PiAI Seminar Series: Physics informed AI in Plasma Science
9:30-10:30, 25 January 2021 (CET)
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Web Seminar

Physics-informed super-resolution for real-time prediction of urban micro-meteorology

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We propose a physics-informed deep convolutional neural network (CNN) for the super-resolution (SR) simulation system that consists of the combination of the CNN for SR and a physics-based meteorological simulation. The CNN is trained using pairs of high-resolution (HR) and low-resolution (LR) images created from meteorological simulation results for different resolutions so that it can map LR simulation images to HR ones. In the developed physics SR for temperature distributions, building height map and sunshade distributions as well as the temperature distributions are taken into account. We performed HR micrometeorology simulations for the heart of Tokyo on a supercomputer to obtain datasets for training and evaluating the SR. The results show that the present physics SR outperforms the image SR by as much as about 40% in the case with a spatial scaling factor of 4 for temperature distribution images. The SR with factor 4 can make the HR prediction 256 (=4^4) times faster. This means that the proposed SR simulation system can realize the real-time urban micrometeorology prediction on consumer computers.