Bayesian Selective Inference

Selective inference is statistical inference for parameters selected after viewing the data. Selective inference methodology consists of methods for selecting "interesting" parameters and methods for providing valid marginal inferences for the selected parameters. In my series of lectures I will describe frequentist approaches for providing selective inference and present Bayesian methodology for selecting "interesting" parameters and for providing valid marginal inferences for the selected parameters.

In the first lecture I will explain the relation between selective inference, simultaneity, post-hoc inference, and control over the False Discovery Rate. I will also show how the Benjamini-Hochberg FDR controlling procedure performs valid parameter selection and how it can be extended to construct confidence intervals for selected parameters. In the second lecture I will explain the inherent sub-optimality of using the Benjamini-Hochberg procedure for selecting parameters and I will present joint work with Ruth Heller: eBayes FDR controlling procedures for discovering replicability in genomics that are considerably more powerful than the Benjamini-Hochberg procedure. In the third lecture I will present methodology for constructing exact significance tests for cross tabulated data for ``difficult'' composite alternative hypothesis for which there is no natural test statistic. The tests are Bayesian extensions of the likelihood ratio test, that are optimal with respect to the prior distribution and are closely related to Bayes factors and Bayesian FDR controlling testing procedures. In the fourth lecture I will introduce a Bayesian framework for providing inference for selected parameters.