

Prediction of Water Quality of Ajichay River using developed Artificial Neural Network and Supporting Vector Machine Models

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Abstract

International efforts have been launched to save the endangered Urmia Lake as one of the largest natural lake worldwide. Ajichay River located in East Azarbaijan province, Iran, is one of the main rivers discharging into this lake and, thus, its water quality can directly affect the Urmia Lake ecosystem and life. In this research, we develop and propose two new numerical packages on the basis of Artificial Neural Network (ANN) and Supporting Vector Machine (SVM) models to estimate the monthly Total Dissolved Solid (TDS) of Ajichay's water. For the ANN calibration, the feed forward back prop (FFB) model is used to obtain a set of coefficients for a linear model, and the radial basic function (RBF) kernel was used for the SVM model. The input data sets of both ANN and SVM models consist of six water quality parameters: TDS, Mg, Na, Ca, Cl, and SO_4 collected monthly over a period of 30 years at Vanyar station situated on the banks of Ajichay River. Both models can successfully predict the variability of water's TDS, but the ANN model with $R^2=0.958$ and $\text{RMSE}=0.0043$ has a more efficient and accurate estimation compared to the SVM model with $R^2= 0.84$ and $\text{RMSE} = 0.009$.

Keywords: Urmia Lake, Ajichay River, Total Dissolved Solid, Supporting Vector Machine, Artificial Neural Network