

PiAI Seminar Series: Physics informed AI in Plasma Science
9:30-10:30, 07 February 2022 (CET)
17:30-18:30, 07 February 2022 (JST)
Web Seminar

Runge-Kutta Physics Informed Neural Network (RK-PINN) for solving
plasma PDEs with transient terms

Linlin Zhong

Southeast University, Jiangsu, China

In recent years the Physics Informed Neural Networks (PINNs) have been widely used in solving various partial differential equations (PDEs). In the last PiAI seminar, I presented a physics informed dual neural network which can be used in the simulation of PDE governing plasmas. In essence, this is a data driven computational paradigm, which is mesh-free, equation-discretization-free, and easily implemented compared with finite element methods and finite volume methods. However, PINN based models are not easy to be well trained because of the tremendously large optimization space, especially for complex models with many coupled equations and parameters. Here in this seminar, I would like to share an idea of combining Runge-Kutta formalism and PINNs which is more efficient than purely PINNs in some extent. I would also demonstrate how this so-called Runge-Kutta Physics Informed Neural Network (RK-PINN) can be applied to solve plasma PDEs with transient terms, such as 1D arc and corona models. If time permits, I would like to share our preliminary works on AutoML in solving PDEs.