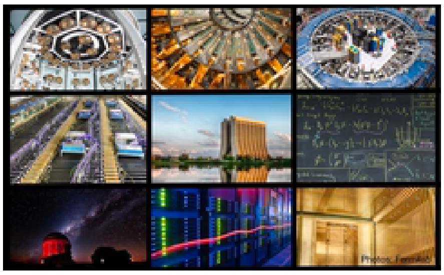

Contribution ID: **49** Type: **not specified**

Estimating Cosmological Constraints from Galaxy Cluster Abundance using Simulation-Based Inference

Wednesday, 22 June 2022 14:00 (15 minutes)

Modern and next-generation cosmic surveys will collect data on billions of galaxies. To derive constraints on dark matter and dark energy, we will require more efficient data analysis methods that can handle unprecedentedly large amounts of data and address multiple systematics and unknowns in galaxy cluster modeling. In this work, we use simulation-based inference (SBI; aka likelihood-free inference) to estimate five fundamental cosmological parameters (e.g., Ωm, h, ns) from the observable abundance of optical galaxy clusters. We use and compare two very different simulations – the N-body-based Quijote simulation suite and the analytical forward models from Cosmosis. We train a neural network on these simulations to predict the posterior probability of cosmological parameters, conditional on the observable galaxy cluster abundance. This amortized posterior calculation permits fast calculations on large data sets. Additionally, the resulting posterior is not constrained to limited analytic (e.g., Gaussian forms). Our results show that the SBI method can successfully recover the true values of the cosmological parameters within 2σ, which is comparable to state-of-the-art MCMC-based inference methods.

Primary authors: NORD, Brian (Fermilab); REZA, Moonzarin; ZHANG, Yuanyuan (Fermilab)

Presenter: REZA, Moonzarin

Session Classification: Cosmic Physics