

# Clustering redshifts in DESC

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# Clustering redshifts in DESC

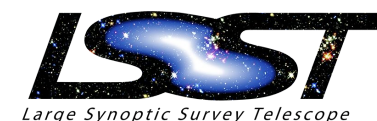
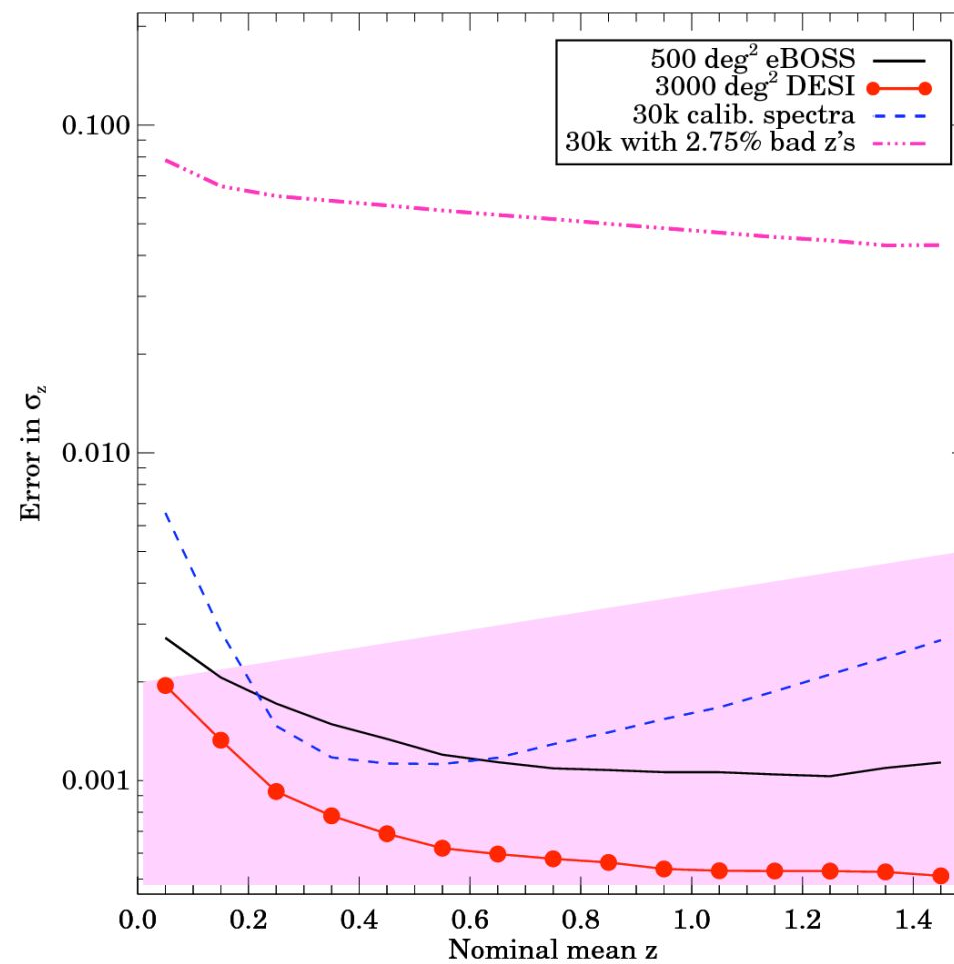
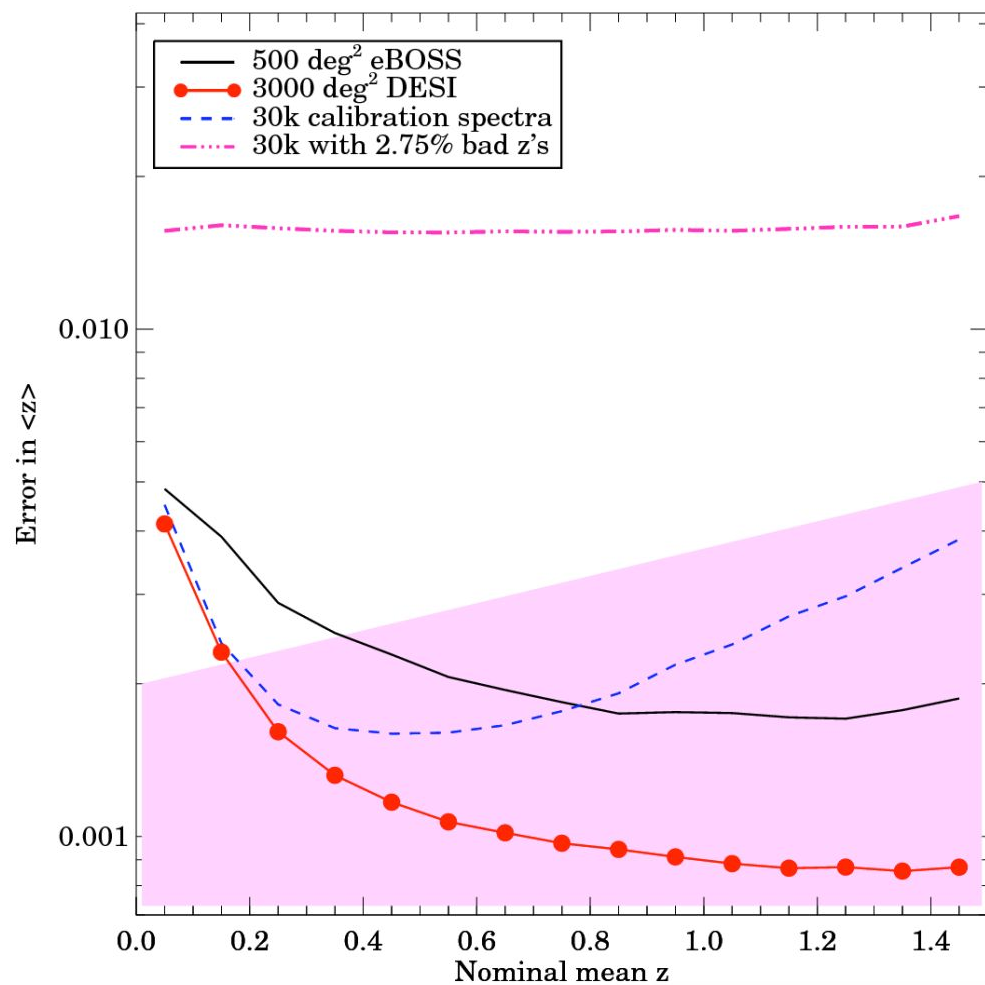
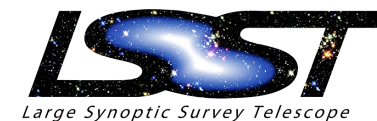


