Cielo Sharkus

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Hai Tao is a researcher at Baoji University of Arts and Sciences, their specialty is macchine learning. Dr. Aiman M. Bobaker is an associate Professor of Analytical Chemistry at the University of Benghazi. Majeed Ramal works on neuro-fuzzy models as a Professor of environmental engineer at the University of Anbar. Zaheer Yaseen is a hydrologist from Ton Duc Thang University in Vietnam. Dr. Hossain is a professor of AI and hydrology at Heriot Watt University. Lastly, Shamsuddin Shahid is an associate Professor at the University of Malaysia.

This article presents robust methodology for calculating BOD and OD without having to go through laborious empirical modeling. The authors introduce a novel method for computational models: weaving together the interface of machine learning with artificial intelligence. Their methodology is a branch of neuro-fuzzy modeling, which combines artificial neural network and fuzzy logic. An artificial neural network is a system of computing which has a model “learn” to perform a task. For example, in this paper, the system “learns” about what results in increased BOD and ranks that parameter higher. The fuzzy logic component describes that truth variables may be any real number between 0 and 1. Fuzzification, which is the process of creating a numerical output from a system with some degree of membership, results in a robust way to make decisions. The combination of fuzzy logic and neural networking gave rise to the model described here: hybrid response surface method which is used to predict water quality variables.

The focus of this paper is to create methodology for easy prediction of BOD and DO from readily available water quality parameters such as: temperature, turbidity, pH, EC, Ca, Alkalinity, COD, sulfate, TDS, and TSS. Since regression modeling is a popular method for estimating water quality parameters, this paper compares this new model against this traditional model. This paper provides a robust background on creating a reliable technique for estimating BOD and DO, while also factoring in the highly stochastic behavior using fuzzy logic. This paper covers all aspects for creating this model, from parameter tuning to evaluation of model performance. The way they assess the efficacy of the model is also rich, which couples machine learning evaluation protocols with traditional performance measuring indicators. Current advances in machine learning, artificial intelligence, and neural networking are discussed at length, in addition to the creation of standardized equations. The paper was extremely robust in the creation of this model, and if I were to make any criticisms it is only that the models did not incorporate a biological response element to it. My additional insight is that you can easily formulate an if/than argument in the model that proposes safe ranges of BOD/OD for maximum life sustainability.

The fundamental idea that is tackled in this paper is that you can estimate BOD and DO from very little data if you create the right model. One of their most successful models relied on only temperature and turbidity, which can be rapidly assessed. The simplicity of each model, and the nesting that each of them offers creates an excellent way to address water quality in depth.