

How to Use Online Review System

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How to Use Online Review System

Overview > Enter and Edit Reviews ? 🖨️ ↓

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116	Track 6. Advanced Reactor Thermal Hydraulics and Safety <i>Format: Oral</i> Influence of the Intermediate Heat Exchanger Geometry on the Flow in a Model Representative of a Sodium Fast Reactor	<ul style="list-style-type: none"> ▶ Show Abstract ▶ Contribution Details ▶ Send E-Mail to Program Committee ▶ Show Review ▶ Show All Reviews (1)
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1116	Full_Paper_Track 6. Advanced Reactor Thermal Hydraulics and Safety <i>Format: Oral</i> Influence of the Intermediate Heat Exchanger Geometry on the Flow in a Model Representative of a Sodium Fast Reactor	<ul style="list-style-type: none"> ▶ Show Abstract ▶ Contribution Details ▶ Send E-Mail to Program Committee ▶ Review Requests: 0 ▶ Enter Review ▶ Upload File for Author ▶ Show All Reviews (0)
1st file Contribution_1116.pdf Time left to submit the review: 30 days 7 hours, Deadline: 30th Apr 2025, 11:59:59pm KST Reports of other reviewers: Show All Reviews		

This section contains the abstract information that has been submitted and reviewed.

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How to Use Online Review System

Overview > Enter and Edit Reviews > Submit Review

Submit Review

Please use this form to submit your review. Note that a ConfTool session is limited to two hours. Click on 'Contribution Details' to access abstract and paper.

Contribution Details

Submission Type / Conference Track: Full_Paper_Track 7. Digital Technologies for Thermal Hydraulics

Format: Oral

1109

A Comparative Study of Large Language Model Agents for Data-Driven Critical Heat Flux Prediction

Keywords: Critical heat flux, Large language model, AI-Agent, Bayesian optimization, Uncertainty of ML model

Abstract

In this work, we compare human-developed and Artificial Intelligence (AI)-generated models for predicting Critical Heat Flux (CHF) in nuclear reactor safety analysis. This study harnesses AI and Machine Learning (ML) to develop predictive models that learn from experimental data, specifically using the extensive NRC CHF database. We compare human-developed models optimized via deep ensemble methods and Bayesian optimization with AI-agent-developed models using large language models (LLMs).

The human models use a Gaussian distribution approach for predictions, with uncertainty quantified through variance. Bayesian optimization refines hyperparameters such as learning rate and batch size, enhancing prediction accuracy measured by Root Mean Square Error (RMSE).

In contrast, an AI agent system, developed using a Large Language Model (LLM), autonomously created CHF predictive models with a neural network architecture. The LangChain suite facilitates system interactions, the execution of Python scripts, and task management through LangSmith and LangGraph, simulating a multi-agent system for an automated workflow that encompasses model development, training, and evaluation.

The performance comparison between the human and AI-developed models focuses on prediction accuracy, uncertainty quantification, and computational efficiency. The AI models demonstrated performance comparable to that of human-optimized models, showcasing their potential to automate nuclear safety analysis tasks.

This study highlights the promise of AI in enhancing nuclear reactor safety analysis. Future work should focus on integrating AI models with advanced simulation tools and expanding their application to broader safety analysis cases, including transients.

History of Uploads

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1st file  Contribution_1109.pdf (28th Feb 2025, 01:19:47pm KST)

Click on file to review the submitted Full Paper.

Information on the Contribution

Contribution ID	1109
Submission Type / Conference Track	Full_Paper_Track 7. Digital Technologies for Thermal Hydraulics
Title	A Comparative Study of Large Language Model Agents for Data-Driven Critical Heat Flux Prediction
Format	Oral

Review Comments Please enter 'None', if there is no comment.

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- * Recommendation
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 - Accept with MINOR revisions
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