

HLIS



roman-hlis-cosmology.caltech.edu



github.com/Roman-HLIS-Cosmology-PIT



Effortless: Efficient Optimal Image Reconstruction & **Fisher Forecasts** for Cosmological Yields from the Roman HLIS

Presenter: Kaili Cao (The Ohio State University → University of Michigan)

Shifting Landscapes in Astrophysics: New Frontiers to Explore with Roman, July 13, 2026

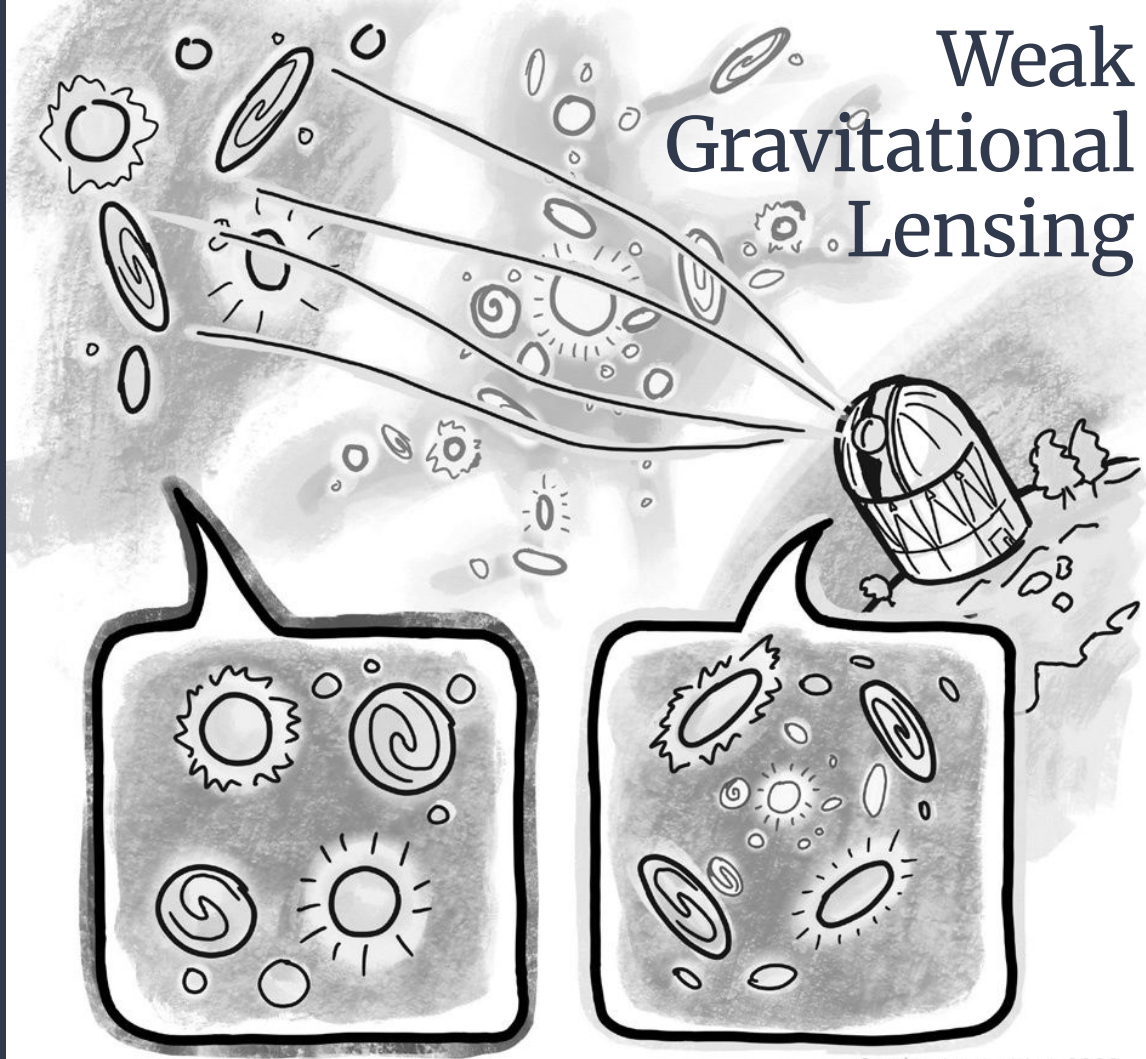
Roman HLIS Cosmology PIT @ Shifting Landscapes

11:55 AM	Poster Pops #1 (Al Zaman, Cao #1, Cao #2 Damiano, Ding, Do Ó, El Morsy, Romanowski) Monday	
2:45 PM	Poster Pops #2 (Fausey, Ferguson, Gizis, Harbo Torres, Honaker, Huang, James, Khan) Monday	
11:20 AM	Axel Guinot (Carnegie Mellon Univ.)	Weak lensing with Roman: from galaxy shapes to shear measurement
11:35 AM	Eric Huff (JPL)	Kinematic Weak Lensing with the Roman Space Telescope

