

Effect of unrecognized blends on cosmic shear inference

Erfan Nourbakhsh (Princeton University)

Project & Community Workshop 2022













- Cosmic shear as a probe of cosmology
- Blending phenomenon
- The need for a mock catalog
- Blending emulation
- Results
 - Cosmic shear two-point correlations
 - Cosmological inference
- Summary

Nourbakhsh, Tyson, & Schmidt (2022)

https://doi.org/10.1093/mnras/stac1303

position-position correlation

position-position correlation

position-shear correlation

This Talk

shear-shear correlation





Fraction of unrecognized blends: 14% for LSST gold sample i<25.3 (Dawson+16)



RED: Subaru GREEN: HST

Fraction of unrecognized blends: 14% for LSST gold sample i<25.3 (Dawson+16)

Mock catalog [incorporating realistic galaxies]

- A simulation gives us access to the truth catalog (w/o blending) and the emulated (w/ blending) catalog
- Buzzard N-body simulation (DeRose+2019)
 - Two realizations available to DESC
 - \circ 10,000 sq. deg. each realization
 - 3 billion galaxies per realization upto z=2.35 → 0.5 billion total for WL



8

Mock catalog [incorporating realistic galaxies]

- A simulation gives us access to the truth catalog (w/o blending) and the emulated (w/ blending) catalog
- Buzzard N-body simulation (DeRose+2019)
 - Two realizations available to DESC
 - 10,000 sq. deg. each realization
 - O 3 billion galaxies per realization upto z=2.35
 → 0.5 billion total for WL
- We make the simulation LSST-like













Unrecognized blending emulation





Erfan Nourbakhsh | 11 August 2022



Redshift tomography

[after 22<i<24 cut]





We use two types of covariance matrix to estimate the uncertainty of measuring the cosmic shear signal:

- 1. 2x1000 jackknife pseudo-samples
- 2. Analytical Gaussian covariance (<u>TJPCov</u>)





Erfan Nourbakhsh | 11 August 2022









- About 12% of the emulated galaxies in the i<24 sample are unrecognized blends
- There is a suppression due to blending in cosmic shear signal
- An ~ 0.025 (>2σ of noise) decrease in the derived structure growth parameter S₈ is seen due to blending in both tomographies
- A slight additional bias is seen for the photo-*z*-based tomography
- Blending did not add much bias in terms of the redshifts, but more testing with deeper data is required to say how that translates to LSST 10-year depth



Thank you!



Erfan Nourbakhsh | 11 August 2022