

Workshop on AI for Accelerating Fusion and Plasma Science

Tuesday, 28 November 2023 - Friday, 1 December 2023

IAEA Headquarters

Topics

Physics/Engineering

This session focuses on the current applications of AI to physics and engineering applications. Speakers will discuss the current state-of-art for these technologies in fusion science and other fields. Discussions will include successes of these technologies as well as current limitations and research opportunities. This session will bring into focus how AI is currently being used and spur important discussions between disciplines to cross-pollinate ideas into the fusion science space and highlight challenges for AI researchers to tackle.

AI

This session is dedicated to discussing machine learning research both broadly and specifically relevant to fusion and plasma science. Examples of topics include advanced AI techniques for time-series prediction, self-supervised/unsupervised training on large datasets, and reinforcement learning for control and scenario design. Additionally, AI techniques to enhance simulation, for general, fast surrogate creation in digital twin applications and Bayesian inference to compare to experiment.

Enabling Infrastructure

High Performance Computing (HPC) and cloud technologies offer nowadays a platform to accelerate the design and the simulation of multiphysics and multiscale systems through massive parallel computing, allowing the processing of huge amounts of multidimensional data and to solve complex problems at extremely high speed. HPC and AI offer the opportunity of advancing human knowledge and produce significant transformations, as successfully shown in fields such as sequence DNA, self-driving cars, automate stock trading, and digital twins accurately modelling complex systems. This session has the objective of bringing together experts in the field to discuss how to accelerate fusion and plasma science leveraging HPC and AI resources.

Special Track

This session is dedicated to discussing lessons learned and best practices from AI applications in fields outside fusion and plasma science. This multidisciplinary session will bring together experts from renowned institutes from particle physics, civil space programs and/or United Nations system organizations. The scope is to engage in collaborative discussions on how to accelerate scientific research leveraging AI, while preserving Open Science and FAIR principles.