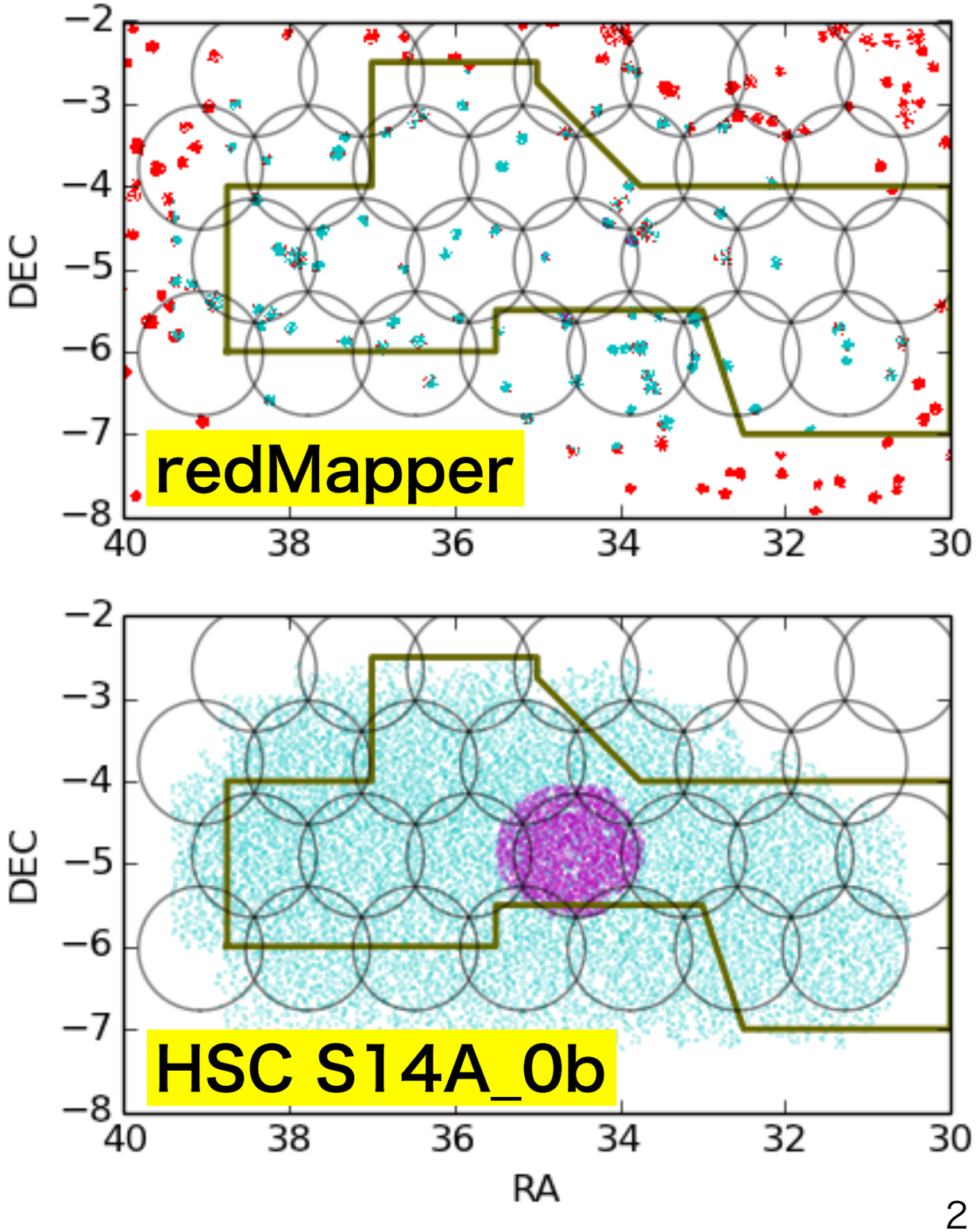
HSC project # 131 :
Testing the HSC photometry with red-sequence galaxies

Questions

- If we have improved photometry, is the scatter of red-sequence galaxies in mag-color plane tighten?
- Which magnitude system gives better photometry? (If the red-sequence galaxies are all elliptical, should dev_mag be the best ?)

SDSS **redMapper** cluster(&member) catalog and HSC **S14A_0b** photometric catalog at XMMLSS region



redMapper (SDSS DR8)

- # of clusters ~ 100
- # of members ~ 1000 (P_mem > 0.7)
- 0.1< z < 0.6
- all central have either photo-z or spec-z

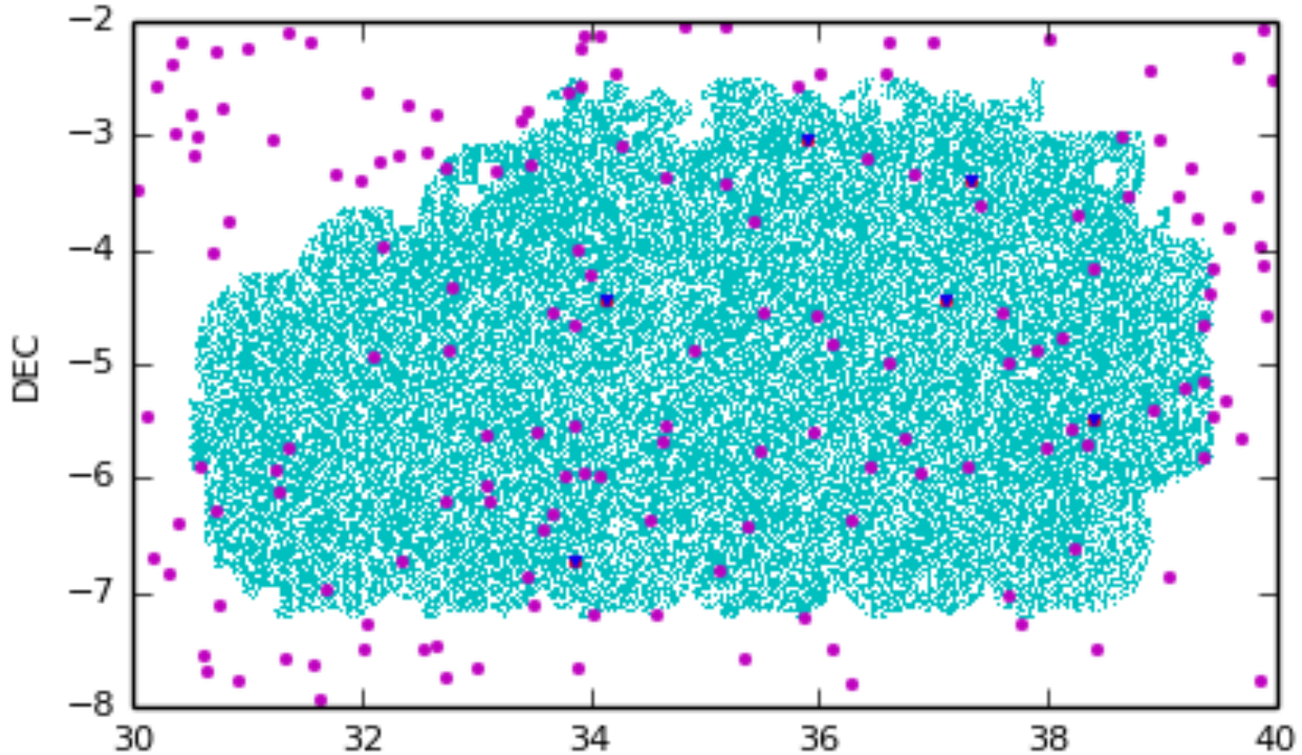
HSC (S14A_0b)

- much deeper (i<25.5)
- select objects having all color (and all mag_systems)
- totally ~25 deg^2

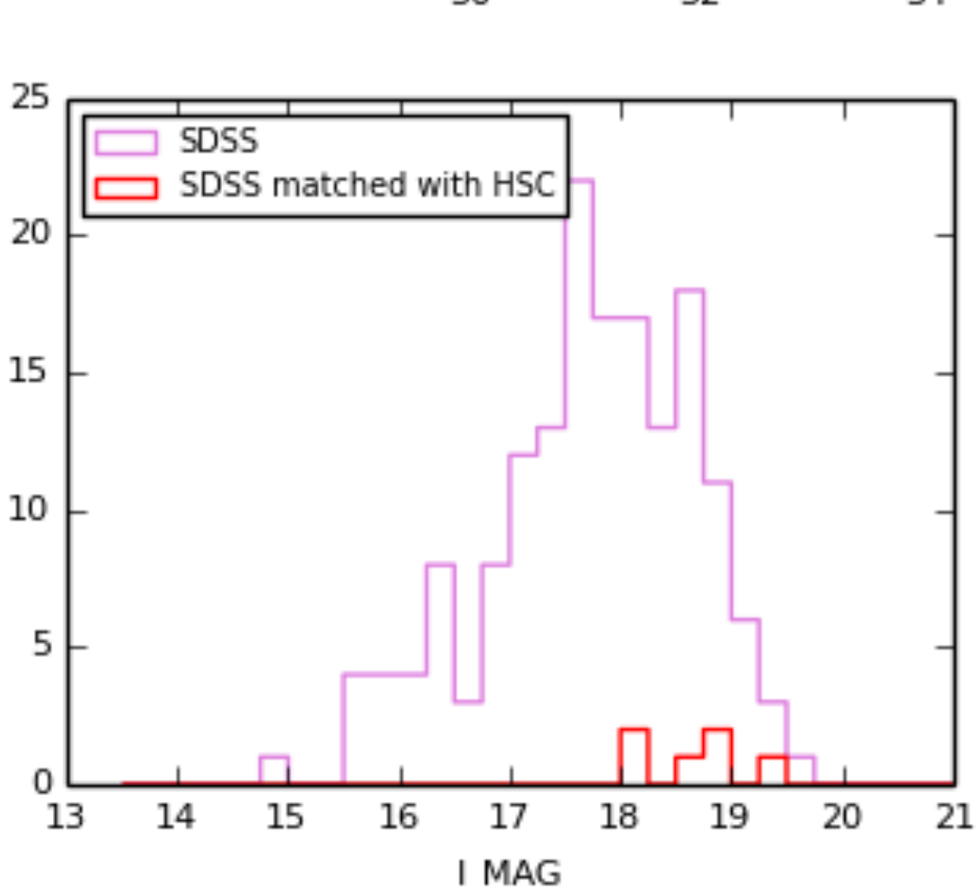
object matching (d < 1 arcmin) : astroML.crossmatch_angular

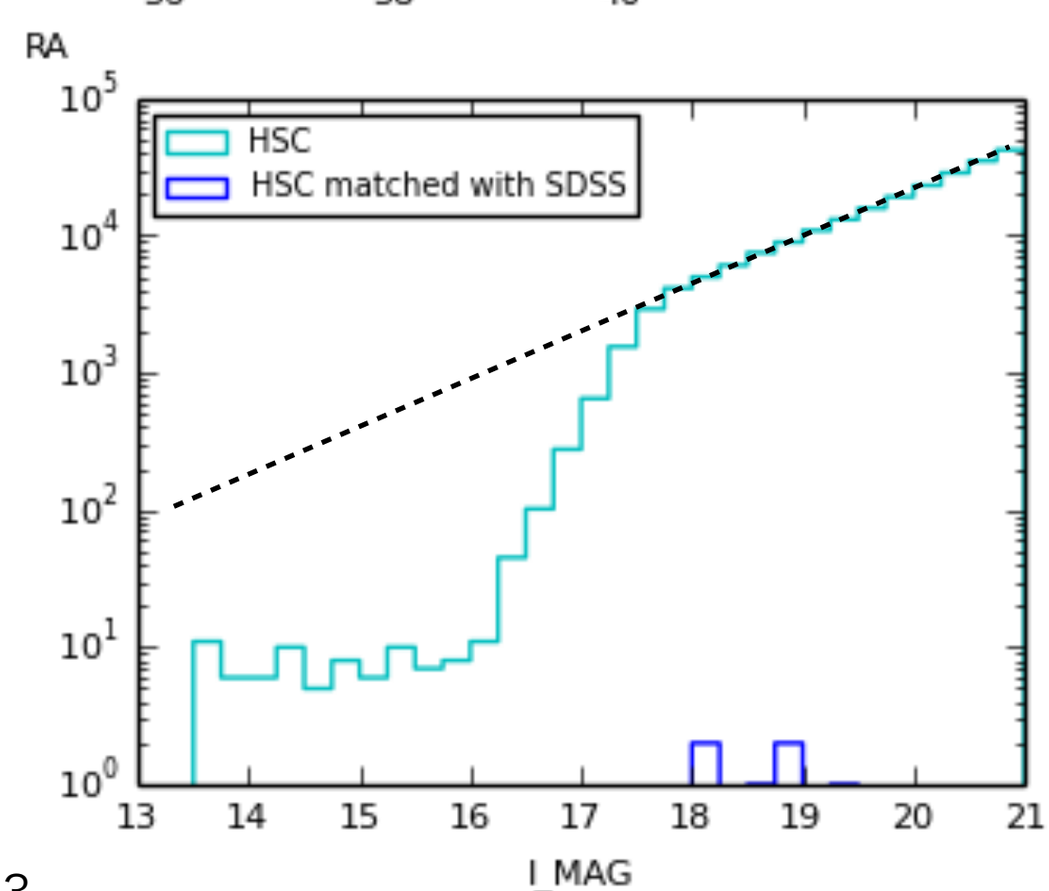
cluster center

only 6 have counterpart in HSC



masking?
or
selection?
or
astrometry?