Table 4.6.1: Photometric Redshift key analysis tools

Analysis Tool/ <b>CODE NAME</b>	Purpose	DC1	DC2	DC3	CornCam
Photo-z Simulations <b>PZGALAXYGENERATOR</b>	Provide testbed for exploring systematics & incompleteness impact on photo-z's	<b>PZ1</b> Provide realistic estimates of shapes of $p(z)$ from LSST	<b>PZ1</b> Incorporate spectroscopic incompleteness and template mismatch into simulations	Refine LSST $p(z)$ shape / uncertainty estimates with realistic systematics from imaging simulations	N/A
Photo-z Algorithms <b>PZPDF</b>	Calculate PDFs ( $p(z, \alpha)$ ) from photometry	<b>PZ1</b> Test calibration of $p(z)$ 's provided by existing algorithms	<b>PZ3</b> Test provision of $p(z)$ on DC2 dataset	<b>PZ3</b> Test provision of $p(z, \alpha)$ on DC3 dataset, methods for combining results from multiple codes	Run resulting photo-z codes on survey data
Training Methods <b>PZPDF</b>	Optimize photometric redshift results from algorithms, given a training set		<b>PZ1</b> Test methods of training with incomplete spectroscopy; <b>CX1</b> Develop methods for mitigating blending	<b>PZ3</b> Refine use of training information within photo-z algorithms	
Calibration Methods <b>PZCALIBRATE</b>	Determine actual $p(z)$ for comparison to estimated $p(z)$ 's	<b>PZ2</b> set requirements on DC2 simulations for cross-correlation calibration tests	<b>PZ2</b> Test cross-correlation calibration algorithms	<b>PZ3</b> Test end-to-end calibration on DC3 data	Run end-to-end calibration pipeline on survey data
Spectroscopic Training Sets <b>PZSPECZSELECTOR</b>	Obtain spectroscopic redshifts for galaxies to improve photo-z algorithms	Work with DES and other precursor teams to obtain training samples to pre-LSST depth	<b>PZ1</b> Set requirements for spectroscopic redshift training sets	<b>PZ4</b> Develop efficient spectroscopic redshift target selection algorithms	<b>PZ4</b> Obtain training samples with proposals to new spectrographic instruments

