



The Abdus Salam
**International Centre
for Theoretical Physics**



Joint IAEA-ICTP Workshop on Artificial Intelligence and Machine Learning in Advancing Nuclear Engineering and Technology: from Theory to Practice

Description:

Organized in cooperation with the IAEA Collaborating Centre on AI for Nuclear Power, this workshop explores Artificial Intelligence (AI) and Machine Learning (ML) in nuclear engineering, covering AI paradigms, ML techniques, decision support, and practical exercises to build skills for real-world applications.

MORE INFORMATION:

The increasing integration of AI and ML into nuclear engineering and technology underscores the need for a robust understanding of their theoretical foundations and practical applications. This workshop offers participants a comprehensive exploration of the philosophy, theory, and concepts of AI and ML while emphasizing their relevance to real-world nuclear applications. Topics include AI paradigms, machine learning techniques, and decision support for safer, sustainable nuclear energy systems. Hands-on exercises with real-world datasets will reinforce concepts, build skills, and enable participants to assess AI methods' reliability and effectiveness. Contributions from experts at the IAEA Collaborating Centre at Purdue University will provide valuable insights, bridging the gap between theory and practice to advance nuclear technology.

LECTURES:

- Introduction to AI and Applications in Nuclear Engineering
- Mathematics of Deep Learning
- Feature Engineering and Clustering
- Large Language Models
- Adversarial AI and Privacy
- AI Learning Paradigms
- Pattern Recognition
- Bayesian Statistics and Gaussian Processes
- Reinforcement Learning
- AI Deployment in Nuclear System

LABS:

- Introduction to Python/Jupyter
- Deep Learning Mathematical Tools
- Fault Diagnostics and Prognostics
- Language Models Implementation
- Time Series Data Mining
- Bias Inference in Critical Safety
- Reinforcement Learning in Nuclear Applications

SPEAKERS:

- H. Abdel-Khalik, Purdue University, USA
- I. Ahmed, Politecnico di Milano, Italy
- P. Baraldi, Politecnico di Milano, Italy
- L. Carayannopoulos, Massachusetts Institute of Technology, USA
- U. Mertuyrek, Oak Ridge National Laboratory, USA
- N. Pedroni, Politecnico di Torino, Italy
- D. Valcamonic, Politecnico di Milano, Italy
- E. Zio, Politecnico di Milano, Italy



10 - 14 March 2025



Trieste, Italy



**Deadline:
31 January 2025**

DIRECTORS:

- A. Miassoedov, IAEA, Austria
- N. Ngoy Kubelwa, IAEA, Austria
- H. S. Abdel-Khalik, Purdue University, USA

LOCAL ORGANIZER:

S. Di Gioia, ICTP, Italy

FURTHER INFORMATION:

E-mail: smr4061@ictp.it

Web: <https://indico.ictp.it/event/10826/>

Female scientists are encouraged to apply.



GRANTS:

A limited number of grants are available to support the attendance of selected participants, with priority given to participants from developing countries. There is no registration fee.

