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PERMEATE FLUX ESTIMATIONS OF CROSSFLOW MEMBRANE FILTRATION SYSTEMS USING GENETIC ALGORITHMS OPTIMIZED ARTIFICIAL NEURAL NETWORKS

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ABSTRACT
The geometry and modeling parameters of an artificial neural network (ANN) have significant effects on its predictive performance efficiency. The optimal geometry of an ANN is problem-dependent. Although some guidance is available in the literature for the choice of geometry and modeling parameters, most ANNs are calibrated using the trial-and-error approach. This paper presents the use of genetic algorithms (GAs) to search for the optimal geometry and values of modeling parameters of a multilayer feedforward back-propagation neural network (BPNN) and a radial basis function network (RBFN). The predictive performance efficiency of the GA-ANN combination is examined using an already published experimental dataset from a crossflow membrane filtration experiment. The data include the permeate flux decline under various operating conditions (e.g., transmembrane pressure and filtration time) with different physicochemical properties of feed water (e.g., different combinations of three particle diameters, three pH values, and four ionic strengths). It is illustrated that the GA-optimized ANN predicts the permeate flux decline more accurately than a network in which the ANN calibration is accomplished using a trial-and-error approach. It is shown that scaling the training dataset to the 0 to 1 range helps the modeler find the solution range of an RBFN using GA.

Reference: *Sahoo, G.B., and C. Ray. 2008. Permeate flux estimations of crossflow membrane filtration systems using genetic algorithms optimized artificial neural networks. Journal of Environmental Hydrology, Vol. 16, Paper 31.*

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