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Bayesian Generative Strong Lensing with LensCharm

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Strong gravitational lensing offers a unique view into the distant cosmos by probing directly the distribution of dark matter and providing independent constraints on the Hubble constant.

These research objectives call for the utmost precision in the estimation of the distributions of the lens mass and the source surface brightness. Recent strides in telescope technology promise to provide an abundance of yet undiscovered strong lenses, presenting observations of unprecedented quality. Realizing the full potential of these advancements hinges on achieving the highest reconstruction fidelity, both for the source and the lens.

To this end we introduce LensCharm, a novel Bayesian approach for strong-lensing signal reconstruction. LensCharm offers a generative-model framework that allows to concurrently and non-parametrically reconstruct both the source brightness and the lens mass distribution along with their associated uncertainties. We showcase the distinctive strengths of our approach on multi-wavelength astronomical data.

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