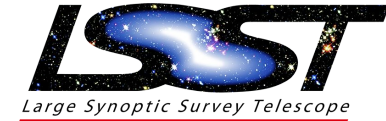
# Clustering redshifts in DESC



“Spectroscopic Needs” Newman et al. 2013

# Clustering redshifts in DESC

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**Active team:** S. Schmidt, C. Morrison, J. Newman, A. Malz, C. Davis, & others.

## **Near term goals:**

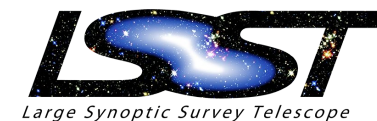
How much area do we need for DC2, Photo-z sims?  
Tradeoffs with realistic (complex) clustering/area/realistic photometry.

How important is lensing to clustering-zs and do we need it in DC2?

Is the galaxy bias as currently simulated good enough to test its effect on clustering-zs especially at small scales?

# Clustering redshifts in DESC

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## Test data set:

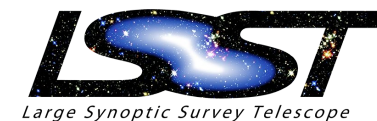
Buzzard 1.1: Joe DeRose and Risa Wechsler et al. 10,000 deg<sup>2</sup> simulation with lensing and a semi-analytic galaxy model populating halos.  $\sim 30$  gal/arcmin<sup>2</sup> to  $z=2.0$ .

Select Dark Energy Spectroscopic Instrument (DESI) like galaxies from sim to use as reference redshifts. ( $r < 19.5$ , LRG, ELG)

Currently using DES depths/colors and Gaussian “photo- $z$ ”. In the future we will have LSST like data with a photo- $z$ .

# Clustering redshifts in DESC

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## Prelim work/results:

**the-wizz** (<https://github.com/morriscb/the-wizz>): Publicly available clustering-z code based off Schmidt13, Menard13, Rahman15. Recent major code overhaul, getting closer to throughput required for future surveys.

