LSST-DESC,
Mexican contribution

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Cinvestav

CONAHCYT

LSST DESC
Dark Energy Science Collaboration

Dark Energy Science Collaboration (DESC)

Design and implement dark energy analysis from the Vera C. Rubin Observatory's data

Dark Energy Science Collaboration (DESC)

~1200 members

- LSST data holders
- Interested in working with DESC

DESC Meeting
ETH Zürich 2024

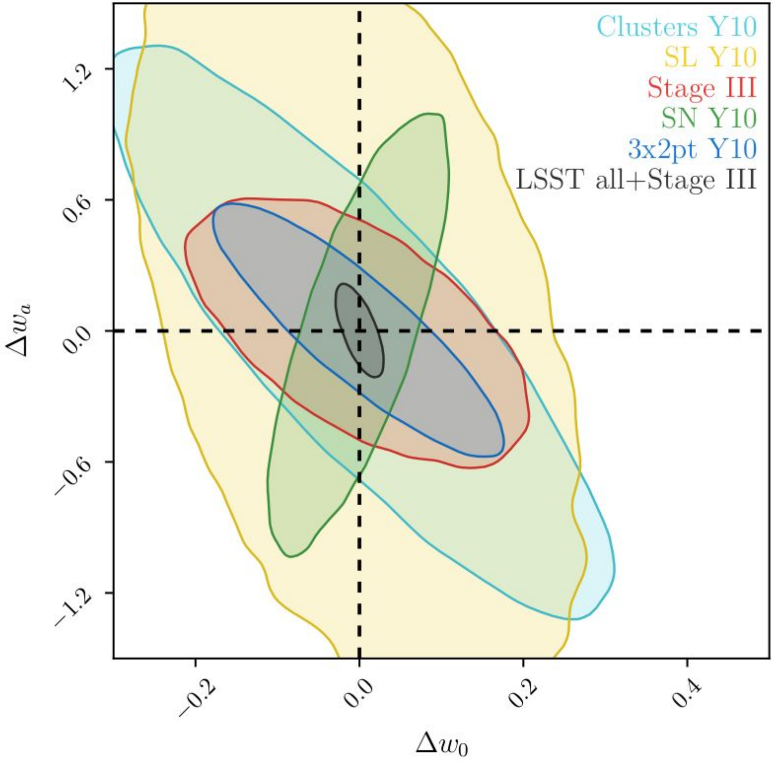
Science objectives

Given the Dark Energy equation of state parametrization

$$w(a) = w_0 + (1 - a)w_a$$

where $\omega = -1$ corresponds to a cosmological constant.

