Spec-z efficiency using DESI Quicksim (An Update)

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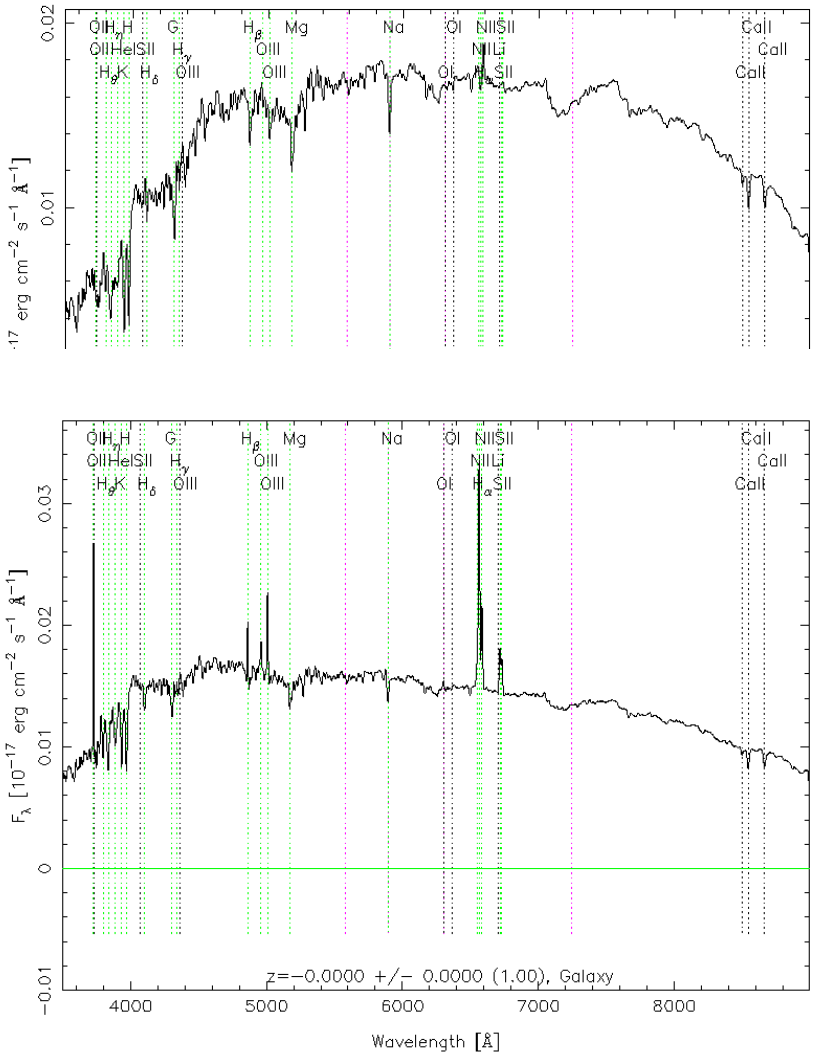
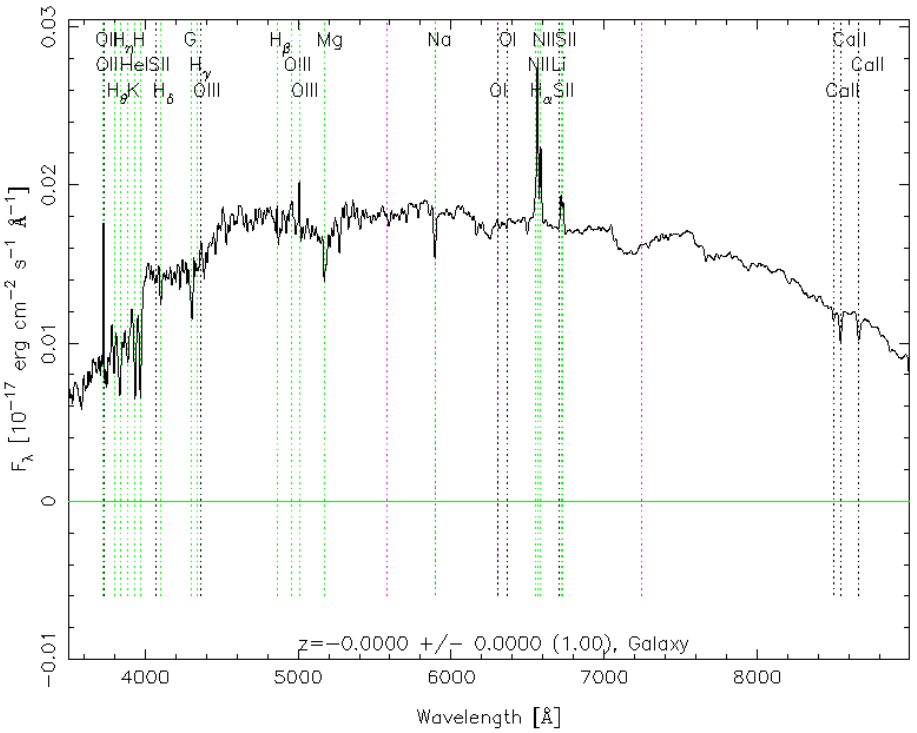
Introduction

