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Forward modelling of the large-scale structure: perfectly parallel simulations and simulation-based inference

Tuesday, October 13, 2020 4:55 PM (20 minutes)

I will first introduce a new, perfectly parallel approach to simulate cosmic structure formation, based on the spatial COmoving Lagrangian Acceleration (sCOLA) framework. Building upon a hybrid analytical and numerical description of particles' trajectories, sCOLA allows an efficient tiling of a cosmological volume, where the dynamics within each tile is computed independently. I will show that cosmological simulations at the degree of accuracy required for the analysis of the next generation of surveys can be run in drastically reduced wall-clock times and with very low memory requirements.
In a second part, I will discuss how such simulations can be used as "black-box" models within data analysis. I will focus on two recent algorithms (SELFI and BOLFI), aiming at inferring the primordial matter power spectrum and cosmological parameters. I will present an application to a Euclid-like configuration and discuss prospects for simulation-based inference from Euclid data.

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