

Title: **Application of neural networks to model double tube heat exchangers**

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Date: June 2023

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Artificial Intelligence is experiencing dramatic growth in recent times. AI models such as ChatGPT have become controversial topics as they continuously transform our world. Nevertheless, the true nature of AI is still widely misunderstood by society. Nowadays, Artificial Intelligence is still seen by many as an obscure and foreign concept, even mysterious and threatening. However, this couldn't be further from the truth. At their essence, they are just mathematical tools which rely on centuries-old knowledge: algebra and calculus.

In this project, a neural network model has been created to solve a chemical engineering problem, the predictive model of a double tube heat exchanger.

This model is a neural network that predicts future system outputs (inner stream output temperature) from the past values of the input variables of the system (inner and outer streams input temperatures and outer stream flow rate).

The data used to train the model was obtained in a simulation written in the Python programming language. Afterwards, the optimal design parameters of the neural network were found experimentally by training different models and testing their performance. This was done in three stages: a proof of concept, a general design stage and a detailed design stage.

The model has been successful in predicting the future state of the system with high exactitude while being circa. 3000 times faster than a conventional simulation.

Keywords: artificial intelligence, neural networks, simulation, dynamics, Python, software architecture