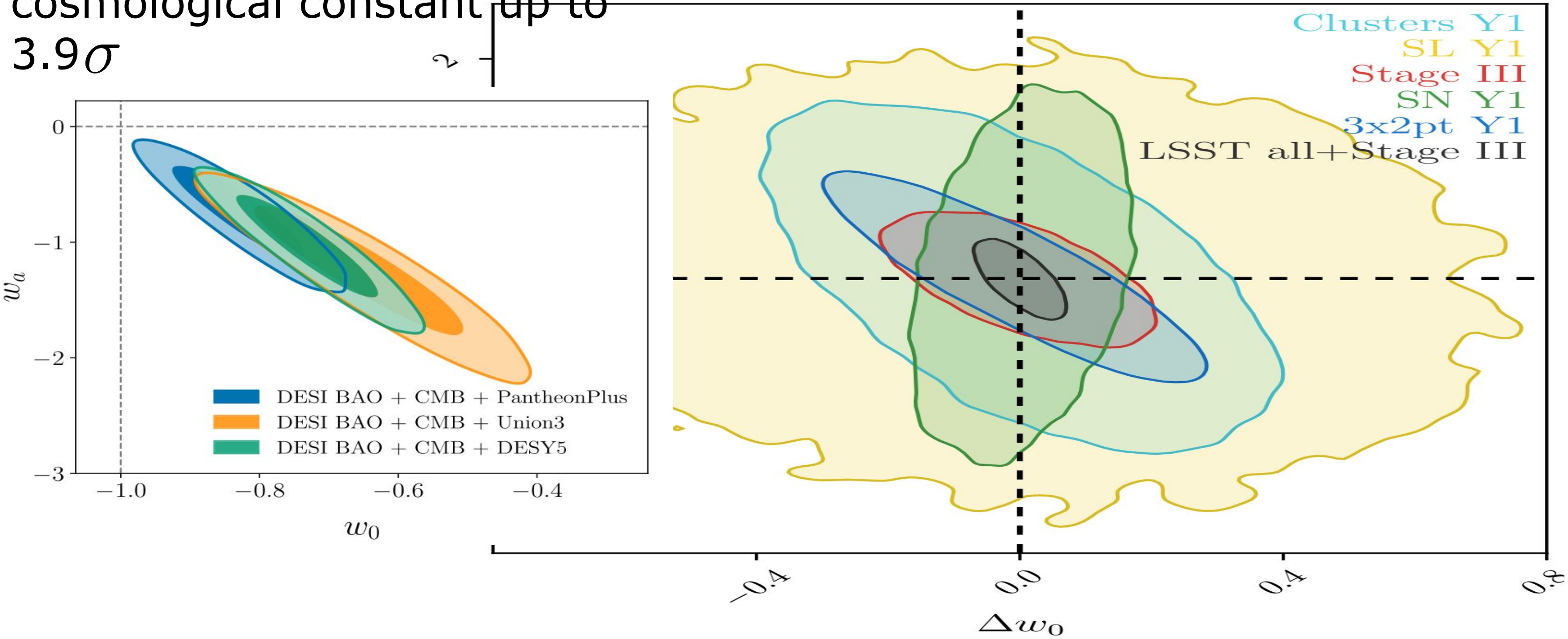
$$\sigma(w_0) = 0.02 \text{ and } \sigma(w_a) = 0.14$$



For Y1

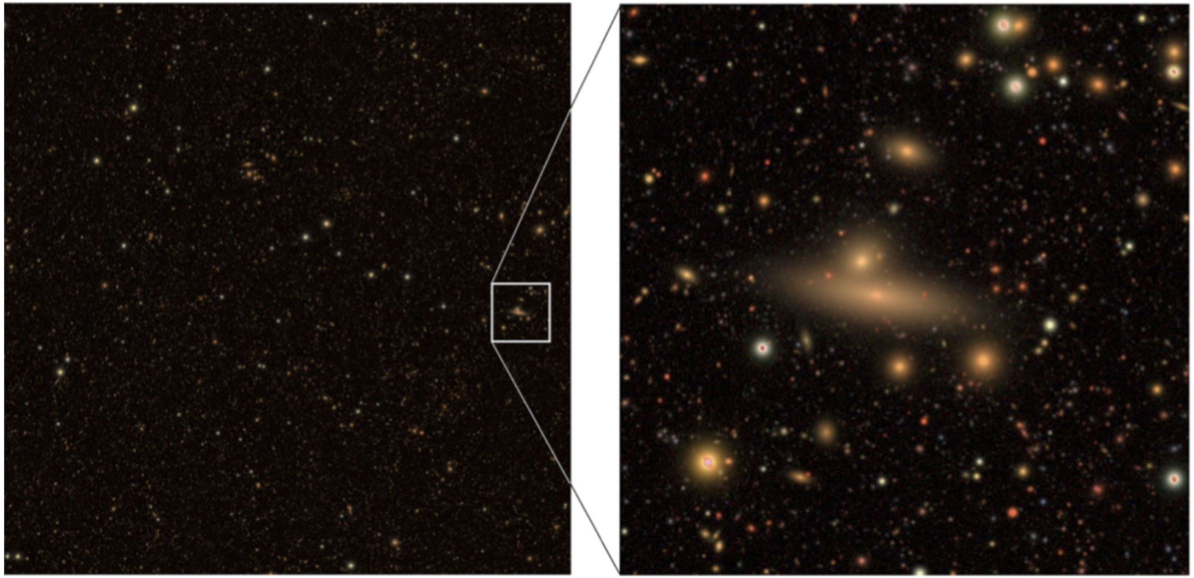
DESI found a deviation from the cosmological constant up to 3.9σ

