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Subhalo effective density slope measurements from HST strong lensing data with neural likelihood-ratio estimation

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The CDM model is in remarkable agreement with large-scale observations but small-scale evidence remains scarce. Studying substructure through strong gravitational lensing can fill in the gap on small scales. In the upcoming years, we expect the number of observed strong lenses to increase by several orders of magnitude from ongoing and future surveys. Machine learning has the potential to optimally analyze these images, but its application to real observations remains limited. I will present the first application of machine learning to the analysis of subhalo properties in real strong lensing observations. Our work leverages a neural simulation-based inference technique in order to infer the density slopes of subhalos. I will compare our method's prediction on HST images to the expected CDM measurements and discuss the implication of our work.

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