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Enhanced weak lensing cosmology with the lensing PDF

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Weak lensing cosmology stands at a crossroads, with cosmological tensions between cosmic shear experiments and those from Planck's analysis of the CMB hinting at either undiscovered physics or unaccounted-for systematics. In response to this mystery, we present a new weak lensing statis- tic capable of vastly enhancing cosmological inference. The "lensing PDF" - or the distribution of projected structures in various density bins - directly probes non-Gaussianities in large-scale structure, extracting extra cosmological information beyond the reach of two-point statistics con- ventionally employed in this field. Using numerical simulations tailored to match upcoming data from LSST, I demonstrate that lensing PDFs outperform standard lensing probes by >90% in con- straining the matter energy density and amplitude of the matter power spectrum. This approach consequently presents a promising means to shed light on the observed cosmological discordance.

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