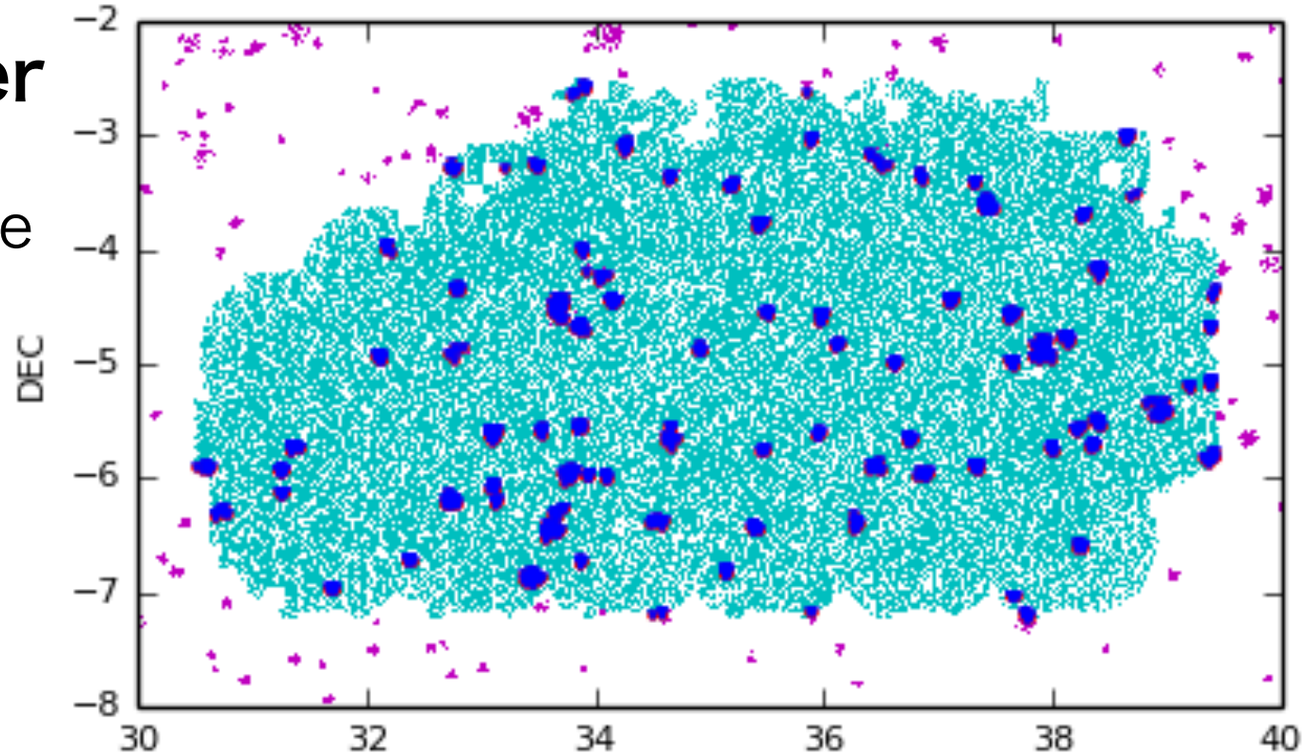


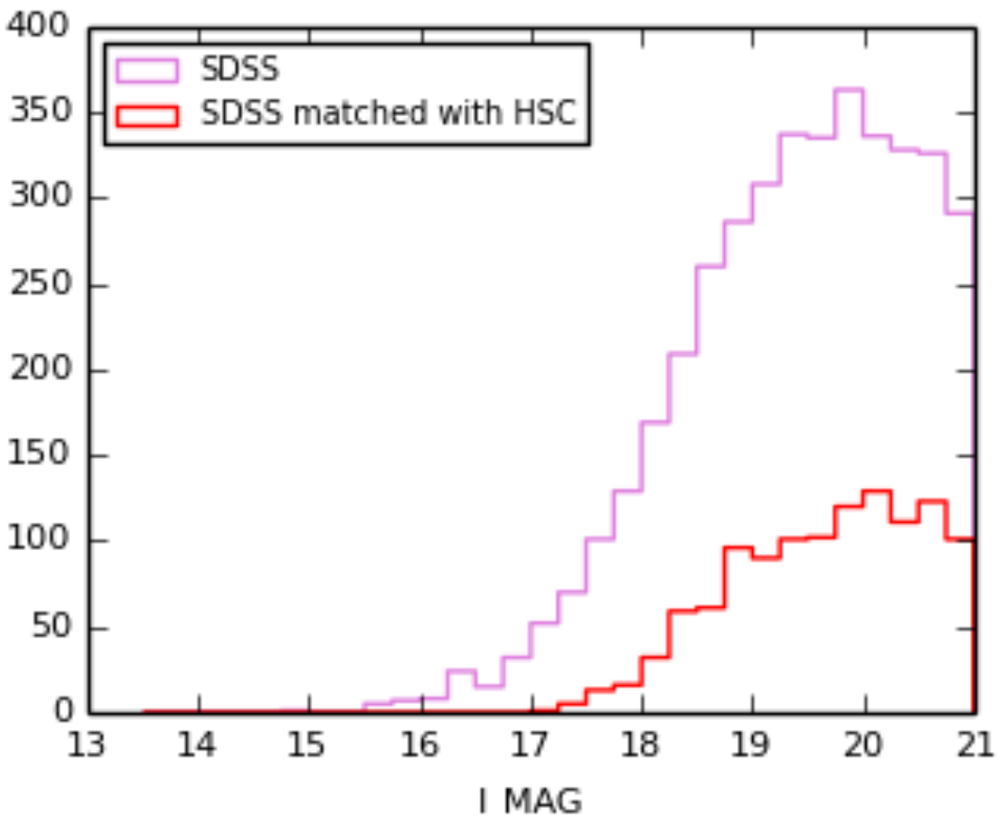


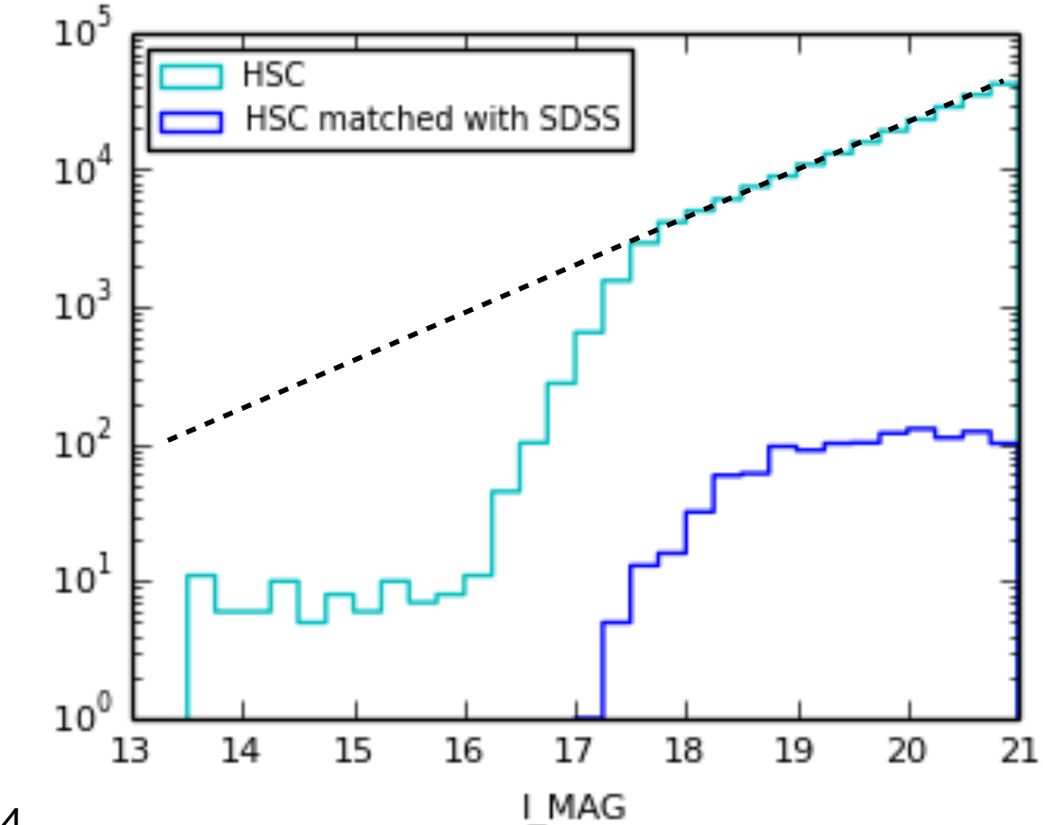
object matching (d < 1 arcmin) : astroML.crossmatch_angular

cluster member

~70% objects have counterpart in HSC

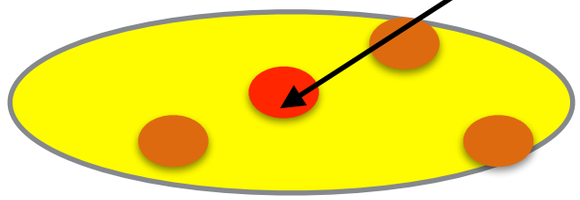






How do we assign redshift to the cluster members?

