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Deep K-Correct: Estimating K-Corrections and Absolute Magnitudes from Galaxy Images

The estimation of K-corrections and absolute magnitudes are essential in extragalactic astronomy for comparing galaxy properties across different redshifts. The state-of-the-art methods rely on deterministic template-fitting techniques: Blanton's KCorrect, which estimates K-corrections and absolute magnitudes from photometry and redshift, and FastSpecFit, which refines these estimates by incorporating spectroscopic data. However, spectroscopy is expensive and often unavailable for large galaxy surveys. We introduce Deep K-Correct, a novel approach that leverages the latent space of the astronomical foundation model AstroCLIP to estimate K-corrections and absolute magnitudes directly from galaxy images. Unlike traditional methods, Deep K-Correct eliminates the need for photometric or spectroscopic measurements, utilizing the rich representations learned from millions of galaxies. We explored both zero-shot learning (using K-Nearest Neighbors) and few-shot learning (training neural network layers on top of the embeddings). Our results show that Deep K-Correct matches and marginally surpass the accuracy of KCorrect in predicting K-corrections while requiring only images and redshift as input. We discuss the tunning of the method for the upcoming LSST images and the computation of other physical properties for stars and galaxies using Foundational Models

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