PiAI Seminar Series: Physics informed AI in Plasma Science
10:00-11:00, 17 May 2021 (CET)
17:00-18:00, 17 May 2021 (JST)
Web Seminar

Plasma diagnostics and heating control with generative adversarial networks

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The data size and complexity of the object information are increasing in the demand for detailed measurement and high precision control, and the role of data drive science is increasing. We developed plasma diagnostics and heating control method using a generative adversarial network (GAN) [1], which recently has made remarkable achievements, especially in the image conversion.

A tomographic method using GAN has been developed to obtain local intensity profiles from the data of imaging diagnostic [2]. The pairs of local emissivity and line-integrated images which simulate an experimental system are prepared to train a network. After validating the accuracy of trained network, the network reconstructs a local image from the line-integrated image measured by a device. This procedure has been applied to an imaging diagnostic of He II-emission in the RT-1 magnetospheric plasmas, including the effects of stray light within the measured image to remove reflections from the chamber walls in the reconstruction. The obtained local intensity profile elucidates the clear effect on ion-cyclotron-resonance heating.

In this presentation, as an application of GAN, a phase space tomography based on the spectrum obtained by collective Thomson scattering measurement in LHD[3] and a development of ECH feedback injection system for fusion plasmas will also be shown.

[1] I. Goodfellow *et al*., NIPS (2014).

[2] N. Kenmochi *et al*., Plasma Fusion Research, **14** (2019) 1202117.

[3] M. Nishiura, *et al*., J. Instrumentation, **15** (2020) C01002