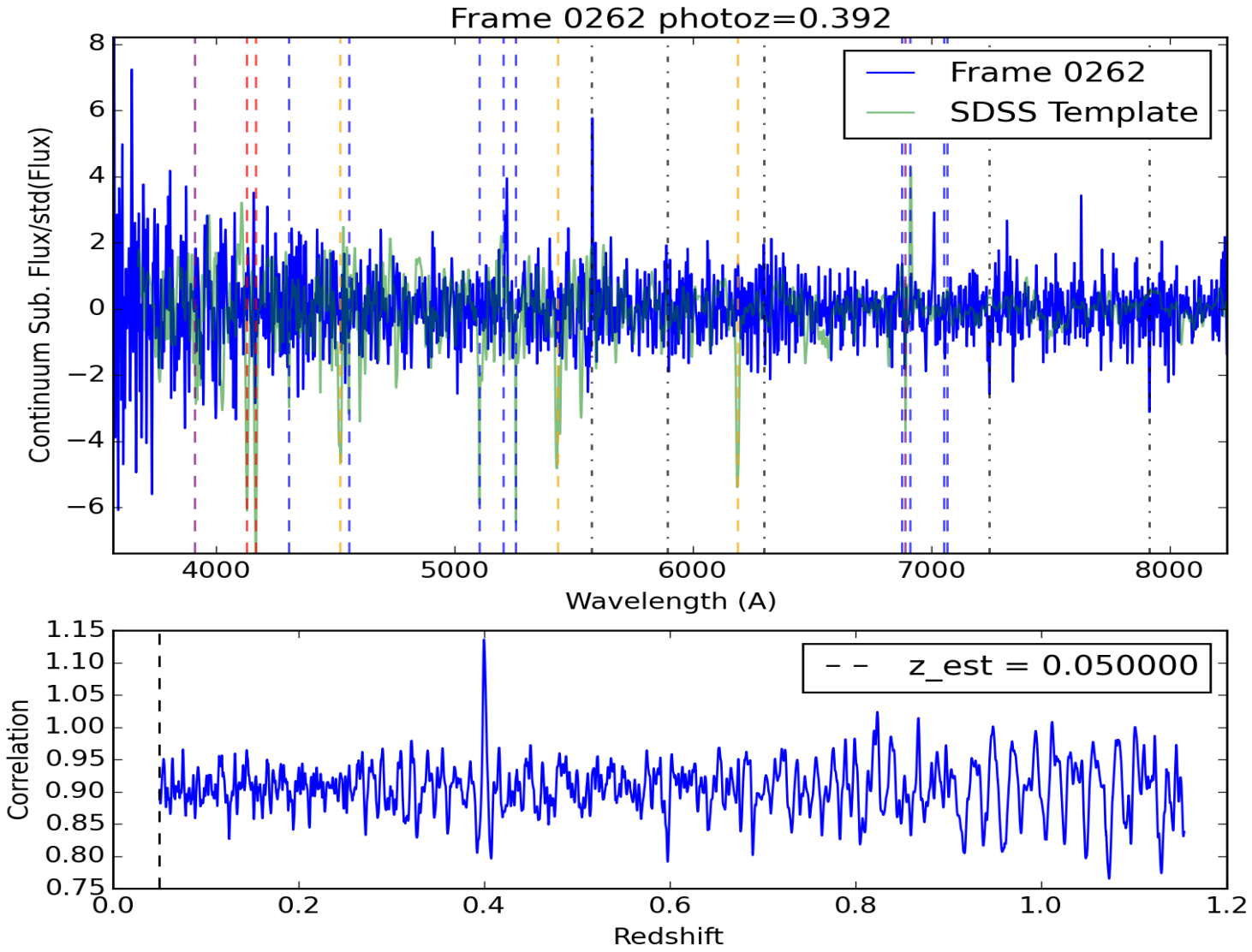
- Using a redshift estimation code developed at U. Michigan between Dan Gifford and myself
- Cross-correlates SDSS template spectra of galaxies with the input spectrum
- Used quicksim to generate simulated spectra to both test my code and to the recovery efficiencies for DESI
- Did tests on LRG’s and ELG’s so far

