P-values adjustment with False Discovery Rate (FDR)

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In cases we are making multiple pairwise comparisons, one needs to correct the result for multiple comparisons. The most conservative method is Bonferroni correction, however it is overly pessimistic. A more used procedure is false discovery rate, FDR. Hereunder I provide a pseudocode illustrating this method.

Publication: https://pubs.acs.org/doi/10.1021/acs.jproteome.7b00170

Input: a list $\mathcal{P}$ of *P*-values obtained from statistical significance tests.
the proportion of false discoveries π_0.
Output: a list of the adjusted values.

initialize $\widehat{FDP}$ = [], FDR = []
$\mathcal{P}^{(\text{asc})}$ = sort the *P*-values $p \in \mathcal{P}$ in ascending order; s.t. $p_i \leq p_{i+1} \forall i \in [1, |\mathcal{P}|) \cap \mathbb{N}$
for every *P*-value $p_k \in \mathcal{P}^{(\text{asc})}, k \in [1, |\mathcal{P}|] \cap \mathbb{N}$
compute a **False Discovery Proportion (FDP)** estimate of the False Discovery Rate:

$$\widehat{FDP}[k] = \frac{p_k \times |\mathcal{P}| \times \pi_0}{k}$$

for every $k \in [1, |\mathcal{P}|] \cap \mathbb{N}$
compute the **False Discovery Rate (FDR)**: $FDR[k] = \min_{i \geq k} \{\widehat{FDP}[i]\}$

return $FDR[0: |\mathcal{P}|]$