

# Dark Energy Survey Results and Methods with Applications to Other Surveys

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<https://aas245surveys.web.illinois.edu/>



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**Dhayaa Anbajagane**: Precision measurements in the Dark Energy Survey: building synthetic skies to characterize photometric datasets

**Theo Schutt**: Modeling the point-spread function for DES Y6

**Vernon Wetzell**: Shear Determination: Tackling Bias in the Billion-Galaxy Era

**Giulia Giannini**: Calibrating Redshifts - Insights from the DES 3x2pt Experience for Next-Generation Surveys

**Rebecca Chen**: Type Ia Supernova Cosmology from DES to LSST and Roman

**Narayan Khadka**: SLSim - Simulating a Strongly Lensed Universe

**Yuanyuan Zhang**: Galaxy Cluster Cosmology: results from DES and preparation for LSST

**Javier Sanchez**: Status, limitations and prospects of studying the large-scale structure using photometric surveys

**John Franklin Crenshaw**: Photometric Redshifts with LSST - Methodological Advancements, Rubin Commissioning, and the Potential for High-Redshift Cosmology

**Peter Ferguson**: Unveiling dark matter in the near-field from present (DES) and future (LSST) cosmological surveys



Dhayaa



Theo



Vernon



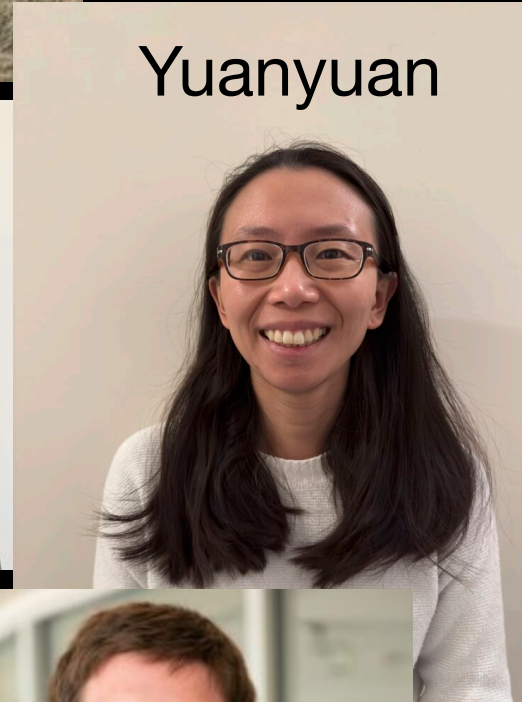
Giulia



Rebecca



Narayan



Yuanyuan



Javier



John Franklin



Peter

Announcing the first of many DES papers  
supporting the final cosmology analysis

*Dark Energy Survey Year 6 Results:*

*Photometric Dataset for Cosmology*  
[arxiv.org/abs/2501.05739](https://arxiv.org/abs/2501.05739)

*Synthetic source injection across the full survey  
using BALROG* [arxiv.org/abs/2501.05683](https://arxiv.org/abs/2501.05683)

