

TheFARRM:

Forced-photometry on All Roman-Rubin Matches

Jesse Han, Ani Chiti, Alex Broughton, Jim Chiang, Risa Wechsler, Phil Marshal +



TheFARRM:

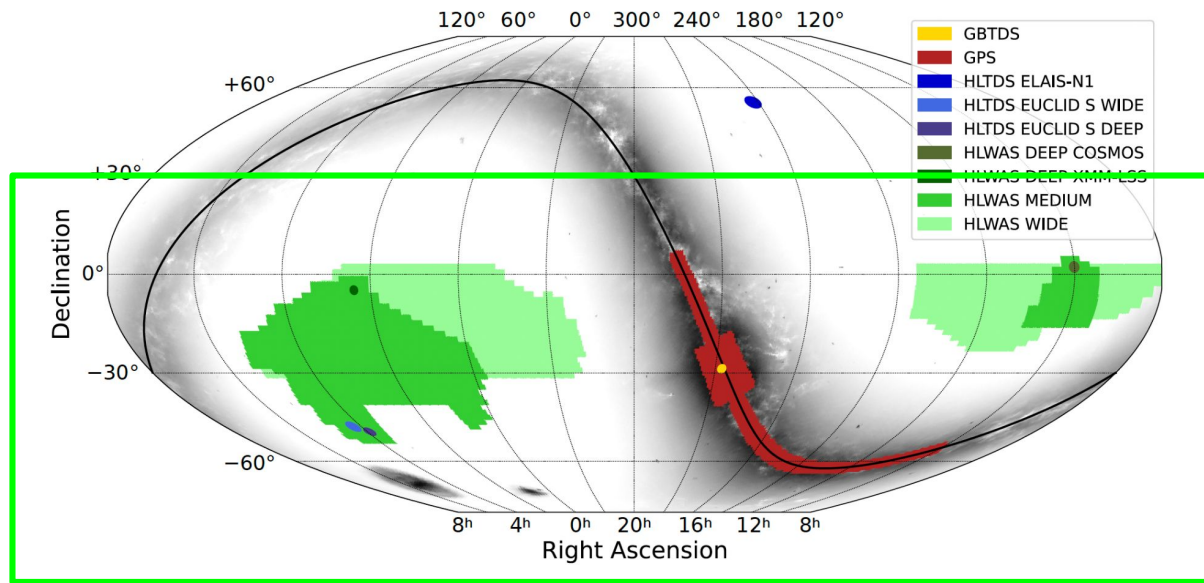
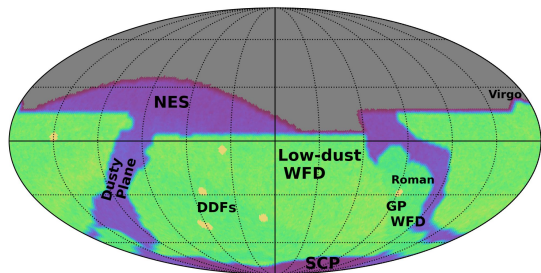
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Rubin LSST has begun!

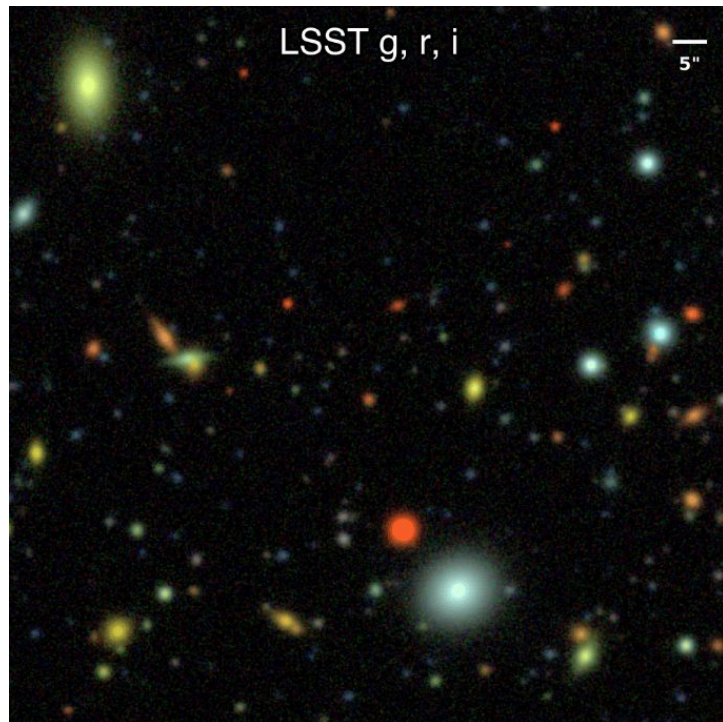


LSST Wide-Fast-Deep
20,000 deg²; $r \sim 27.5$ mag (5σ , point source)

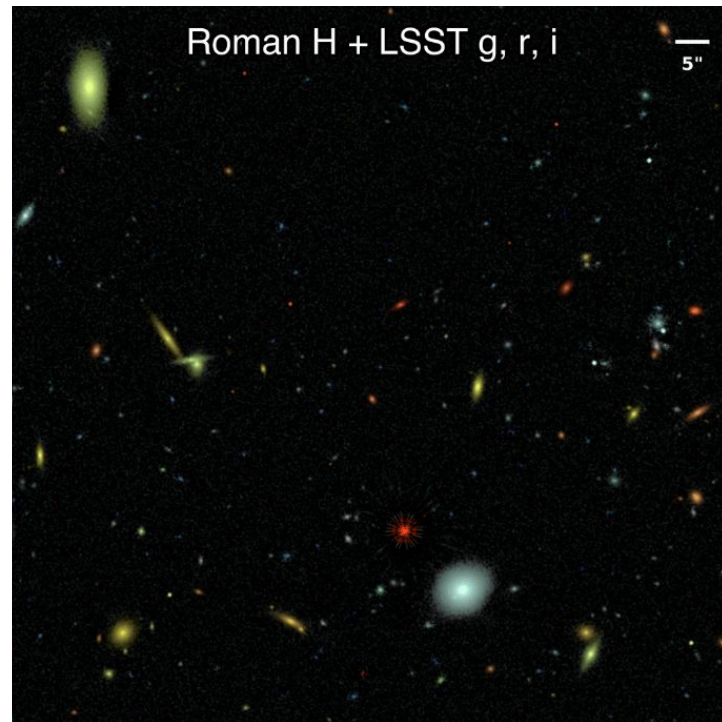


Rubin accessible sky

How do we synergize the top two missions of the 2010 decadal survey?



