Automated Side Scan Data Interpretation using Deep Learning for Offshore Energy

Authors:
Hamid Shayanfar, Global Maritime, Canada
Bedanta Goswami, Global Maritime, UK
Anskey Miranda, Global Maritime, Canada
Ramyar Zarza, Global Maritime, Canada
Even Rosenlund, Even.Rosenlund@globalmaritime.com

Abstract ID: 93
Call:: MRC 2025 Technical Track – Call for Abstracts
What Theme Are You Submitting for?: Data, Modeling, and Simulation
Keywords: Deep Learning, Detectron2, Faster R-CNN, Object Detection, Seabed Imaging, Side Scan Sonar (SSS)

Seabed imaging is critical to a variety of subsea engineering projects. A detailed analysis of seafloor objects (e.g. boulders, debris, existing infrastructure) is crucial to reduce risks to planning and execution of offshore infrastructure projects such as monopiles, anchors, cables, pipelines, jack-ups, rigs etc. In addition to risk and cost mitigation, analysis of seabed risks is often a regulatory requirement for obtaining clearances and permits. Side scan sonar (SSS) is a frequently used geophysical tool used to acquire high resolution seabed data, allowing a detailed interpretation of potential obstacles on the seafloor. Interpretation of processed SSS data is traditionally carried out manually, where a human typically relies on the intensity contrast of the seabed image to identify potential target locations and their dimensions in length, width and height. Interpretation of these large datasets is challenging and resource intensive in terms of time and labor. An automated object detection method was therefore developed as a solution to reduce timeline and improve consistency of interpretation. The proposed method uses the Faster R-CNN model architecture within the Detectron2 framework, to generate bounding boxes to identify potential seafloor objects and estimate location and dimension in SSS data. The model was trained and tested on one survey mosaic approximately 1,400 m by 100 m, containing 949 labeled objects (boulders and debris of dimension ranging from 0.1 m to 10 m). The dataset comprised 1,800 images. Of these, 1,440 images were used for training/validation (80%/20% split) and 360 for testing. Training used raw and augmented SSS images on an NVIDIA GeForce RTX 3060 GPU. The initial model achieved a recall of 0.66 on the test datasets and performed well in detecting and sizing objects on datasets at different seabed locations. Further improvements will be made to implement object classification and incorporate synthetic data into training models.