Project

The successful applicant will work at INAF-OAS within the stimulating environment of the Navile Campus in Bologna, the largest cluster of institutes for astrophysical research in Italy (DIFA, INAF-OAS, INAF-IRA, ALMA Regional Center, and the headquarters of the Cherenkov Telescope Array).
The research activity will be done under the supervision of Dr. M. Talia, Dr. L. Pozzetti and Dr. M. Bolzonella. The advisors and collaborators are deeply involved in the Euclid mission, with leadership roles in particular in galaxy evolution working group and in the organitation unit to derive galaxy Physical Properties.

Euclid will provide a data archive increasingly large and rich in information. Traditional approaches, like SED fitting, are well established to derive physical properties of galaxies (stellar mass, SFR, age, dust, metallicity). However, they are no longer sufficient to recover physical properties and select peculiar objects from the next generation of extragalactic surveys, such as Euclid. The huge amount of data urges the researcher to implement new techniques based on Machine Learning (ML).

The goals of the project will include:

1. explore available galaxy mock catalogs using empirical models (MAMBO, SPRITZ) or semi-analytical models (GAEA) for Euclid Deep and Wide Survey, considering observational effects;
2. explore different techniques to recover galaxy and AGN physical properties and their uncertainties from photometric and/or spectroscopic data, in particular exploring ML methods;
3. use ML to classify different types of galaxies, e.g. passive vs star-forming: this classification can be used to improve and speed up the computation of physical properties, or to combine similar objects and derive their average physical properties beyond the observational limits for single objects;
4. use ML to discover and study rare or yet unseen objects, thanks to the unprecedented datasets that will be available in Euclid;
5. develop a dedicated pipeline with the best performance method;
6. assess the impact of physical properties errors on derived scaling relation (SFR-Mass, Mass-metallicity, etc…), and on the distribution functions (LF, MF, SFR- functions as a function of redshift).

People with a background either in galaxy evolution studies or cosmology and statistical methods and informatics are encouraged to apply.