LSST



Roman Resolution + LSST Colors

COSMOS 2025 Galaxies + Dwarf Mock

LSST imsim

DM Pipelines: detect, deblend, measure

CModel/Multiprofit catalogs

Roman-informed Reprocess (TheFARRM)

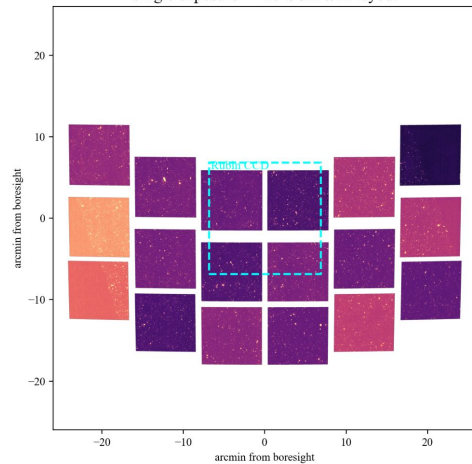
Roman isim

SOC Pipelines (romancal)

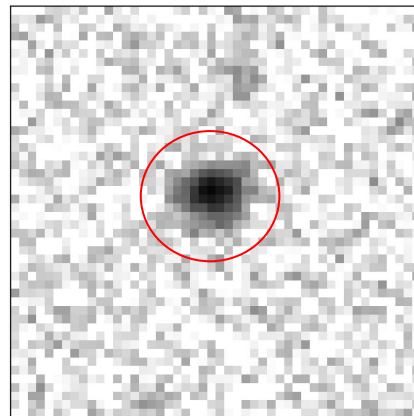
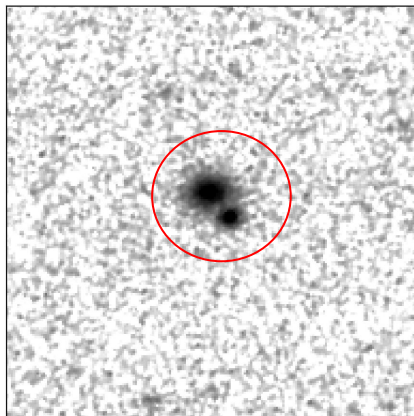
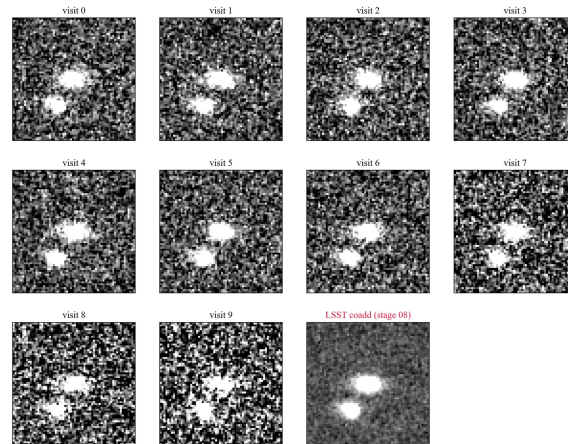
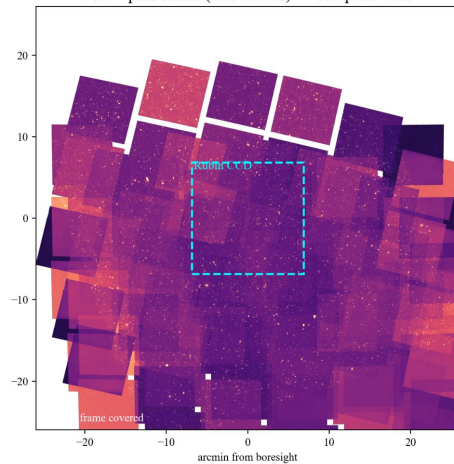
L4 catalog

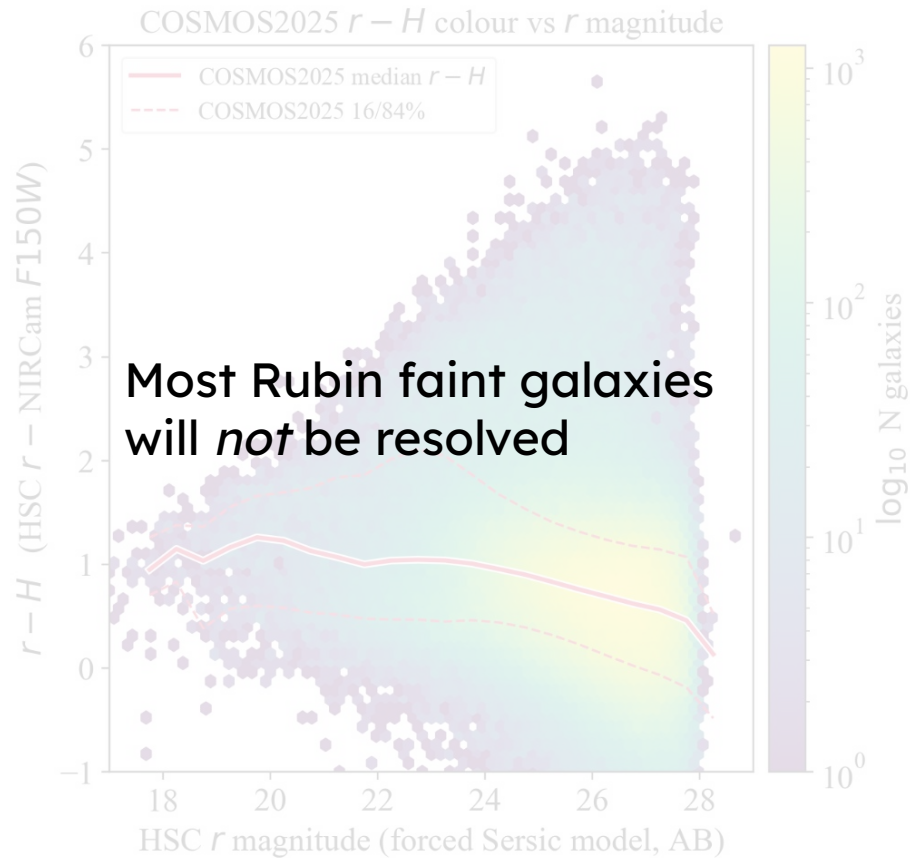
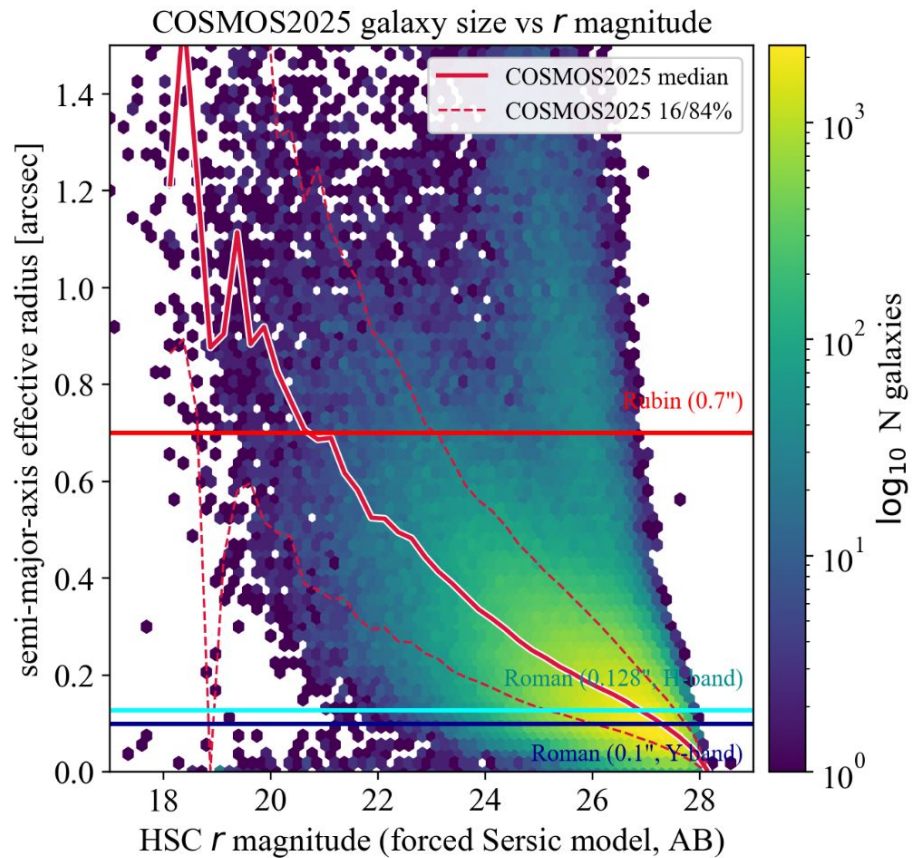


