PETER MCCULLAGH

A Symposium Celebrating his 65th Birthday

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Aspects of Bayesian Higher-Order Asymptotics

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ABSTRACT

First-order asymptotic distribution theory for parametric Bayesian inference is unsurprisingly unremarkable, in light of known results for frequentist likelihood-based procedures. Yet, in the small- to moderate-sample setting, which is of greatest practical relevance, less is known about Bayesian parametric inference, relative to what is known about likelihood methods. Specifically, the toolbox for refinements of large-sample theory for posterior distributions is missing some standard tools from the frequentist setting. McCullagh (1984, 1987) provided us with deeper insights into the theory of cumulants, and supplied tensor methods for studying refinements to first-order distribution theory. Putting some of these methods to good use, I will discuss two different types of refinements to Bayesian large-sample theory. First, I consider a general approach to asymptotic expansions for posterior densities, and show how the resulting expansions are often more accurate than existing approaches. Second, I study decompositions of asymptotic refinements in the posterior framework which can shed light on the effects of nuisance parameters on inference for interest parameters.