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Enhance and improve modelling prediction by using an adaptive neuro-fuzzy inference system-based model to predict pollution removal efficacy in wastewater treatment plants

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ABSTRACT

An adaptive network-based fuzzy inference system (ANFIS) was used to create models for predicting the removal of biological oxygen demand (BOD), total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) in a wastewater treatment plant treating process wastewaters. Temperature (*T*), hydraulic retention time, and dissolved oxygen were used as input variables for the BOD, TN, TP, and TSS models, using linear correlation matrices between input and output variables. The results show that the created system has provided reasonable forecasting and control performance. The minimum root mean square errors of 1.4816, 1.9558, 0.2299 and 0.4733 for effluent BOD, TN, TP and TSS could be achieved using ANFIS. The maximum *R*-square values for BOD, TN, TP and TSS were 0.9137, 0.9204, 0.9865 and 0.9231, respectively. ANFIS's architecture consists of both artificial neural networks and fuzzy logic including linguistic expression of membership functions and if–then rules, consequently it can overcome the limitations of traditional neural networks and increase the prediction performance.

Keywords: Adaptive network; Fuzzy inference; Neural networks; Wastewater treatment; Biological oxygen demand; Total nitrogen

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