知の物理学研究センター

ipi seminar

Institute for Physics of Intelligence

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「De-noising image of cosmic large-scale structure with deep learning」

２０１９年６月６日(木)　１０時３０分～１２時００分

東京大学本郷キャンパス理学部１号館４階 431 号室

Weak gravitational lensing is a powerful probe of the large-scale cosmic matter distribution. Wide-field galaxy surveys allow us to generate the so-called weak lensing maps, but actual observations suffer from noise due to imperfect measurement of galaxy shape distortions and to the limited number density of the source galaxies. In this talk, we introduce a deep-learning approach to reduce the noise. We develop an image-to-image translation method with conditional adversarial networks (CANs), which learn efficient mapping from an input noisy weak lensing map to the underlying noise field. We train the CANs using 40000 image pairs obtained from 1000 ray-tracing simulations of weak gravitational lensing. We show that the trained CANs reproduce the true one-point probability distribution function of the noiseless lensing map with a bias less than 1 sigma on average, where sigma is the statistical error. We then discuss whether or not the statistical analysis of weak lensing map with our de-noising can give a better understanding of cosmic mass density.