

Master thesis project

Topic: Learning more accurate surrogate models with observations (measurement) for the storm surge forecasting on the North Sea

Location: external master project at Deltares (Delft) .

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Surrogate AI models aim to mimic the behavior of a numerical model using AI methods. The main advantage is that they can be much faster than the models that were used as their data-source.

The AI models need to be trained on training data. Numerical models are very efficient in generating the training data, which has many benefits. The main benefit is that numerical models can create a full set of all relevant parameters at all grid points. In contrast, measurements in the field are generally sparse in space and time, and limited to only a subset of the relevant variables.

Still, there is much to be gained from the measurements, since numerical models generally have systematic errors, and the approximations by the AI modeling tends to add to these biases.

In this project we aim to include measurements into the surrogate AI modeling. We foresee at least two useful approaches. The first uses transfer learning, where the AI model is first pre-trained on the numerical model data, and then fine-tuned using the measurements. The second approach uses data-assimilation to include the measurement into the dataset used for training. Such a combined "model+data" product is often called a re-analysis. In addition to these methods there may be more. These technique will be applied to a storm surge model for the North Sea.

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