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Photometric redshift with Deep Learning technique: Application to HSC Deep Survey

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Convolutional Neural Networks have recently shown high performances in measuring photometric redshifts in the local SDSS surveys. Extending this technique at higher redshift remains a challenge due to the lack of representativity of the training set for faint sources. In this talk we apply this technique on the state-of-the-art HSC deep imaging survey (with UgrizY photometry down to i~26.5), which mimics the future LSST survey and where a large spectroscopic redshift training set is available. With respect to previous works, we first demonstrate that a multi-modal approach allows us to better extract the features available in the multi-band images. We then show that accurate photo-z can be measured up to i~24.5 with a precision of 0.014 σMAD (normalized median absolute deviation of the residuals) and 2% of outliers. The availability of infrared bands improves these results. At fainter magnitudes we must rely on the 30-band photo-z's from COSMOS2020 to build a representative training set. We show that variable conditions and SNRs across the HSC survey impact the photo-z and we present a domain matching framework to overcome this issue. We also present a relabeling technique to exploit the large amount of unlabeled data.

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