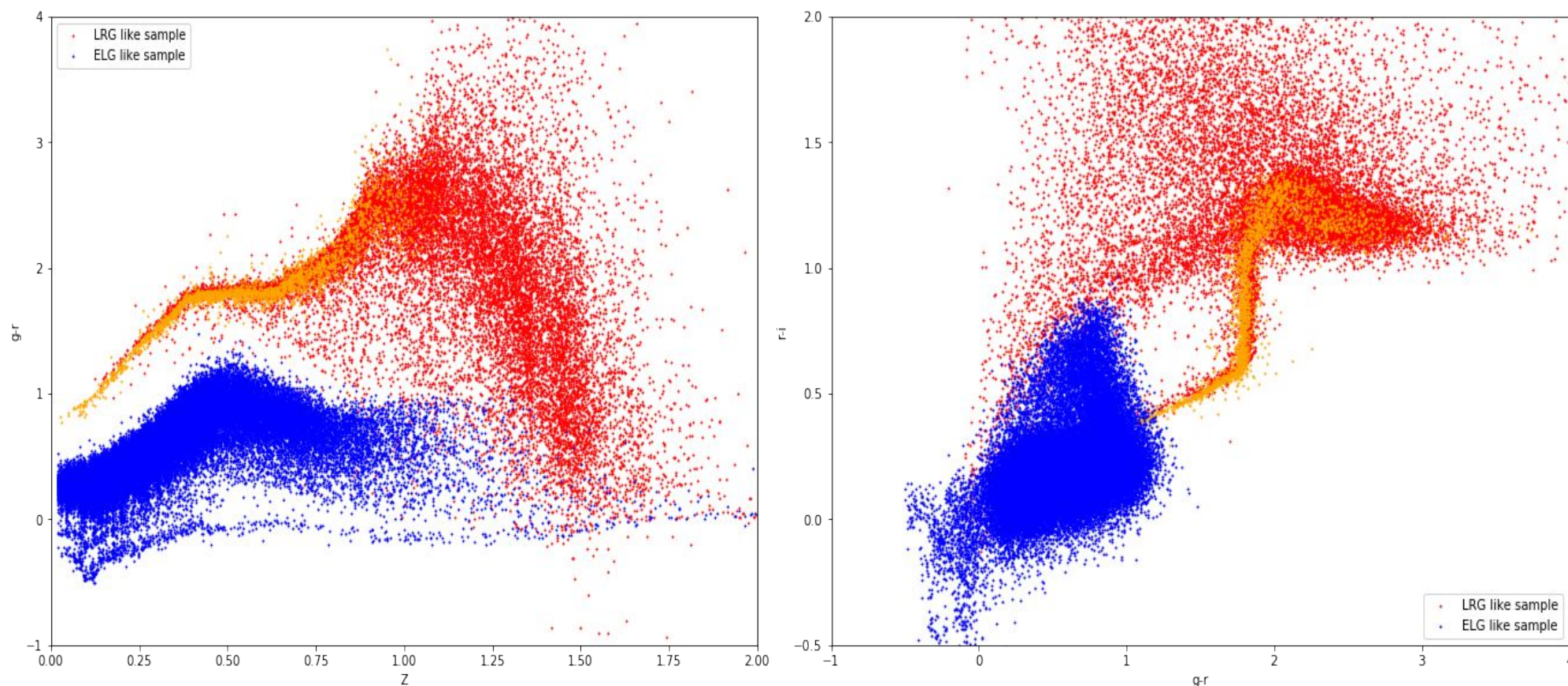
Run on  $\sim 900$  deg<sup>2</sup> of Buzzard1.1 using DESI like objects as references. Currently using Gaussian scattered “photo-zs” as unknown sample.

# Clustering redshifts in DESC

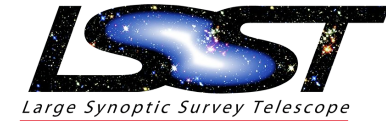
LRG:  $z < 23.0$ ,  $\log_{10}(\text{stellar\_mass}) > 11.22$

