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The Lasso as an exploratory tool in hydroclimatic forecasting: a case study of the Waitaki River catchment, New Zealand

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Predictability of river discharge is a topic of increasing practical importance. Seasonal and monthly forecasting poses a challenge, especially in catchments with limited groundwater reservoir influence or relatively small basins which prevent forecasting by delayed flow. Additional climatological information can be utilized in forecasting models, for example when there is a lack of serial correlation between consecutive months and seasons.
Here, we address a problem of seasonal forecasting of hydro-lake river inflows using large scale oceanic-climatic predictors. This forecasting problem is high-dimensional with small sample sizes. We highlight usefulness of regularized linear regression method Lasso as both a predictive and exploratory tool. This approach allows to explore relationships between large-scale climatological processes and local hydrology. A modified cross-validation procedure is proposed to maximize the available information in a forecasting model.
We demonstrate the experimental results with a case study of seasonal lake inflow forecasting in the Waitaki catchment in New Zealand and discuss analysis of the selected spatial predictor variables.