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# Photometric Classification of Supernova with a Biased Training Set

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The expansion of the Universe can be studied via a Bayesian model that relates the difference between the apparent and intrinsic brightnesses of objects to their distance which in turn depends on parameters that describe this expansion. While apparent brightness can be readily measured, intrinsic brightness can only be obtained for certain objects. Type Ia Supernova (SNIa) occur when material accreting onto a white dwarf triggers a powerful supernova explosion. Because this occurs only in a particular physical scenario, we can estimate the intrinsic brightness of SNIa. To take advantage of this, however, SNIa must be precisely classified using (low resolution) photometric data and a biased training set. We use Gaussian Processes to account for irregular observation times and diffusion maps to identify features for a random forest classifier. To account for bias in the overall training set, we use propensity scores to form homogeneous groups where the training subsets are more representative. Finally we enrich the training sets by probabilistically generating synthetic data. In this way we are able to identify SNIa nearly as well as we would with an unbiased training set.

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