Dependency and false discovery rate control

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Abstract:

One of the nice properties of the linear step-up procedure (Benjamini and Hochberg, 1995) based on Simes' (1986) critical values is the control of the false discovery rate not only under independence but also under specific dependency assumptions like positive regression dependency or multivariate total positivity of order 2 (cf. Sarkar, 2002; Benjamini and Yekutieli, 2001). An investigation of possible assumptions concerning structure of possible tests and dependency assumptions and a unifying proof for FDR control is given in Finner and Dickhaus (2008). A further interesting approach implementing a specific dependency condition in connection with various rejection curves can be found in Blanchard and Roquain (2008). For multiple test procedures based on plug-in estimates for the proportion of true null-hypotheses (also called adaptive procedures) it is often required that the empirical cumulative distribution function (ecdf) of the p-values with respect to true null hypotheses converges in some sense (weak dependency assumption). In this talk we investigate the asymptotic behaviour of the ecdf of p-values in different scenarios. Among others, we consider block dependent p-values, p-values for pairwise comparisons of means and p-values for testing pairwise correlations with respect to large correlation matrices. We develop sufficient conditions for convergence of the ecdf of p-values and asymptotic FDR control of corresponding multiple test procedures.

References

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