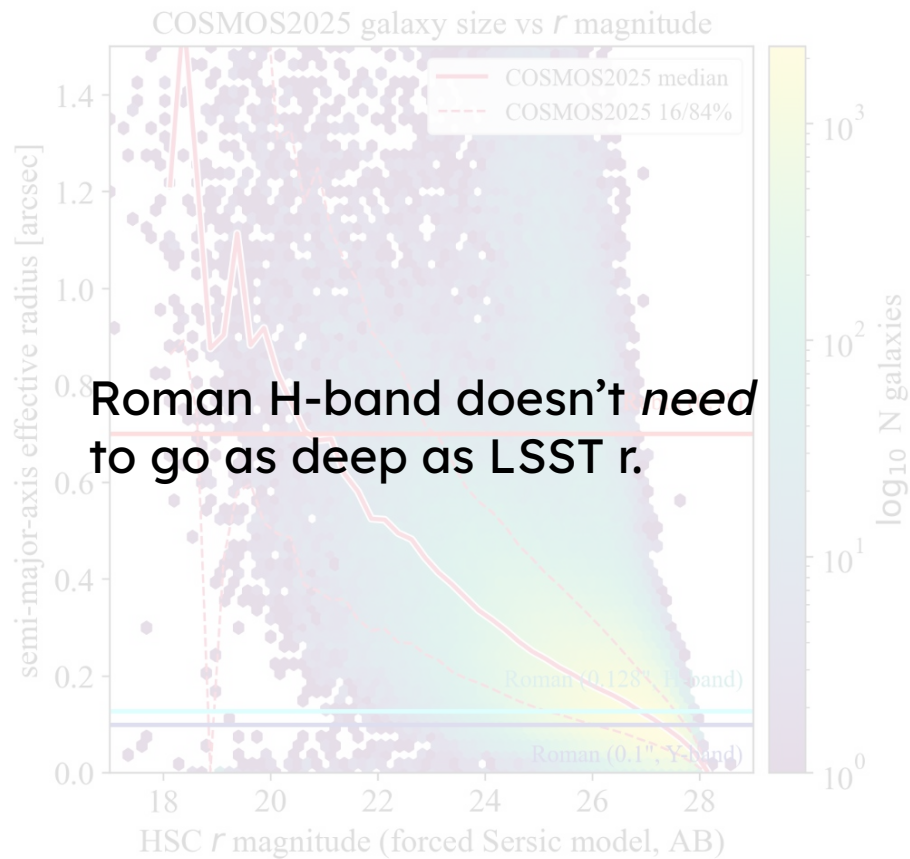
Single exposure — 18-SCA WFI layout



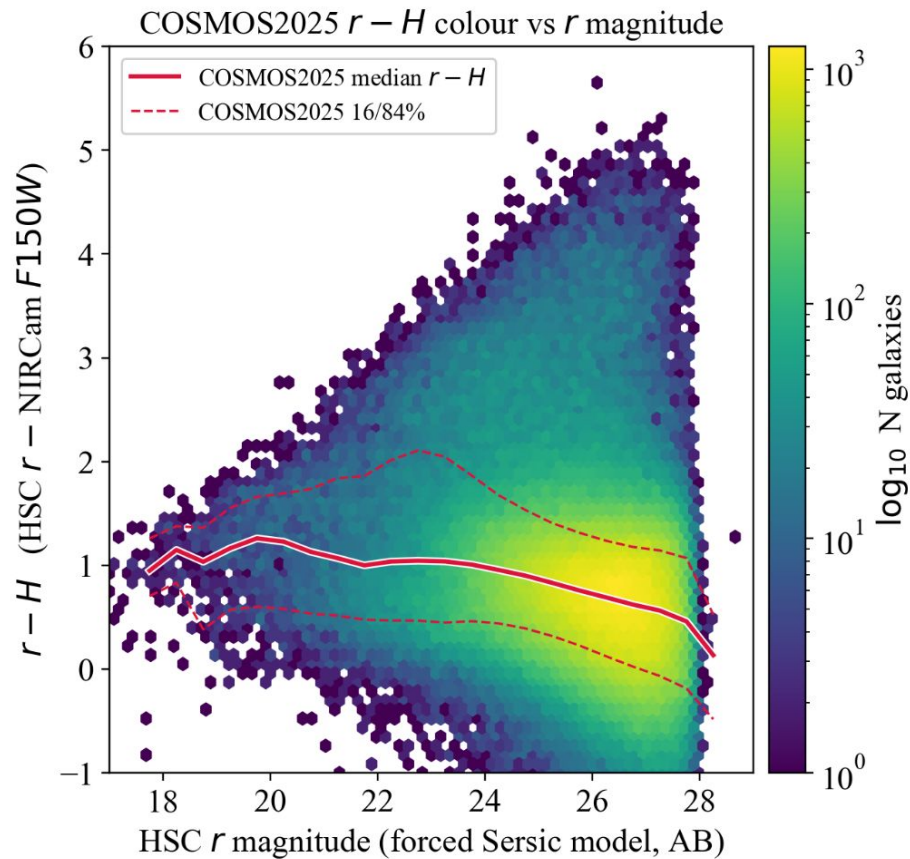
Full 2-pass coadd (108 frames) — complete field