Cyan: Presentations on behalf of HLIS PIT
Green: Other presentations by HLIS PIT members

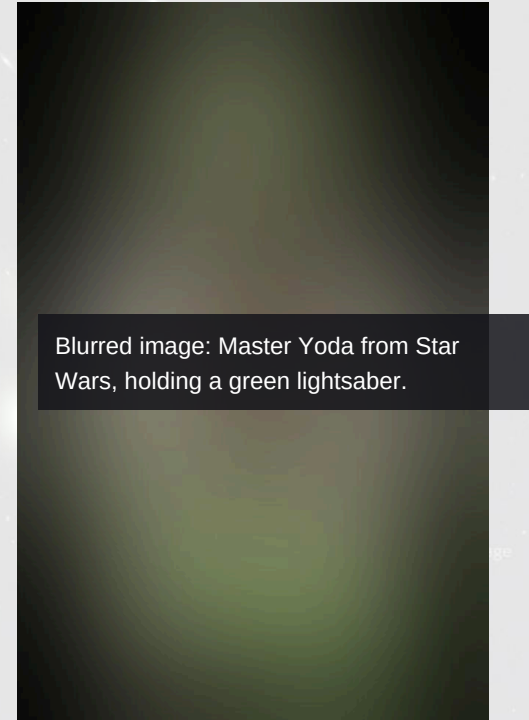
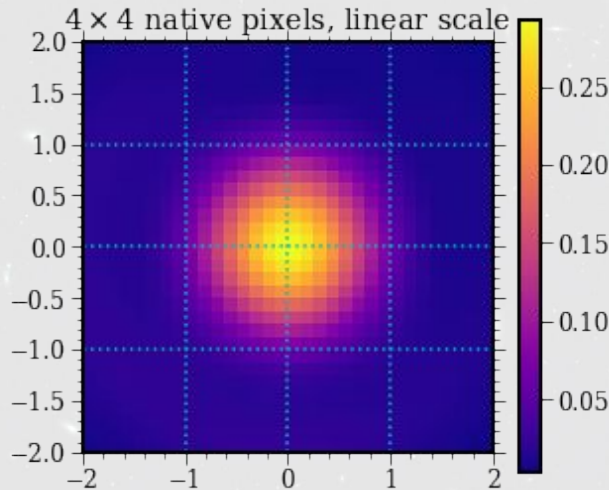
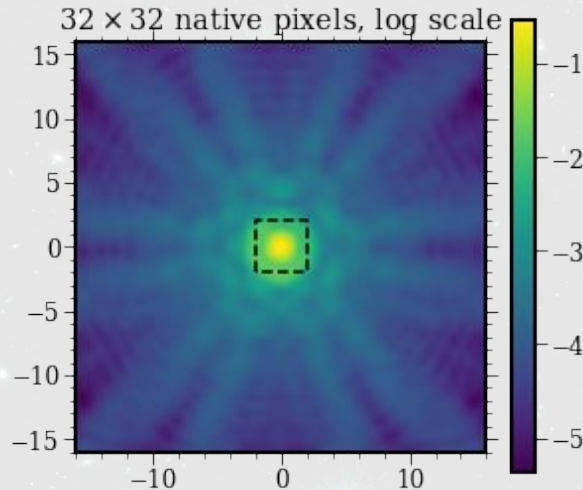
Our Project
Infrastructure
Team:
Maximizing
Cosmological
Science with the
Roman High
Latitude
Imaging Survey

Weak
Gravitational
Lensing



Why do we coadd images? – “Oversample, we must!”

- Roman point spread functions (PSFs)
 - = Airy disk ($\sim \lambda/D$) + linear obscuration + diffraction spikes + detector effects
 - An example in **Y106** band shown below



Blurred image: Master Yoda from Star Wars, holding a green lightsaber.

Image credits: Lucasfilm Ltd., Janson_G

Foreseeable Future: Efficient Optimal Image Reconstruction with **Effortless** (Cao 2026*)