Cross-Correlate SDSS Templates





Shifting through redshifts

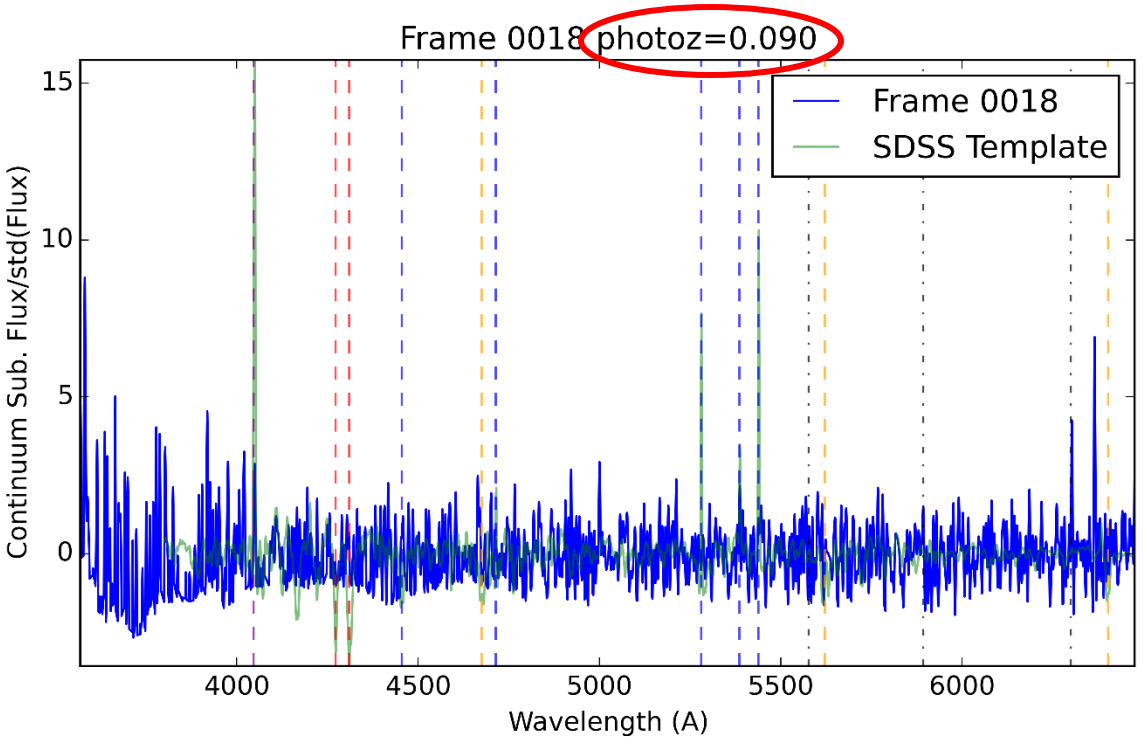


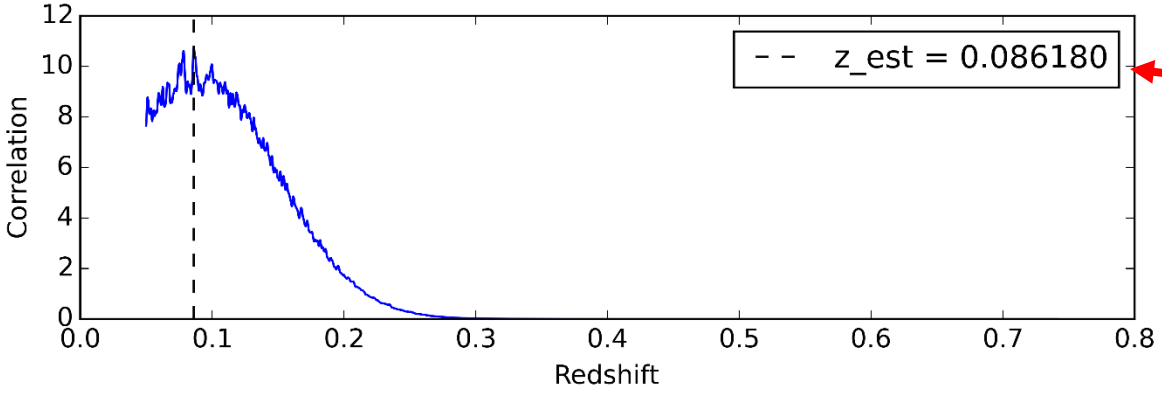
Before

LRG Quick-z inputs

- Fixed:
  - z_input: 0.7
  - Airmass: 1.0
  - Model: ‘lrg’
  - Output_mag_band: i
- Varied:
  - Exposure times: 600-4200s in 600s increments
  - z outputs: 0.1-1.3 in 0.1 increments
  - Output i Mag: 18-24.1 in 0.1 mag
- 3767 redshifts with mean signal to noise from 0.1 to 15.

