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A review of variance estimators with extensions to multivariate nonparametric regression models. (English) Zbl 0946.62056

Ghosh, Subir (ed.), Multivariate analysis, design of experiments, and survey sampling. A tribute to Jagdish N. Srivastava. New York, NY: Marcel Dekker. Stat., Textb. Monogr. 159, 469-498 (1999).

From the introduction: Consider the multivariate regression model where the experimenter observes n outcomes $Y_i = (Y_{i,1}, \ldots, Y_{i,d})' \in \mathbb{R}^d$ at design points $t_i \in T$ given by

$$Y_i := Y(t_i) = g(t_i) + \varepsilon \qquad (i = 1, \ldots, n). \tag{1}$$

Here, $T \subseteq \mathbb{R}$ is the design space, $g : T \to \mathbb{R}^d$ denotes an unknown regression function, and $\varepsilon_i := (\varepsilon_{i,1}, \ldots, \varepsilon_{i,d})'$, $i = 1, \ldots, n$, is an i.i.d. sequence of centered d-dimensional random vectors with existing second moments. Chemical experiments can serve as the simplest example for these models. We consider the problem of estimating the covariance structure Σ of the response variable,

$$\Sigma := \mathrm{Cov}[\varepsilon_i] \in \mathbb{R}^{d \times d}$$

which will be assumed to be independent of the specific design point $t \in T \subseteq \mathbb{R}$. The design space T will be assumed, without loss of generality, to be the unit interval $[0, 1]$.

The purpose of this paper is to construct estimates for the covariance matrix of the error distribution in the regression model in equation (1). Because in multivariate models the computational effort for calculations of such estimators increases significantly, we propose a computationally "simple" method of estimating the covariance matrix which can easily be obtained from the approach for univariate data, i.e., $d = 1$. In this case, several estimators of the variance $\sigma^2 = V[\varepsilon_1]$ have been suggested during the last two decades.

For the entire collection see [Zbl 0927.00053].

MSC:

62H12 Estimation in multivariate analysis
62G08 Nonparametric regression and quantile regression
62J02 General nonlinear regression
65C60 Computational problems in statistics (MSC2010)

Cited in **4** Documents

Keywords:

multivariate regression; covariance structure; covariance matrix

Edited by FIZ Karlsruhe, the European Mathematical Society and the Heidelberg Academy of Sciences and Humanities
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