

Non-negative determinant of a rectangular matrix: Its definition and applications to multivariate data analysis

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Abstract

It is well known that the determinant of a matrix can only be defined for a square matrix. In this paper, we propose a new definition of the determinant of a rectangular matrix, and examine its properties. We first apply the properties to squared canonical correlation coefficients and also squared partial canonical correlation coefficient and so on. Furthermore, the proposed definition of the determinant of a rectangular matrix allows us to decompose the likelihood ratio quite easily when the given set of variables X and Y are partitioned into $X = (X_1, X_2, \dots, X_p)$ and $Y = (Y_1, Y_2, \dots, Y_q)$. The last section discusses an intuitive method which allows determining necessary and sufficient conditions of redundancy of sets of variables measured in terms of the likelihood ratio of a partitioned matrix.

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Keywords

Determinant, Rectangular matrix, Canonical correlation, Partial canonical correlation, Likelihood ratio, Redundancy of variables.