X15a Population-level inference of dust attenuation properties in local galaxies

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Dust attenuation must be carefully considered when inferring the physical parameters of observed galaxies from their spectral energy distributions (SEDs). Our understanding of dust attenuation is limited due to known degeneracies between galaxy properties and dust attenuation in SED fitting of single galaxies (dust-metallicity-age degeneracy). We introduce a novel approach to infer dust attenuation properties by statistically matching observed galaxies with ones from cosmological simulations. The observation data sample used is the SDSS Main Galaxy Sample cross-matched with *GALEX*. The simulation data comes from the UniverseMachine (Behroozi et al. 2019). We use stellar population synthesis to generate unattenuated SEDs for the simulated galaxies. The parameters of dust attenuation laws are thereafter modeled as a probability distribution with a machine learning approach. The parameter distributions are constrained by minimizing the distance (Wasserstein distance) between the simulated and the observed distributions of SEDs, in color-color and color-magnitude spaces. This population-level inference approach has many benefits, including breaking the parameter degeneracy by incorporating number density evolution from cosmological structure formation. Our findings reveal a significant departure from the universality of the dust attenuation laws in local galaxies. This forms a crucial part of our ongoing efforts toward population-level inference of galaxy properties from their SEDs.