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PDFraptor a software processing flow for photometric redshifts with machine learning methods

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Valeria Amaro(1), Civita Vellucci(1), Massimo Brescia(2), Stefano Cavuoti(2), e Giuseppe Longo(1)
1- Università Federico II di Napoli
2- INAF –Osservatorio Astronomico di Capodimonte

Photometric cosmological surveys rely on accurate photometric redshifts to pursue a large part of their scientific goals. In the general frameworks of the VST KIDS and VOICE surveys and of the preparatory work for the Euclid mission, we present PDFraptor (Probability Density Function Application for PhoTOmetric Redshifts) a software processing flow aimed at estimating both photometric redshifts and their associated pdf using machine learning methods. Machine learning methods require an extensive sample of objects (a.k.a training set) with well measured spectroscopic redshifts to be used in order to learn the unknown function which maps the photometric parameter space onto the redshift space. Errors are instead estimated using a different sample of objects never exposed to the method during the training phase (test set). For most methods belonging to this family, error estimates are global (i.e. they are derived from the statistics of the whole test set). PDFraptor, starting from the measured photometric errors, perturbs the photometry of the objects in the training set and runs different instances of the ML method in order to derive realistic estimates of how the various sources of errors project onto the redshift estimates. The procedure associate accurate probability distribution functions to the individual redshifts, thus increasing their accuracy and reliability. The application of PDFraptor to COSMOS data will be discussed as a case study.

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