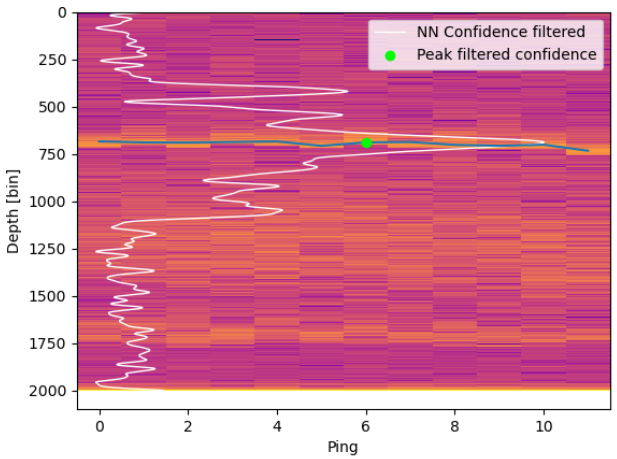
Machine learning based approaches for detection and classification of fish farm equipment measured using acoustics

Problem Statement

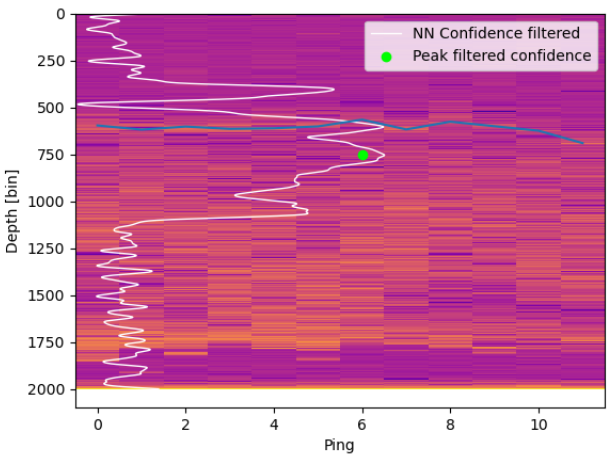
Measurement equipment and methods used today make it difficult to obtain an accurate description of the spatial extent and dynamics of the cage and the fish distribution and movement within. This project aims to develop some machine learning based approaches to efficiently extract those information from multibeam measurements with a high accuracy

Methodologies

The first step is to develop the methods to observe features in a single ping configuration. This was done by training a feed forward neural network to replicate manually labeled data from an echosounder suspended under a salmon cage, pointing up. The input is a 12 ping x 2000 bin image, and the output is the index of the bin that the feature is located at. The network is constructed as a fully connected 3 layer network with ReLU activation function between each layer



Correct classification



Incorrect classification

Preliminary results

Our approach is able to correctly locate the net and surface(within 1m) with an accuracy of 99.69% when new data is applied to the construction of the neural network

Next steps

Move to a multibeam setting by

- Developing a transformation method to account for changes in the field of view.
- Slicing the image over multiple swaths and pings, to extract 2d horizontal images.
- Design a new object detection algorithm to specify and classify the equipment from those constructed images

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