Understanding Classification of European Catchments using Artificial Intelligence

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Catchment similarity detection is a fundamental topic for both operation and research hydrology.

Classification of catchments and hydrologic similarity can be assessed by a variety of geographical and hydrological characteristics.

In this study we have adopted a large-scale dataset of varying geographic characteristics derived from both ground-measured and space-measured data products.

To gain an improved understanding of the similarity of European catchments an Artificial Neural Network was adopted that has the ability to apply unsupervised learning to discover hidden patterns.

The Self-Organizing Map has the ability to describe uncategorized data including visualizing low-dimensional views of high-dimensional data while preserving topological properties of the input space.

Training the Self-Organizing Map results in a certain composition of the input matrix containing the clustering, but the lack of location-perspectives makes analyzing the patterns very difficult by itself.

To get an improved understanding of the applied clustering of the Self-Organizing Map, the events represented in each node were linked to the corresponding geographical locations.

With this combined view we have the ability to allocate SOM derived topological patterns to geographical catchments and regions within Europe.

Based on the adopted approach it becomes clear that the applied clustering presents the Danube catchment as the most distinctive European catchment regarding the geographical and hydrological characteristics describing it.

Overall results shows that Neural Networks can provide an inclusive analysis of catchment similarity, but additional information is required to obtain a deeper understanding of the derived patterns of the applied clustering.

An interactive viewer is available at: https://ai.hkvservices.nl/european-catchments/

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catchment classification, hydrologic similarity, self-organizing map, artificial neural networks, Europe