

Test for multivariate stochastic order among ordered experimental groups

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Abstract

Comparison of two or more ordered experimental groups on the basis of multivariate data is a common problem of interest in a variety of applications such as toxicology, clinical trials and drug development etc. Marginally, not only that the data are not normally distributed, the shape of the distribution may even change with test group/population. Thus the data are not likely to be multivariate normally distributed. Secondly, from an application point of view, often researchers are not only interested in determining whether the test groups are different from each other but whether they are “ordered” (in some sense) in the response vector. Since the shape of the distribution may change over the test groups, it may not be sufficient or even meaningful to compare the mean vectors. For example, even though the population mean vectors are identical the probability distributions could be very different. Consequently, standard multivariate methods such as the multivariate analysis of variance (MANOVA) may not be suitable. This talk is motivated by a multivariate data obtained from a comet assay conducted at NIEHS where researchers were interested in studying the DNA damage in cells due to exposure to genotoxicants such as hydrogen peroxide H_2O_2 . We begin this talk by describing the notion of multivariate stochastic order between a pair of random vectors and then develop a multivariate nonparametric procedure to test for multivariate stochastic order between 2 or more random vectors. Methodology developed in this talk fully exploits the underlying structure in the study design and the data. The resulting methodology is illustrated using the NIEHS comet assay data.