Machine Learning for Galaxy Cluster Membership Assignment

Keywords – Astrophysics - Cosmology - Machine Learning

Context

Upcoming astrophysical surveys such as Euclid [1] aim to tighten cosmological constraints using properties of galaxy clusters such as their mass function and clustering strength. Optical cluster detection algorithms often provide unreliable or no information as to which clusters individual survey galaxies belong. This information significantly impacts the determination of cluster density profiles and velocity dispersion measurements. Current techniques for assigning galaxies to clusters generally involve defining arbitrary cuts in colour and redshift and may not take into account all of the available information.

Machine learning techniques offer the flexibility to incorporate all available features in the training data and to potentially identify better correlations between objects.

Outline of project objectives

The internship will essentially be comprised of the following tasks and objectives:

1. Get familiarised with the current state of the art for galaxy cluster membership assignment.
2. Identify an appropriate machine learning framework to implement for this problem.
3. Test this framework on simulated galaxy catalogues and compare with other methods.
4. Apply the framework to real data and study the impact this has on cluster properties.

Candidate

The candidate should be a Master 2 (or equivalent) student with background in either physics/astrophysics or applied maths/signal processing/data science. Knowledge of machine learning methods would be a plus. Experience with Python is not required, but would be advantageous.

Internship

The internship will take place in the CosmoStat laboratory, under the supervision of Samuel Farrens.

- *Deadline for applications:* February 28th, 2019.
- *Contact:* Samuel Farrens (samuel.farrens@cea.fr).
- *Duration:* 4-6 months.

[1] https://www.euclid-ec.org/