Extending the Integrated Laplace Approximation

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The Integrated Nested Laplace Approximation and its associate R-INLA package provide a suitable framework for approximate Bayesian inference. In particular, R-INLA will fit complex Bayesian hierarchical models in a fraction of the time required by other computational intensive methods such as Markov chain Monte Carlo. However, a limitation of INLA is that in order to fit a model it needs to be implemented within R-INLA. Also, INLA only provides marginal inference of the model parameters and other related quantities.

In this work we will show how to extend INLA and R-INLA by combining it with MCMC. In this way, we will provide an easy way to extend the number of models that R-INLA can fit, as well as other other important topics such as (low dimension) multivariate inference and handling missing values in the covariates of regression models.