

Artificial Neural Network Metamodel for Water Distribution System Pressure Estimation

Sanghoon Jun¹⁾ and *Donghwi Jung²⁾

¹ *Department of Civil and Architectural Engineering and Mechanics, The University of Arizona, Tucson, AZ, USA 85723*

² *School of Civil, Environmental and Architectural Engineering, Korea University, Seoul, South Korea*

¹ sanghoonjun@arizona.edu

² sunnyjung625@korea.ac.kr

ABSTRACT

Water distribution system (WDS) hydraulic simulation models such as EPANET (Rossman 2000) have been widely used for various purposes (e.g., system operations, network design). However, since computationally extensive simulations are required to satisfy one's goal, WDS metamodels (or surrogate models) have been developed. With the advent of machine learning techniques, artificial neural networks (ANNs) have been increasingly developed as a WDS metamodel. However, no previous work has investigated the impact of ANN structure to the performance of WDS metamodel.

This study develops several ANN metamodels with different structures to examine the impact of ANN hyperparameters on WDS pressure prediction accuracy. The differences between EPANET computed values and ANN predicted results are calculated for each metamodel and the most significant parameter for the prediction is determined. In addition, comparisons are performed for several water distribution networks (WDNs) to provide some guidelines on constructing the ANN metamodel structure. After this presentation, any researcher who are planning to develop their own ANN metamodel should be able to build the model appropriately and quickly for their application WDN.

ACKWOLEDEMENT

This work was supported by the National Research Foundation of Korea(NRF) grant funded by the Korea government(MSIT)(No. NRF-2021R1A5A1032433).

REFERENCES

¹⁾ Ph.D. Candidate

²⁾ Assistant Professor

Rossman, L. A. 2000. EPANET 2 user's manual. Cincinnati: USEPA