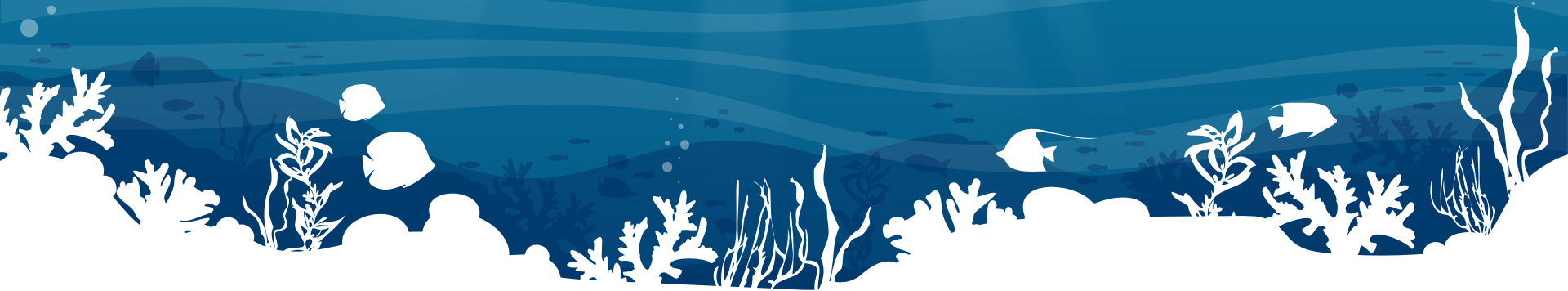







Ocean Floor Contour Prediction

Mike, Max, Merve





Introduction



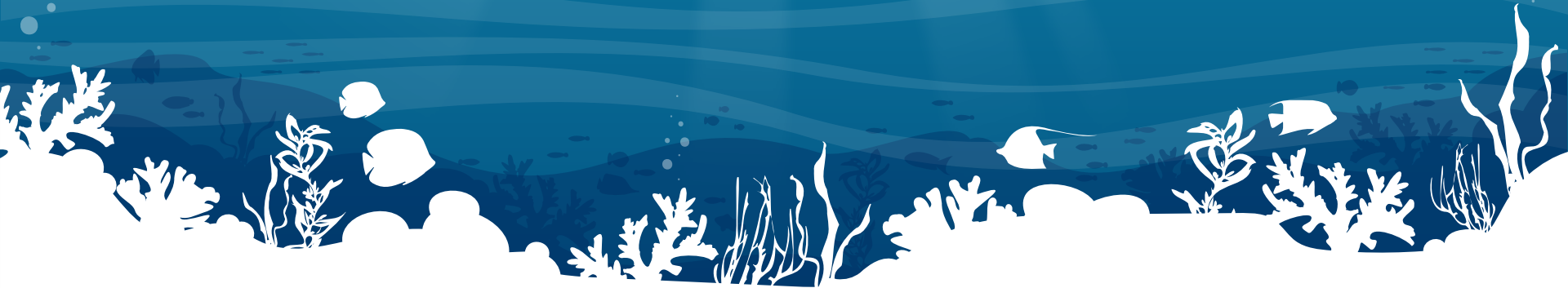
Background and Motivation

-  Mapping the ocean floor is crucial
 -  Navigation, marine resources management, predicting natural hazards
-  High detail mapping (LiDAR or Acoustics)
 -  Ships and AUVs
 -  Expensive and Time consuming

Related Work

-  GEBCO Seabed 2030 Project (UN)
-  Satellite Geoid Estimation (US Navy)
-  BathyNet (Developing deep net - 2021)
-  Mostly Unpublished