ELG:  $r < 23.4$ ,  $b_{300} > 0.102$

Densities: 354 LRG/deg<sup>2</sup>; 1445 ELG/deg<sup>2</sup>



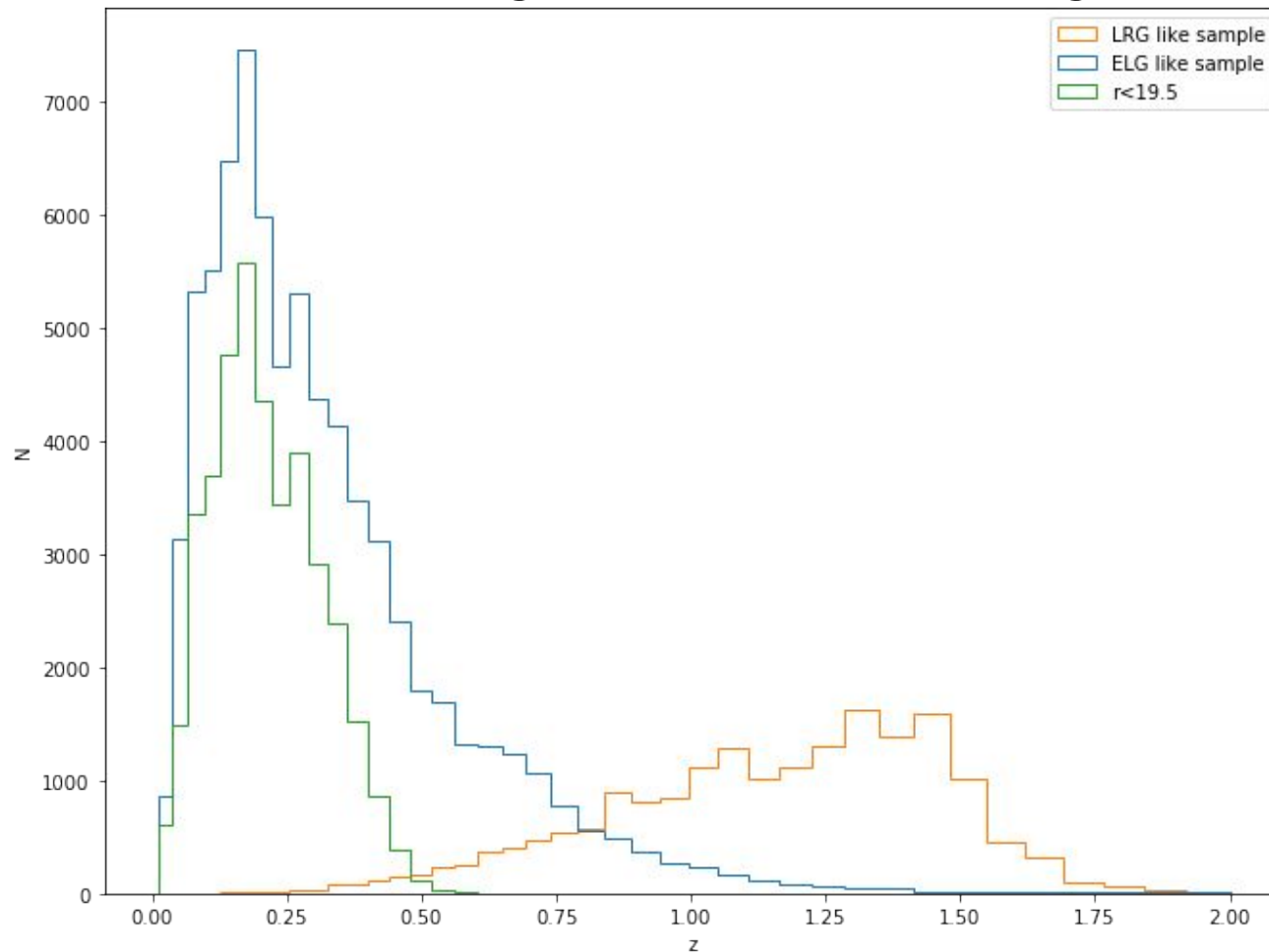
