Model Falsification From A Bayesian Viewpoint With Applications To System Identification And Model Selection

Agnimitra DASGUPTA, Erik JOHNSON

Bayesian and model falsification inference developed independently, the former using observations to update prior beliefs about hypotheses to yield a posterior that probabilistically represents an inverse problem's solution space, and the latter excluding a hypothesis whose predictions are statistically inconsistent with the observations. The key difference between them is that falsification does not require specifying a likelihood. In practice, model falsification samples models independently from a prior density and falsifies one or more samples; this process resembles an approximate Bayesian computation (ABC) wherein the falsifier plays the role of a discrepancy measure. We show rigorously how different model falsifiers can be embedded within ABC methods and the 'noisy' likelihoods they lead to. Our reinterpretation of model falsification opens the possibility of simulation based inference using new discrepancy measures, as demonstrated on two numerical examples.