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Homogeneity and change-point detection tests for multivariate data using rank statistics

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Detecting and locating changes in highly multivariate data is a major concern in several current statistical applications. In this context, the first contribution of the paper is a novel non-parametric two-sample homogeneity test for multivariate data based on the well-known Wilcoxon rank statistic. The proposed two-sample homogeneity test statistic can be extended to deal with ordinal or censored data as well as to test for the homogeneity of more than two samples. The second contribution of the paper concerns the use of the proposed test statistic to perform retrospective change-point analysis. It is first shown that the approach is computationally feasible even when looking for a large number of change-points thanks to the use of dynamic programming. Computable asymptotic p-values for the test are then provided in the case where a single potential change-point is to be detected. Compared to available alternatives, the proposed approach appears to be very reliable and robust. This is particularly true in situations where the data is contaminated by outliers or corrupted by noise and where the potential changes only affect subsets of the coordinates of the data.

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