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An introduction to INLA with a comparison to JAGS

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Abstract:

During the last three decades, Bayesian methods have developed greatly and are now widely established in many research areas, from clinical trials, to health economic assessment, to the social sciences, to epidemiology.

The main challenge in Bayesian statistics resides in the computational aspects. Markov Chain Monte Carlo (MCMC) methods are normally used for Bayesian computation, arguably thanks to the wide popularity of the `BUGS` software. While extremely flexible and able to deal with virtually any type of data and model, in all but trivial cases MCMC methods involve computationally- and time-intensive simulations to obtain the posterior distribution for the parameters. Consequently, the complexity of the model and the database dimension often remain fundamental issues.

The Integrated Nested Laplace Approximation (INLA) approach has been recently developed as a computationally efficient alternative to MCMC. INLA is designed for *latent Gaussian models*, a very wide and flexible class of models ranging from (generalized) linear mixed to spatial and spatio-temporal models. For this reason, INLA can be successfully used in a great variety of applications, also thanks to the availability of an `R` package named `R-INLA`.

In this talk, we first briefly review the basics of Bayesian computation; then we move on to discuss latent Gaussian models and their computational advantages; finally, we present the fundamental characteristics of the INLA approach. We present a set of worked examples and discuss the modelling assumptions needed, with particular reference to the MCMC counterpart, which we described using JAGS.