Department of Decision Sciences

Statistics Seminar

Fiducial, confidence and objective Bayesian posterior distributions

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Abstract

Both objective Bayesian analysis and fiducial inference can be seen as attempts to derive distributions for an unknown parameter without any prior information. Thus, it is natural to inquire on their relationships. We propose a way to construct fiducial distributions using a step-by-step conditional procedure related to the inferential importance of the parameter components. To solve the well known non-uniqueness problem for discrete models, we use the geometric mean of the "extreme" fiducial distributions, and show its good behavior. Connections with the generalized fiducial inference approach developed by Hannig and with confidence distributions are also analyzed. The suggested procedure coincides with the original Fisher's proposal for continuous models with a real parameter. The dependence of our fiducial distribution on the importance ordering of the parameter components naturally suggests to consider the reference posterior as the objective Bayesian counterpart. Indeed, we show that in many cases they coincide. This happens for example for location-scale models, real exponential families and a subclass of multivariate exponential family including the multinomial and the negative-multinomial models. More generally, when the coincidence does not hold, asymptotic results can be obtained. Besides showing the asymptotic normality of the fiducial distribution, for univariate parameter models we prove that its expansion is equivalent up to an error of $O(n^{-1})$ with that of the Jeffreys posterior. A comparison of the coverage of the fiducial intervals with that of other common intervals proves the good behavior of the former.

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