Methodology



Dataset



Data from NOAA
Seafloor Mapping



Mostly well
mapped areas



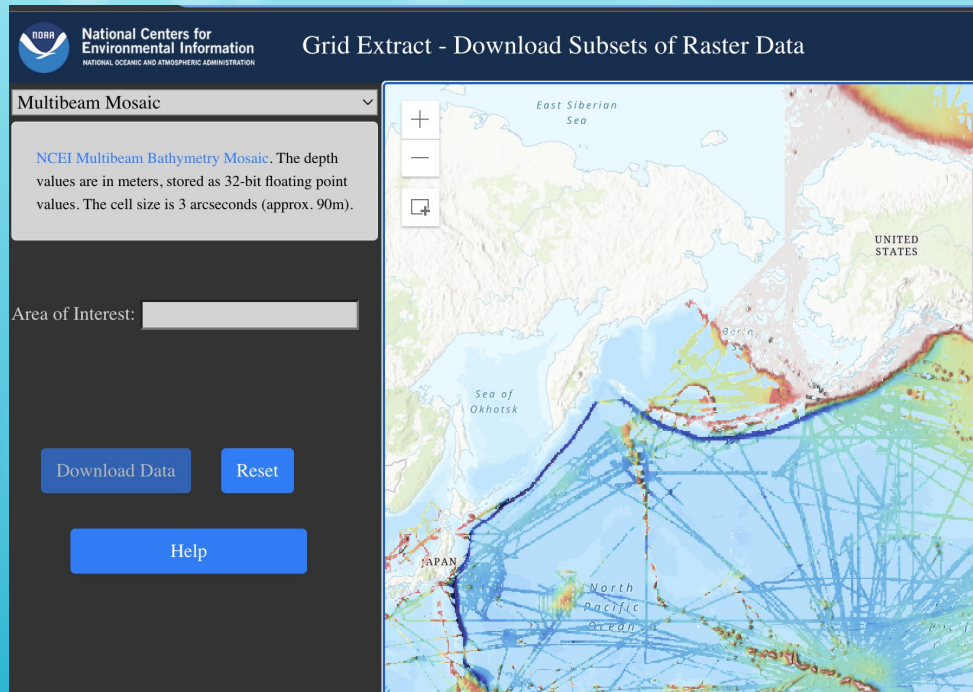
Depth as Values



Done Manually



32k Images



Predicting Contours



Setup



Reassigned NaNs
(unmapped areas) to
image's average depth



Train on center and predict
expansion



Input output
80x80 → 100x100



Baseline models



Linear Regression



Vanilla CNN



Specialized models



U-Net (try to leverage identity
relation)



