Department of Decision Sciences

Statistics Seminar

Testing hypotheses via a mixture estimation model

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Abstract

We consider a novel paradigm for Bayesian testing of hypotheses and Bayesian model comparison. Our alternative to the traditional construction of posterior probabilities that a given hypothesis is true or that the data originates from a specific model is to consider the models under comparison as components of a mixture model. We therefore replace the original testing problem with an estimation one that focus on the probability weight of a given model within a mixture model. We analyse the sensitivity on the resulting posterior distribution on the weights of various prior modelling on the weights. We stress that a major appeal in using this novel perspective is that generic improper priors are acceptable, while not putting convergence in jeopardy. Among other features, this allows for a resolution of the Lindley-Jeffreys paradox. When using a reference Beta B(a,a) prior on the mixture weights, we note that the sensitivity of the posterior estimations of the weights to the choice of a vanishes with the sample size increasing and advocate the default choice a=0.5, derived from Rousseau and Mengersen (2011). Another feature of this easily implemented alternative to the classical Bayesian solution is that the speeds of convergence of the posterior mean of the weight and of the corresponding posterior probability are quite similar.

Joint work with K. Kamary, K. Mengersen and J. Rousseau.

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