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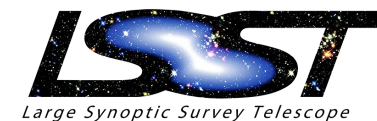
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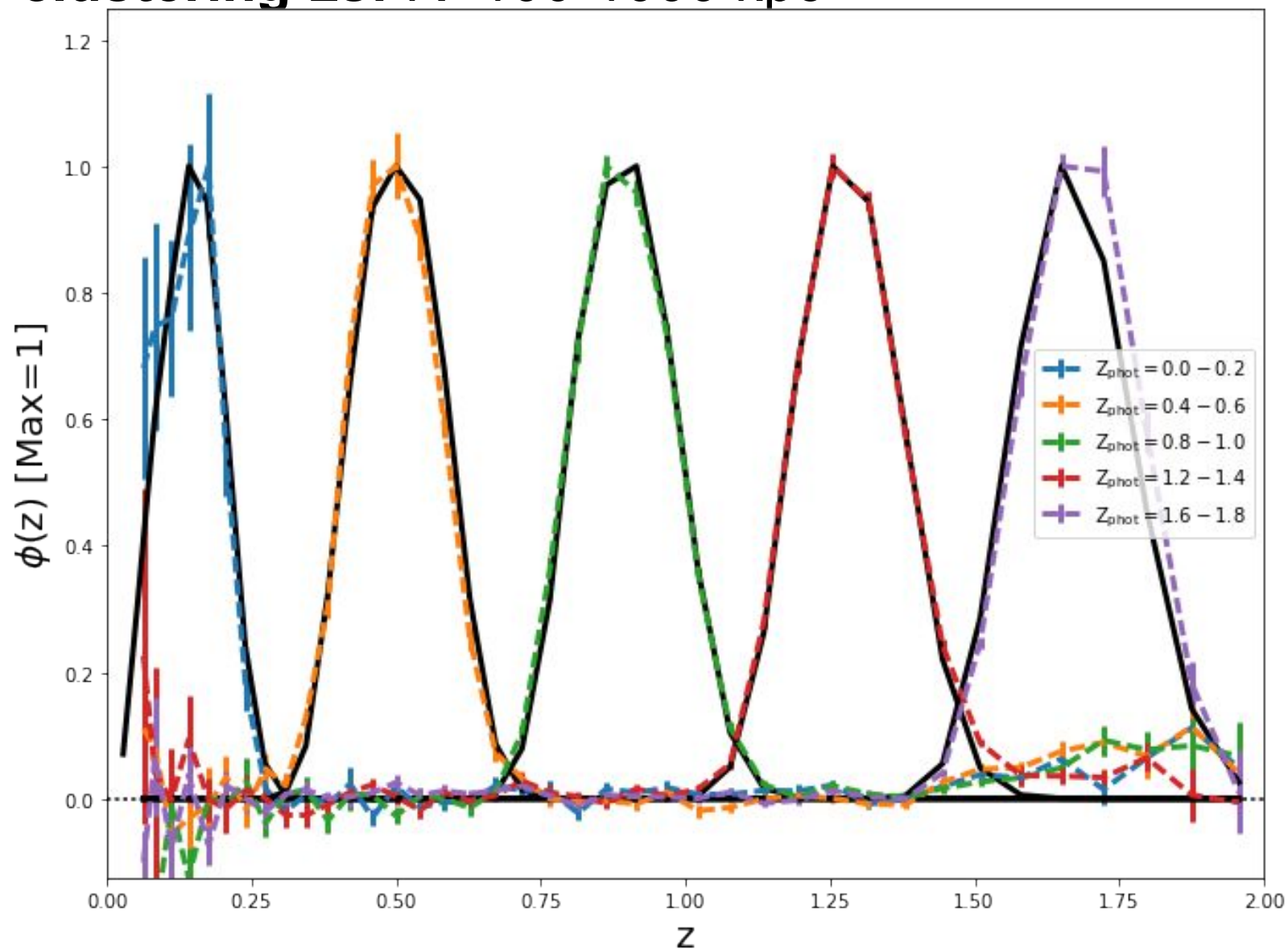