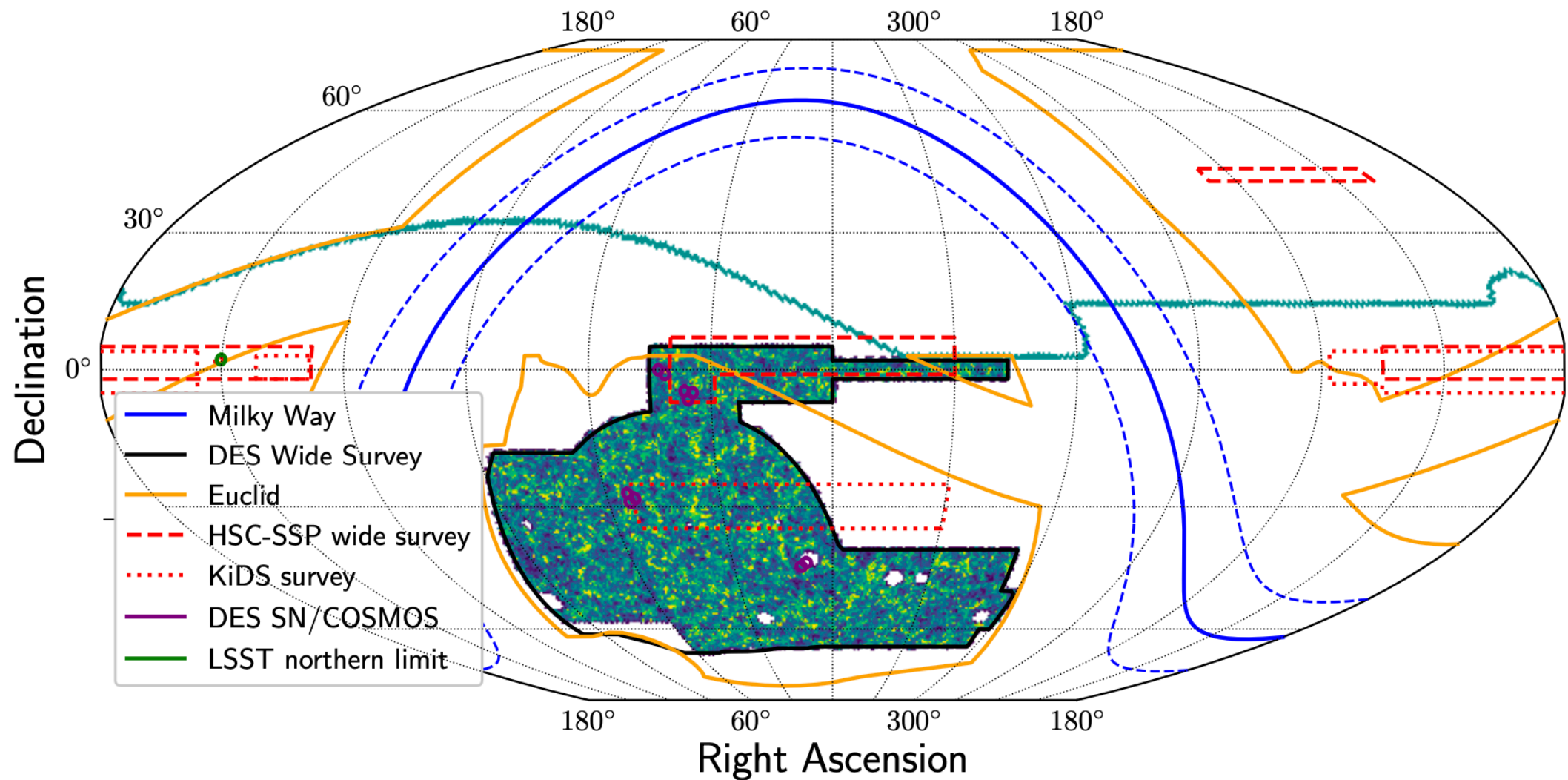
*Point-Spread Function Modeling*  
[arxiv.org/abs/2501.05781](https://arxiv.org/abs/2501.05781)

*Cell-based Coadds and Metadetection Weak  
Lensing Shape Catalog* [arxiv.org/abs/2501.05665](https://arxiv.org/abs/2501.05665)