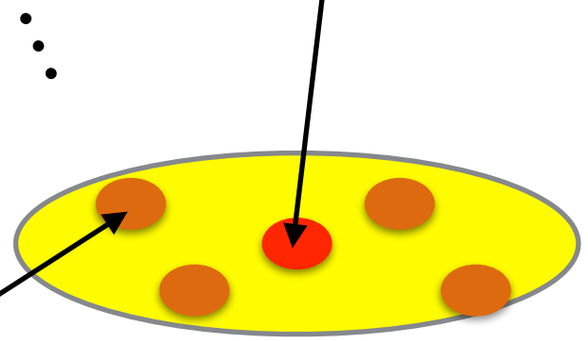
redshift



cluster ID = 0

・cluster center

either z_{spec} or z_{λ}

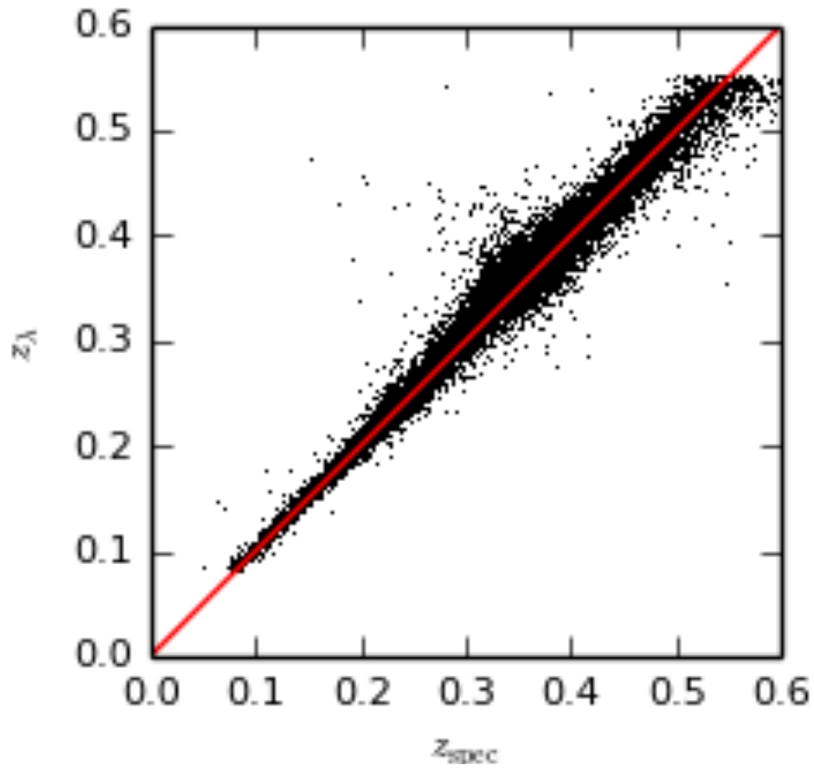


cluster ID = i

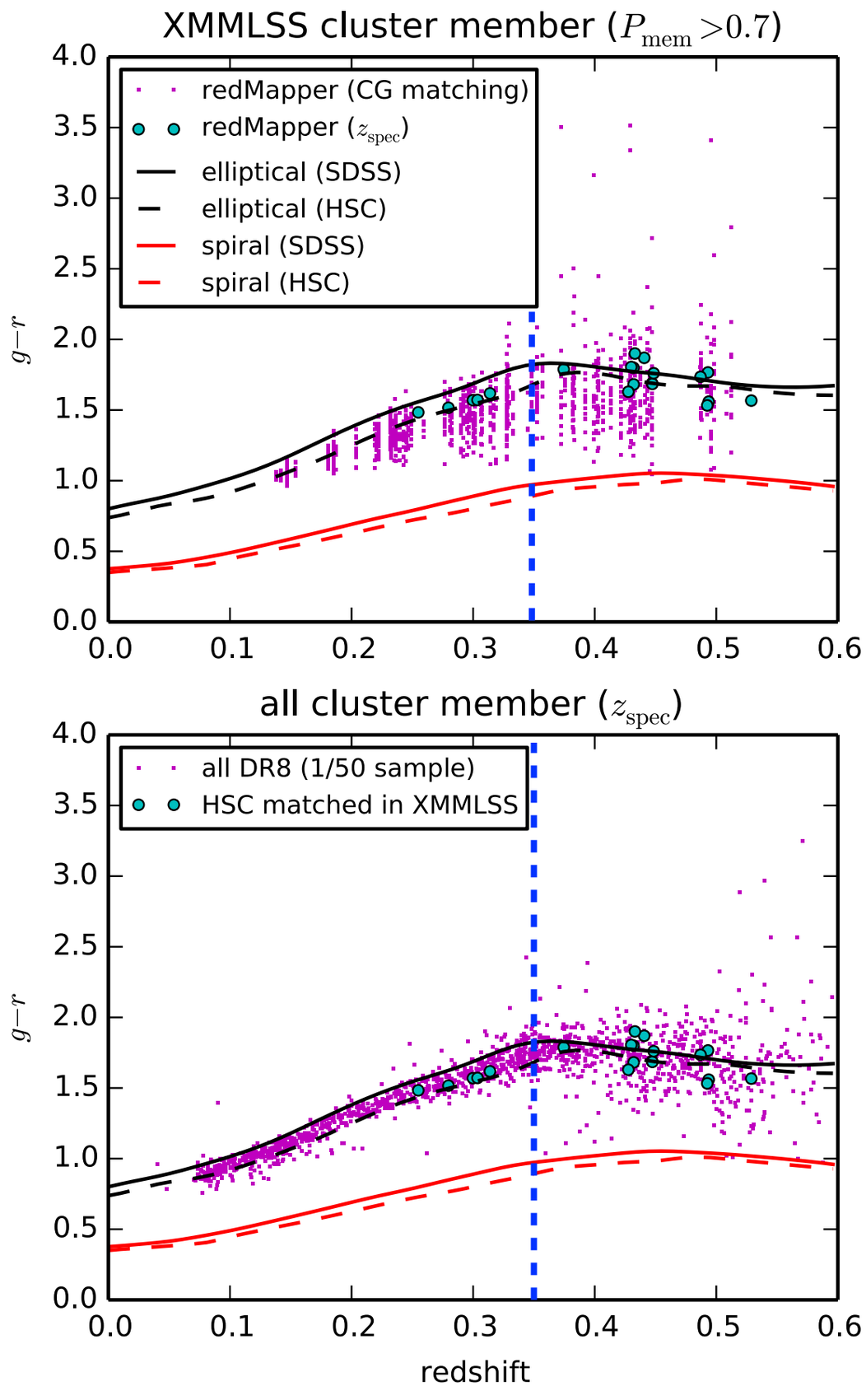
・cluster member

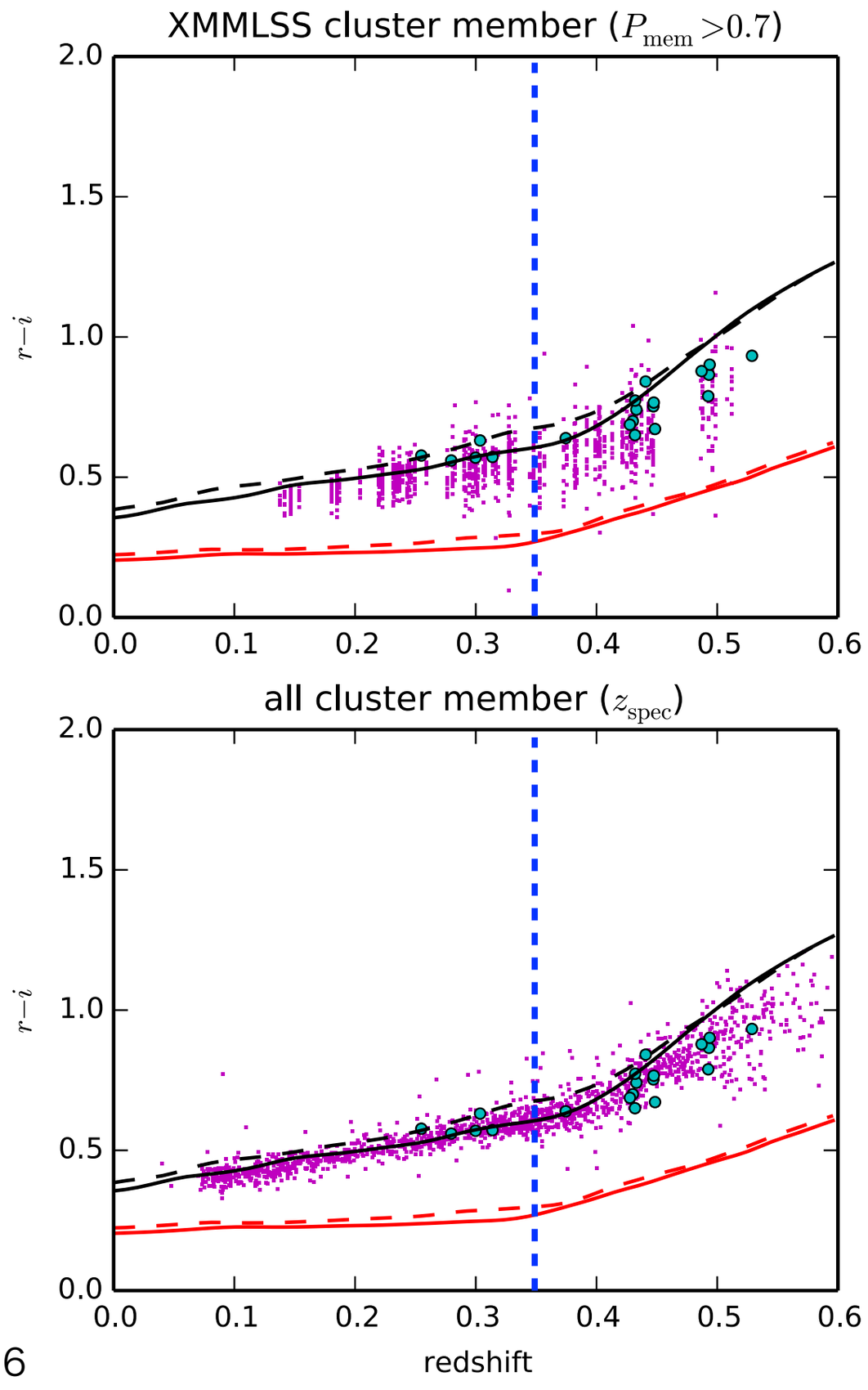
no redshift (but some bright galaxies have z_{spec})

⇨ z_member := z_center

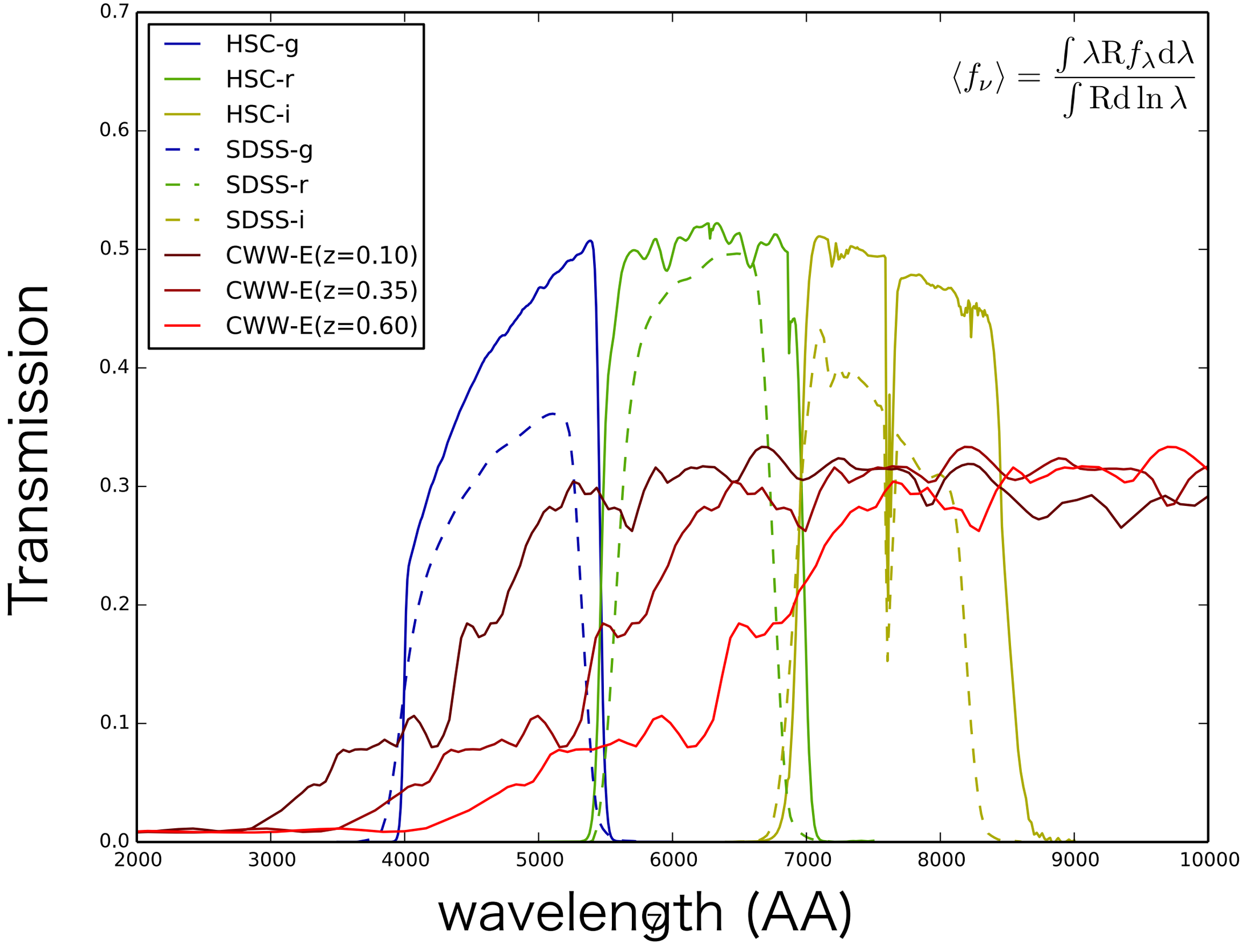


redshift-color relation (Is the membership criterion correct?)

