Bayesian Robustness
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ON LOCAL SENSITIVITY MEASURES IN BAYESIAN ANALYSIS

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The sensitivity of Bayes procedures to the choice of a prior distribution is a major concern for many Bayesians. A Bayesian analysis strongly depends on modeling assumptions which make use of both prior and likelihood and to study the impact of it on the utility function. In this paper we investigate the effects of dual perturbations (prior and/or likelihood) on the posterior inference. In particular, we develop local sensitivity measures to detect how sensitive the posterior is with respect to simultaneous perturbations in both prior and likelihood. We then apply our methodology in (generalized) linear models to study the effects on posterior distributions (or measures) using some notion of distance between probability measures. Finally, discussion and an example using real data are provided.

1. Introduction. A Bayesian analysis depends strongly on the modeling assumptions, which make use of both prior and likelihood to study the impact on the utility function. Even after fitting a standard statistical model to a given set of data, one does not feel comfortable unless some sensitivity checks are made for model adequacy. One way to measure the sensitivity of the present model is to perturb the base model in potentially conceivable directions to determine the effect of such alterations on the analysis. In many situations, it is often difficult to specify or elicit a method that would yield a convincing prior. The problem becomes more difficult for high dimensional parameters. Thus, to perform a complete Bayesian analysis, one must use some sensitivity measures to check model adequacy. Notable references are due to Berger (1984,1990,1994) and those contained therein. The sensitivity analysis or the robustness issues in Bayesian inference can be classified into two broad categories, global and local sensitivity. In global analysis one considers a class of reasonable priors and calculates the range of quantities of interest.

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