DESC Y1 forecast



Probes

- Weak lensing
- Strong lensing
- Large scale structure
- Galaxy clusters
- Supernovae



DC2 simulation
LSST DESC 2020

Cosmological expansion

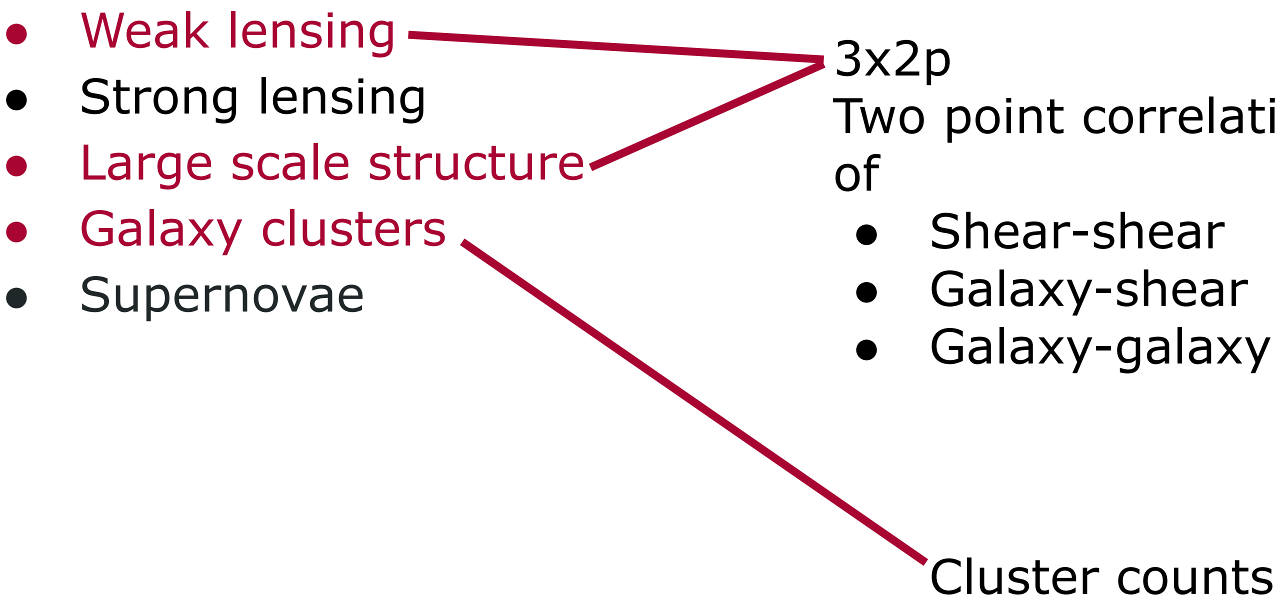
- Weak lensing
- Strong lensing
- Large scale structure
- Galaxy clusters
- Supernovae

Quasar or supernovae time delays measure H0 directly

~112 000 SNIa
(current catallogs ~2000)

DC2 simulation
LSST DESC 2020

Structure growth



- Weak lensing
- Strong lensing
- Large scale structure
- Galaxy clusters
- Supernovae

