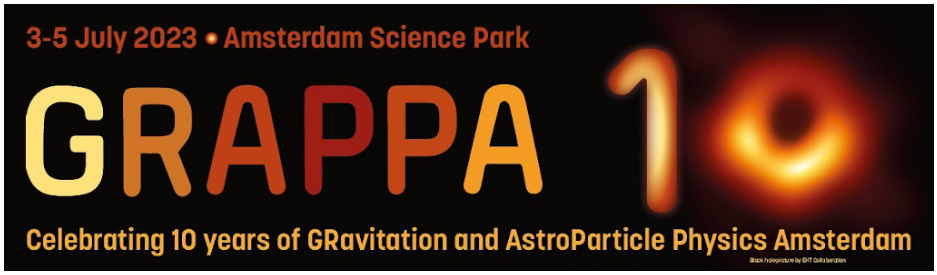

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Sequential simulation-based inference for strong gravitational lensing images

Monday, 3 July 2023 14:15 (15 minutes)

Galaxy-galaxy strong gravitational lenses are a unique laboratory for probing the smallest self-bound dark matter structures in our Universe and testing the ΛCDM paradigm. However, performing precise statistical analysis of such observations is extremely challenging, since it requires disentangling the source galaxy's light from the lens' mass distribution and marginalizing over different substructure configurations. Research in this field can be broadly separated into works that aim to directly detect individual perturbers and works that aim to statistically constrain the matter distribution by looking at collective perturbations caused by an unresolved population of perturbers.
In this talk, I will present recent advances in both of these approaches using a new multi-stage *neural* simulation-based inference method. I will also show the first application of machine learning to a real strongly lensed observation by reanalyzing JVASB1938+666 system, one of the few examples so far of substructure detection using traditional gravitational imaging techniques. These first results demonstrate that this method is imminently applicable to existing lensing data and to the large sample of very high-quality observational data that will be delivered by near-future telescopes.

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