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Cosmology with Galaxy Photometry Alone

Thursday, November 30, 2023 5:00 PM (15 minutes)

In this talk I will present the first cosmological constraints from only the observed photometry of galaxies. Villaescusa-Navarro *et al.* (2022) recently demonstrated that the internal physical properties of a single galaxy contain a significant amount of cosmological information. These physical properties, however, cannot be directly measured from observations. I will present how we can go beyond theoretical demonstrations to infer cosmological constraints from actual galaxy observables (*e.g.* optical photometry) using neural density estimation and the CAMELS suite of hydrodynamical simulations. We find that the cosmological information in the photometry of a single galaxy is limited. However, we can combine the constraining power of photometry from many galaxies using hierarchical population inference and place significant cosmological constraints. With the observed photometry of $\sim$15,000 NASA-Sloan Atlas galaxies, we constrain $\Omega_m = 0.310^{+0.080}_{-0.098}$ and $\sigma_8 = 0.792^{+0.099}_{-0.090}$.

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