Z105a Development of the Estimation for a Multivariate Distribution Function and Its Applications to Multiwavelength Data Analysis

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A recent vast progress of multiwavelength surveys brought a new insight to astronomical studies, but at the same time, new difficult problems in the data analysis. Handling multiwavelength data immediately introduces a messy entanglement of various selection effects. Then, an appropriate analysis for such a complicated dataset is crucial for such situation, in order to avoid an improper or even often erroneous interpretation of data.

When we have a multiwavelength (or more generally, a multivariate) dataset, various methods have been already developed to estimate a multivariate distribution function (DF) based on pivot data, corresponding to a primary selection band in astronomy. However, nowadays such a method is quite limited to make a maximal use of the information contained in the data. We first introduce a recent development of the maximum likelihood method to estimate a multivariate DF with a copula function. When we have a set of marginal DFs at each wavelength, we can construct a multivariate DF incorporated with (generally nonlinear) correlations between different wavelengths. This is a direct extension of the traditional parametric method for the estimation of the distribution function with a selection effect. The copula function enabled to deal with a combination of various selection effects like truncation and censoring. Then we try to extend this method to a completely nonparametric estimation.

These methods are surely useful for the forthcoming huge multiwavelength surveys in the near future.