3x2p
Two point correlation functions of

- Shear-shear
- Galaxy-shear
- Galaxy-galaxy

Cluster counts

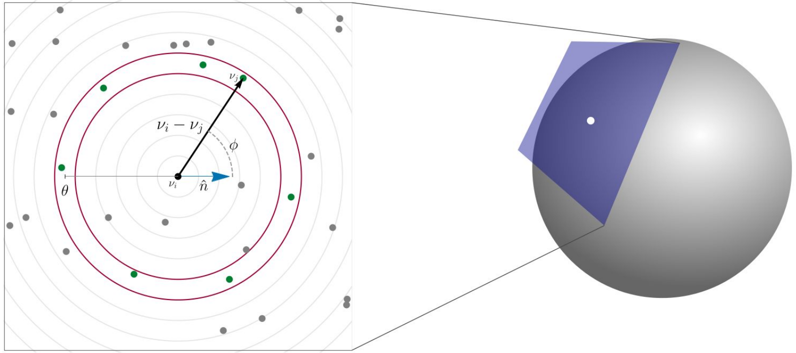
DC2 simulation
LSST DESC 2020

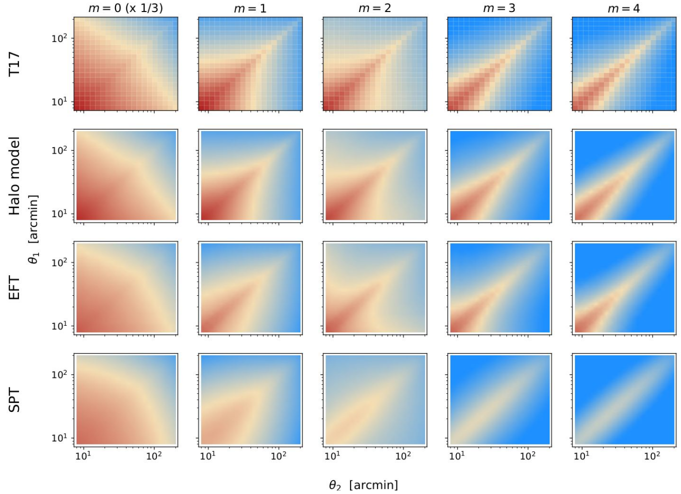
Mexican contributions at DESC

Modeling the 3-point correlation function of projected scalar fields on the sphere

Abraham Arvizu, [a,b] **Alejandro Aviles**, [b] **Juan Carlos Hidalgo**, [b]
Eladio Moreno, [a] **Gustavo Niz**, [a] **Mario A. Rodriguez-Meza**, [c]
Sofía Samario, [b] **The LSST Dark Energy Science Collaboration**

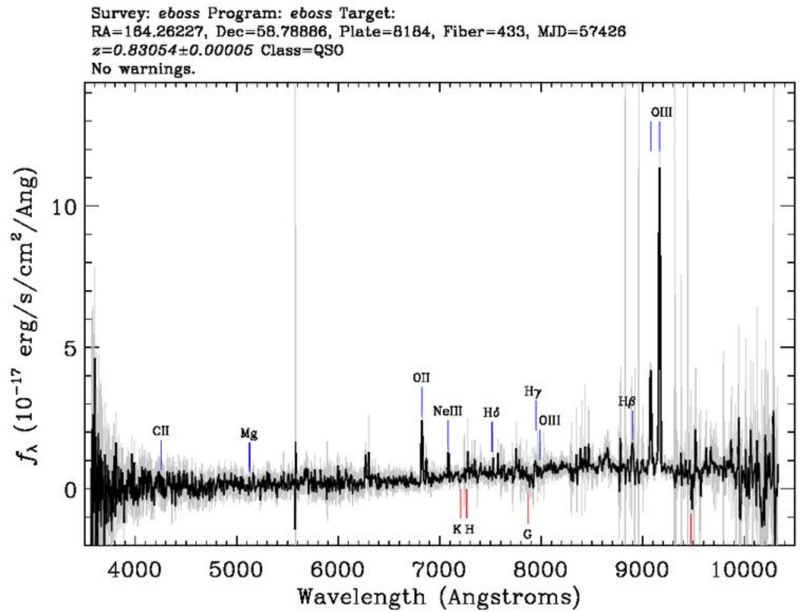
$$\zeta(\boldsymbol{\theta}_1, \boldsymbol{\theta}_2; \boldsymbol{\nu}) = \langle X(\boldsymbol{\nu}) X(\boldsymbol{\nu} + \boldsymbol{\theta}_1) X(\boldsymbol{\nu} + \boldsymbol{\theta}_2) \rangle_c.$$