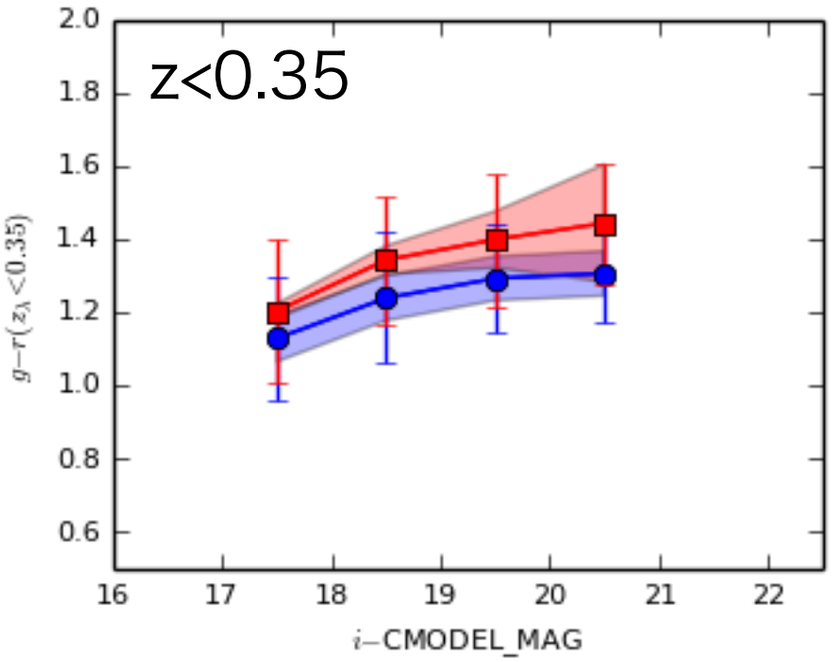


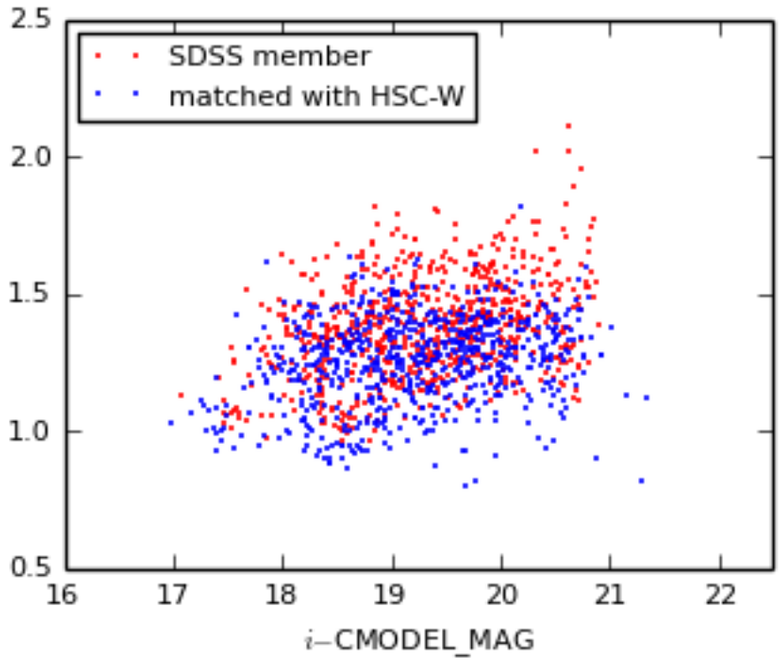


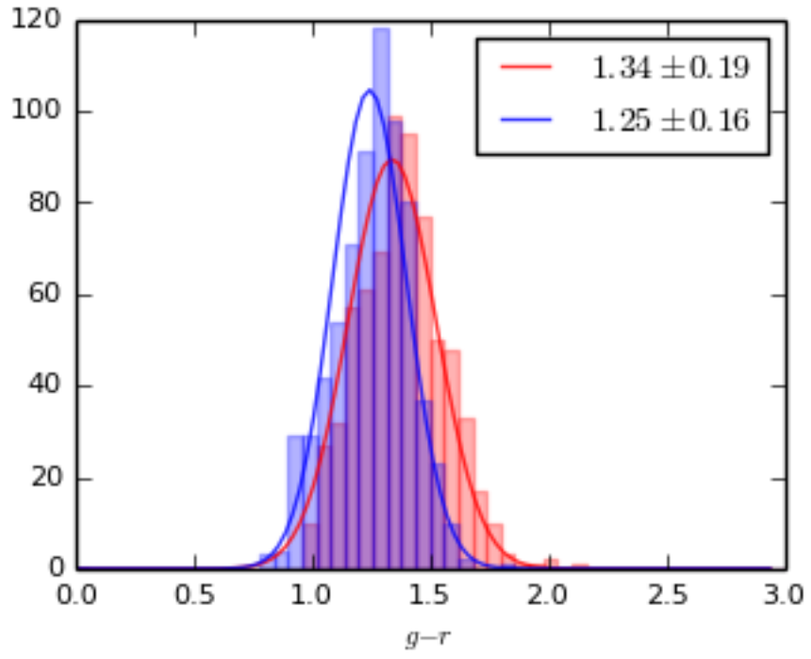
Filter systems of SDSS and HSC

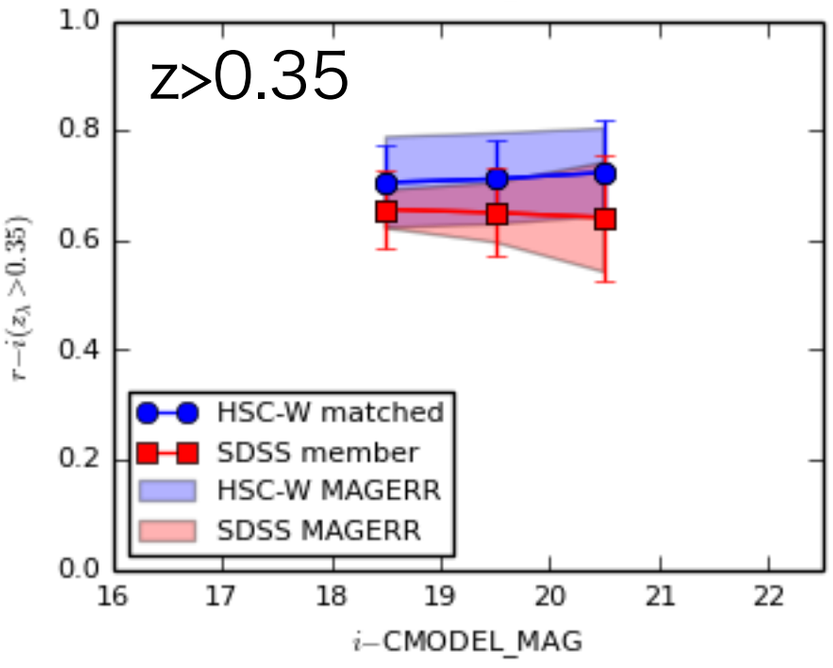


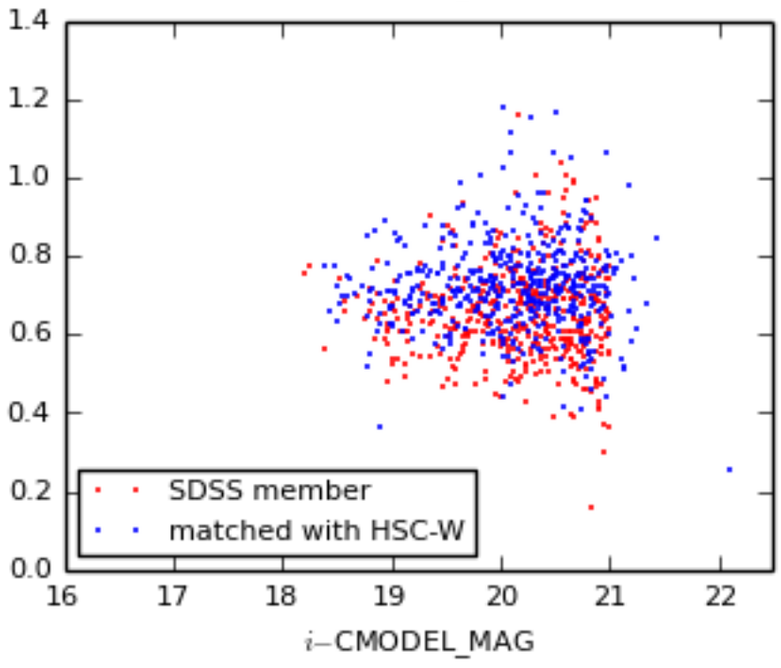
cmodel_mag

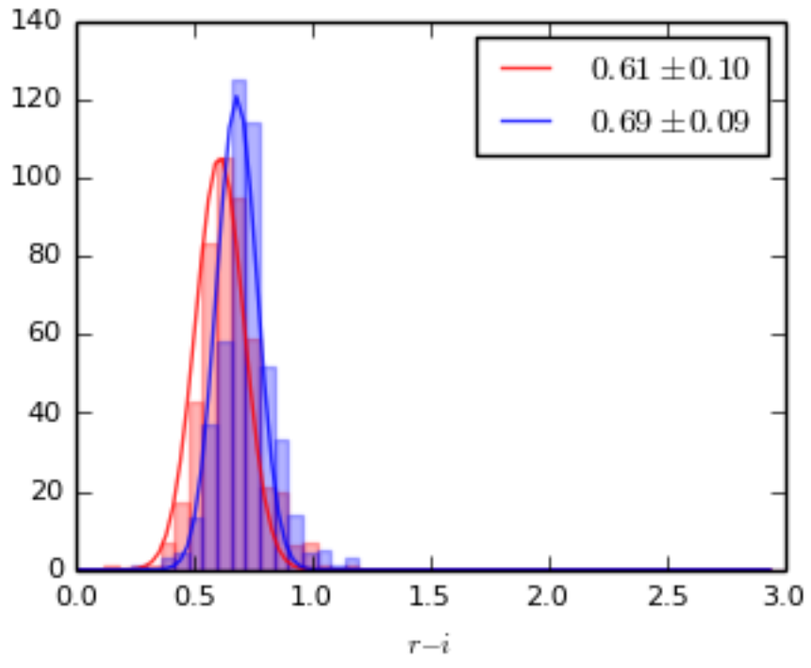

z<0.35
$g-r(z_\lambda<0.35)$
$i-$CMODEL_MAG

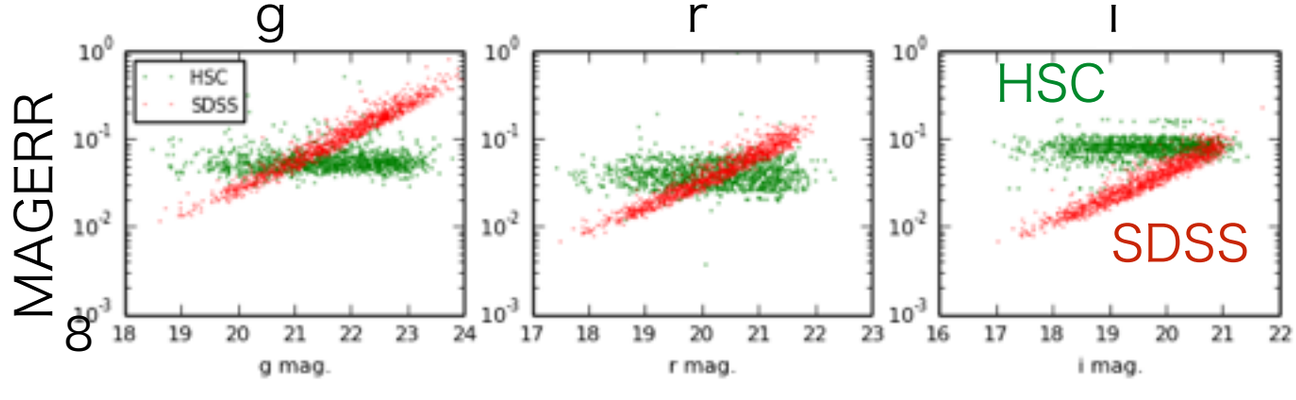

SDSS member
matched with HSC-W
