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Cosmology Constraints from Strong Gravitational Lensing using Hierarchical Simulation Based Inference

Strong lenses are valuable probes of both astrophysics and cosmology, but traditional modeling methods for each system are computationally expensive. In addition, these methods won't be able to cope with the millions of lenses that will be discovered in the next generation of cosmic telescopes and surveys. New tools for inference, like Simulation-Based Inference (SBI) using Neural Posterior Estimation, present an opportunity for addressing this challenge. We perform SBI to simultaneously infer lensing system parameters and the dark energy equation of state from a population of galaxy-galaxy strong lenses. We compare the constraining power of a population level inference with the inference from individual lenses.

This analysis is important for cosmology inference from the upcoming strong lens follow-up surveys such as The 4MOST Strong Lensing Spectroscopic Legacy Survey (4SLS).

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