

Giacomo Dimarco - Control and uncertainty quantification through deep neural networks for plasma simulation

Thursday, 23 May 2024 16:45 (45 minutes)

We will consider the development of numerical methods for simulating plasmas in magnetic confinement nuclear fusion reactors. In particular, we focus on the Vlasov-Maxwell equations describing out of equilibrium plasmas influenced by an external magnetic field and we approximate this model through the use of particle methods. We will additionally set an optimal control problem aiming at minimizing the temperature at the boundaries of the fusion device or alternatively the number of particles hitting the boundary. Our goal consists then in confining the plasma in the center of the physical domain. In this framework, we consider the construction of multifidelity methods based on neural network architectures for estimating the uncertainties due to the lack of knowledge of all the physical aspects arising in the modeling of plasma.