

第 66 回 RESCEU コロキウム



東京大学大学院理学系研究科 附属ビッグバン宇宙国際研究センター

日 時: 2024 年 11 月 19 日(木) 14:00 ~ 15:30

場 所: 理学部 4 号館 1 階ピロティ RESCEU セミナー室

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Fast Inference in Cosmology and Astrophysics with Differentiable Simulations

Abstract

In cosmology/astrophysics, many fundamental problems involve complex forward models that are computationally intensive to solve, particularly in parameter inference tasks which rely on Monte Carlo sampling. Traditional approaches often struggle with convergence and feasibility in these high-dimensional spaces. However, differentiable simulations open new avenues for efficiency and accuracy in these domains. By introducing differentiability into these models, we can leverage advanced inference methods, such as Hamiltonian Monte Carlo, which show promising convergence properties even in high dimensions. Additionally, machine learning techniques can adapt difficult, seemingly non-differentiable processes—such as discrete galaxy assignments—into differentiable frameworks, making them more tractable. This talk will discuss these innovations, including field-level inference from the Lyman Alpha Forest, galaxy population modeling in dark matter halos, and fully differentiable hydrodynamical simulations, illustrating how they transform inference tasks in cosmology and astrophysics.

興味をお持ちの方の聴講を歓迎致します。