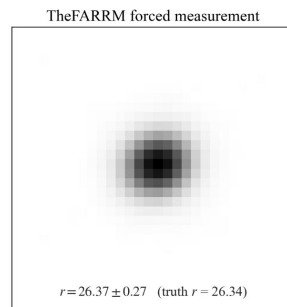
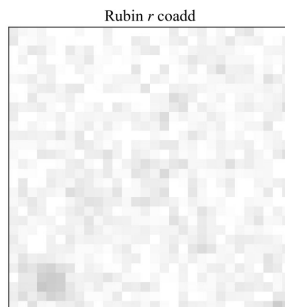
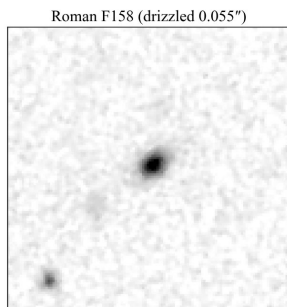
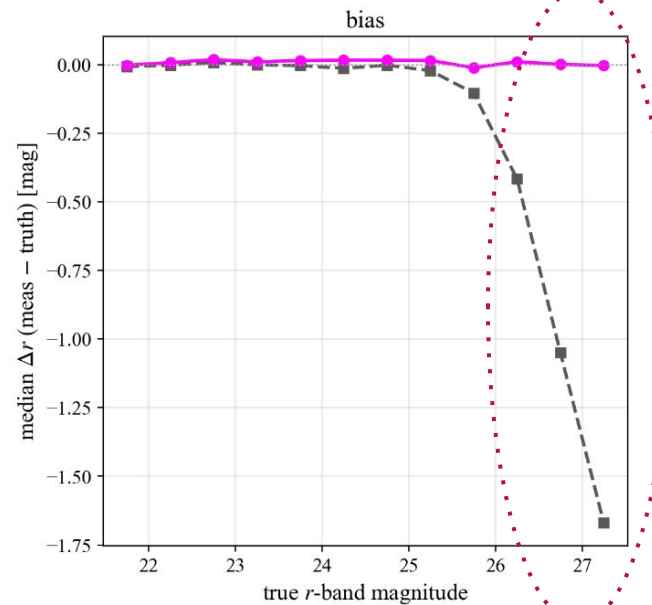
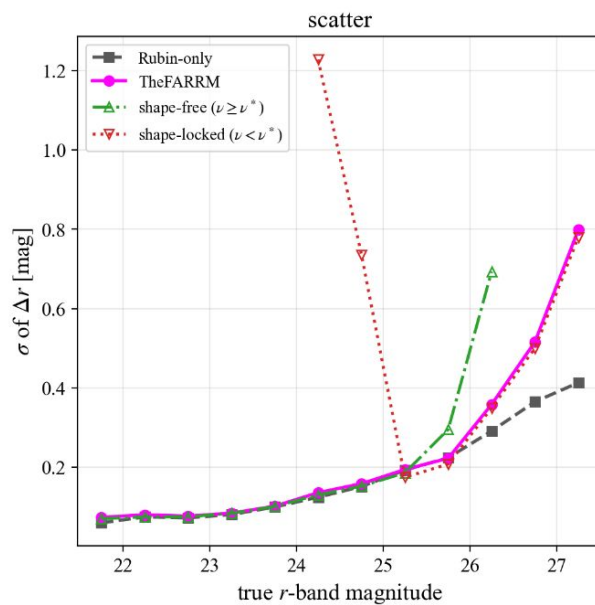
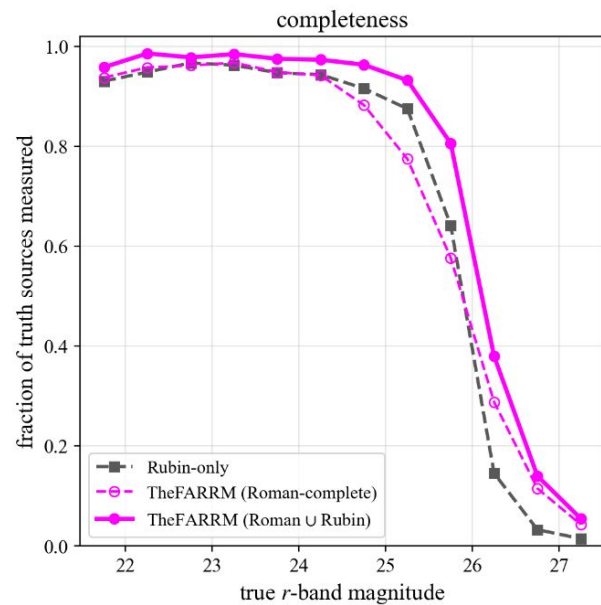




Roman H-band doesn't *need* to go as deep as LSST r .

