

Controlling False Discovery Proportion (FDP) in structured data sets

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Since the seminal work of Benjamini and Hochberg (1995) (BH) introducing the FDP, multiple testing procedures have found widespread applications across diverse domains. The BH procedure has facilitated the identification of significant variables within large data sets, providing insights to scientific questions spanning fields such as biology, clinical trials, and marketing research, by ensuring guarantees on the proportion of false discoveries. However, the BH procedure has several limitations, e.g. it is most effective for uniform p-values under the null; it is developed within a batch framework requiring simultaneous availability of all p-values; the false discovery control guarantees are only in expectation, among others. These limitations can lead to power loss, reduced interpretability, or even inflation in the Type I error rate in different contexts where we consider the data as “structured” such as the discrete, online, preordered, or weighted p-value settings.

In this presentation, I will introduce novel procedures and methodologies designed to accommodate these specific settings. These approaches are designed to effectively control Type I errors in expectation, whether in situations where our objective is to detect noteworthy elements by rejecting false null hypotheses or in cases where we aim to estimate the number of such elements through null proportion estimation.



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