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Pixel-Level Synergy: Merging Euclid and LSST/Rubin for Precision Cosmology

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Euclid and LSST/Rubin will soon deliver unprecedented cosmological datasets.
Euclid provides exquisite spatial resolution but limited spectral coverage.
LSST/Rubin offers deep, multi-band imaging across wide areas.
For optimal science, these complementary strengths must be combined.
Euclid requires Rubin colors for accurate photometric redshifts.
Rubin, in turn, needs Euclid's resolution for robust source deblending.
A joint analysis at the pixel level maximizes the scientific return.
we introduce a novel multiband deconvolution technique aimed at improving the resolution of ground-based astronomical images by leveraging higher-resolution space-based observations. The method capitalizes on the fortunate fact that the Rubin r, i, and z bands lie within the Euclid VIS band. We illustrate the effectiveness of our method in terms of resolution and morphology recovery, flux preservation, and generalization to different noise levels. This approach extends beyond the specific Euclid-Rubin combination, offering a versatile solution to improving the resolution of ground-based images in multiple photometric bands by jointly using any space-based images with overlapping filters.

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