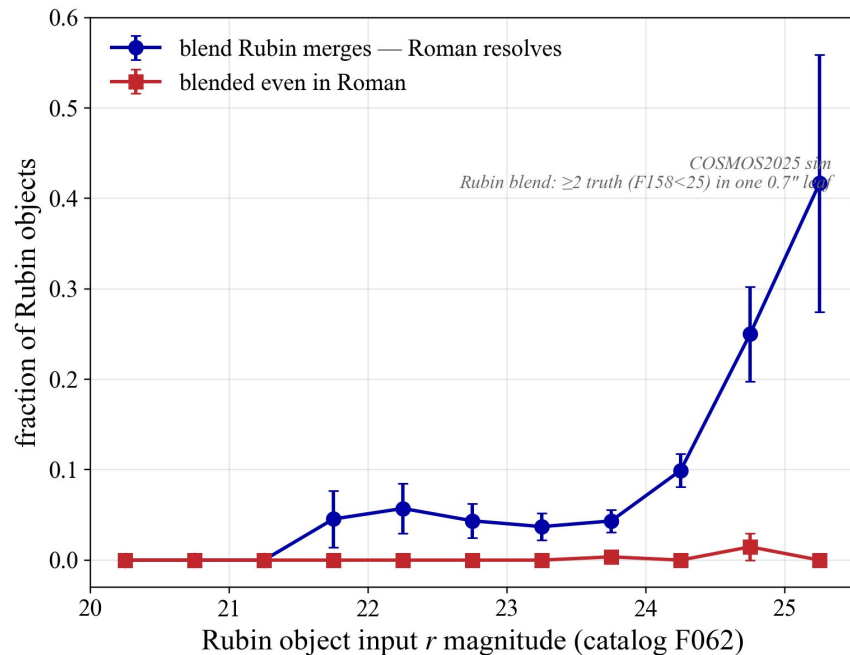


Photometry recovery

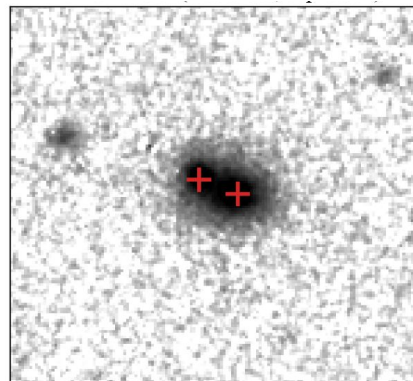


Application 1: Deblending

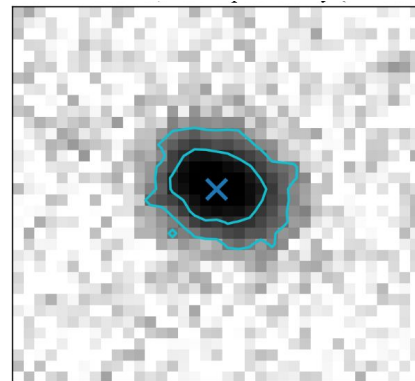
Blended fraction



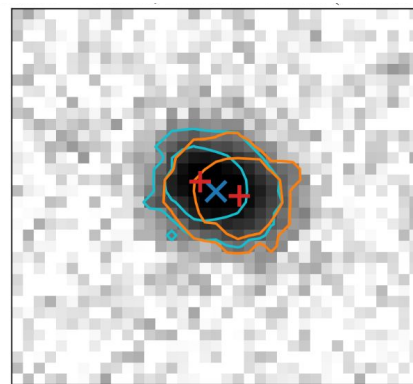
Roman



Rubin

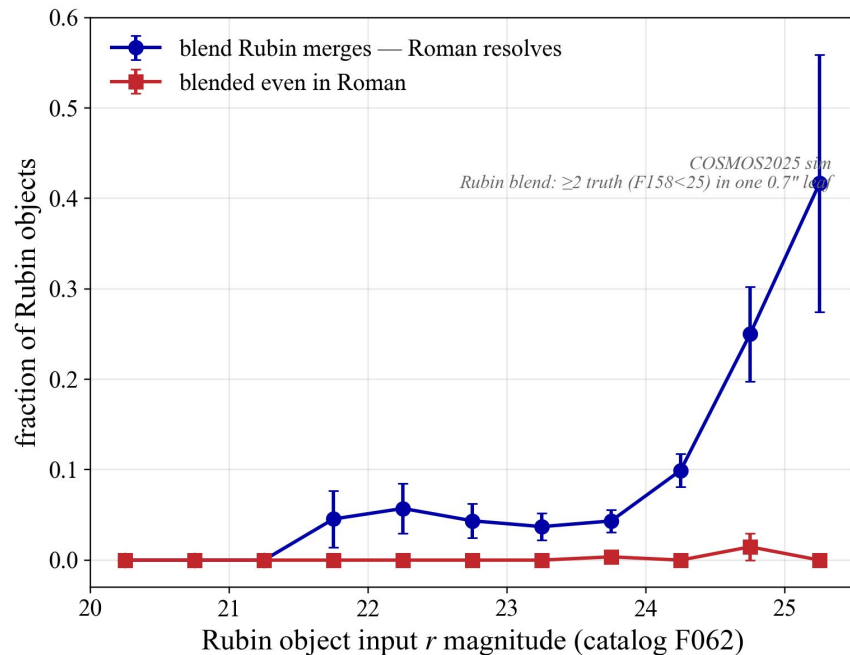


TheFARRM

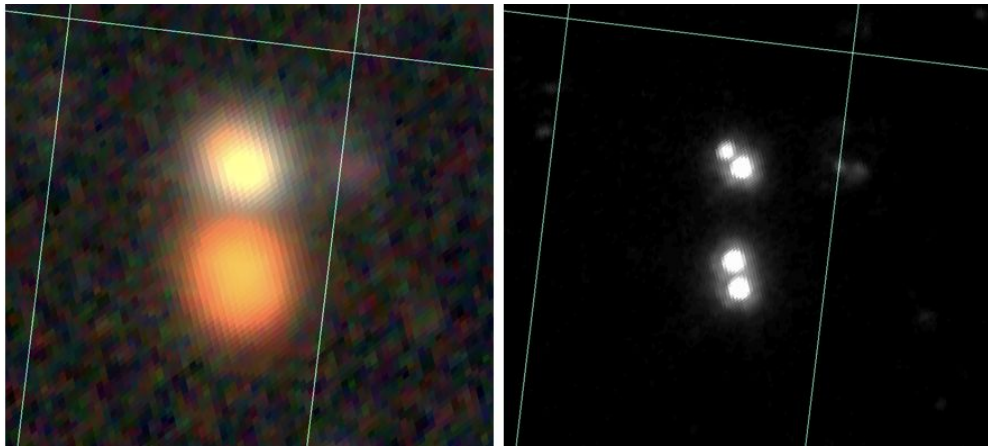


Application 1: Deblending

Blended fraction

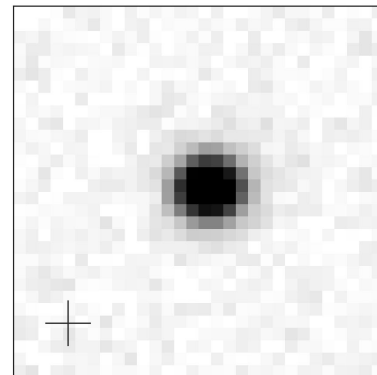
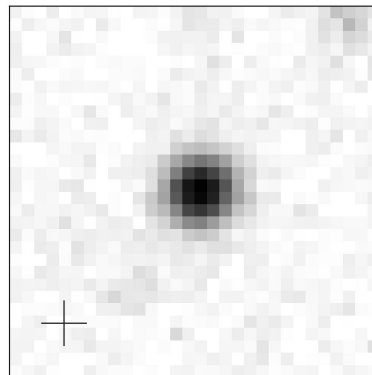
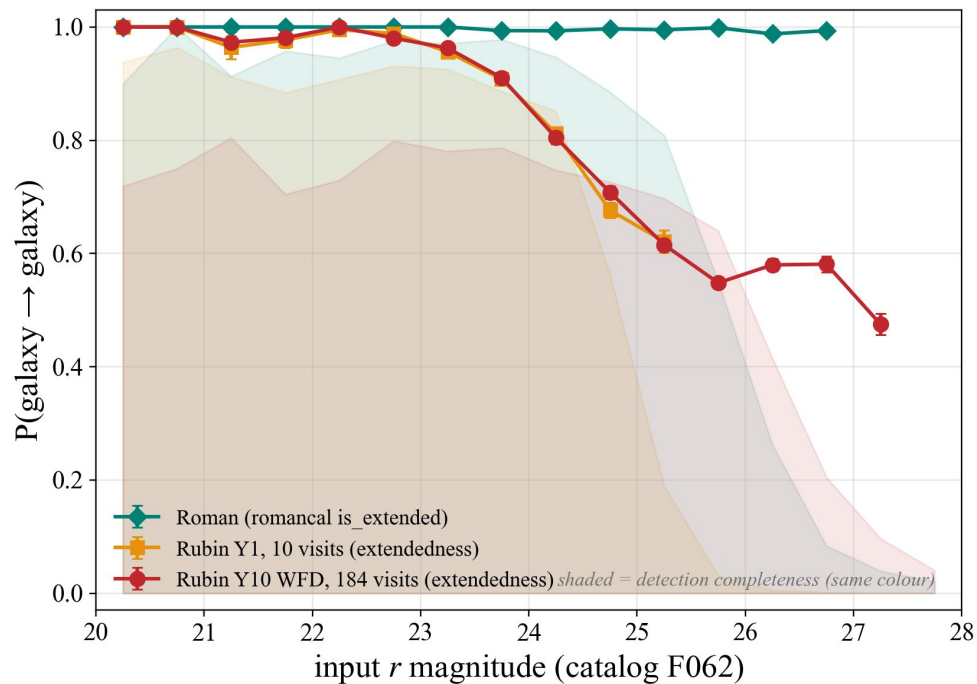


Also important for stellar binaries/triples!



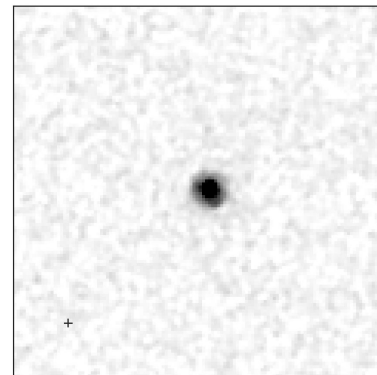
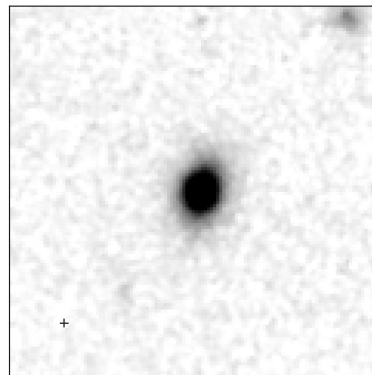
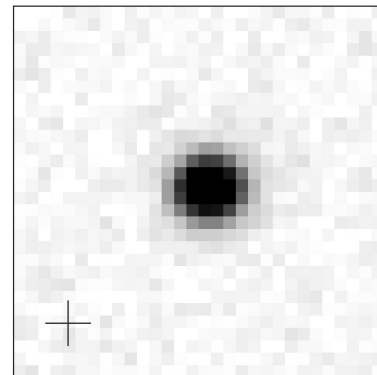
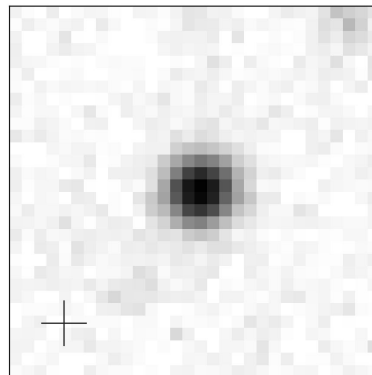
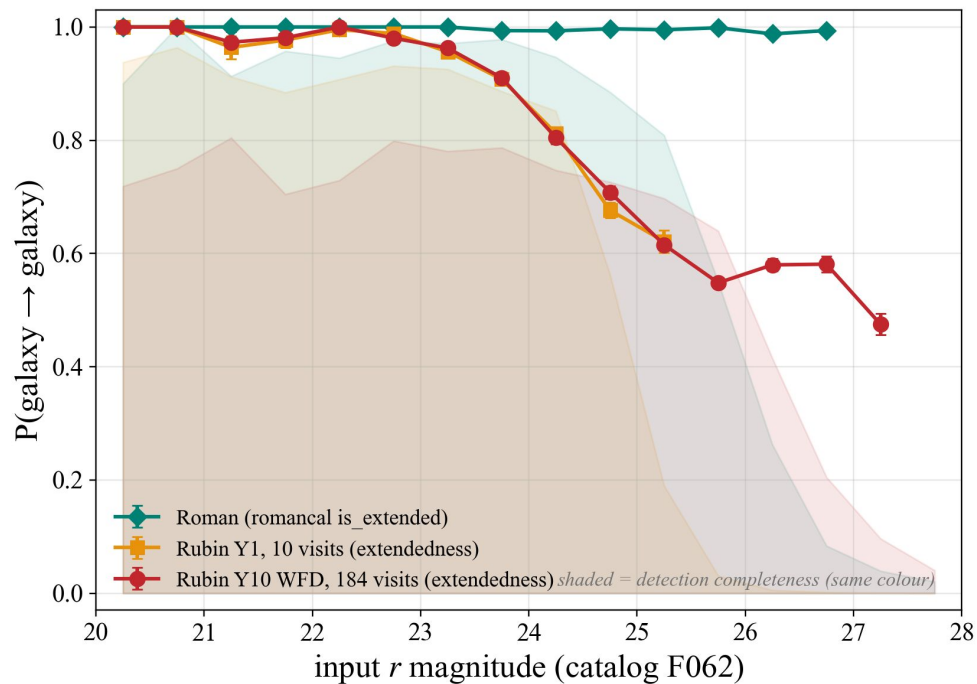
Application 2: Star-Galaxy Separation