Recovery of Quick-z simulated spectra



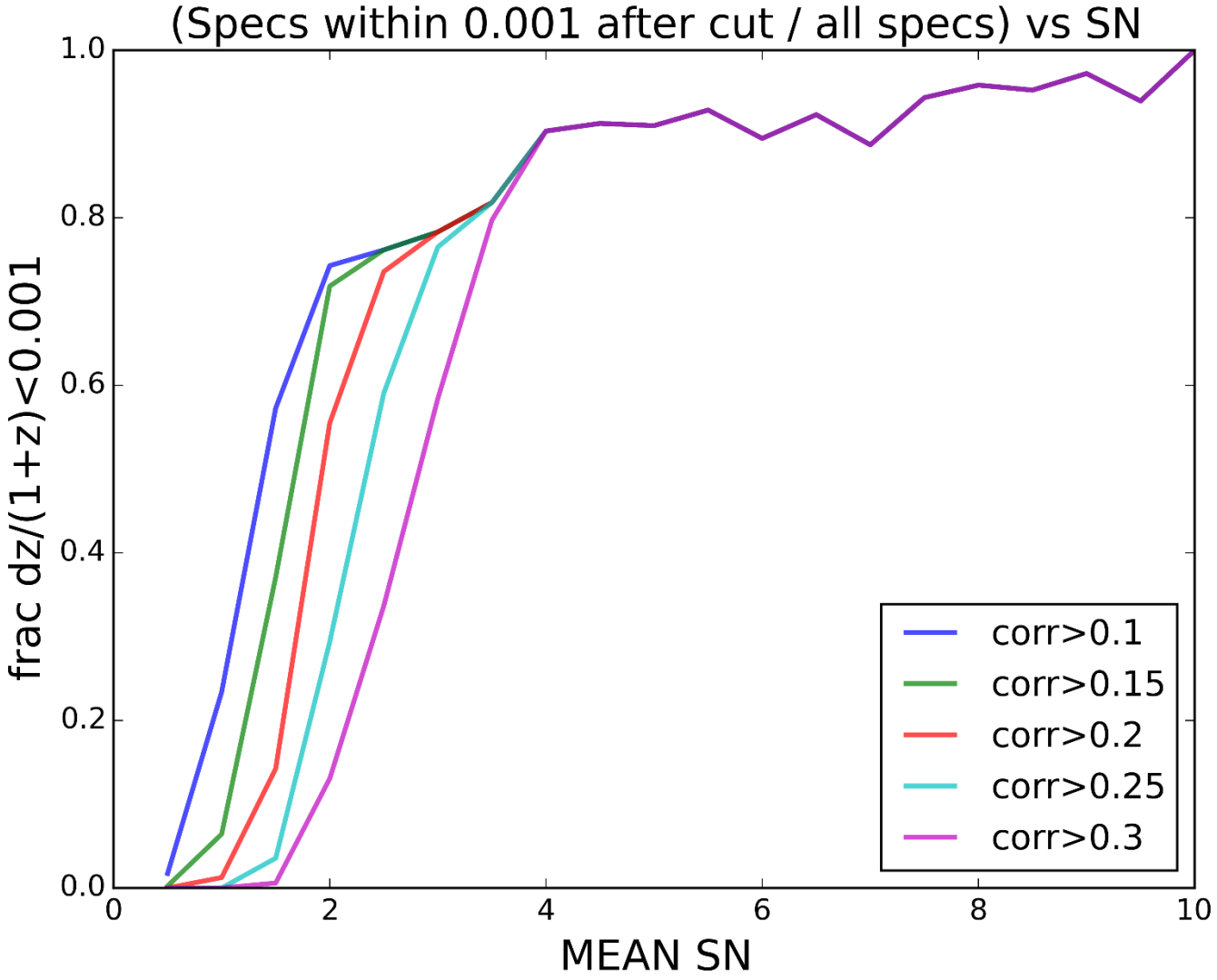


0.5 < Mean SN < 1.0

Truth: z = 0.1

Mis-identified

Cutting on correlation: Frac of total



Update

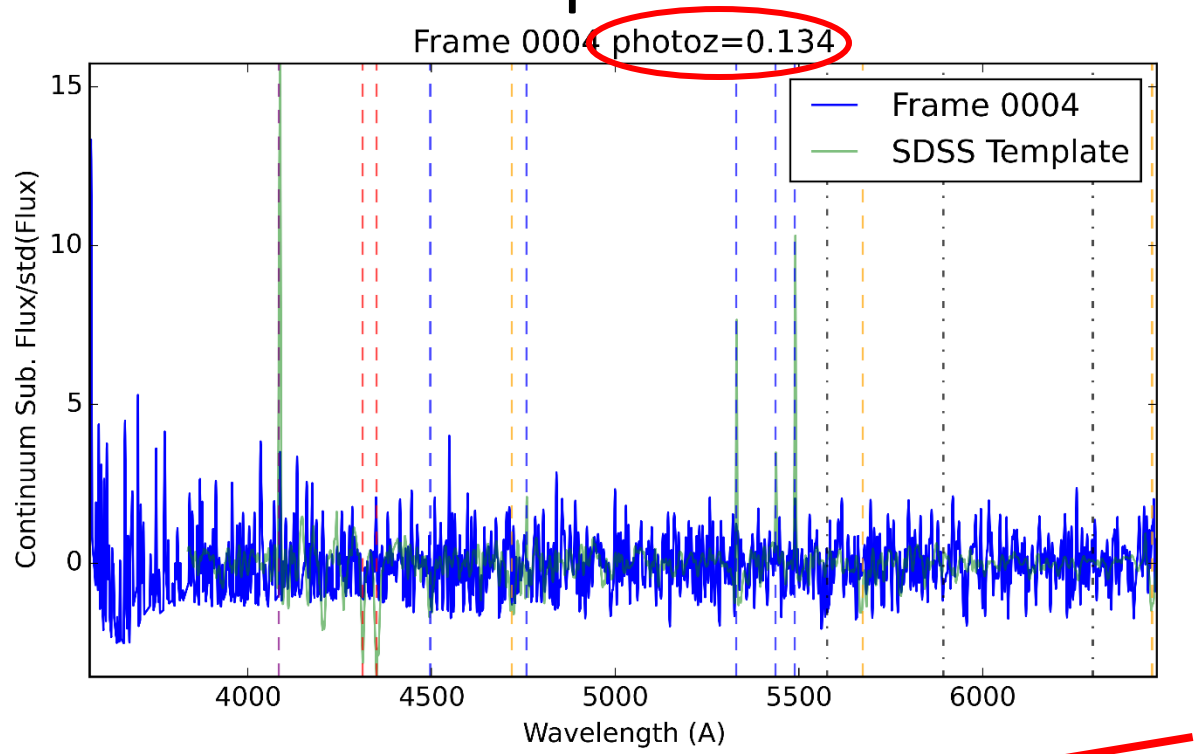
Changes

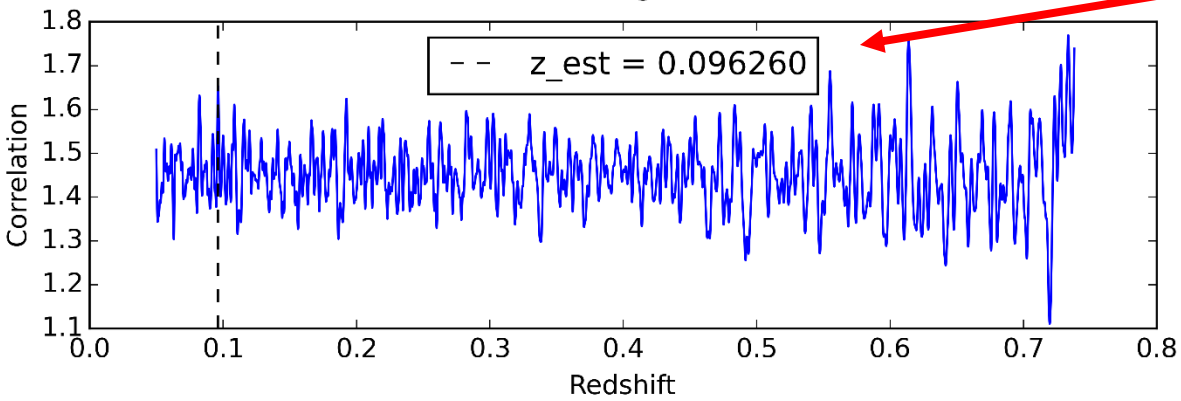
- Realized the 3-sigma deviating “photo-z’s” were causing the recovery inefficiencies at S/N > 4
- Removed Gaussian prior
- Replaced with flat prior \pm 5 sigma
- Greatly improved performance

LRG Quick-z inputs (Same)

- Fixed:
  - z_input: 0.7
  - Airmass: 1.0
  - Model: ‘lrg’
  - Output_mag_band: i
- Varied:
  - Exposure times: 600-3600s in 600s increments
  - z outputs: 0.1-1.2 in 0.1 increments
  - Output i Mag: 18-24 in 0.1 mag
- 3767 redshifts with mean signal to noise from 0.1 to 15.