Photometric redshifts

JDS, David Márquez -- Cinvestav

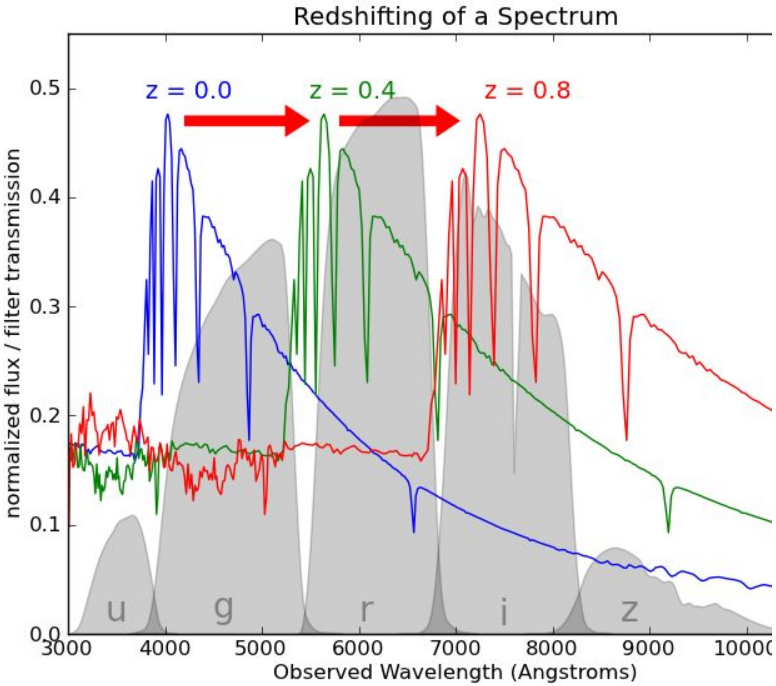

Survey: *eboss* Program: *eboss* Target:
RA=164.26227, Dec=58.78886, Plate=8184, Fiber=433, MJD=57426
z=0.83054±0.00005 Class=QSO
No warnings.

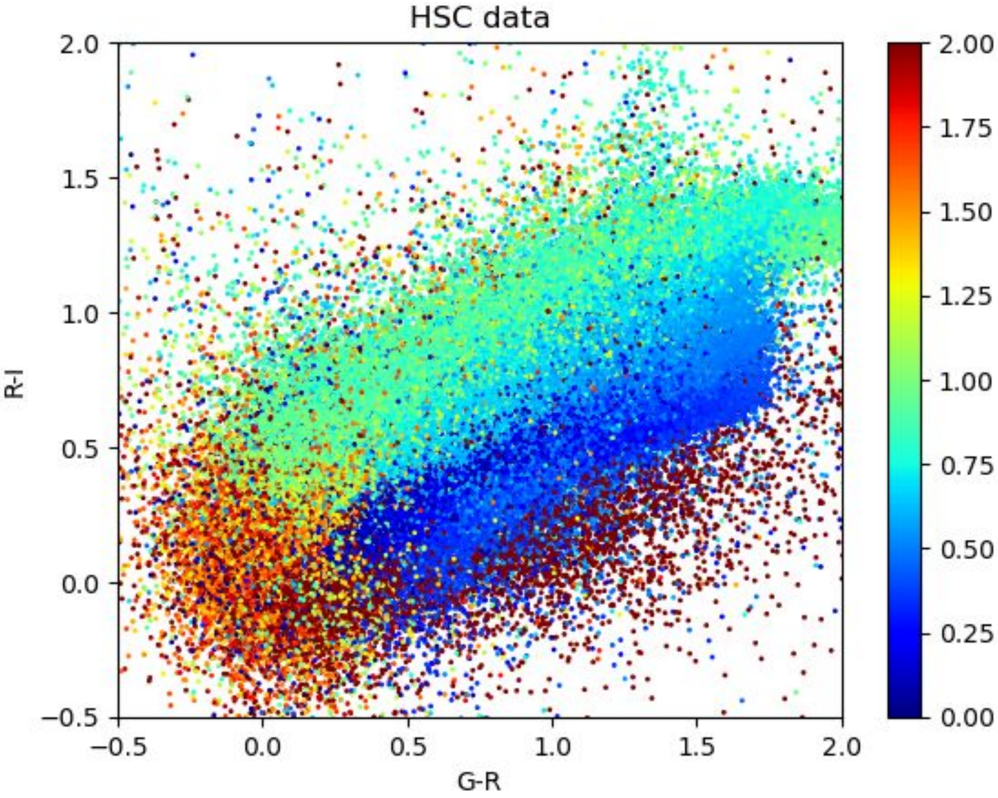
$$z = \frac{\lambda_{obs} - \lambda_{emit}}{\lambda_{emit}}$$