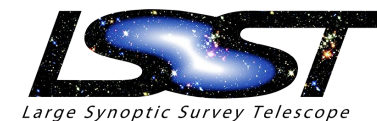
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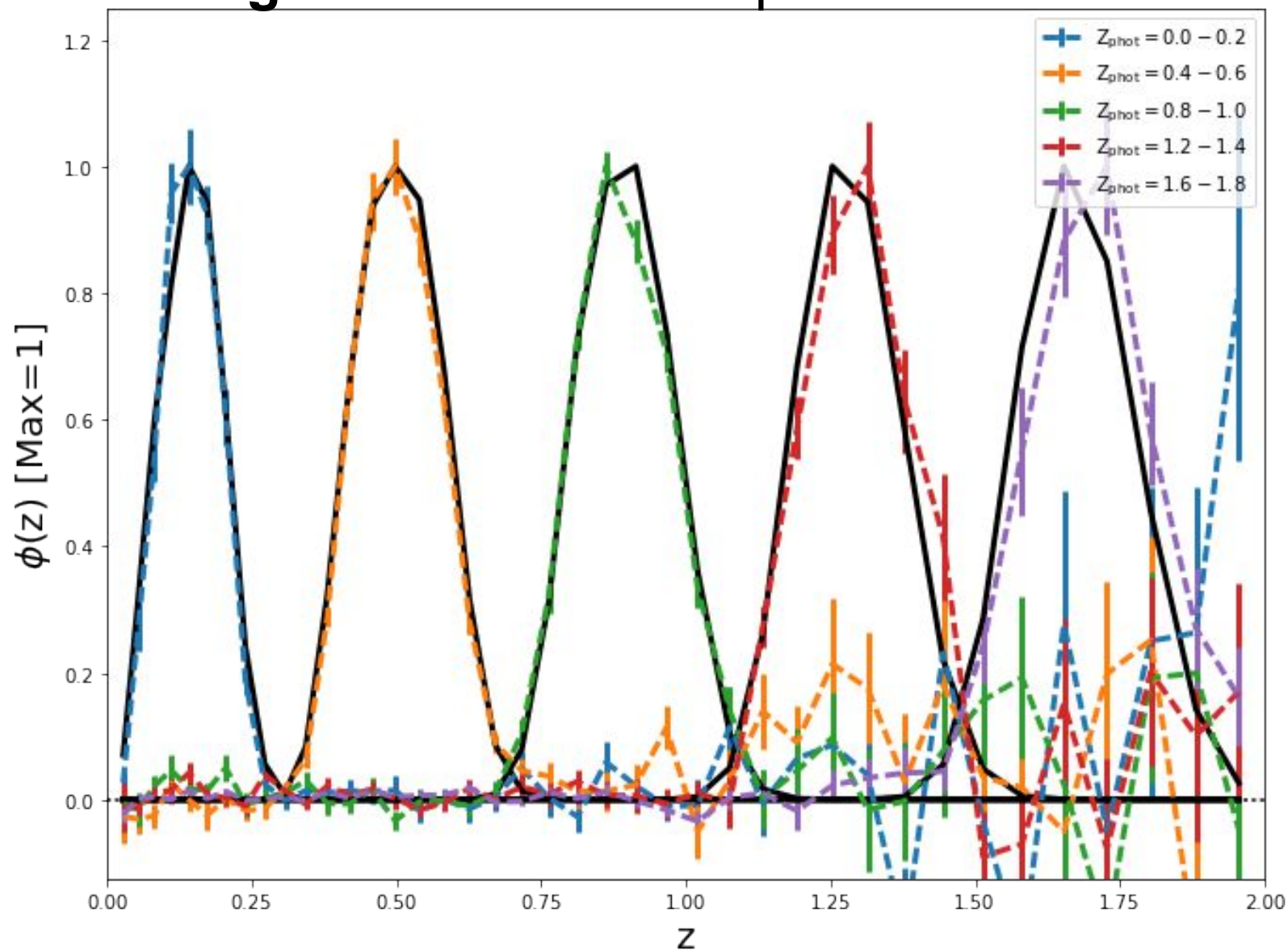
## LRG clustering-zs: R=100-1000 kpc