Use a flat prior instead



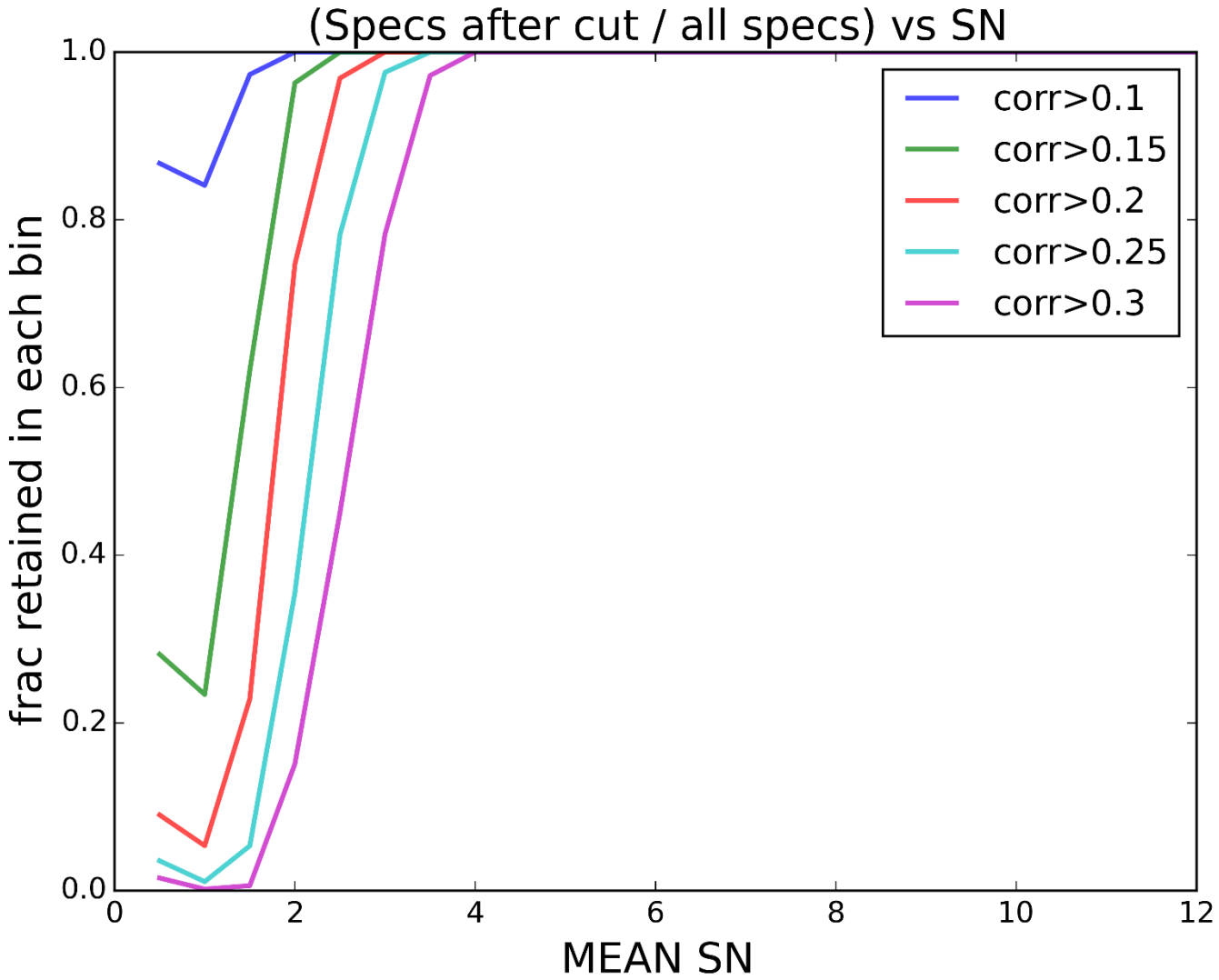


0.5 < Mean SN < 1.0

Truth: z = 0.1

‘Correctly’ identified

Cutting on correlation: Frac of total



Conclusion

- Able to run over large range of Quicksim parameters fairly efficiently using loops (switched from command-line interface to a python function call).
- Can generate many simulated spectra based off saved output templates over this large parameter space.
- Code generates a “photo-z” by taking:
  - true_z + 0.02*(1+true_z)*n (n is Gaussian random number)
- These ‘photo-zs’ are inserted as priors with the spectra into an automated redshift estimator developed Dan Gifford and Anthony Kremin (UM PhD students).