$i-$CMODEL_MAG


1.34 ±0.19
1.25 ±0.16
$g-r$

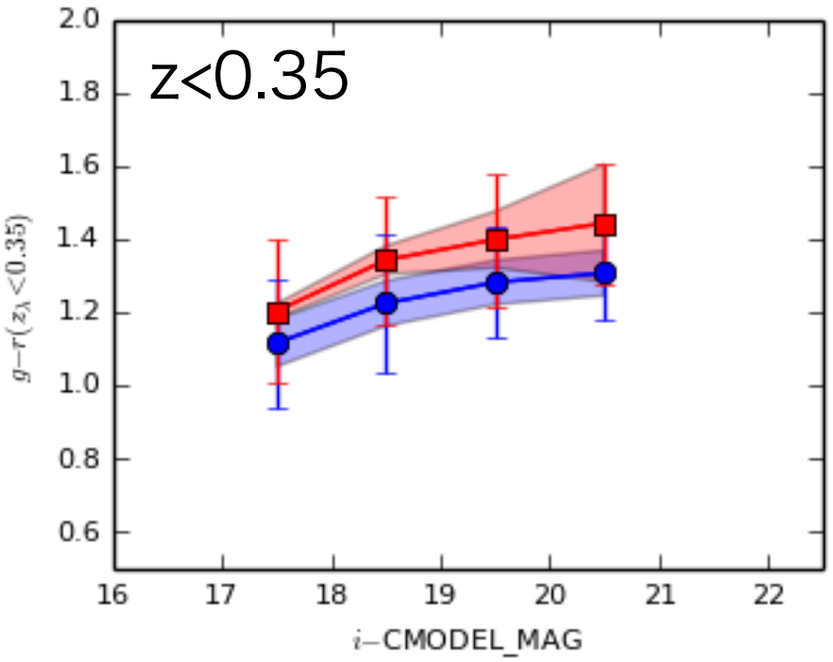

z>0.35
$r-i(z_\lambda>0.35)$
HSC-W matched
SDSS member
HSC-W MAGERR
SDSS MAGERR
$i-$CMODEL_MAG

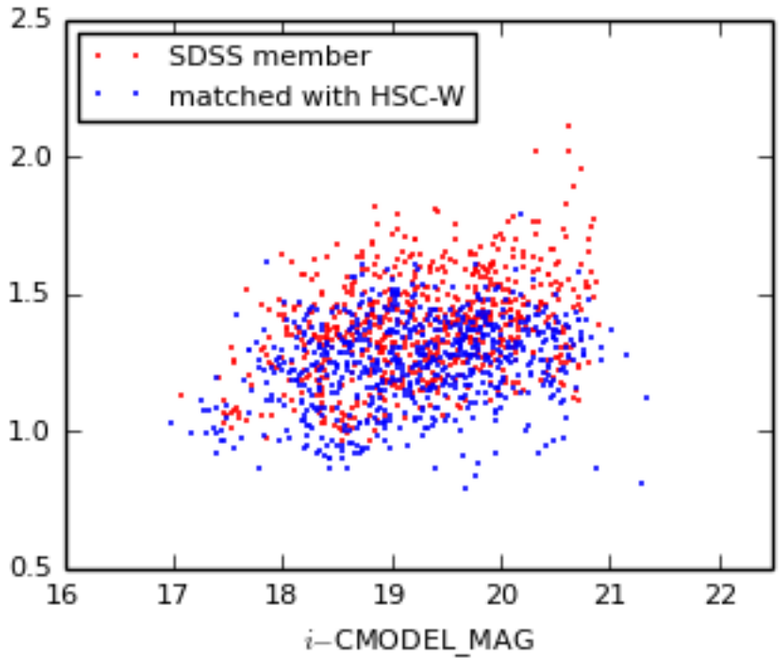

SDSS member
matched with HSC-W
$i-$CMODEL_MAG

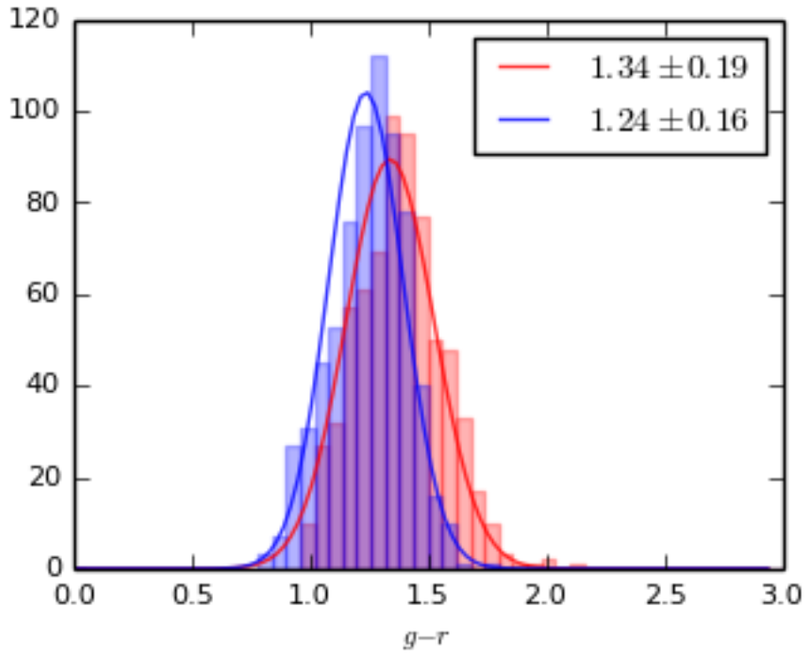

0.61 ±0.10
0.69 ±0.09
$r-i$

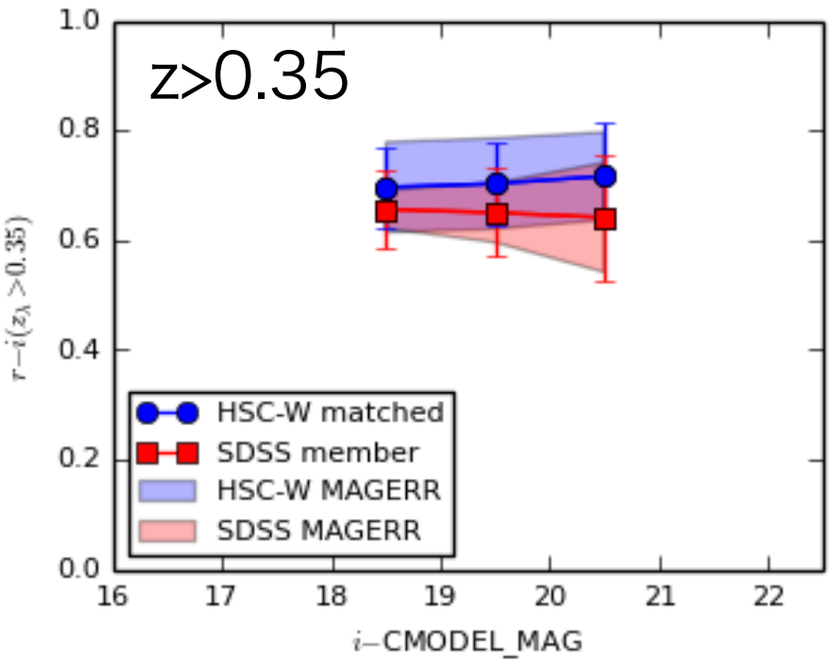

g
r
i
MAGERR
HSC
SDSS
g mag.
r mag.
i mag.

