

# Specification of Landmarks and Forecasting Water Temperatur

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## **Abstract**

We present and analyse a data set containing water and air temperature in the river Wupper in the northern part of Germany. The analysis pursues two concrete aspects. First, it is of interest to find so called landmarks, these are regularly occurring timepoints at which the temperature follows particular pattern. These landmarks will be used to assess whether the current year is running ahead or behind the "average" seasonal course of a year. Secondly, we focus on forecasting water temperature using smooth principal components. The latter approach is also used for bootstrapping temperature data, which allows to assess the variability of the specified landmarks.

The implications of our modelling exercise are purely economic. The data trace from a larger project which aims to develop a temperature management tool for two power plants along the river Wupper. These use river water for cooling purposes and to preserve natural wild life in the river there is a strict limit of the maximal temperature of the water. The latter constraints the possible production range of the power plant. More accurate forecasts therefore mean a higher potential of energy production.