

Third Workshop on Current Challenges in Cosmology



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Optimal methods for retrieving information from upcoming surveys (Remote talk)

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Due to the unprecedented sensitivity and large field of views, extracting the maximum amount of information remains a key challenge in future surveys. In this talk, I will discuss the current challenges in analyzing the expected big data from upcoming large scale surveys, and present several promising techniques to perform high-dimensional likelihood-free inference and emulation using generative models, namely normalizing flows, and diffusion models. I will then focus on my recent attempts to open the black-box of neural networks. In particular, I will show how a similarity measure metric of learning representation may be used to examine the relationship between similarity and performance of pre-trained neural networks on the CAMELS Multi-field Dataset. By comparing representations between layers of two randomly-initialized neural network architectures, a correlation between similarity and accuracy in recovering cosmological parameters is observed. This analysis shows that exploring representation similarity against performance offers meaningful insights into complex deep learning models to generalize them to out-of-distribution samples.

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