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# Awesome analysis of MACS1752

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**ABSTRACT**

**Key words:** Galaxies: clusters: individual: MACS J1752.0+4440; Large-scale structure of Universe;



We make use of the Extreme Deconvolution Gaussian Mixture Model (XDGMM) to determine the number of subclusters. This algorithm allows us to 1) get rid of the artificial imprint of the mask of the Keck DEIMOS spectrograph, 2) separate stars from galaxies, 3) separate foreground or background galaxies.

The features that we make use of are in the XDGMM include the half-light radius, $I_{iso}$, $G_{iso}$, $R_{iso} - I_{iso}$, etc.

It is customary to use more cluster than needed for high dimensional GMM then manually identify the relevant clusters (See Statistics, Data Mining and Machine Learning in Astronomy reference.)

We further perform a weighted Kernel Density Estimation (KDE) from the identified clusters (Ng et al. 2015) to examine the number density peaks and the luminosity peaks.



We continue to make use of the identification of cluster members from the XDGMM in this analysis, but we only make use of the member galaxies with secure spectroscopic redshift. We use the biweight statistic to determine the location and the scale of the relative line-of-sight (LOS) velocities of the subclusters. A previous, less extensive use of the GMM has been shown by the ECGMM people.



To determine the source redshift of the lensed galaxies, we train a Random Forest regressor based on the data in the COSMOS field.



We cross validate our results by withholding 10% of our source galaxies.



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