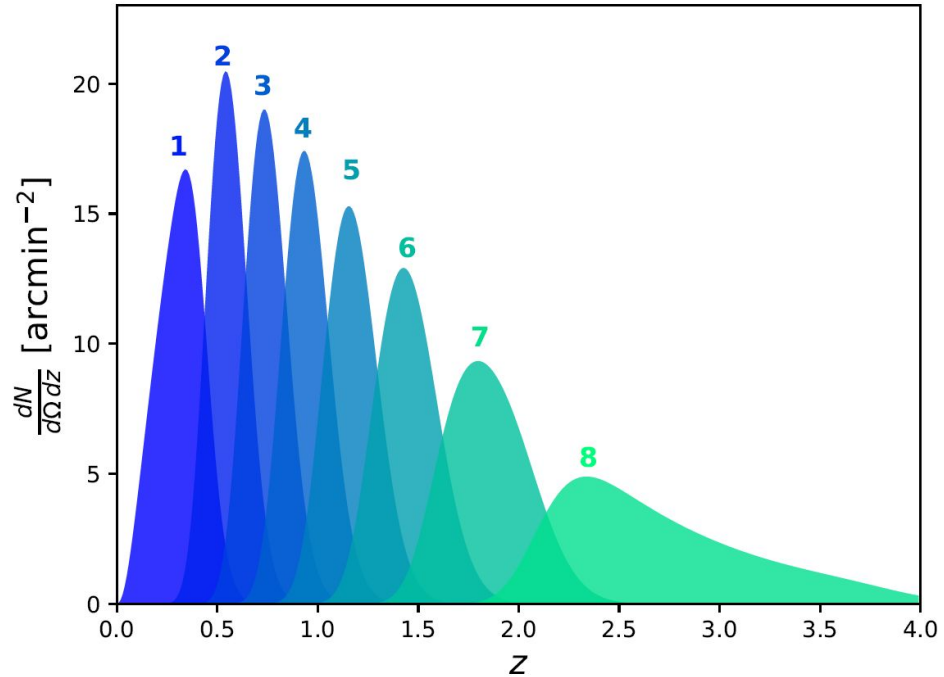


Weak Lensing Observables: 3×2pt (Three Two-Point Correlation Functions)

Cosmic shear: autocorrelation of galaxy **shapes**

Galaxy-galaxy lensing (GGL): cross-correlation of galaxy **shapes** and galaxy **positions**

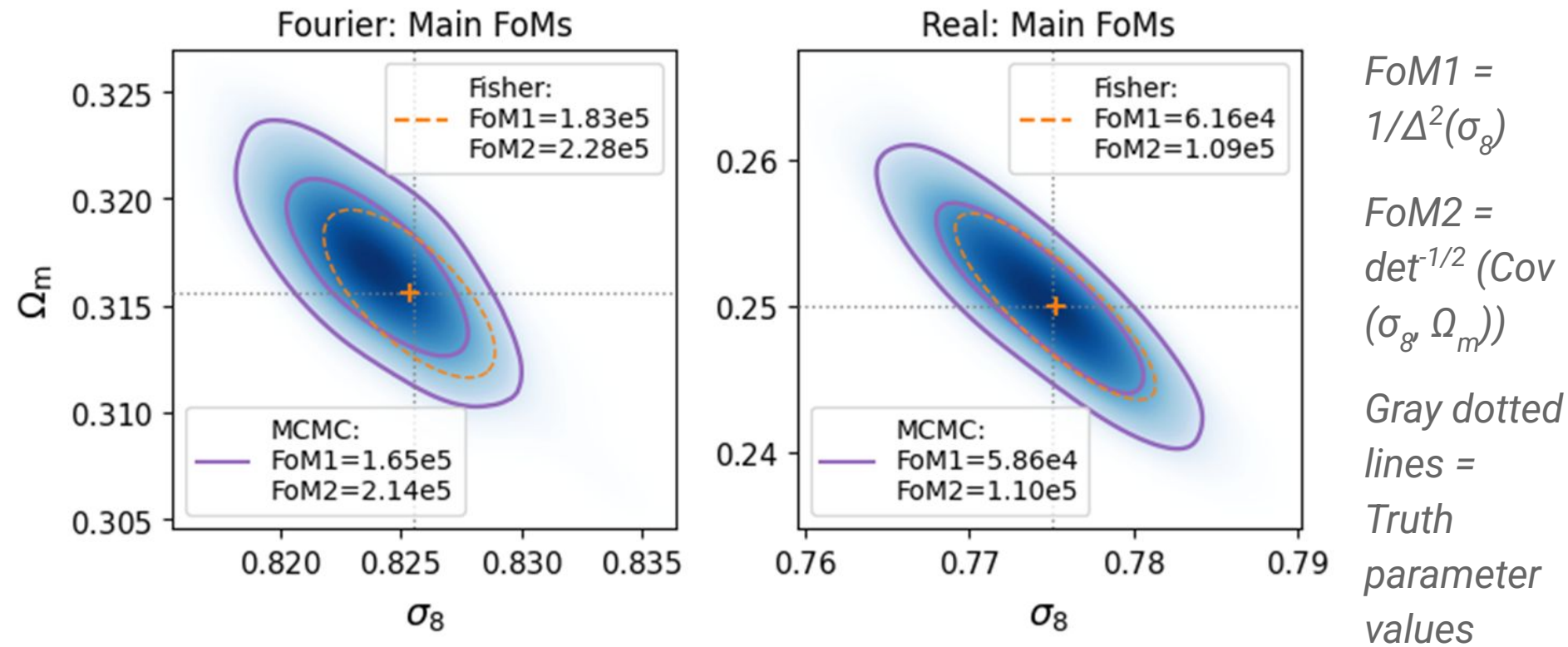
Galaxy clustering: autocorrelation of galaxy **positions**



Credit: Haley Bowden

Fisher Forecasts for Constraining Power

(Below: Figure 6 in K. Cao et al. 2026, submitted)



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