USE OF NEURAL NETWORKS ENHANCED DIFFERENTIAL EVOLUTION FOR BACKCALCULATING ASPHALT CONCRETE VISCOELASTIC PROPERTIES FROM FALLING WEIGHT DEFLECTOMETER TIME SERIES DATA

K. Gopalakrishnan, S. Kim,H. Ceylan & O. Kaya
Iowa State University, Department of Civil, Construction and Environmental Engineering, Ames, IA, USA

ABSTRACT
The new AASHTO pavement design guide of Pavement ME Design recommends the use of Asphalt Concrete (AC) dynamic modulus, |E*|, as a design parameter for flexible pavements. This study investigated the feasibility of employing Neural Networks (NNs) as well as nature-inspired meta-heuristics to backcalculate AC |E*| master curve coefficients based on enhanced single-drop FWD data from full-depth asphalt pavements. The overall approach involved first generating a synthetic database of AC |E*| master curve (input) – FWD time series data (output) scenarios for a variety of pavement layer thicknesses and pavement temperatures using a computationally-efficient layered viscoelastic forward analysis tool. The use of a NN forward analysis surrogate model within the framework of a hybrid global optimization scheme, referred to as VENNDE (ViscoElastic-Neural Network-Differential Evolution) yielded satisfactory predictions of the AC dynamic/relaxation modulus master curve as well as subgrade modulus and is therefore recommended for future investigations.