



Internship/master's thesis research at VORtech (Delft)

IJmuiden cross current estimation using Machine Learning

The Challenge

IJmuiden is the entrance to the North Sea Channel that connects the port of Amsterdam with the North Sea. It is one of the busiest shipping routes in the Netherlands. A daily forecast of the cross currents outside the harbor is made to determine if the conditions are right for ships to enter the IJmuiden Harbor safely.

This forecast is made with a neural network that was developed 25 years ago. The inputs to the network are the tide and the wind and the output is the (experienced) cross current. The model was trained using the recorded steerage angles of incoming ships. However, over the course of 25 years, the area and the ships have changed considerably. Therefore, the neural network is missing substantial cross current events with some regularity.

In 2017 a measurement campaign was conducted with current measurements in the channel. Next to the channel there is also a current measuring pole with an ADCP (Acoustic Doppler Current Profiler) that measures velocity profiles in the vertical. In addition, the potential of numerical modelling to improve the forecasts was investigated with a 2D model. This model does, however, not include freshwater outflow which is thought to be relevant for the flow patterns in channel.

The challenge is to improve the cross current estimations with the available information.

Research Questions

The following questions have been raised. An internship or master's thesis research can address one or more of these.

1. Can a post processing AI model be built based on measurements and expected freshwater outflow to improve the results.
2. Or is a 3D model the only solution.
3. Or is it possible to train an AI model offline based on 3d model outcomes.

To answer these questions, it is deemed useful if the intern will get a practical feeling for the context by sailing on a ship in the area and through meetings with pilotage, with experts from the Hydro-Meteo Center that produces the forecasts and with people from the Port of Amsterdam. We expect the intern to show a keen interest in these meetings.

The Company

VORtech is a company of scientific software engineers. Our team consists of some 30 colleagues with a background in engineering, mathematics, and computer science. We work on operational software for forecasting, simulation, analysis, and optimization. Our customers are mostly government agencies and large industrial corporates.

We have the ambition to be a technology leader. Therefore, we welcome collaboration with universities to learn new techniques and to help turn new developments into practical applications. Each year, one or two master students do an internship or their master's thesis research at VORtech. We tend to take an active role in each internship, providing close guidance and support.

As an intern, you will be part of the team and participate in all the activities, both social and work-related.

Are you Interested?

If you are interested in the internship or master's thesis research as described in this text, please contact Mark Roest (mark.roest@vortech.nl). If there are multiple candidates, we may have to select as we can only support one intern/master's thesis at a time.

