






# Artificial intelligence -based prediction of heat transfer enhancement in ferrofluid flow under a rotating magnetic field: Experimental study

Somayeh Davoodabadi Farahani <sup>a</sup>  , Abazar Abadeh <sup>a</sup>, As'ad Alizadeh <sup>b</sup>,  
Zarindokht Helforouh <sup>c</sup>


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<https://doi.org/10.1016/j.csite.2024.104442>

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## Abstract

The utilization of various techniques, both passive and active, to enhance heat transfer in fluids by scientists is continually advancing. One of the active methods being explored is the impact of a magnetic field (B) on flow to improve heat transfer. This study focuses on experimentally evaluating the effectiveness of B and the rotation of B on heat transfer of ferrofluid. The findings indicate that by increasing the volume fraction of nanoparticles, heat transfer can be enhanced by approximately 2.73–2.82%. Furthermore, the use of B and intensifying its intensity leads to a 3.75–3.8% enhancement in heat transfer. Rotating the B and increasing the rotational speed also contribute to improved heat transfer, with a 0.2rad/s increase in rotation speed resulting in a 5%–12.43% improvement in heat transfer. By utilizing available data and employing artificial intelligence methods such as Group Method of Data Handling (GMDH) and Long Short-Term Memory (LSTM), an estimation of the Nusselt number ( $Nu$ ) has been achieved. The outcomes demonstrate that both models have displayed high accuracy in predicting  $Nu$ , with GMDH showing superior accuracy compared to LSTM in estimating  $Nu$ .