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Neural Networks System for Resolution Boundary Conditions Problems in Steady-State and Transient-State Heat Conduction.

Content

Mechanical engineering studies dynamic systems, one of which is heat exchangers, which are governed by vector fields due to fin systems. Fins are used to increase the surface area available for heat transfer, which creates turbulence in the fluid flow, improving heat transfer and allowing for more compact designs in heat exchangers. The objective is to show a set of neural networks that can solve problems related to fin systems in steady-state and transient heat conduction. The processes necessary for heat transfer are defined. To do this, artificial network models are created in Python and Julia with feedforward NNs for the prediction of experimental data used to calculate efficiency. However, the PINN architecture is used to predict the temperature in each unit section of the fin thickness for the steady state in the general case of the transient state. It is also important to mention that physics-based neural networks (PINN) outperform FEA in heat transfer applications by: almost completely eliminating meshing requirements or allowing meshless solutions for complex geometries; providing continuous space-time solutions without discretisation errors. The result obtained was a machine learning model (perceptron) implemented in software capable of predicting relevant data on the triangular, circumferential, and rectangular fin systems for the design of future applications in thermomechanical and fluid mechanics optimisation.

Tipo de presentación

Póster

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