MACHINE LEARNING FOR ASTROPHYSICS
2ND EDITION CATANIA, 8-12 JULY, 2024

Contribution ID: **236** Type: **Oral Presentation**

Simulation-based Supernova Cosmology

Thursday, 11 July 2024 11:30 (20 minutes)

The field of supernova Ia (SN Ia) cosmology—which already yielded the groundbreaking discovery of dark energy—is set to be revolutionised in the coming years by an avalanche of new data. Their analysis will require a methodology that can easily scale to the >10^5 expected SNae Ia while rigorously accounting for systematics. To this end, I will present a SN Ia analysis framework based on truncated marginal neural ratio estimation (TMNRE)—a variant of simulation-based Bayesian inference (SBI)—that addresses a number of outstanding issues. The use of neural networks (NNs) allows one to analyse raw SN light curves without an expensive fitting stage that derives summary statistics. The framework can derive marginal constraints on the cosmological parameters of interest by efficiently and implicitly marginalising the O(10^5) latent variables. Similarly, TMNRE can be used for quick and principled Bayesian model comparison, addressing e.g. the need for additional standardising variables. Lastly, by employing modern set- or transformer-based NN architectures, SBI can seamlessly incorporate selection effects and non-Ia contamination while simultaneously analysing host information to derive photometric redshift estimates, making it a single-stage-to-cosmology analysis framework.

Presenter: KARCHEV, Konstantin

Session Classification: Cosmology & Simulations