Bayesian variable selection and classification with control of predictive values

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Abstract

In clinical development, the selection of novel prognostic biomarkers has to be paired with the evaluation of the clinical utility of the risk score defined by these biomarkers. Before we apply the selected markers into routine standard care, for classification or patient selection, a cutoff value must be assessed based on the positive (PPV) and negative (NPV) predictive value. In this presentation, we propose a Bayesian variable selection method which incorporates information about the predictive values into the biomarker selection process and simultaneously estimates the cutoff value on the risk score of the selected markers. A step function is used to model the probability of response, such that the cutoff and predictive values are parameters of the model. This model allows for a pre-specification of a minimum PPV (or NPV equivalently) in the variable selection algorithm. The choice of different prior distributions is compared and discussed via simulation studies and a real data application.