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Experiments with models committees for flow forecasting

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In hydrological modelling typically a single model accounting for all possible hydrological loads, seasons and regimes is used. We argue however, that if a model is not complex enough (and this is the case if conceptual or semi-distributed models are used), then a single model can hardly capture all facets of a complex process, and hence more flexible modelling architectures are required. One possibility here is building several specialized models and making them responsible for various sub-processes. An output would be then a combination of outputs of individual models.

In machine learning this approach is widely applied: several learning models are combined in a committee (where each model has a "voting" right with a particular weight). In this presentation we concentrate on optimising the above mentioned process of building a model committee, and on various ways of (a) building individual specialized models (mainly concentrating on calibrating them on various subsets of data and regimes corresponding to hydrological sub-processes), and (b) on various ways of combining their outputs (using the ideas of a fuzzy committee with various parameterisations). In doing so, we extend the approaches developed in [1, 2] and present new results.

We consider this problem in multi-objective optimization setting (where objective functions correspond to different hydrological regimes) – leading to a number of Pareto-optimal model combinations from which the most appropriate for a given task can be chosen. Applications of the presented approach to flow forecasting are presented.

References

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