

# Reconstruction of cosmological initial conditions with sequential simulation-based inference

*Saturday 20 July 2024 17:00 (15 minutes)*

Knowledge of the primordial matter density field from which the present non-linear observations formed is of fundamental importance for cosmology, as it contains an immense wealth of information about the physics, evolution, and initial conditions of the universe. Reconstructing this density field from the galaxy survey data is a notoriously difficult task, requiring sophisticated statistical methods, advanced cosmological simulators, and exploration of a multi-million-dimensional parameter space. In this talk, I will discuss how simulation-based inference implemented through sliced score matching allows us to tackle this problem and obtain data-constrained realisations of the primordial dark matter density field in a simulation-efficient way for general non-differentiable simulators. In addition, I will describe how graph neural networks can be used to get optimal data summaries for galaxy maps, and how our results compare to those obtained with classical likelihood-based methods.

## Alternate track

1. Computing, AI and Data Handling

## I read the instructions above

Yes

**Primary author:** SAVCHENKO, Oleg (GRAPPA, University of Amsterdam)

**Presenter:** SAVCHENKO, Oleg (GRAPPA, University of Amsterdam)

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