# Photometric Dataset for Cosmology (Y6 Gold)

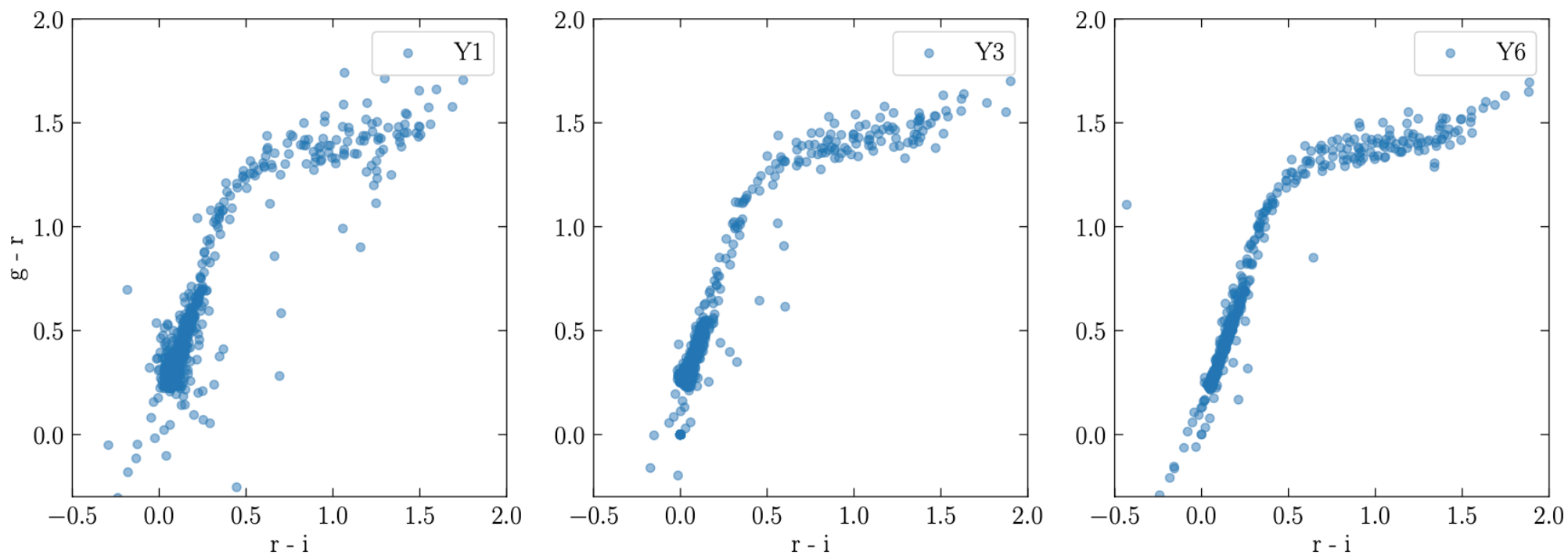
- 5000 square degrees, *grizY*,  $N = 669$  million to  $i = 23.4$  ( $10 \sigma$  for extended sources)  
after selection cuts:  $N_{\text{gal}} = 448$  M and  $N_{\text{stars}} = 120$  M
- photometric uniformity  $< 2$  mmag
- morphological classification: galaxies with  $i < 22.5$  are selected with 98.6% efficiency and 0.8% contamination
- new methods, simultaneous fits to multi-epoch photometry for improved shapes, colors, and photometric redshifts
- enhanced per-object quality information
- high-res maps: masked regions, depth, foregrounds, ...

# the DES Footprint in context



72,217 individual exposures with the Dark Energy Camera (DECam) on the CTIO Blanco Telescope

