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Development of multilayer perceptron artificial neural network (MLP-ANN) and least square support vector machine (LSSVM) models to predict Nusselt number and pressure drop of TiO_2/water nanofluid flows through non-straight pathways

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Abstract

In this study, Multilayer Perceptron Artificial Neural Network (MLP-ANN) model and Least Square Support Vector Machine (LSSVM), were developed to predict the thermal performance and pressure loss of nanofluid flow through coils as non-straight pathways. There different coils with various curvature ratios and coil pitches were constructed and used. Stable TiO_2 (50 nm)/water nanofluid in different concentrations from 0.0 to 2.0% were prepared using appropriate method. As it is expected, considerable enhancement

of heat transfer was achieved by application of nanofluids instead of water in system. Volume concentration of nanofluid, Prandtl number (ranging from 4.82 to 9.11) and Helical number (106.80 to 1282.87) were introduced to the developed models to obtain Nusselt number (9.89 to 53.30) and pressure drop (291.35 to 18784 kPa) as the output data of the models. According to the output results of developed models, MLP-ANN model was able to predict both Nusselt number and pressure drop of nanofluid flow more precisely in comparison to LSSVM model. The developed MLP model of this study exceeded LSSVM model to high correlation coefficient value of 0.97.