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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; methods: statistical

## 1 INTRODUCTION

## 2 DATA

### 2.1 Keck DEIMOS Observations and Spectra Reduction

- Date and observation conditions
- Refer to Will's 2014 paper for details of spectra reduction

### 2.2 Suburu / SuprimeCam Observation

Date and observation conditions

### 2.3 Hubble Space Telescope Observation

Date and observation conditions

### 2.4 Data Reduction for Subaru and HST data

refer to James' CIZA paper

#### *2.4.1 Extinction Correction*

There is low extinction in the field of view of MACSJ1752. The mean of the extinction magnitude in E(B-V) is 0.036, while the corresponding standard deviation is $8.5 \times 10^{-3}$ (ACCORDING TO WHOSE MAP?). We first perform cubic interpolation to infer the E(B-V) values at the spatial location of all the entries of our data catalog. Then we perform dust correction for other bands according to Schlafly & Finkbeiner (2010).

#### *2.4.2 Shape measurement and source selection*

[I may just move all these to a new paper and stick with a quick-and-dirty approach] We make use of two state-of-the-art classification / regression algorithms, gradient boosting trees and a Random Forest algorithm, to select our source and obtained consistent results. Data cleaning, preprocessing and feature engineering have always been considered to be one of the most important steps in a data analysis (quote Machine learning paper).

The predictors that we included in the classification algorithms are all the colors and magnitudes that we have, the half-light radius, identification status flag and the redshift. The class labels in the predictions are member galaxies, source galaxies, and other contaminants such as stars, foreground galaxies, and unidentifiable contaminants with problematic status flags.

To minimize misclassification rates, we discarded samples with classification probability less than 0.5 in the dominant classification.

We make use of stratefied cross validation to find a training error rate is test error rate is .

The false positive rate from the out-of-bag samples is .

After obtaining the source population, we perform signal-to-noise ratio (SNR) cuts to make sure the ellipticity errors are $< 0.3$ and the SNR are $> 5$.

The resulting source density count from our cleaned catalog is , which is within $\sigma$ of the source density count of the training COSMOS fields catalog after removing stars and foreground galaxies. Finally, the effective lensing depth $\beta$, i.e. the mean of $D_{LS}/DL$[DOUBLE CHECK] etc. of the inferred source population is .

- K-correction? (not needed)
- Selection based on $(g - i)$ vs i band?
- Star galaxy separation based on half-light radius
- Source density counts
- S/N cuts - ellipticity error $< 0.3$ and detection significance $> 5\sigma$

#### *2.4.3 Source redshift estimation*

Cosmic Evolution Survey photometric catalog (COSMOS) Ilbert et al. 2009 comparison of depth between our Subaru image and the COSMOS image?

## 3 METHOD

### 3.1 Optical analysis

#### *3.1.1 Determining the number of galaxy subclusters and membership*

#### *3.1.2 Brightest Cluster Galaxies identification (BCG)*

#### *3.1.3 Number density and luminosity map*

#### *3.1.4 Dynamics of the subclusters*

- LOS velocities
- mass estimation from velocity dispersion

### 3.2 Weak lensing (WL) analysis with LENSTOOL

### 3.3 Offset between the DM and galaxy centroids

### 3.4 Setup of Dawson's dynamical simulation

#### *3.4.1 Weights due to radio relic info*

## 4 RESULTS

## 5 DISCUSSION

### 5.1 Offset between the DM centroids and galaxy centroids

## 6 ACKNOWLEDGEMENTS

## REFERENCES

Schlafly E. F., Finkbeiner D. P., 2010, 103, 15, 1012.4804, doi:10.1088/0004-637X/737/2/103

## APPENDIX A: MCMC DIAGNOSTICS FROM THE WL ANALYSIS

Fig 1. Chains indicating burn-in and the posterior density acceptance rate!

## APPENDIX B: OUTPUTS FROM DYNAMICAL SIMULATION

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