Two Perspectives on Surface Water Quality

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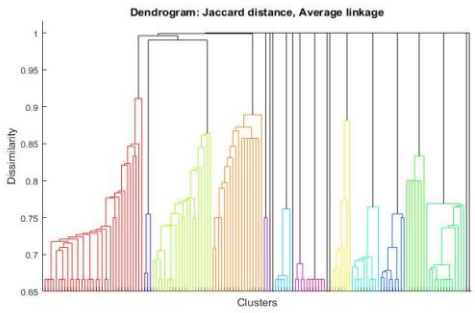
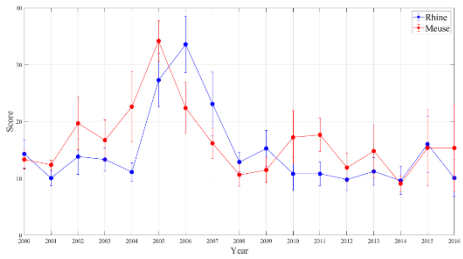
Water quality is important for environmental reasons, but surface water is also an important source for drinking water. Within the OFF/ON project we investigate strategies to characterize raw material and extract information that is relevant for further processing. Here we describe environmentally relevant aspects of water, as well as properties that are relevant for the production of drinking water. Even though the raw material is the same, both descriptions require completely different approaches.

In this study we develop a water quality alarm to detect and identify pollution events and we provide a water quality index to assess the level of purification required to produce safe drinking water from source water

Targeted and untargeted chemical analysis of surface water is performed multiple times per day. The current practice is to send out an alarm when the concentration of a single compound exceeds its regulatory threshold. Our hypothesis is that pollution events can be detected earlier and more robustly by taking into account combinations of compounds that occur together. The first step in our approach is to detect anomalous samples with Isolation Forest. The second step is to then identify pollution events with hierarchical cluster analysis.



European legislation states that rivers should become cleaner and that this should result in a reduced effort to produce drinking water. However, no suitable measure to express this effort exists yet. Therefore, we have created an index that compares measured contaminant concentrations to drinking water guidelines, while taking into account the resilience of contaminants to the treatment process



From our study and results so far we can conclude that:

- **Based on principles of Multivariate Statistical Process Control we are able to detect water samples that deviate from normal conditions**
- **By clustering these deviant samples, we are able to identify several distinct types of pollution related to specific industries or events**
- **We have provided a water quality index to assess the level of purification treatment required to produce drinking water from surface water**
- **It aggregates a large number of measurements into an easily interpretable index**
- **Using process information makes this index more sensitive to relevant changes in source water composition**
- **We have calculated index scores for Dutch surface water in the Rhine and Meuse, but found no general decrease in required purification levels since the 2000 Water Framework Directive**

Future work will focus on extending the water quality alarm to untargeted analysis and on predicting removal efficiencies of contaminants from physical and chemical properties.

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