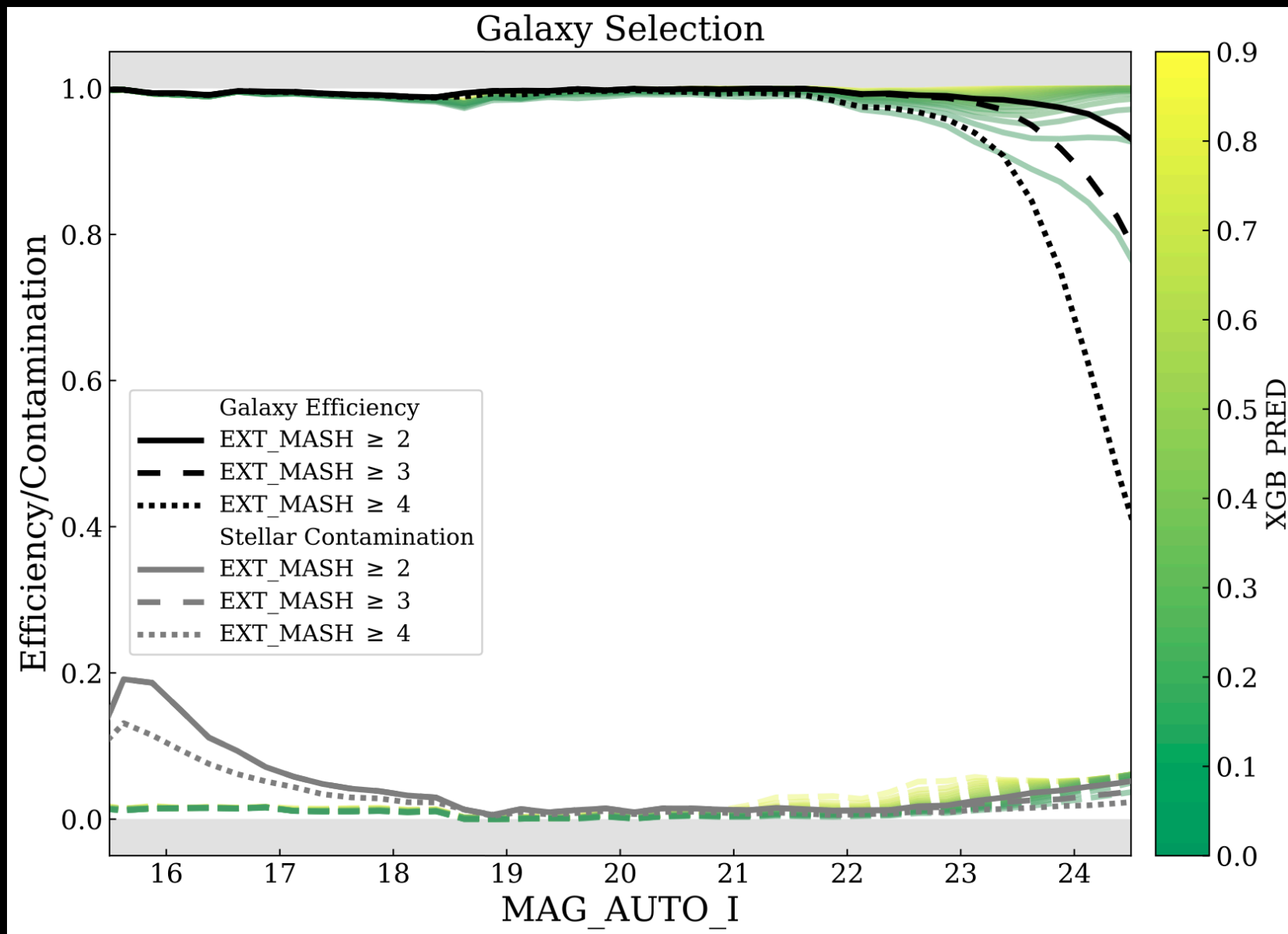
# color-color diagram for stars, illustrating improvement from Y1 to Y3 to Y6



**Figure 2.** Illustration of the increasing calibration and selection quality in successive data releases, from Y1 Gold (*left*), Y3 Gold (*center*) to Y6 Gold (*right*). This figure shows the stellar locus for selected stars in the outskirts of the globular cluster NGC 1261.



# new methods improve star/galaxy separation



the Y6 Gold catalog is available at

<https://des.ncsa.illinois.edu/releases/y6a2>

[https://datalab.noirlab.edu/query.php?  
name=des\\_dr2.y6\\_gold](https://datalab.noirlab.edu/query.php?name=des_dr2.y6_gold)

Y6 Gold was produced by the DES Science Release team:

Keith Bechtol, Ignacio Sevilla-Noarbe, Alex Drlica-Wagner, Brian Yanny, Robert Gruendl, Erin Sheldon, Eli Rykoff, Juan de Vincente, Monika Adamow, Dhayaa Anbajagane, Matt Becker, Will Hartley, Douglas Tucker, and *many many more* DES members!