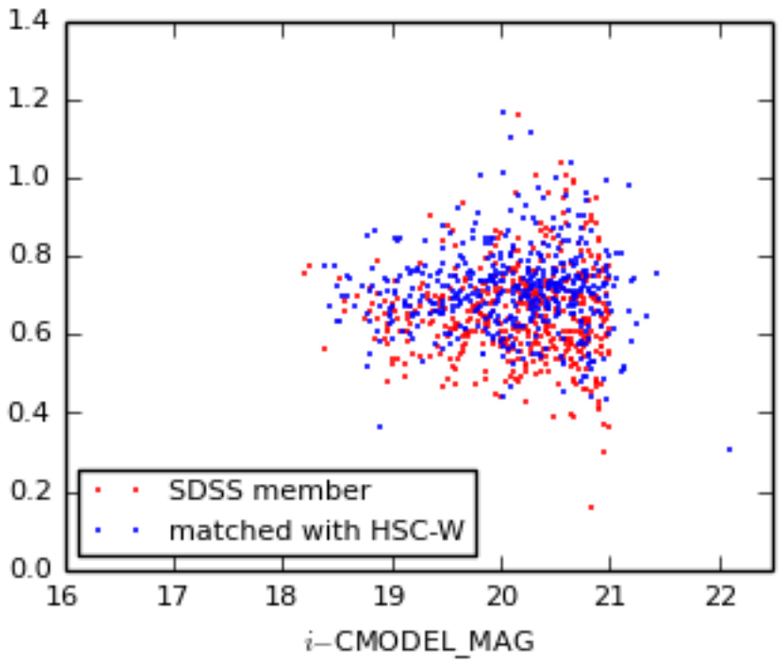
de' Vaucoleures model_mag

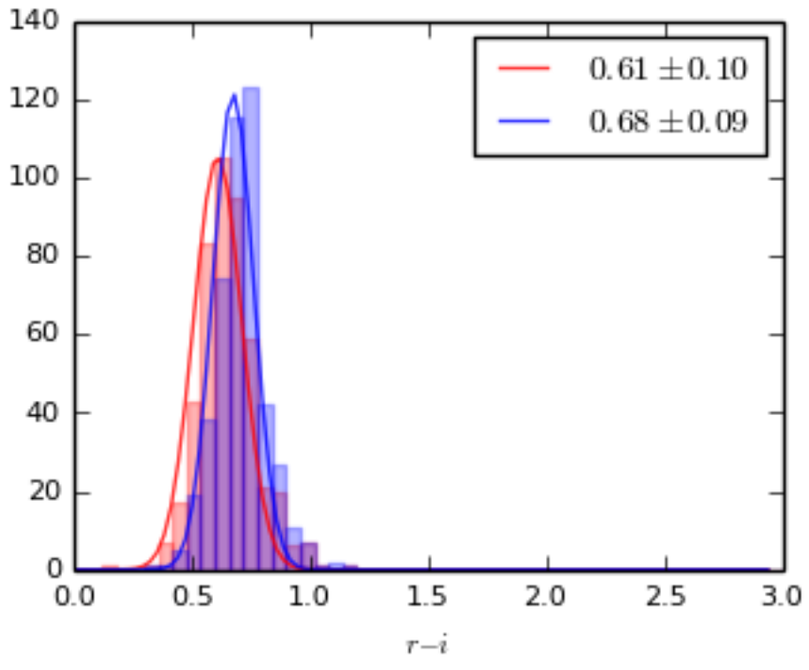




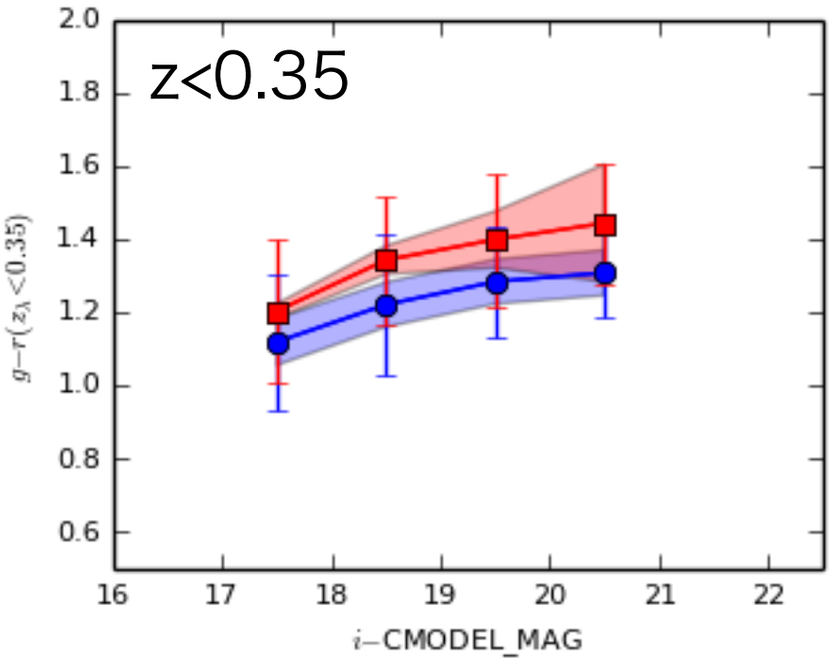


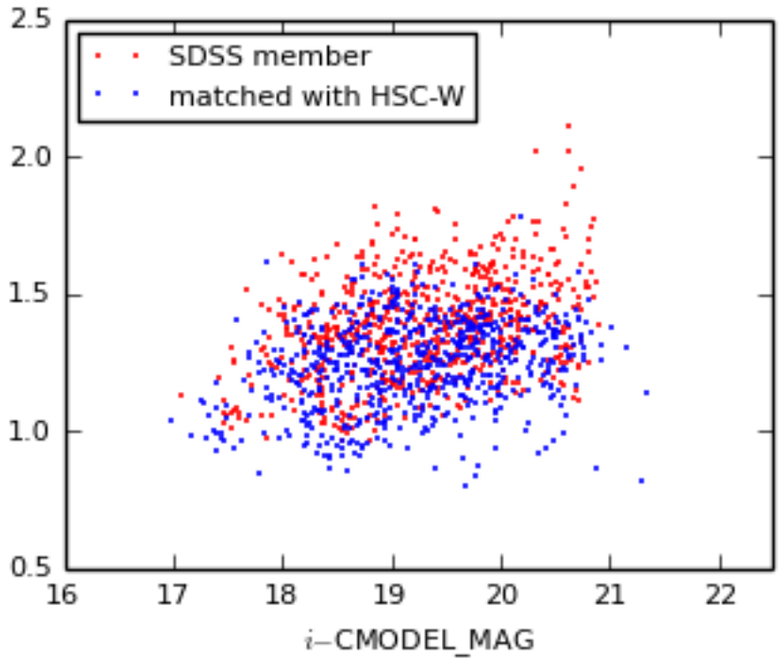


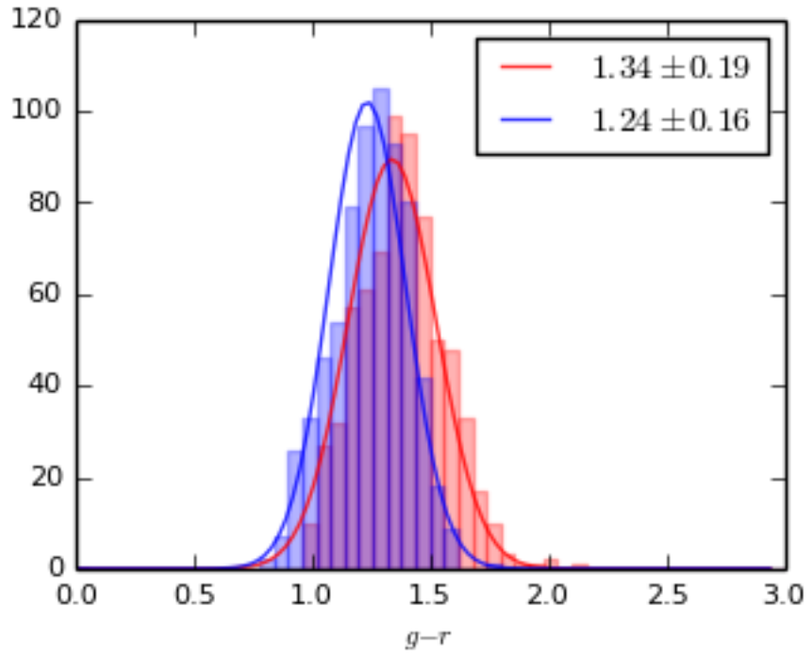


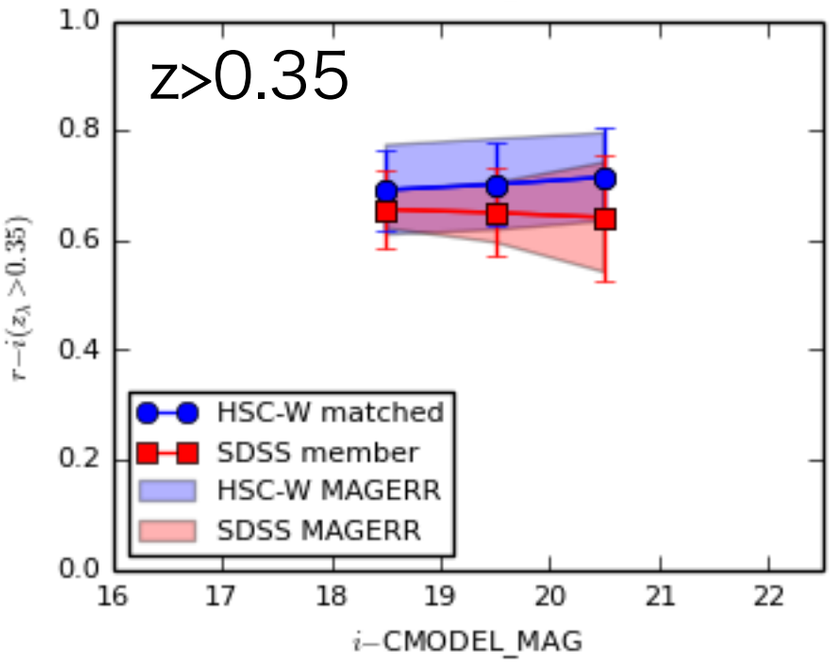


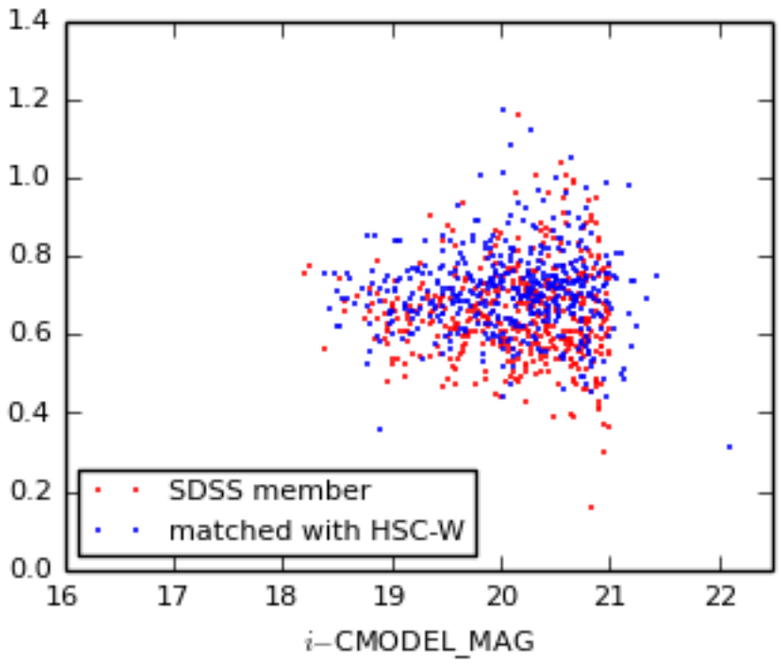
exponential model_mag

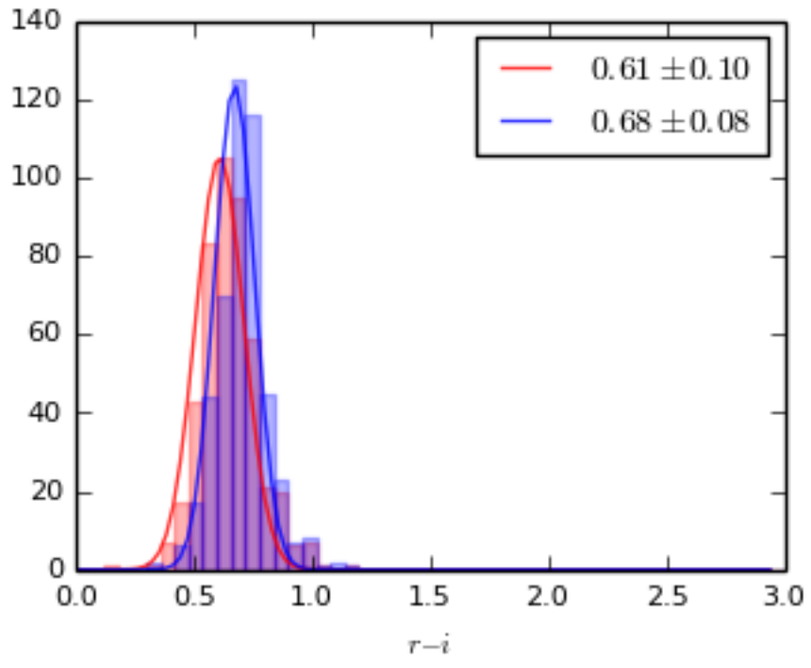




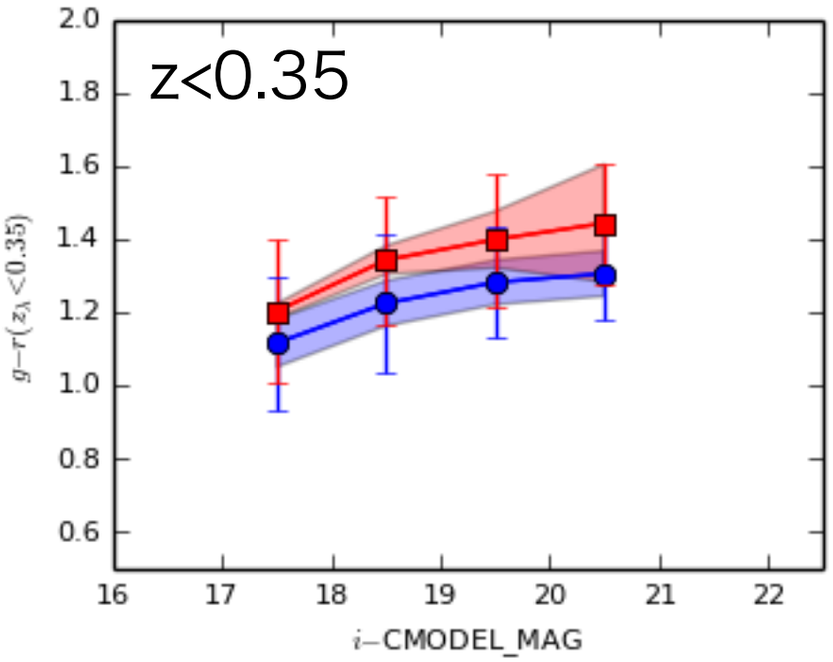


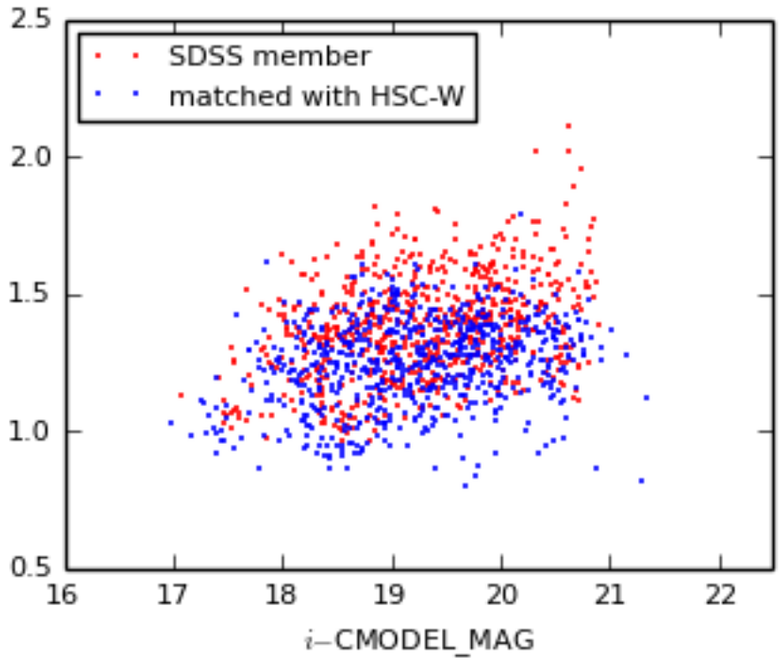