Conditional GAN

Experiments



Experiments: Linear Regression



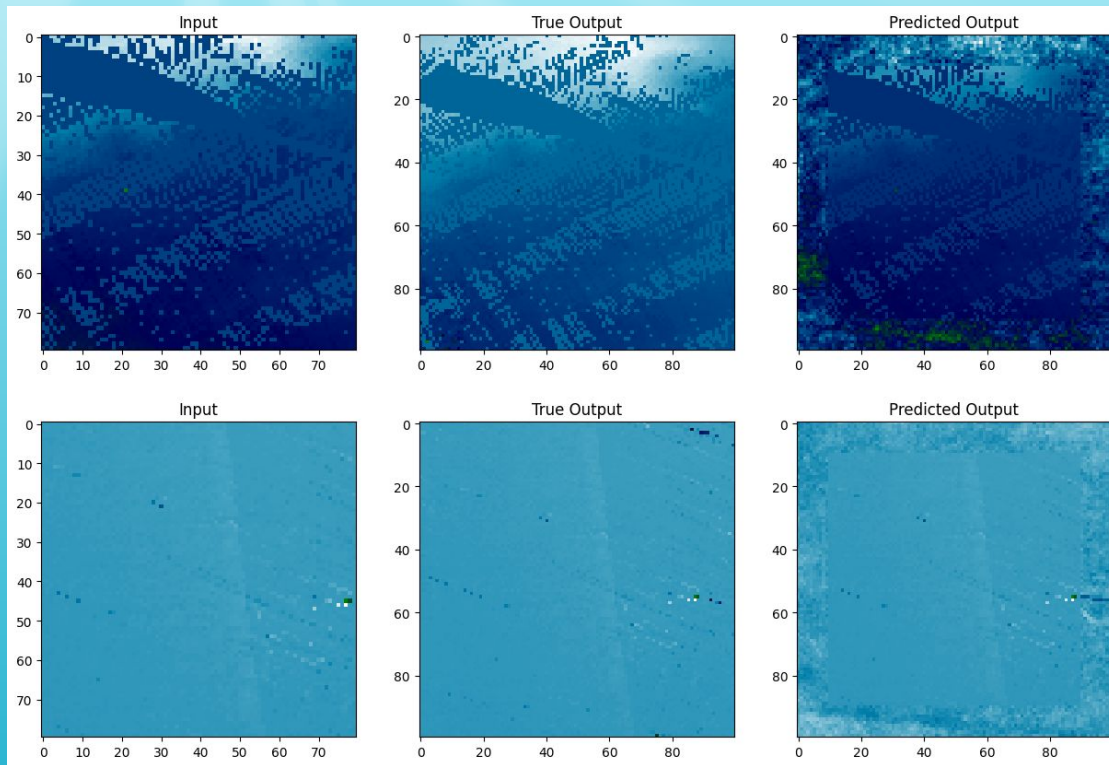
Performance



MSE: 5.8×10^3



SSIM: 0.84



Experiments: CNN



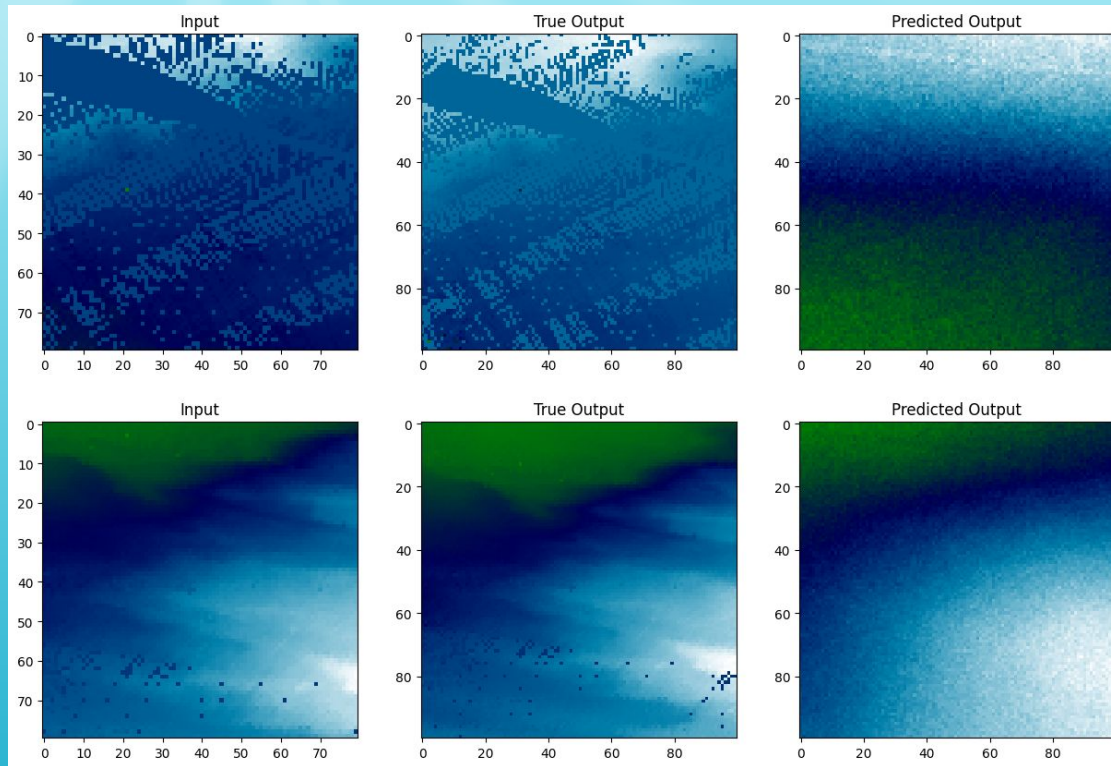
Performance



MSE: 1.1×10^4



SSIM: 0.70



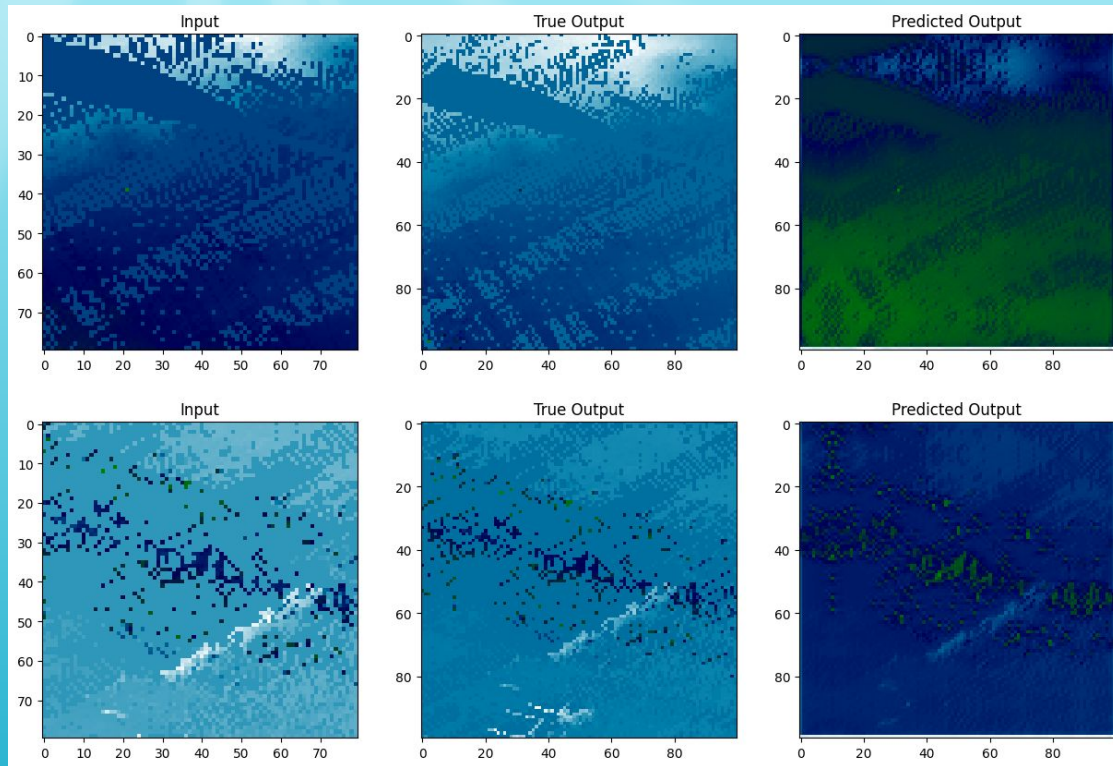
Experiments: U-Net

 Pretrained with VGG

 Performance

 MSE: 6.0×10^6

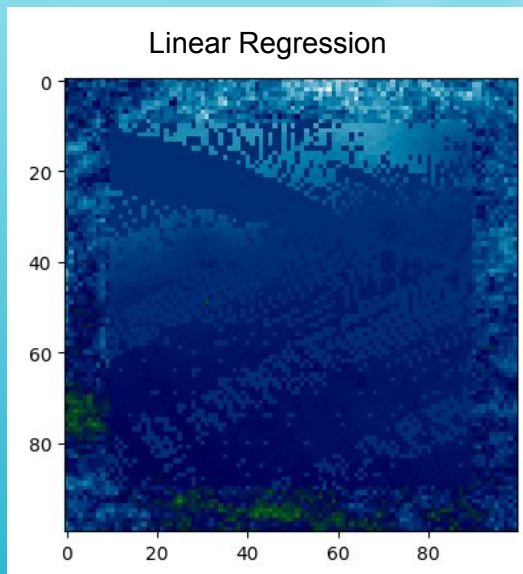
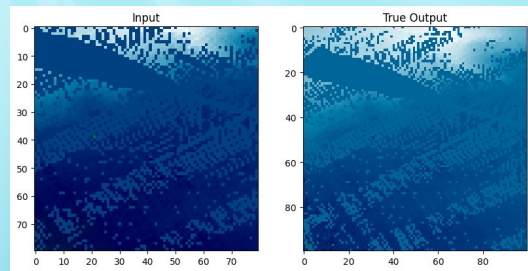
 SSIM: 0.85



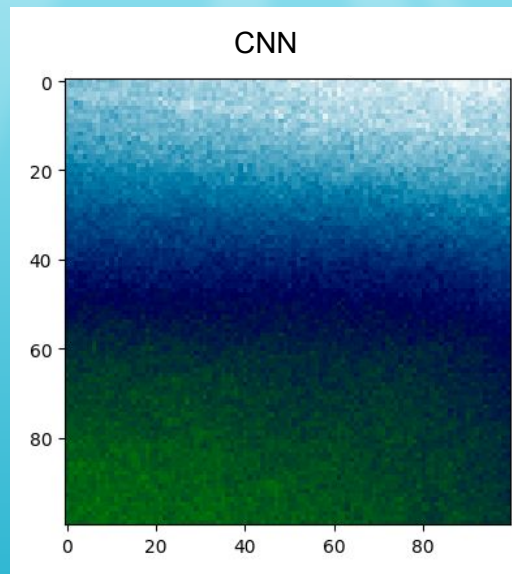
Discussion



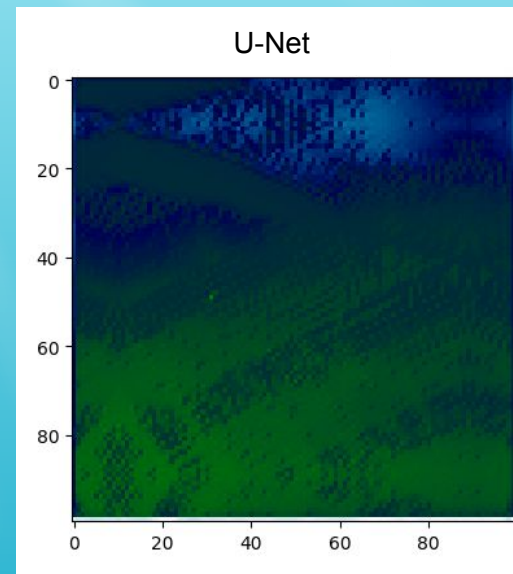
Experiments: Comparison



MSE: 5.8×10^3
SSIM: 0.84



MSE: 1.1×10^4
SSIM: 0.70



MSE: 6.0×10^6
SSIM: 0.85

Conclusion



Limitations



Difficult data collection



Training power



Future work



Frame Prediction



cGan

The background is a deep blue gradient representing an underwater scene. From the top center, several bright, light-blue sunbeams or rays of light fan out across the upper half of the image. The bottom of the image features a white silhouette of an ocean floor with various coral reefs, seaweed, and small fish. A few larger, light-blue fish are also visible swimming in the water. The overall composition is clean and modern.

Thank You!