Is a galaxy, a galaxy?

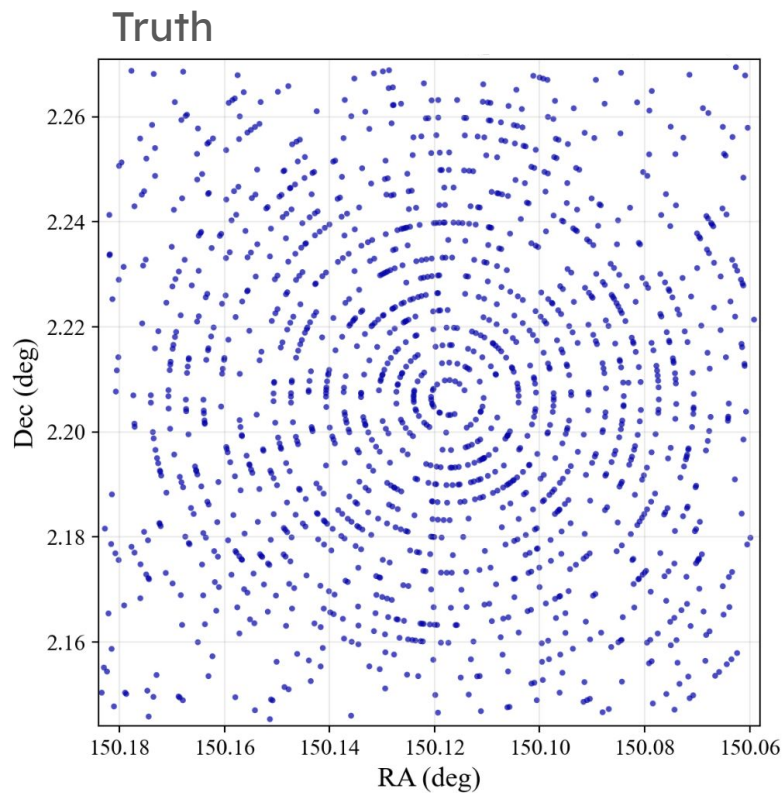


Application 2: Star-Galaxy Separation

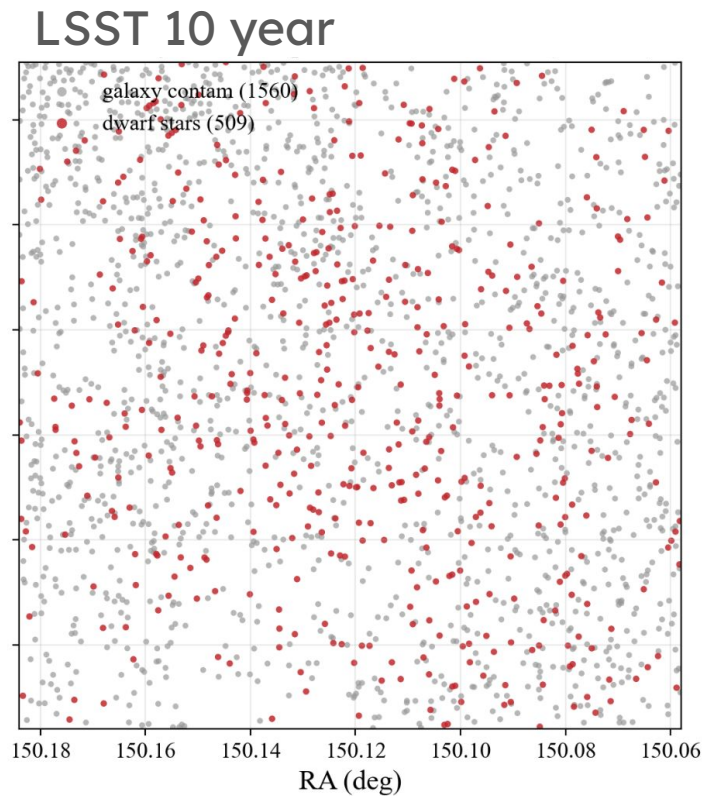
Is a galaxy, a galaxy?



