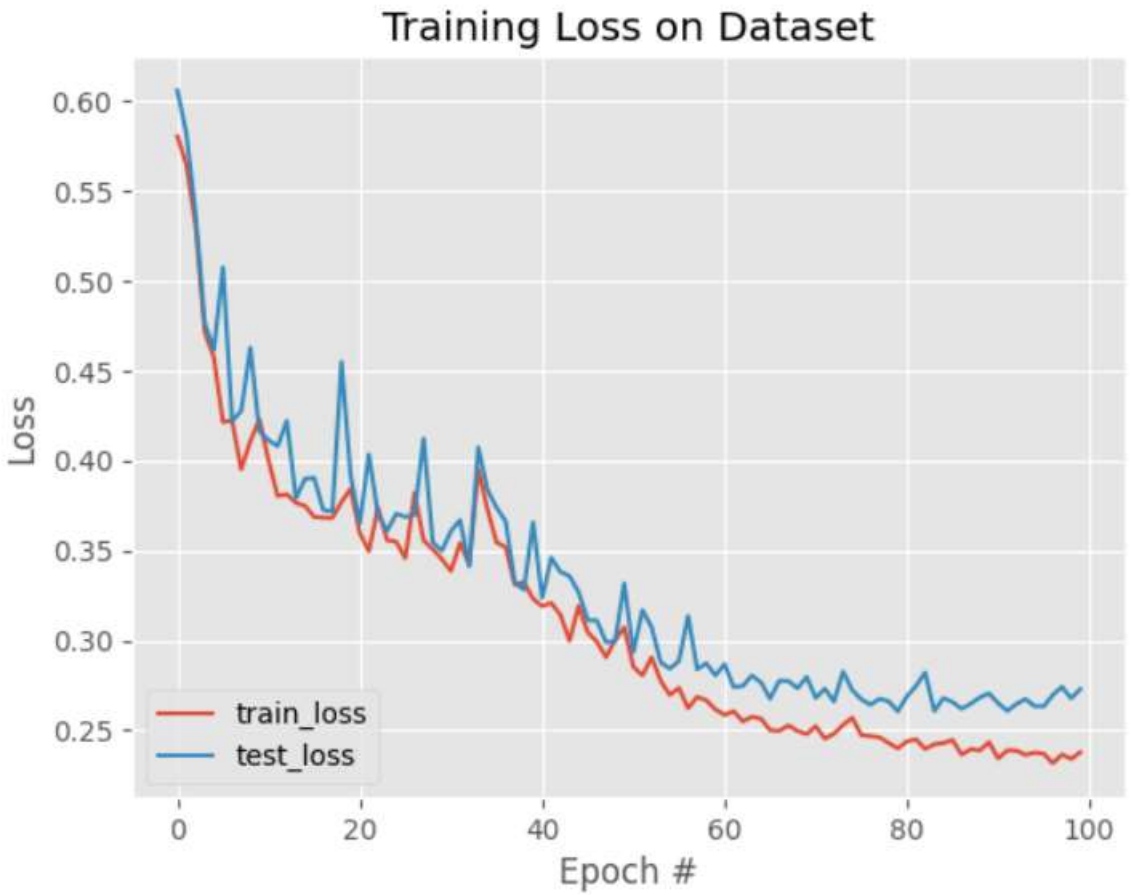
RESULT GRAPHS:TRIAL 1



TRAINING PARAMETERS

- learning rate = 0.001,
- no of epochs = 40,
- batch size = 64
- Image size used - 128x128
- Threshold to remove weak predictions = 0.5

RESULT GRAPHS: TRIAL 2



TRAINING PARAMETERS

- learning rate = 0.001,
- no of epochs = 100,
- batch size = 64
- Image size used - 128x128
- Threshold to remove weak predictions = 0.5

