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Chi-square, K-S, and bootstrap: Fitting astrophysical models to data

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Complicated models from astrophysical theory are often fit to observational data. There are several issues with the classical procedures used in astronomy literature. First, 'chi-square minimization' is commonly used for fitting functions often disregard mathematical assumptions. Second, the Kolmogorov-Smirnov (K-S) test for goodness-of-fit is misused in astronomy when the model parameters are estimated from the dataset under study. Third, the KS is inefficient at detecting deviations between the data and model at the tails of the distribution. Fourth, the K-S test cannot justifiably be applied to multivariate data as KS is no longer distribution-free. Recent developments of bootstrap resampling method, a simple Monte Carlo procedure on data, will be described, to address these issues.

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