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Implicit and Explicit Simulation-Based Inference for Cosmology

Friday 8 November 2024 09:00 (40 minutes)

Physical models in the form of simulations offer an avenue to model the data in all of its complexity, but until very recently using such models to estimate physical fields and parameters remained an open problem.

In this talk, I will discuss two possible points of view on simulators, depending on whether they are "black-box" or "open-box" models, and the different methodologies and strategies which may be applied in each case to use these physical models within a Bayesian inference context. As both of these approaches become tractable, an interesting question for our field is to discuss which point of view will be the most effective and robust in practice.

In the case of black-box simulations (which can only be sampled from), I will discuss in particular considerations of optimal data compression for simulation-based inference.

In the case of open-box simulations, which can be seen as differentiable probabilistic models, with an explicit joint log probability, I will discuss strategies and challenges for building large scale differentiable physical models of the Universe touching in particular on distributed differentiable N-body solvers and building accelerated hybrid physical/ml simulations leveraging neural ODE methodologies.

Track

Presenter: LANUSSE, François

Session Classification: Plenary talks