

Supplementary Materials for

**An empirical Bayes optimal discovery procedure based on  
semiparametric hierarchical mixture models**

Hisashi Noma<sup>\*</sup> and Shigeyuki Matsui

Department of Data Science, The Institute of Statistical Mathematics

10-3 Midori-cho, Tachikawa, Tokyo 190-8562, Japan

<sup>\*</sup>e-mail: [noma@ism.ac.jp](mailto:noma@ism.ac.jp)

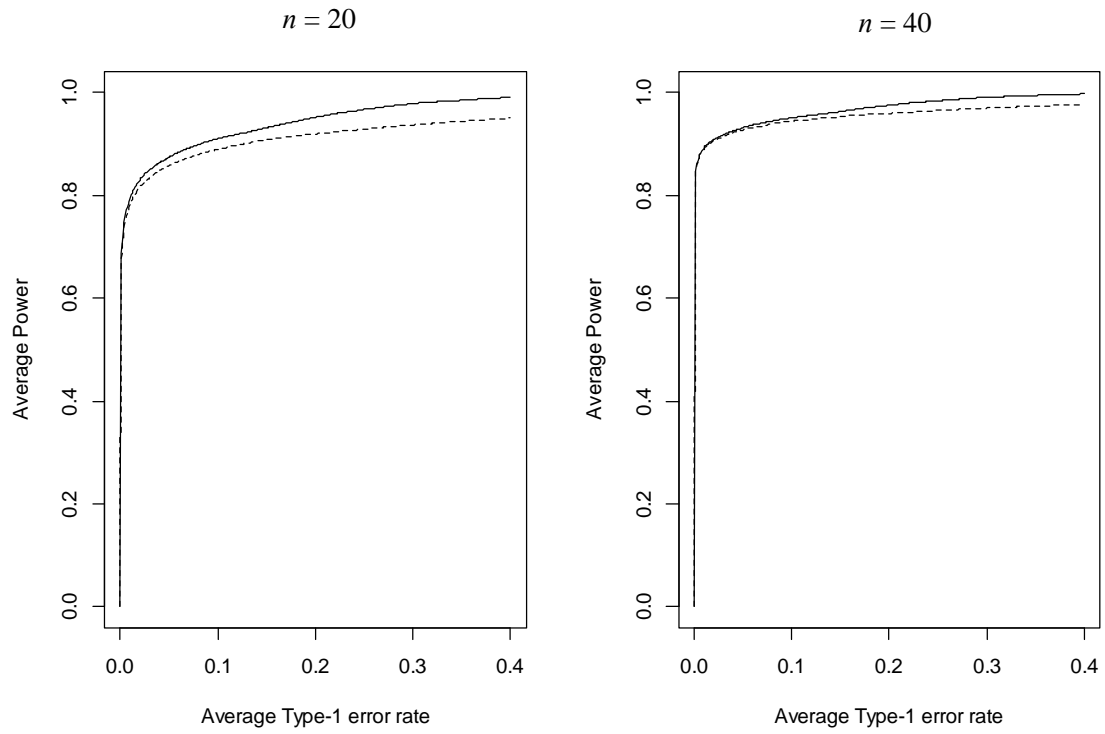
In this supplementary material, we provide small simulation results for checking the correctness of our proposed empirical Bayes method. We assessed the performances by comparing *average power*, which is defined as  $ETP/m_1$  for a certain *average type I error rate*,  $EFP/m_0$ , with the Storey (2007) *et al.*'s method. Simulation data were generated using the two-stage sampling model presented in Section 3,

$$\begin{aligned}x_{k1}, \dots, x_{kn_0} &\sim N(\mu_{0k}, \sigma_k^2) \\ y_{k1}, \dots, y_{kn_1} &\sim N(\mu_{1k}, \sigma_k^2)\end{aligned}$$

with a prior distribution

$$\begin{aligned}\mu_{0k} &\sim N(0, 1) & (k = 1, 2, \dots, 2000) \\ d_k &\sim \pi_0 \delta(\theta) + \pi_1 N(0.40, 0.10^2) \\ \sigma_k^2 &\sim \text{Gamma}^{-1}(1.00, 0.02).\end{aligned}$$

We considered equal sample sizes between classes, that is,  $n_0 = n_1 = n / 2$ , with  $n = 20$  or  $40$ . We conducted 100 simulations for each setting. Simulation results are presented at Figure S1. The average power of the proposed method was greater than that of the Storey *et al.* (2007)'s method, uniformly.



**Figure S1.** Simulation results: The proposed semiparametric empirical Bayes method (solid line) and the Storey *et al.* (2007)'s method (dashed line).

### Reference

Storey, J. D., Dai, J. Y., Leek, J. T. (2007). The optimal discovery procedure for large-scale significance testing, with applications to comparative microarray experiments. *Biostatistics* **8**: 347-368.