

Density Map(s) at $z \sim 2$ in COSMOS/UltraVISTA

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Motivation

- ★ Measure local density for environmental studies, morphology/SFR-density etc...
- ★ My primary interest: galaxy size vs. density
(Zirm+ 2012, Papovich+ 2012, S. Patel's and other talks today)
- ★ Use full information provided by photo-zs
- ★ Identify clusters/groups

Photometric redshifts

- ★ Excellent template sets for fitting
(incl. linear combinations of templates)
- ★ Bayesian priors
- ★ z and redshift prob. distribution: $P(z)$
- ★ EAZY (Brammer, van Dokkum & Coppi 2008)
- ★ Apply to the large COSMOS/UltraVISTA field
uV data now public: <http://goo.gl/BgVUv>

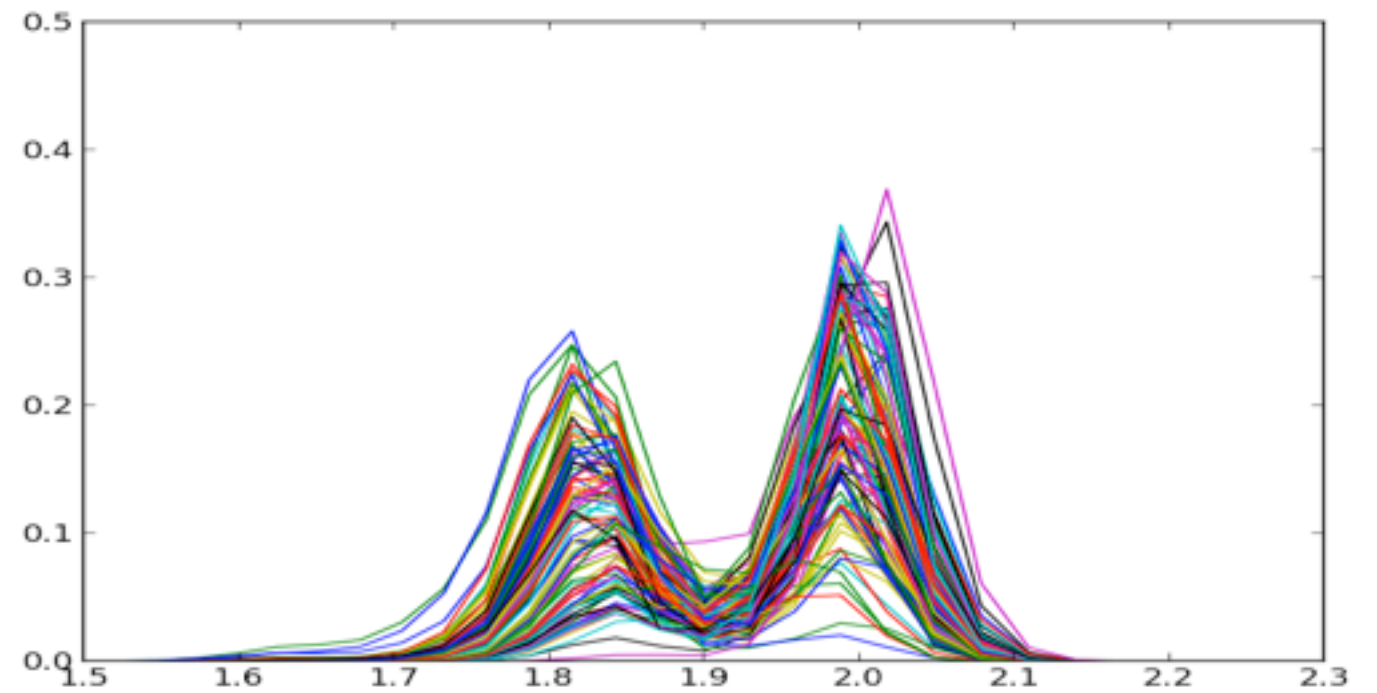
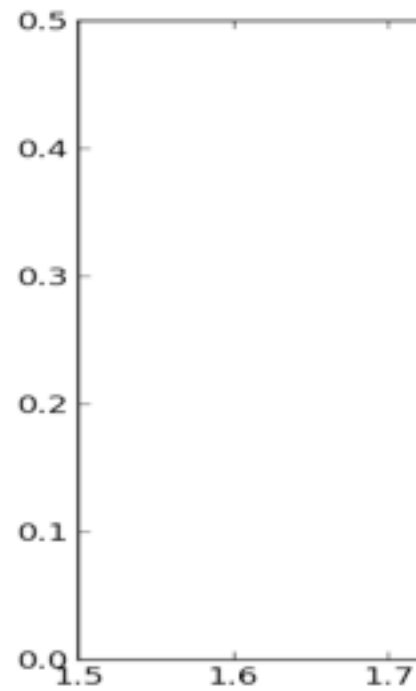
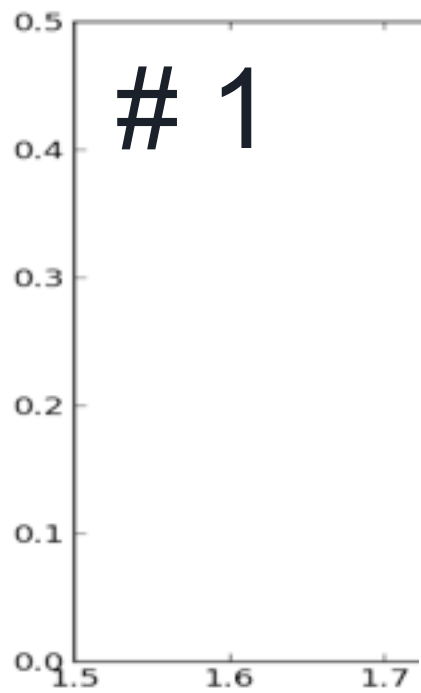
Input Catalog

