

Assessing Bayes Factor Surfaces Using Interactive Visualization and Computer Surrogate Modeling

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Bayesian model selection provides a natural alternative to classical hypothesis testing based on p-values. While many papers mention that Bayesian model selection is frequently sensitive to prior specification on the parameters, there are few practical strategies to assess and report this sensitivity. This talk has two goals. First, we aim educate the broader statistical community about the extent of potential sensitivity through visualization of the Bayes factor surface. The Bayes factor surface shows the value a Bayes factor takes (usually on the log scale) as a function of user-specified hyperparameters. We provide interactive visualization through an R shiny application that allows the user to explore sensitivity in Bayes factors via the Bayes factor surface in a familiar regression setting. We compare the surface with three automatic procedures. Second, we suggest surrogate modeling via Gaussian processes to visualize the Bayes factor surface in situations where computation of Bayes factors is expensive. We consider a portfolio balancing example where a Bayes factor assesses the distribution of residuals in a model that includes shrinkage on regression coefficients and reversible jump steps for variable selection. We suggest Bayes factor surfaces are valuable for scientific reporting since they (i) make potential instability in Bayes factors easy to visualize, (ii) generalize to simple and more complicated examples, and (iii) provide a path for researchers to assess the impact of prior choice on modeling decisions in a wide variety research areas.