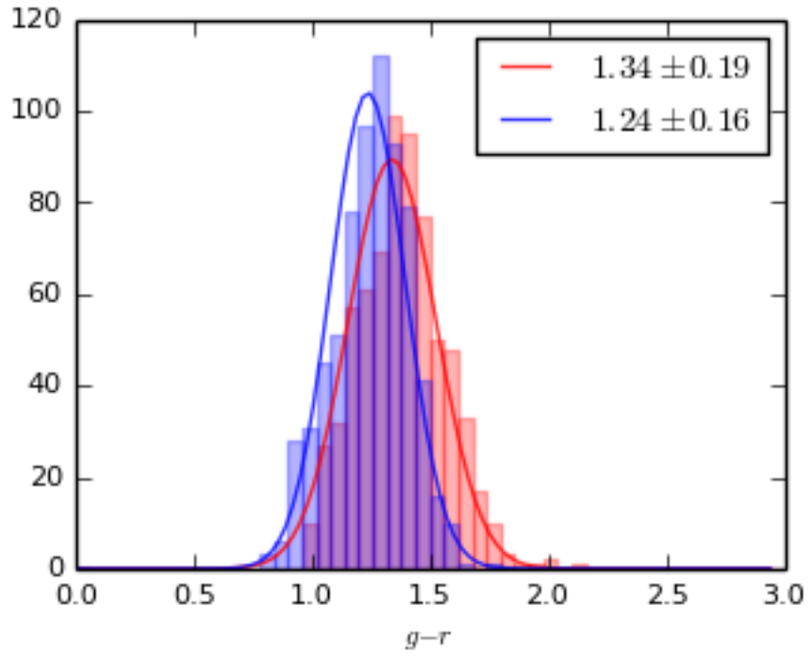


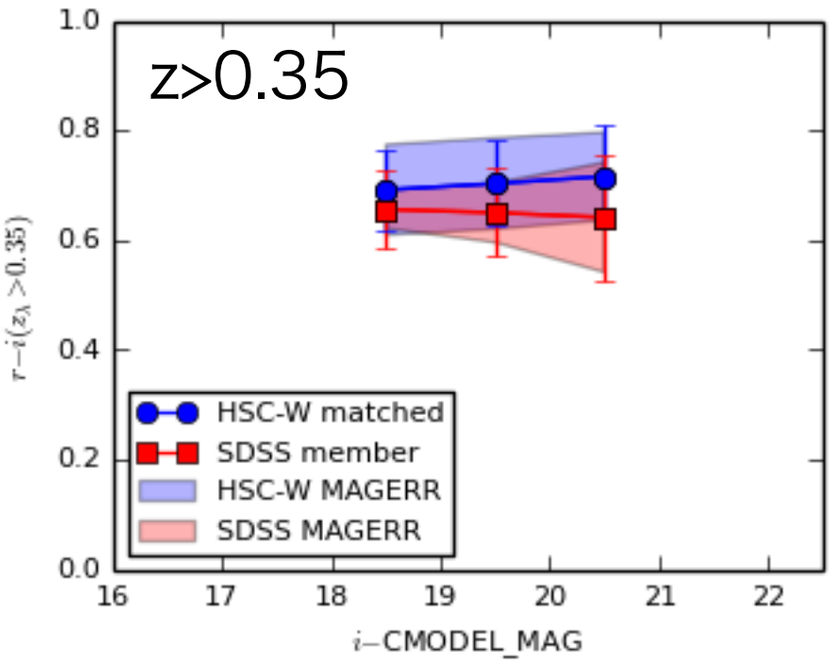


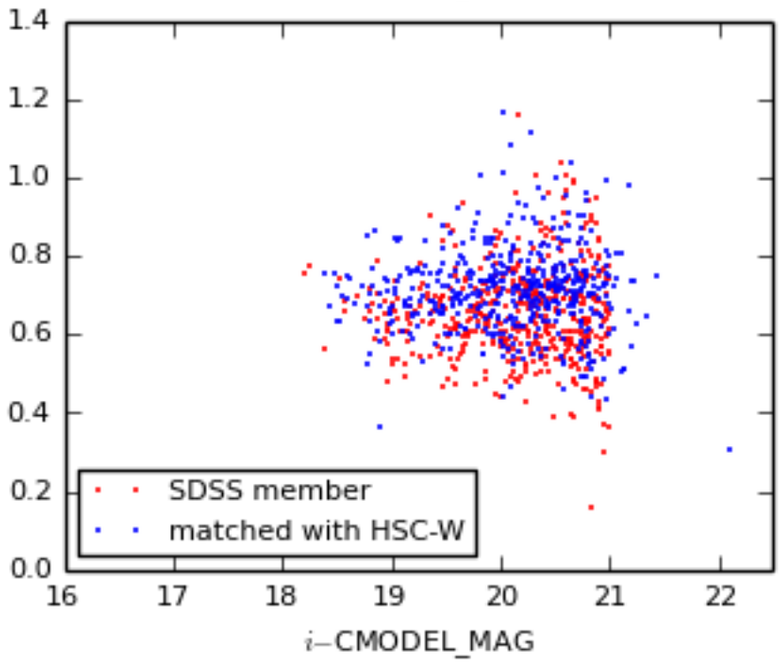
best model_mag (either deV. or exp.)

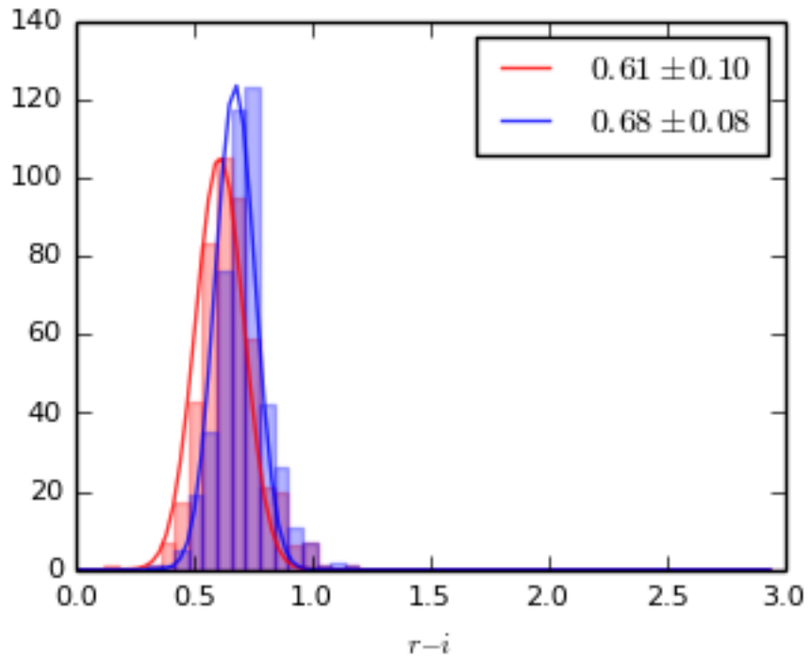






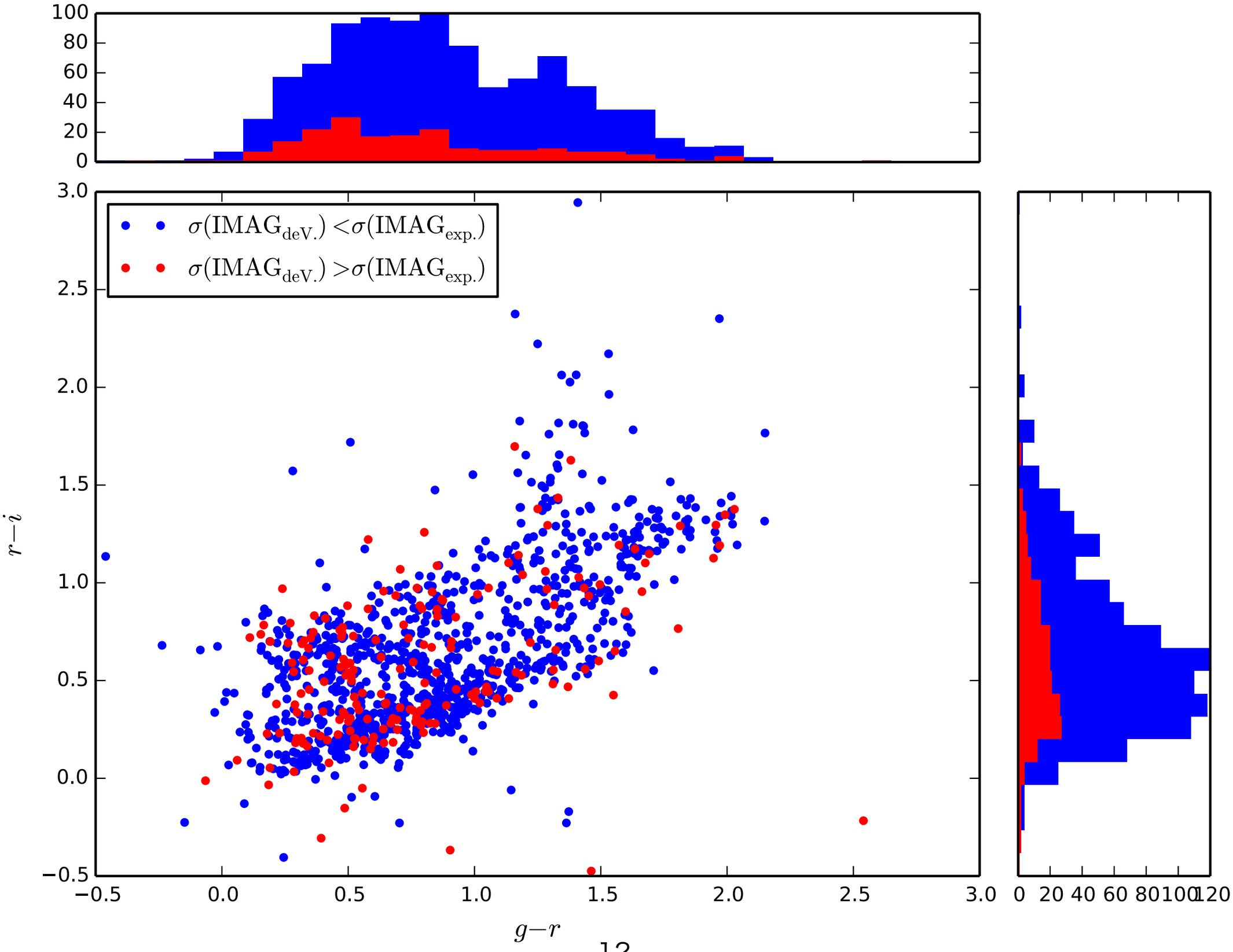






$$\mathrm{MODEL\_MAG} = \begin{cases} \mathrm{deV\_MODEL\_MAG} & \text{for } \Delta \ln f_{\mathrm{deV}} / \Delta \ln f_{\mathrm{exp}} \geq 1 \\ \mathrm{exp\_MODEL\_MAG} & \text{for } \Delta \ln f_{\mathrm{deV}} / \Delta \ln f_{\mathrm{exp}} < 1 \end{cases}$$