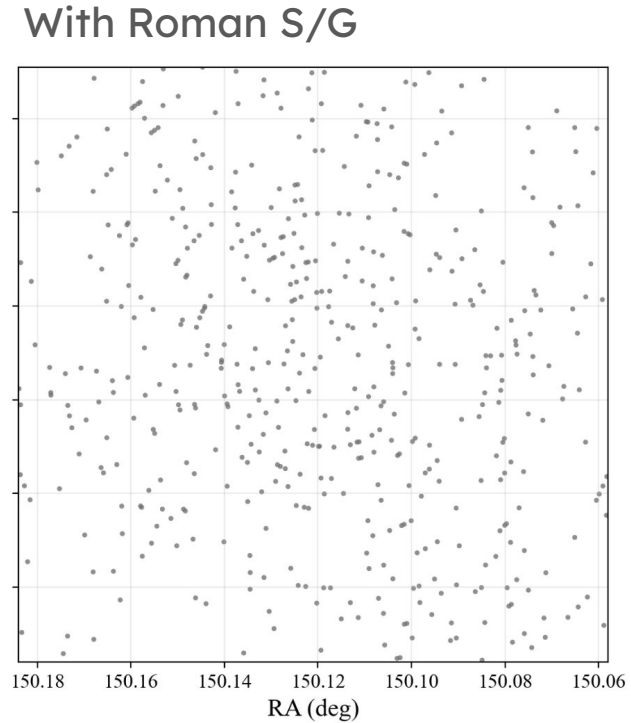
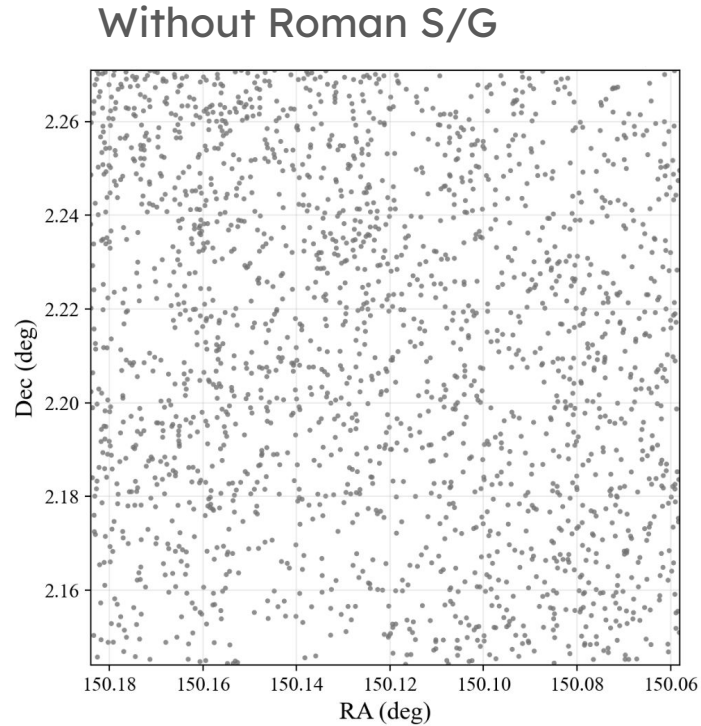
Application 2: Star-Galaxy Separation



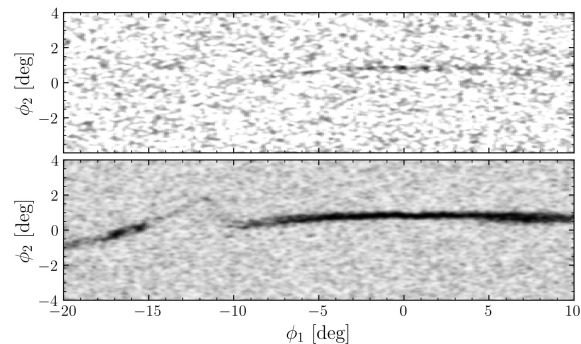
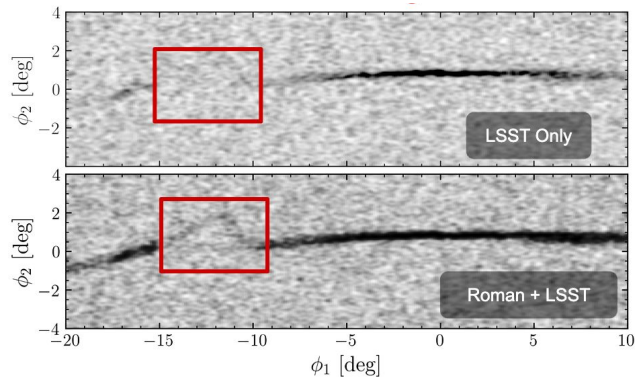
[Fe/H] = -2.3, Age=10Gyr, Plummer $r_h = 4$ arcmin, Distance = 100 kpc, Stellar mass $\sim 1.5 \times 10^4$ Msun



Application 2: Star-Galaxy Separation

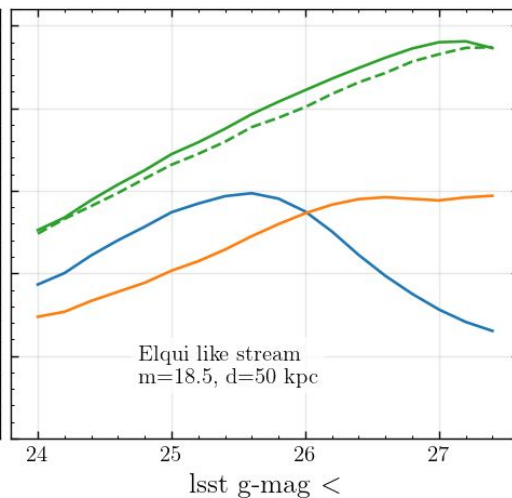
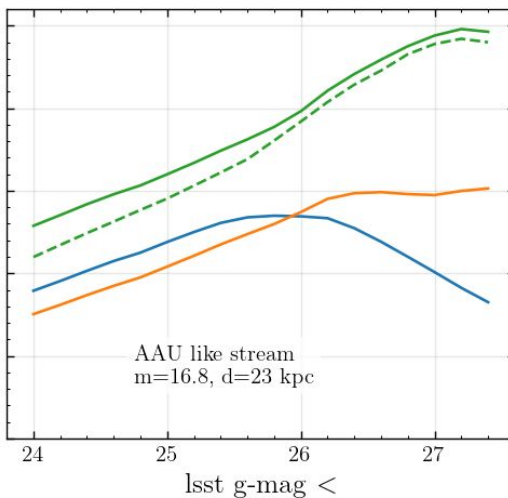
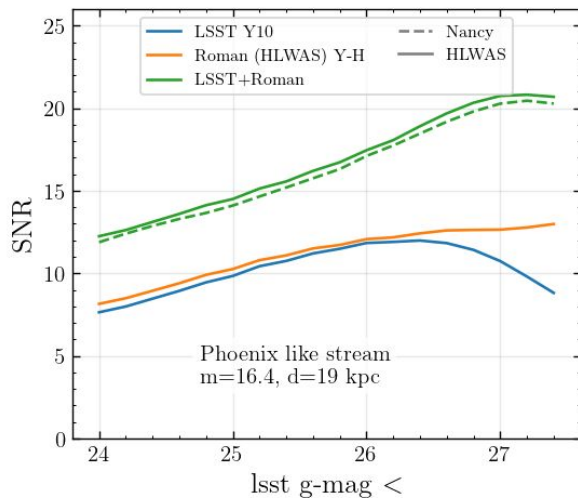