Photometric redshifts

CAP. 5 -TON
NOTICE
CAP. 5 -TON

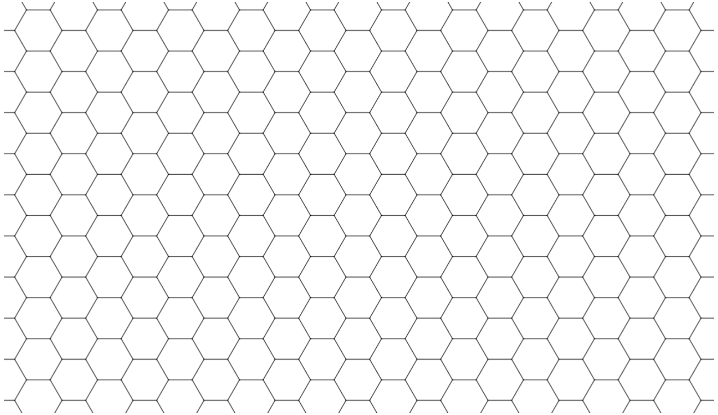
Colors to redshifts



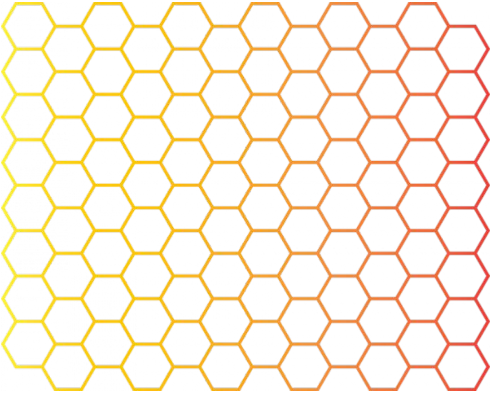


Cross correlation techniques

David Marquez MSc thesis



Galaxies with known z



Galaxies with unknown z

Cross correlation techniques