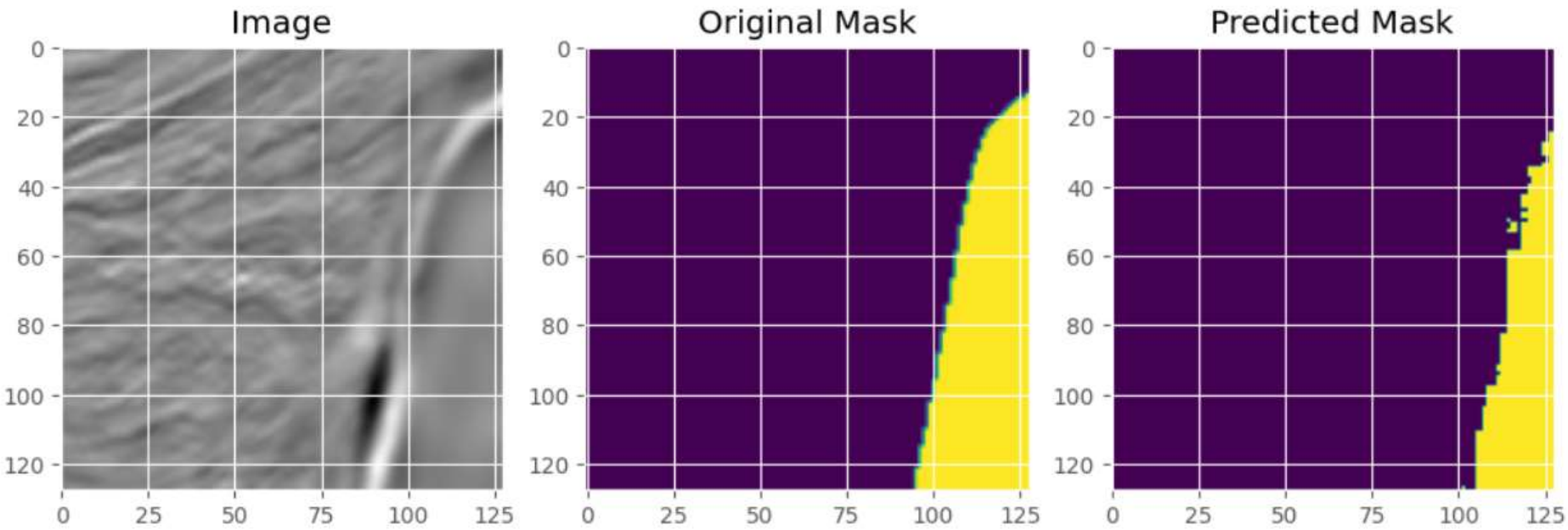


Image
Original Mask
Predicted Mask
0
20
40
60
80
100
120
0
25
50
75
100
125

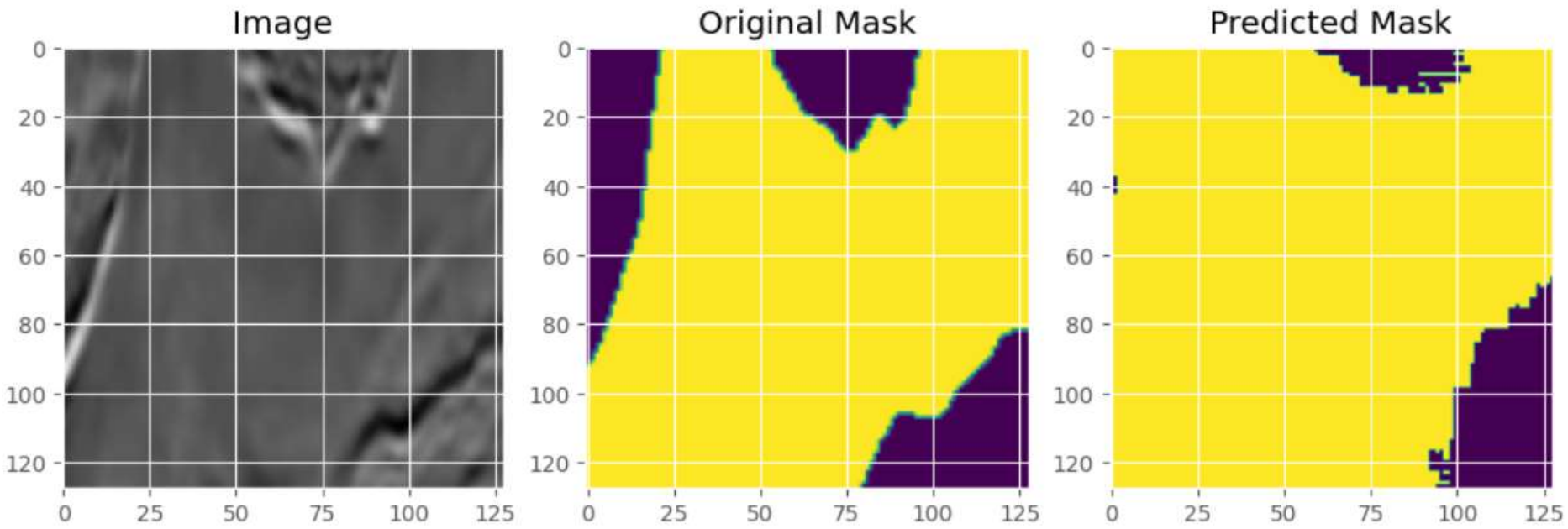


Image
Original Mask
Predicted Mask
0
20
40
60
80
100
120
0
25
50
75
100
125

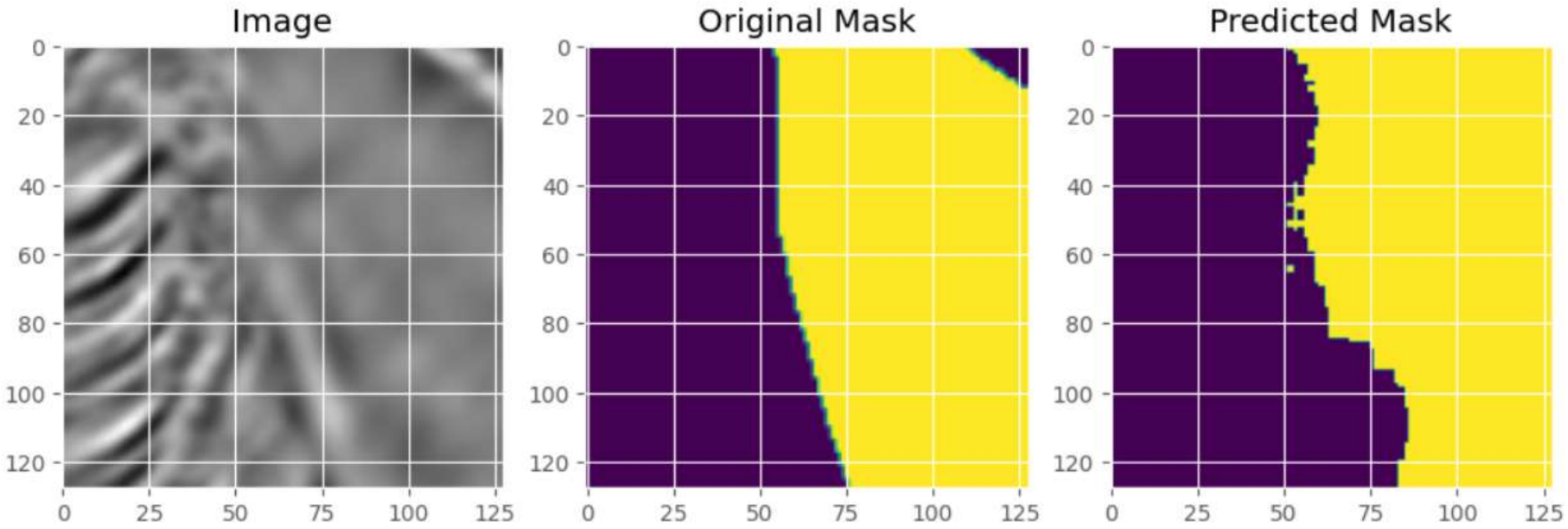


Image
Original Mask
Predicted Mask
0
20
40
60
80
100
120
0
25
50
75
100
125

TRAIN LOSS AND TEST LOSS OF THE PROJECT:

Train Loss	Test Loss
0.23	0.27
0.26	0.29
0.27	0.29

Table 1: Train and Test Losses

CONCLUSION

Using semantic segmentation, we have achieved high accuracy in identifying salt deposits in seismic images of subsurface geological formations.

Some of the top-performing models were based on U-Net have be achieved.

THANK YOU