Application 2: Star-Galaxy Separation

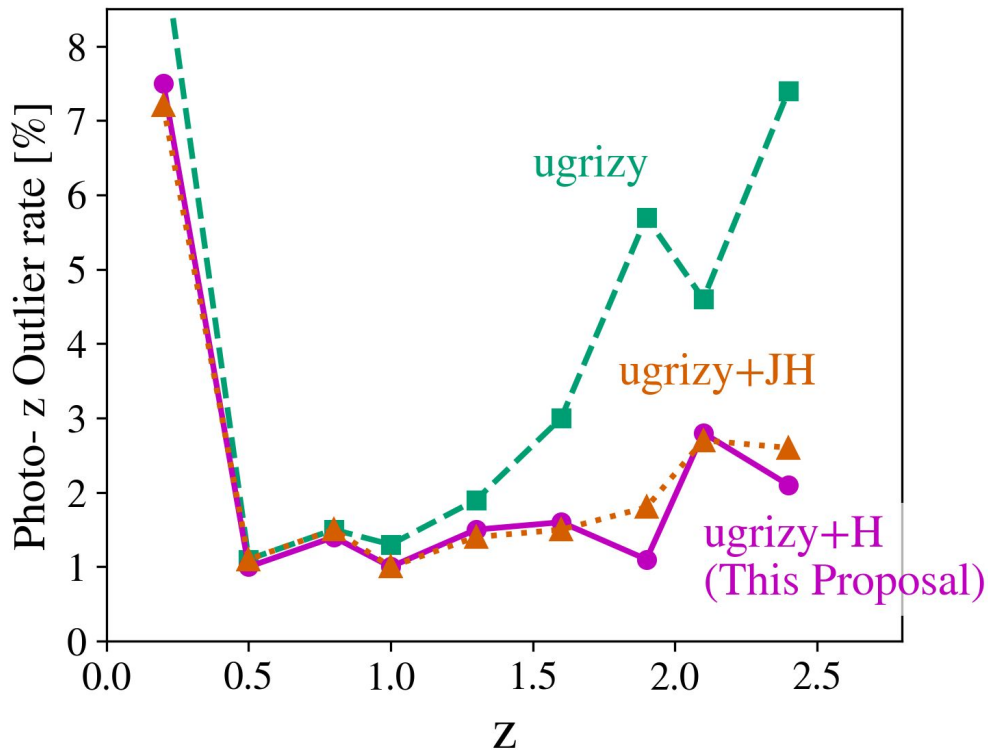


SNR vs g-mag

Figures from Peter Ferguson (UW)



Application 3: Galaxy SEDs & Photo-z



ugrizy+Roman bands for all extragalactic & stars, de-blended, and derived self-consistently.

Photo-z is one application, among many more!

Context & Timeline

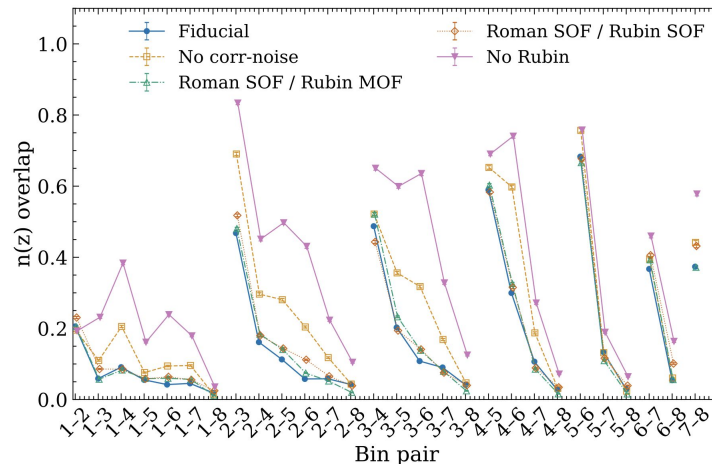
WL-optimized version being done by HLIS PIT

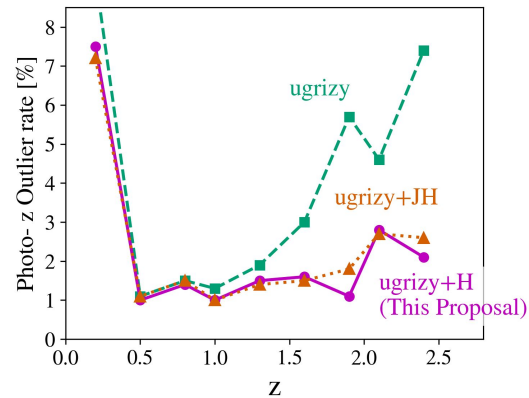
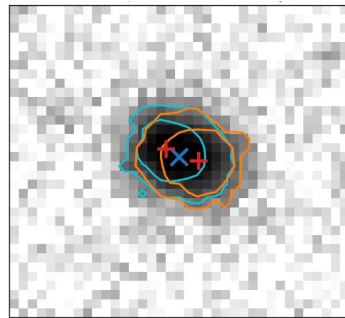
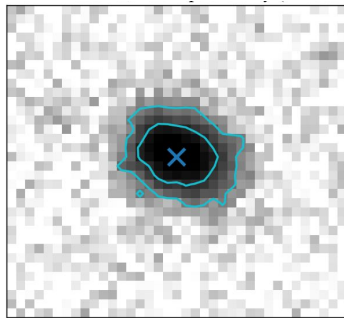
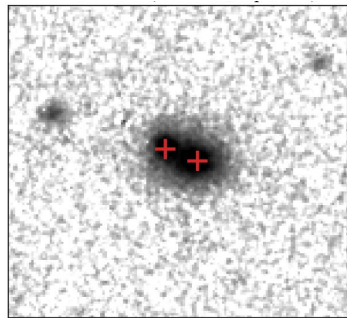
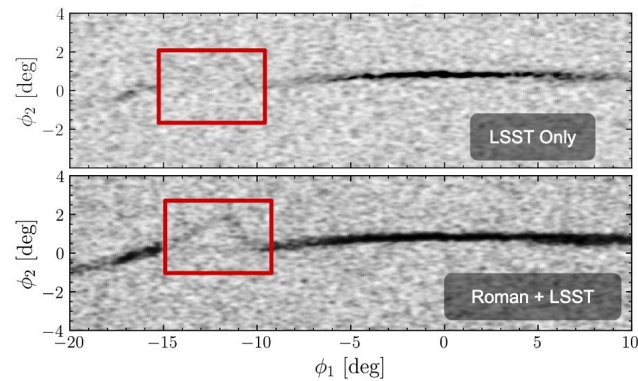
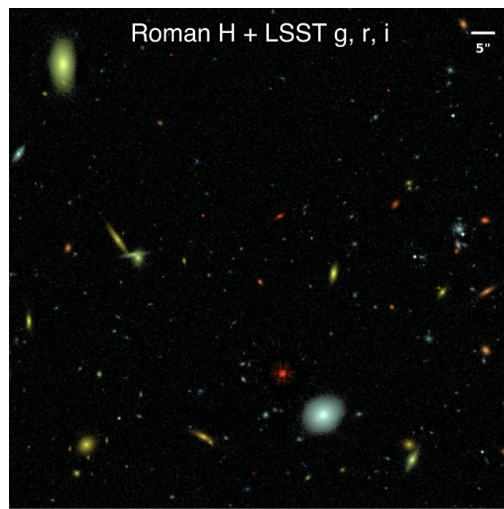
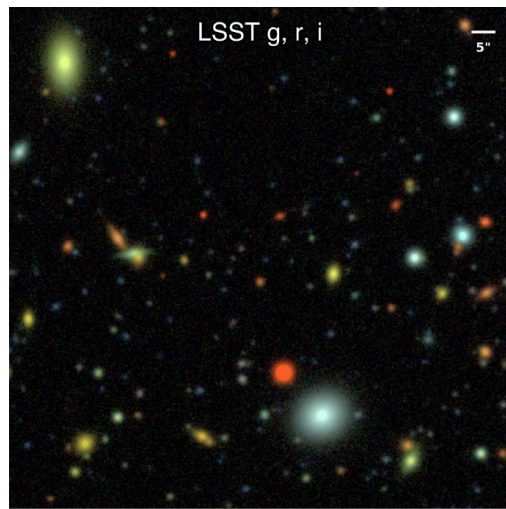
Chun-Hao To+ [arXiv:2607.09849](https://arxiv.org/abs/2607.09849) “slim farmer”

The main difference is **science focus & timeline**.

TheFARRM uses **Roman SOC & LSST DM pipelines**, and will ingest L4 data at a rate only limited by LSST Data Rights policies (🔪), for **general astrophysics**.

This analysis will be carried out on LSST USDF-affiliated facilities, enabling the quick turnaround.





Special thank-you to Roman SOC & LSST DM pipeline developers!