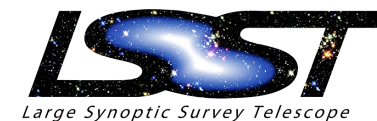
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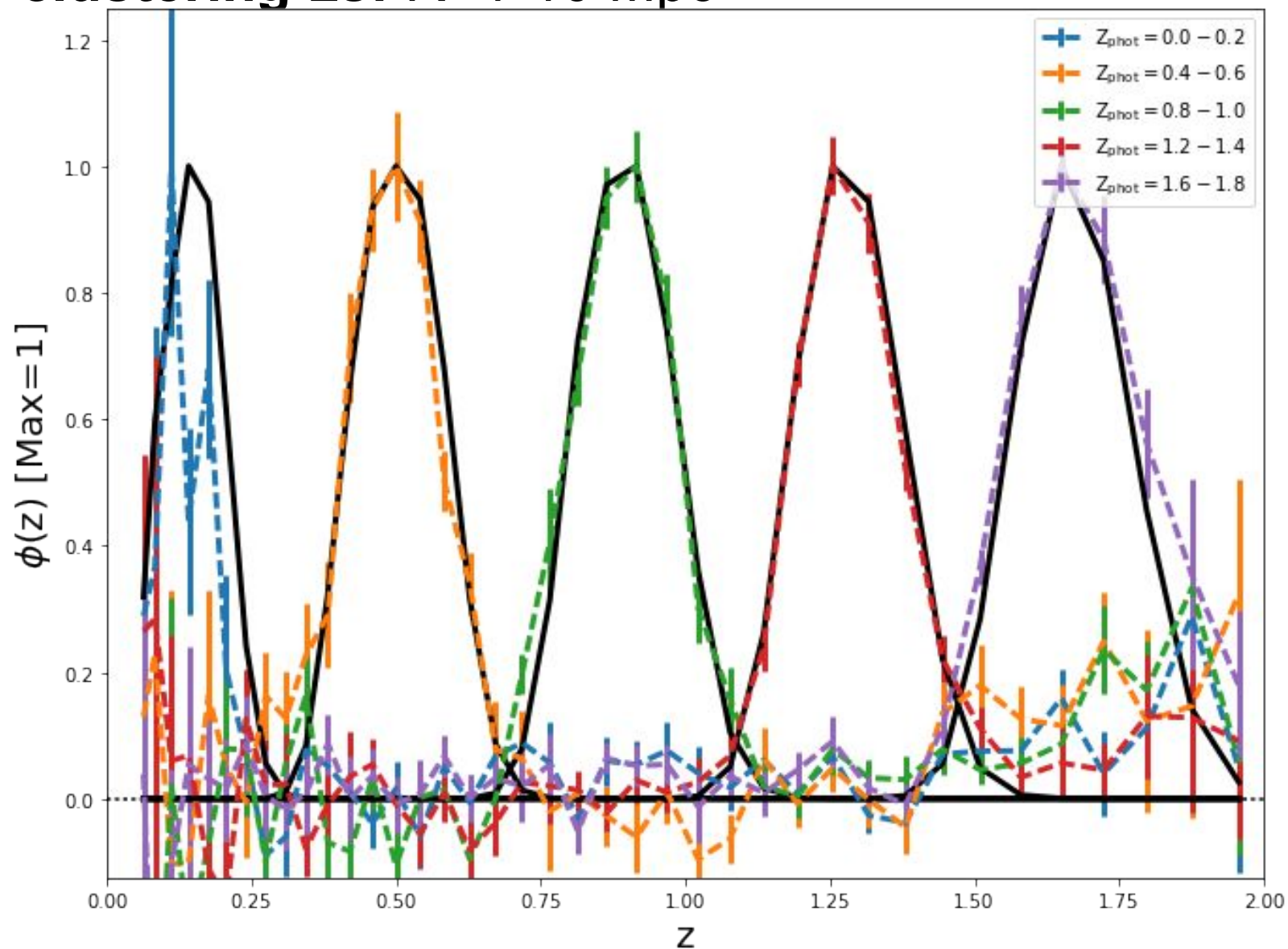
## ELG clustering-zs: R=100-1000 kpc



# Clustering redshifts in DESC

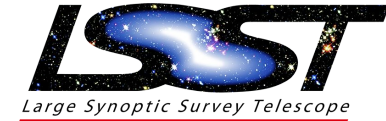


## LRG clustering-zs: R=1-10 Mpc



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## Next Steps:

Pick a galaxy bias correction estimate and compare to using the known bias from the simulation.

Finalize input to DC2 in time for the DESC collaboration meeting in July.

Turn on and off lensing to test its effect on the clustering-zs. Test results from D. Matthews PhD thesis.

Run a photo-z using LSST magnitudes. Test outlier detection.

Start working on how to co-calibrate with photo-z in DC2.