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Title:  *AdaPT: An interactive procedure for multiple testing with side information*

Abstract:

We consider the problem of multiple hypothesis testing with generic side information: for each hypothesis we observe both a $p$-value and some predictor encoding contextual information about the hypothesis. For large-scale problems, adaptively focusing power on the more promising hypotheses (those more likely to yield discoveries) can lead to much more powerful multiple testing procedures. We propose a general iterative framework for this problem, called the Adaptive $p$-value Thresholding (AdaPT) procedure, which adaptively estimates a Bayes-optimal $p$-value rejection threshold and controls the false discovery rate (FDR) in finite samples. At each iteration of the procedure, the analyst proposes a rejection threshold and observes partially censored $p$-values, estimates the false discovery proportion (FDP) below the threshold, and either stops to reject or proposes another threshold, until the estimated FDP is below . Our procedure is adaptive in an unusually strong sense, permitting the analyst to use any statistical or machine learning method she chooses to estimate the optimal threshold, and to switch between different models at each iteration as information accrues.

This is joint work with Lihua Lei.