- ★ K-band selected, includes BVrizYJHK
- ★ photo-zs derived with EAZY
- ★ systematic zeropoint offsets removed iteratively
- ★ star/galaxy separation using NIR colors

An Exercise

- ★ Make no quality cut on photo-zs, use all $P(z)$ s => more tracers
- ★ Is the $P(z)$ itself statistically robust?
- ★ 100 MC realizations of photo-z catalog

Monte Carlo $P(z)$ realizations

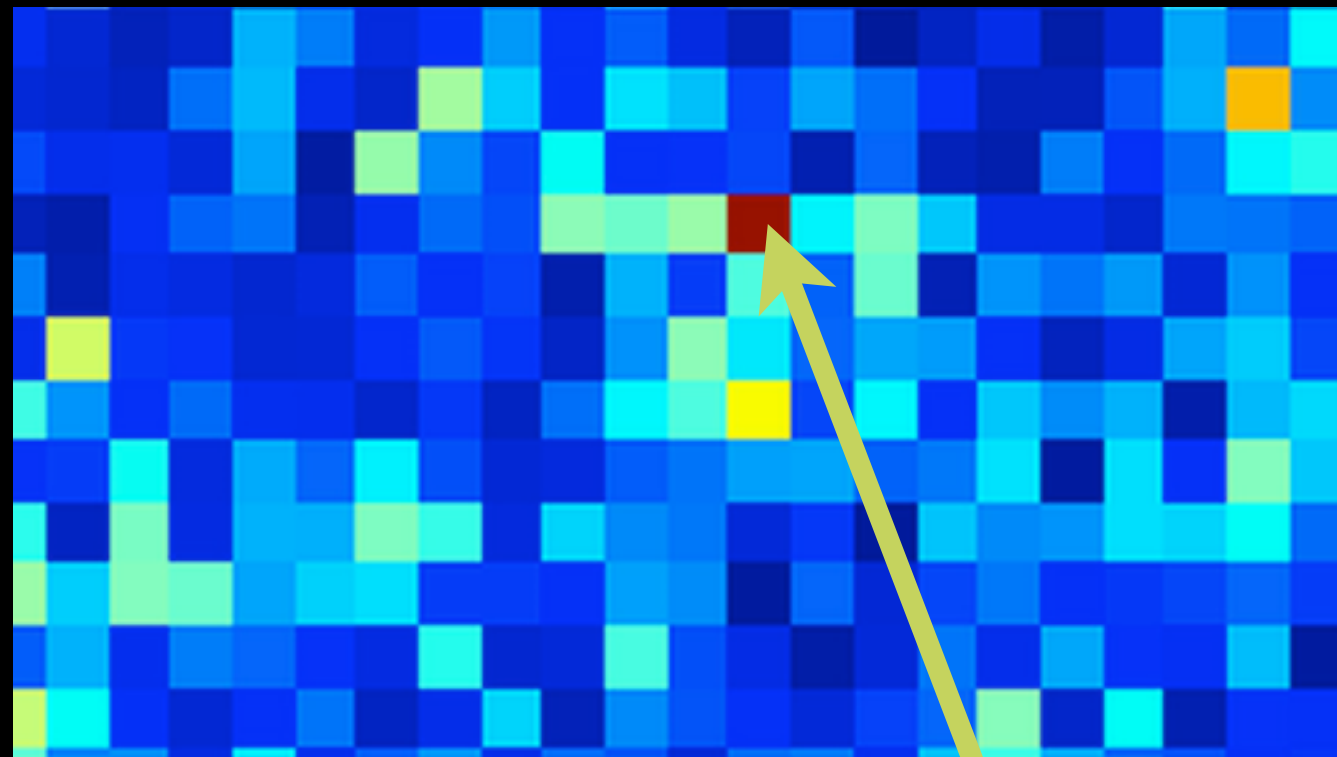


Sums of $P(z)$

- ★ Simple sum on a (RA, Dec, z) grid
- ★ Naturally weights well-determined photo- z s
- ★ Could also homogenize $P(z)$'s to account for precision variation among galaxy types (e.g., Quadri & Williams 2010). Perhaps not needed?

Cropped Density Map

$(2.0 < z < 2.3)$



Spitler et al. (2012) protocluster candidate

What's Next?

- ★ Compare to other density estimators
- ★ Link to lower redshift density maps (e.g., Kovacs et al. 2010, 2011)
- ★ Correlate densities with properties of galaxies, pairs of galaxies (PhD student Allison Man)
- ★ Identify new groups/clusters

Talking Points

- ★ Utilize robust photo-zs as “anchors”
via cross-correlation, akin to using spec-zs to trace structures (Newman 2008, Matthews & Newman 2010)
also, spec-zs of course...
- ★ Comparison to simulations
- ★ Alter the prior(s)?
include auxiliary data not well-modeled by photo-z templates (e.g., MIPS 24um, IRAC bump)
iterate in response to density map?