

Multi-resolution false discovery exceedance control

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MaxT is a highly popular resampling-based multiple testing procedure, which controls the Familywise Error Rate (FWER) and is powerful under dependence. This paper generalizes maxT to what we term "multi-resolution" False Discovery eXceedance (FDX) control. Basic FDX control means ensuring that the FDP — the proportion of false discoveries among all rejections — is at most γ with probability at least $1 - \alpha$. Here γ and α are prespecified, small values between 0 and 1. Our method is in addition simultaneous, in the following way: the procedure outputs a single rejection threshold, but ensures that with probability $1 - \alpha$, simultaneously over all stricter thresholds, the corresponding FDPs are also below γ . In particular, for a small set of hypotheses, the FDP bound is 0, i.e., the FWER is 0. Despite these additional, simultaneous guarantees, our method has power comparable to Romano-Wolf, the most powerful non-simultaneous FDX method. Further, our method is valid under the same assumptions. Thus, this paper shows that FDX methods can often be made simultaneous almost for free.