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Unveiling the Universe with Machine Learning: A Cosmological Perspective (Remote talk)

Monday 23 October 2023 10:15 (1 hour)

In the near future, forthcoming Large-Scale Structure (LSS) missions such as the DESI, eROSITA, Euclid, WFIRST , and LSST are poised to survey extensive cosmological volumes, collecting terabytes of data that promise to enhance our understanding of cosmological parameters with unprecedented precision. To achieve this ambitious objective, it is crucial to extract the maximum amount of information from data. However, we must tackle two primary challenges to conduct optimal cosmological analyses: the development of precise theoretical models in the non-linear regime and the creation of novel computational techniques to surmount the computational bottlenecks inherent in traditional simulation methods.

In this presentation, I will introduce an innovative machine learning (ML) approach designed to construct a deep learning emulator at the field level for cosmological simulations, with a primary focus on neutrino particles. I will demonstrate that the deep learning methodology offers a highly accurate alternative to conventional techniques by directly mapping non-standard cosmological simulations, including those involving neutrinos, from standard simulations. This approach has the potential to generate precise predictions for cosmological fields across a range of input parameters, facilitating faster and more efficient exploration of non-standard cosmological scenarios.

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