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AI surrogate models for forecasting tides and storm-surges

Forecasting the rise of the sea-level at the Dutch coasts during storms is of considerable importance for our low-lying country. For decades, this has been the domain of numerical models. However, forecasting more than a few days ahead necessitates the consideration of uncertainty, for which ensembles are used. This results in computational challenges that can potentially be overcome with the use of AI surrogate models. For this reason, AI surrogate models for tides and storm-surges are currently being developed. Several network architectures are under investigation. The presentation will show some results, for time-series based and GNN type surrogates.

During the development, it's becoming clear that there are many aspects, and possible paths, of the development of an AI surrogate that have to be determined experimentally. Coming from the world of numerical models, there seems to be a lack of guidance from theory. For example, numerical stability can be studied in detail for numerical models, but is sometimes not so easily explained for AI surrogates. In addition, there are often (physical) properties that are important to preserve for the application. As a consequence it is often difficult to predict how much work is needed to achieve a good result and to guess in advance what the attainable accuracy may be.

These points will serve as the basis for the breakout discussions, with the goal of inspiring research into stronger theoretical statements about numerical properties and preservation of some desirable properties in a way that makes the development of AI surrogates more predictable.