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Evaluating Systematic Effects Using Simulations and Real Data in Euclid

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Galaxy clustering analysis relies on precise knowledge of the purity and completeness of cosmological data samples. These properties can be assessed with two approaches: simulations and deeper observations of specific fields.

Simulations provide a controlled environment where the true input is known. However, they come with two major issues: they must be computationally efficient, and they must account for all instrumental features. Moreover, certain detector non-idealities, such as persistence and snowballs, cannot be fully understood and modeled, making it impossible to achieve completely realistic simulations.

On the other hand, deeper observations are limited to small regions of the sky. Their purity and completeness are difficult to evaluate, and in the case of Euclid, the full survey depth required for their assessment could only be reached at the end of the mission. Analysis can be performed using fields with extensive spectroscopic redshift measurements, such as COSMOS. However, these fields are small, and the selection function of spectroscopic catalogs is often complex and not fully representative of the larger data set.

Thus, we present an alternative approach to characterise the cosmological sample by injecting simulated spectra into Euclid spectroscopic images. These images are then processed through the full pipeline up to redshift determination. Instead of explicitly simulating systematic effects, this method naturally inherits them from real observations. This approach is computationally demanding but enables the evaluation of purity and completeness over a larger sky area compared to external datasets and represents a complementary strategy to assess systematics.

Author: PASSALACQUA, Francesca (INFN & University of Padova)

Presenter: PASSALACQUA, Francesca (INFN & University of Padova)

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