Artificial Neural Network-Based Prediction of Effluent Quality of Wastewater Treatment Plant Employing Data Preprocessing Approaches

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Abstract : Prediction of treated wastewater quality is a matter of growing importance in water treatment procedure. In this way artificial neural network (ANN), as a robust data-driven approach, has been widely used for forecasting the effluent quality of wastewater treatment. However, developing ANN model based on appropriate input variables is a major concern due to the numerous parameters which are collected from treatment process and the number of them are increasing in the light of electronic sensors development. Various studies have been conducted, using different clustering methods, in order to classify most related and effective input variables. This issue has been overlooked in the selecting dominant input variables among wastewater treatment parameters which could effectively lead to more accurate prediction of water quality. In the presented study two ANN models were developed with the aim of forecasting effluent quality of Tabriz city's wastewater treatment plant. Biochemical oxygen demand (BOD) was utilized to determine water quality as a target parameter. Model A used Principal Component Analysis (PCA) for input selection as a linear variance-based clustering method. Model B used those variables identified by the mutual information (MI) measure. Therefore, the optimal ANN structure when the result of model B compared with model A showed up to 15% percent increment in Determination Coefficient (DC). Thus, this study highlights the advantage of PCA method in selecting dominant input variables for ANN modeling of wastewater plant efficiency performance.