

The Merging Systems Identification (MeSsl) Algorithm.

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July 10, 2016

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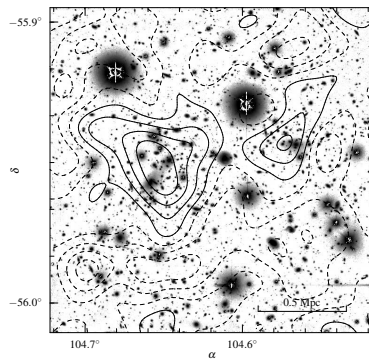
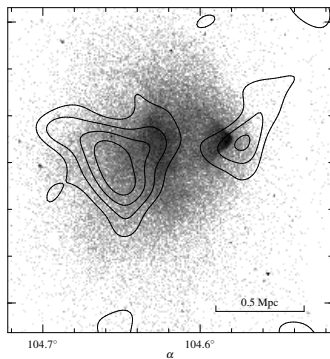
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 - Machine learning algorithm applied for identification of substructures.
 - Application of the MeSsl Algorithm to spectroscopy catalogues
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1 Why searching merging galaxy clusters?

2 The MeSsl Algorithm

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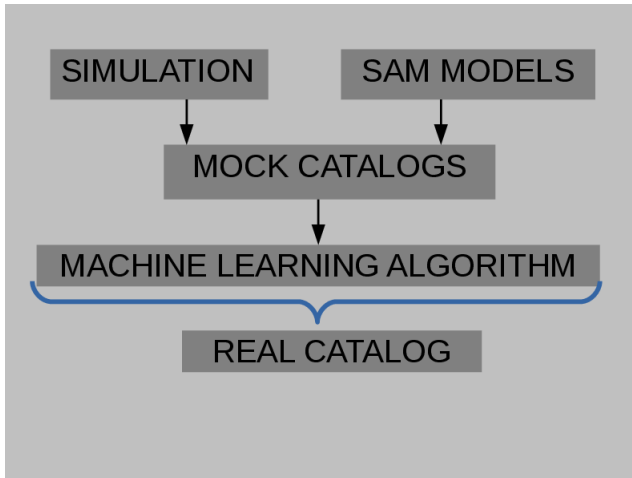
- You can study dark matter particle properties (Markevitch et al. 2004).
 - Offset between Dark-Matter and gas.
 - The great velocity of the secondary cluster.
 - The survivor of the secondary cluster.
- You can test your favourite cosmological model.
 - Studying the probability of finding a Bullet-like cluster (Hayashi et al. 2006; Farrar y Rosen 2007; Forero-Romero et al. 2010;...).
- Study the ICM properties through hidrodynamical simulations (Springel & Farrar. 2005; Lage & Farrar 2014; Zhang et al. 2014;...).

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Clusters identification.

- We construct a mock catalogue based on the results of the application of the SAM Model of Guo et al. 2010 to the Millenium simulation.

Clusters identification.

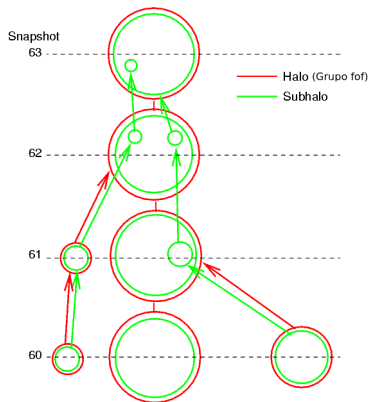
- We construct a mock catalogue based on the results of the application of the SAM Model of Guo et al. 2010 to the Millenium simulation.
- We Perform a friend-of-friend algorithm (*Merchan & Zandivares 2002*) to the mock catalog in order to identify the clusters.

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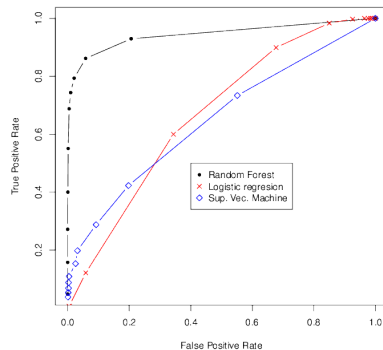
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- We assign each identified cluster with a fof-group in the simulation.

Study of the merger trees.

- Based on the subhalos merger trees, we construct the merger tree for every foF group in the simulation.



- Dressler-Shectman test.
- Non gaussianity test.
- Color.
- Number of galaxies.



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- After that, we estimate the velocity dispersion and the virial radius.

$$\begin{aligned}
 R_{vir} &= \frac{\pi}{2} \frac{ngal(ngal - 1)}{\sum_{i>j}^{ngal} R_{ij}^{-1}} \\
 \sigma &= \frac{\sqrt{\pi}}{ngal(ngal - 1)} \sum_{i=1}^{ngal-1} \omega_i g_i \\
 \omega_i &= i(ngal - i) \\
 g_i &= v_{i+1} - v_i
 \end{aligned}
 \tag{1}$$

Study of the identified substructures.

- We compare the center of the identified substructures with the centers of the associated subhalos, finding a good estimation.

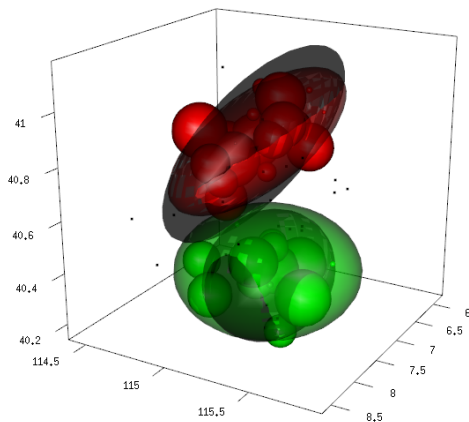
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- We compare the virial radius of the identified substructures with the virial radius of the subhalos, finding that we are overestimating the real values.
- We compare the velocity dispersion of the identified substructures with the velocity dispersion of the associated subhalos, finding that our values are in good concordance with the real values.

Mock Clusters



Application of the MeSsl Algorithm to spectroscopy catalogues

- We find 12 Clusters with high probability of been in a merger in the SDSS DR7.
- We find 4 Clusters with high probability of been in a merger in the WINGS Clusters.
- We find 16 Clusters with high probability of been in a merger in the HECs Clusters.

MeSsl Algorithm (v 0.1)

☒ Load Examples

Choose CSV File

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Separator

- ☒ Tab
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MeSsl

Welcome to MeSsl (Merging System Identification) Algorithm

MeSsl algorithm is a machine learning algorithm trained with mock catalogues that allowed you to clas

Data Input

You must upload a table of galaxies in the clusters to be study. Each cluster cannot have more than 10 in size. The table must have the next structure.:

*id: A numeric column with the cluster id of the system that each galaxy belong.

*ra: A numeric column with the galaxy right ascension in decimal degrees.

*dec: A numeric column with the galaxy declination in decimal degrees.

*z: A numeric column with the galaxy redshift.

*mag: A numeric column with the galaxy apparent magnitude.

*color: A numeric column with the galaxy color.

We recommend to upload low redshift clusters only ($z < 0.2$).

Example Table

In the example table you can study 6 Abell clusters preloaded:

*id=1: Abell 1991.

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Future Work

- Perform astrophysical test over our sample of colliding cluster candidates looking for impose some constraints on dark matter particle properties.
- Apply the detection method to more deep real catalogs.
- Reconstruct the 3d merger with the Bayesian techniques presented by *Dawson et al. 2012*.
- Study the physical properties of the galaxies that belong to the identified coliding substructures.



THANK YOU