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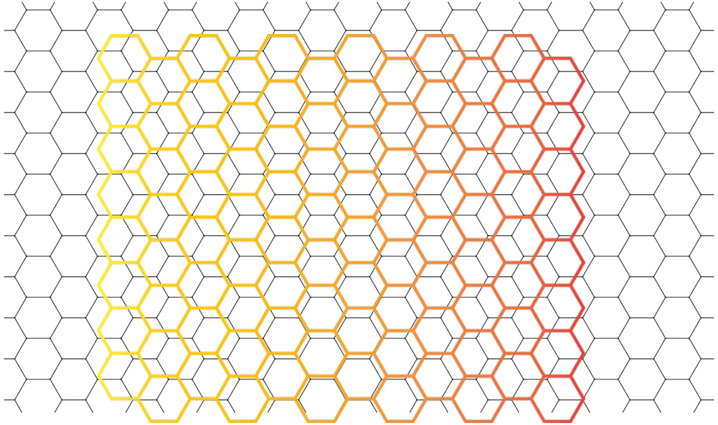
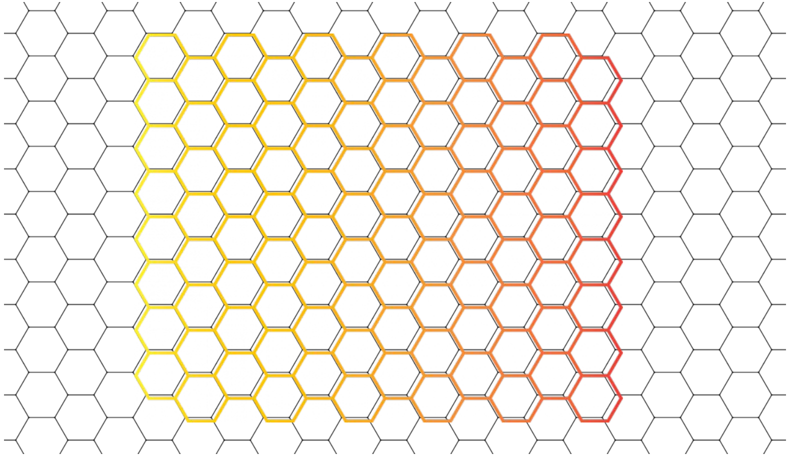
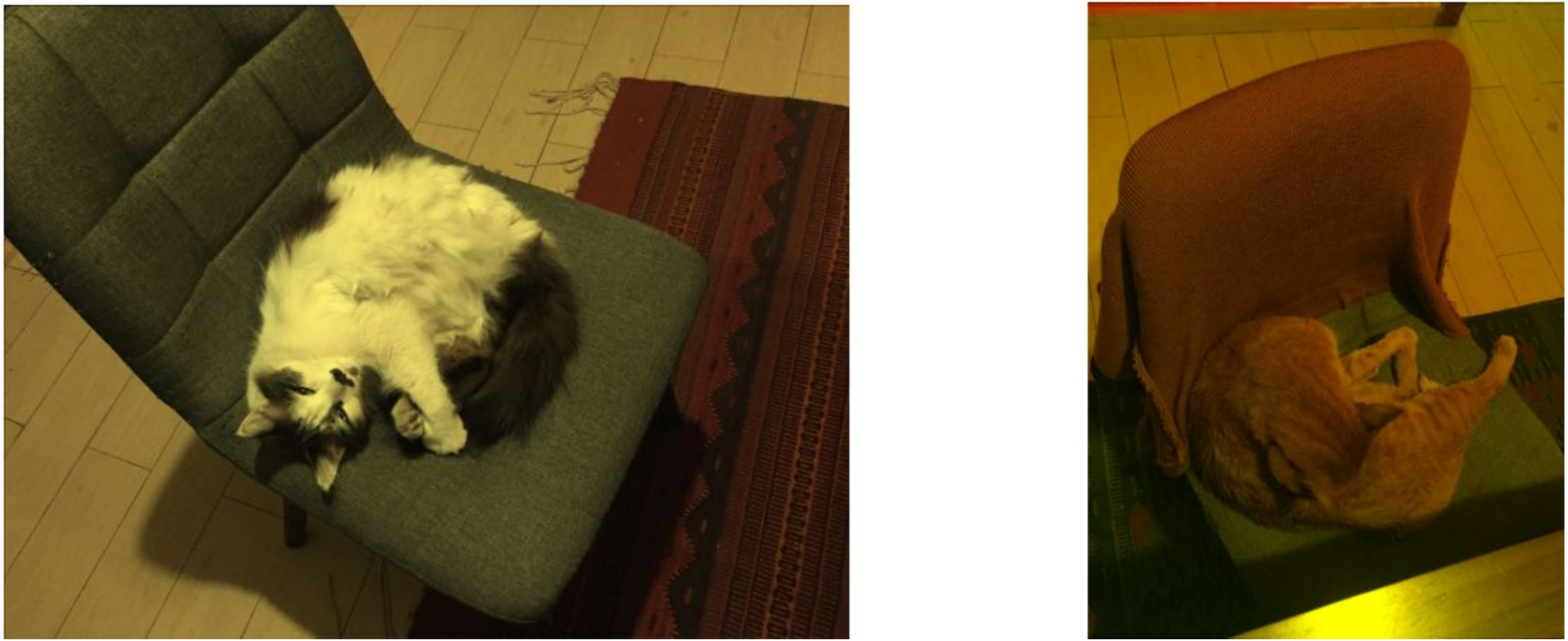


Low correlation means different z



High correlation means the same z

Lots of work ahead
Thanks!



z=.05

z=.15