TEXAS A&M
Institute of
Data Science

Seminar Series

Date:
November 18, 2024

Time:
2:00 - 3:00 pm

Location:
Blocker 220 and Zoom

Faculty host:
Dr. Ulisses Braga-Neto, Director of TAMIDS SciML Lab

Contact:
Delany Baum
delany_baum@tamu.edu

Zoom ID:
974 9688 4861
Passcode: 923446

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Dr. Aaro Järvinen

Senior Scientist, VTT Technical Research Center of Finland

Dr. Aaro Järvinen is a senior scientist in the Fusion Energy research group at the VTT Technical Research Centre of Finland. He is also a visiting scientist in the EUROfusion Advanced Computing Hub at the University of Helsinki, an Academy Research Fellow of the Research Council of Finland, and an ITER Science Fellow. He obtained his Ph.D. from Aalto University in 2015 and has a broad experience in both numerical and experimental fusion energy research. In 2016, he was part of the Lawrence Livermore National Laboratory team located at the DIII-D National Fusion Facility at General Atomics in San Diego, including a role as a co-leader of the core-edge integration task force and a member of the program committee of the APS-DPP community planning process for Fusion Energy and Discovery Plasma Sciences in 2019 – 2020. Since 2021, his research has focused on applications of scientific machine learning (SciML) to accelerate the development of fusion energy, and presently he is leading a team within the Fusion Energy group at VTT focused on these applications.

Accelerating Fusion Energy Development with Scientific Machine Learning

Fusion energy holds a promise of a virtually limitless, carbon-free energy source. However, it is a scientific and technological grand challenge to sustainably maintain high fusion performance, requiring fuel temperatures of ~100 million degrees, while simultaneously obtaining net energy gain and avoiding overheating of the components of the power plant. To achieve these goals, machine learning (ML) methods have been within the portfolio of approaches applied by the fusion energy research community for more than two decades. Within the past few years, the role of these activities has increased substantially, and various ML approaches are nowadays routinely applied or being developed for versatile applications in fusion research. Examples of such applications are several orders-of-magnitude speed-up of computationally demanding plasma turbulence simulations and data-driven predictions of rare, high-impact events that are challenging to predict based on traditional predictive methods. The presentation provides an overview of some of these ML applications in fusion energy research as well as discusses the approaches investigated by the Fusion ML team at VTT.

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