Hybrid Adaptive Neuro-Fuzzy Models for Water Quality Index Estimation

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Abstract

Soft computing models are known as an efficient tool for modelling temporal and spatial variation of surface water quality variables and particularly in rivers. These model's performance relies on how effective their simulation processes are accomplished. Fuzzy logic approach is one of the authoritative intelligent model in solving complex problems that deal with uncertainty and vagueness data. River water quality nature is involved with high stochasticity and redundancy due to the its correlation with several hydrological and environmental aspects. Yet, the fuzzy logic theory can give robust solution for modelling river water quality problem. In addition, this approach likewise can be coordinated with an expert system framework for giving reliable and trustful information for decision makers in enhancing river system sustainability and factual strategies. In this research, different hybrid intelligence models based on adaptive neuro-fuzzy inference system (ANFIS) integrated with fuzzy c-means data clustering (FCM), grid partition (GP) and subtractive clustering (SC) models are used in modelling river water quality index (WQI). Monthly measurement records belong to Selangor River located in Malaysia were selected to build the predictive models. The modelling process was included several water quality terms counting physical, chemical and biological variables whereas WQI was the target variable. At the first stage of the research, statistical analysis for each water quality parameter was analyzed toward the WQI.

Whereas in the second stage, the predictive models were established. The finding of the current research provides an authorized soft computing model to determine WQI that can be used instead of the conventional procedure that consumes time, cost, efforts and sometimes computation errors