Heuristics as a special case of Bayesian Inference

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Abstract: Probabilistic inference models (e.g. Bayesian models) are often cast as being rational and at odds with simple heuristic approaches. We show that prominent decision heuristics, take-the-best and tallying, are special cases of Bayesian inference. We developed two Bayesian learning models by extending two popular regularized regression approaches, lasso and ridge regression. The priors of these Bayesian models match the environmental structures necessary for tallying and take-the-best to succeed. Provably, the Bayesian models become equivalent to the heuristics as their priors become more extreme; hence they subsume heuristics and standard linear regression. In a re-analysis of datasets favouring heuristic approaches, we show that our Bayesian extension of ridge regression outperforms tallying and linear regression. A similar result holds for our Bayesian extension of lasso regression and the take-the-best heuristic. This indicates that true environmental structure and potentially psychological processing often lie somewhere between the assumptions of heuristic and standard regression approaches.