

From Thomas Bayes to Big Data: On the feasibility of being a subjective Bayesian

Abstract

We argue that the Bayesian paradigm, in which a prior represents the statistician's beliefs before observing the data, is not feasible in ultra-high-dimensional models. We claim that natural priors representing a priori beliefs fail in unpredictable ways at parameter values that cannot be honestly ignored. We do not claim that the frequentist estimators we present cannot be mimicked by Bayesian procedures, but that these Bayesian procedures do not represent beliefs. They were created with the frequentist analysis in mind, and in most cases, they cannot represent a consistent set of beliefs about the parameters (for example, since they depend on the loss function, the particular functional of interest, and not only on the a priori knowledge, different priors should be used for different analyses of the same data set). In a way, these are

Frequentist procedures using Bayesian techniques.

The paper presents several examples in which the subjective point of view fails. It is argued that the arguments based on Wald's and Savage's seminal works are not relevant to the validity of the subjective Bayesian paradigm. The discussion tries to deal with the fundamentals, but the argument rests on firm mathematical proofs.

On the way, we explain that Thomas Bayes wasn't Bayesian, although Richard Price probably was.