deV. vs exp model mag

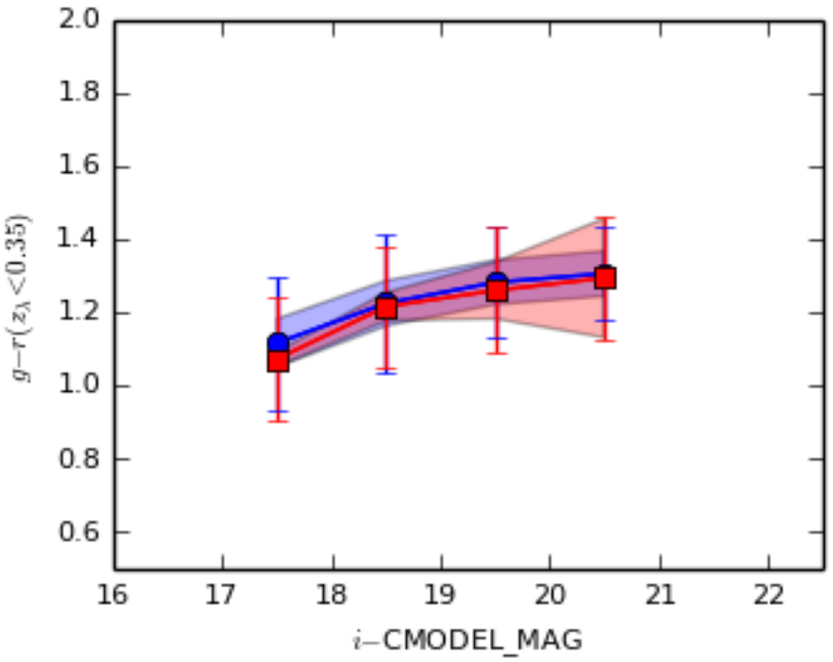


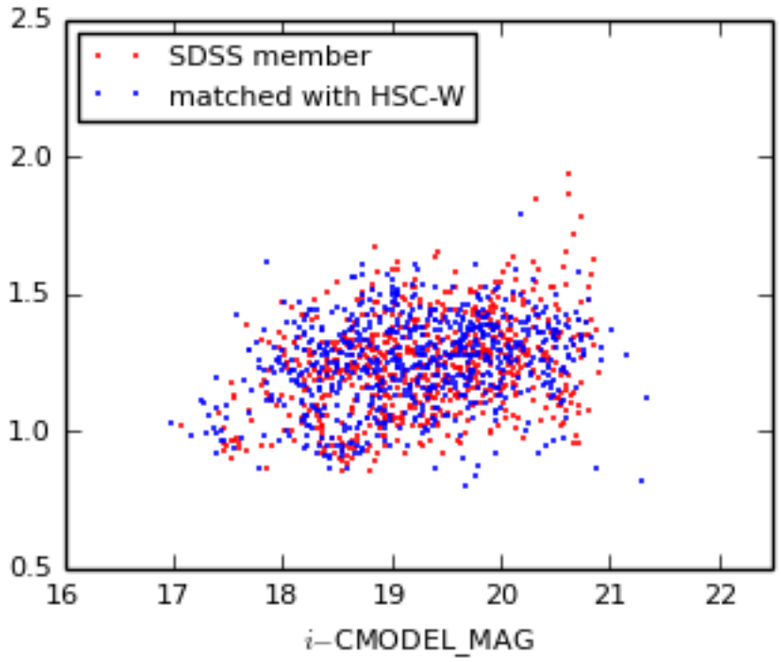
mag. system comparison summary table

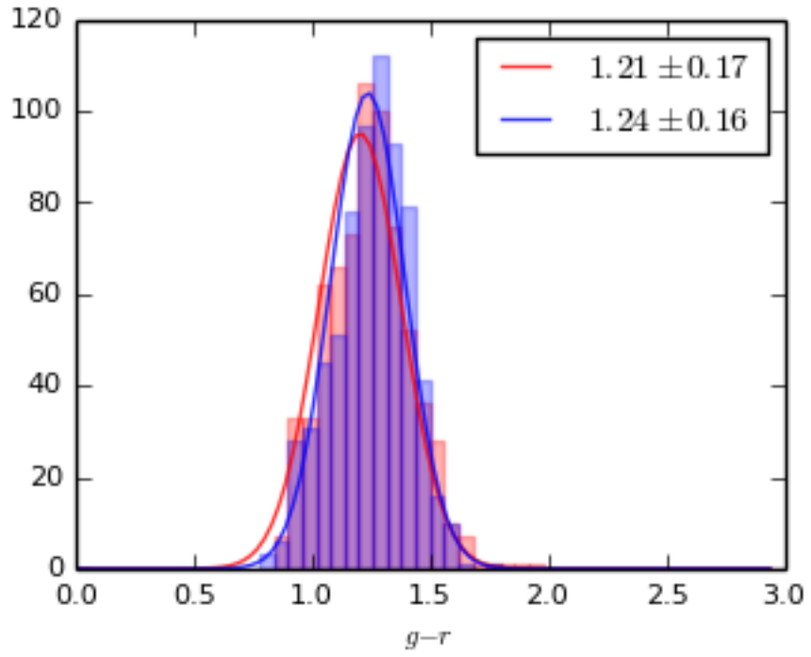
mag.	C model		deV model		exp model		best model		kron	
z	low-z	high-z	low-z	high-z	low-z	high-z	low-z	high-z	low-z	high-z
mean (SDSS)	-	-	-	-	-	-	1.34 (1.21)	0.61 (0.66)	-	-
mean (HSC)	1.25	0.69	1.24	0.68	1.24	0.68	1.24	0.68	1.23	0.68
sigma (SDSS)	-	-	-	-	-	-	0.19 (0.17)	0.10 (0.09)	-	-
sigma (HSC)	0.16	0.09	0.16	0.09	0.16	0.08	0.16	0.08	0.15	0.09

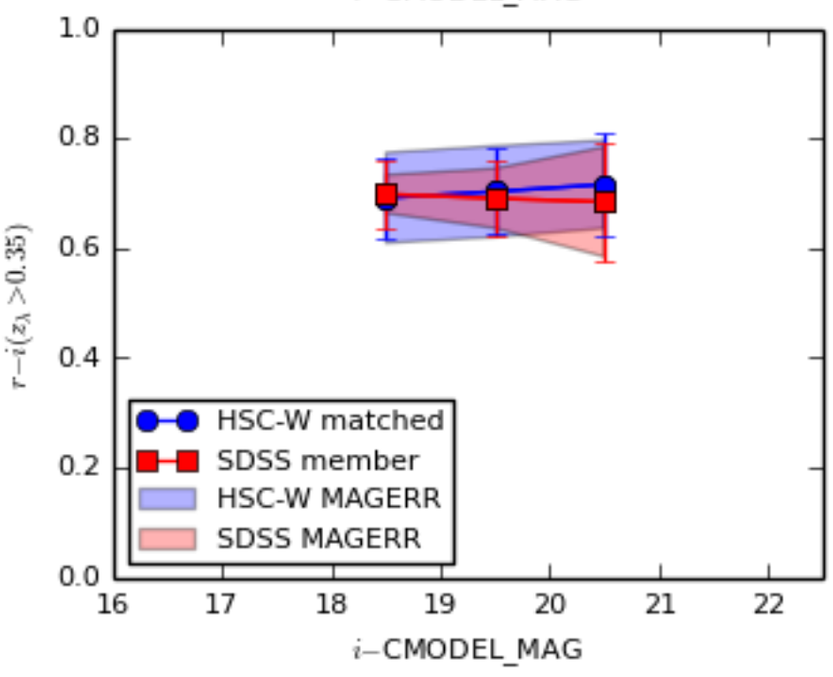
(*) SDSS uses either deV or exp depending on the SN

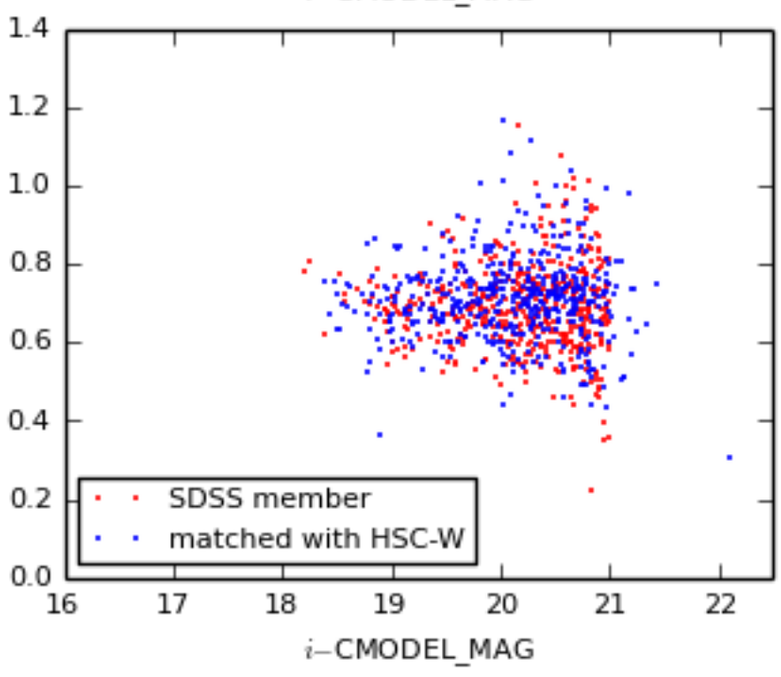
color correction (SDSS -> HSC color)

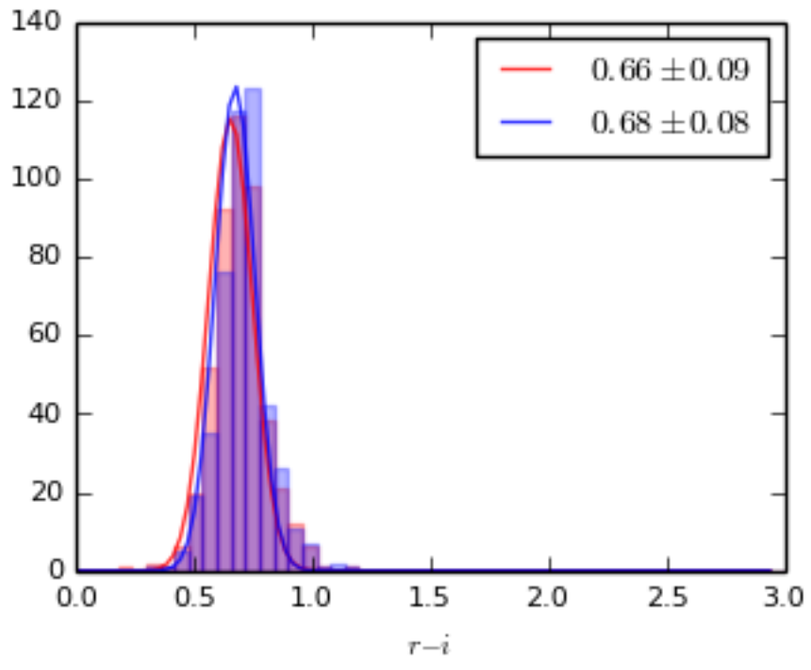












summary

- The redMapper galaxies are cross matched to the HSC photometric data in the XMMLSS region.
- HSC can reproduce mag-color relation of the red-sequence.
- We compare the relation with various photometry systems (i.e. cmodel, deVmodel, expmodel, bestmodel, and kron) but see no significant differences (need finer z binning?)
- So far we have 10^3 galaxies in the XMMLSS which is not sufficient to measure <c|z,m_i>, but we can use GAMA and DEEP2 as well. (Eventually 10^3/25 deg^2 => 5.6x10^4/1400 deg^2)
- Then we can extend our analysis to higher z and fainter m_i.