

ABSTRACT

Arif Agustyawan (17102123), 2021 – COMBINATION OF ARTIFICIAL NEURAL NETWORKS AND PARTICLE SWARM OPTIMIZATION PREDICTION OF WATER PRODUCTION IN MUNICIPAL WATERWORKS (Case Study: MUNICIPAL WATERWORKS OF TIRTA SATRIA BANYUMAS)

As the rate of population growth accelerates, so does the demand for safe drinking water. In Indonesia, Municipal Waterworks (PDAM) is an institution that regulates and manages the community's access to safe drinking water. As a result, the amount of water produced and distributed should be adjusted in accordance with the demand for water. Prediction of PDAM water production is required. Predicting PDAM water production is important for better planning and preparation, as well as to facilitate and assist decision making. To predict the amount of water that must be produced by the PDAM, this research applied a backpropagation Artificial Neural Network (ANN) algorithm in combination with Particle Swarm Optimization (PSO). The ability of ANN backpropagation to predict time series data, such as the amount of PDAM water production from month to month, is quite good. ANN backpropagation has a weakness, which is the minimum local problem, which can cause the artificial neural network stuck at the local minimum. This is affected by the artificial neural network's weight determination, which is not optimal. The PSO algorithm plays a role in this research by optimizing the minimum error value on the network to obtain optimal weight. Water production data from PDAM Tirta Satria Banyumas for the years 2018 and 2019 were used in this research. Based on the best architectural model used in this research (2 x 1 x 1), with a learning rate of 0.6, swarm size 75, termination criteria 100, and acceleration constants $C1 = C2 = 2$, the MSE in the training and testing processes is 0.00179 and 0.00081, respectively. As a result of the MSE value produced by the combination method of ANN backpropagation and PSO, it can be mentioned that the combination of ANN backpropagation and PSO can increase prediction accuracy and produce optimal weight.

Keyword: *PDAM Water Production, Backpropagation, Artificial Neural Network, Particle Swarm Optimization, Prediction*