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Probabilistic characterization of blending in Rubin/LSST: application to cluster lensing cosmology

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The upcoming deep optical surveys, such as the Vera C. Rubin Observatory Legacy Survey of Space and Time (LSST), are set to explore the Universe to unprecedented depths, uncovering billions of galaxies. This amount of detection from the ground will lead to the apparent superposition of galaxies in the images, a phenomenon known as blending. This poses a significant challenge for the precise measurement of individual galaxy properties, especially shapes and redshifts, which are crucial for estimating the masses of large-scale structures, such as galaxy clusters, through weak gravitational lensing.

This talk will introduce an innovative matching approach to properly detect and characterize blended systems in simulated catalogs, in preparation for the future LSST data. The technique employs new metrics —probability of matching and blending entropy —to distinguish recognized and unrecognized blends. It is implemented in the friendly algorithm, developed for the major and international Dark Energy Science Collaboration (DESC) of LSST.

We use it to address the issue of blending in galaxy cluster mass estimates, demonstrating its efficiency. We find that cutting on blending entropy excludes the third of detected galaxies that are strongly impacted by blending from the dataset. We thus demonstrate that blending can cause a low bias in the amplitude of cluster weak lensing profiles, affecting the mass estimates of galaxy clusters. Furthermore, the broader impact of blending on the cosmological parameters Omega_m and sigma_8 from cluster lensing, and how the friendly procedure can mitigate these effects will be discussed.

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