Review

Measurement errors and scaling relations in astrophysics: a review

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Abstract

This review article considers some of the most common methods used in astronomy for regressing one quantity against another in order to estimate the model parameters or to predict an observationally expensive quantity using trends between object values. These methods have to tackle some of the awkward features prevalent in astronomical data, namely heteroscedastic (point‐dependent) errors, intrinsic scatter, non‐ignorable data collection and selection effects, data structure and non‐uniform population (often called Malmquist bias), non‐Gaussian data, outliers, and mixtures of regressions. We outline how least square fits, weighted least squares methods, Maximum Likelihood, survival analysis, and Bayesian methods have been applied in the astrophysics literature when one or more of these features is present. In particular we concentrate on errors‐in‐variables regression and we advocate Bayesian techniques. © 2013 Wiley Periodicals, Inc. Statistical Analysis and Data Mining 6: 15–33, 2013

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