

# An overview of the R-INLA project

Håvard Rue  
King Abdullah University of Science and Technology  
Saudi Arabia  
`{haavard.rue,haakon.bakka}@kaust.edu.sa`

## Abstract

Most generalised linear mixed models (GLMMs), generalised additive models (GAMs), spline models, spatial models, and survival models, have one attribute in common: they contain a high-dimensional Gaussian distribution. In R-INLA ([www.r-inla.org](http://www.r-inla.org)) we use fast numerical methods for sparse matrices to do approximate Bayesian inference for all of these models quickly. Non-Gaussian likelihoods are included via the integrated nested Laplace approximation (INLA), and spatial models through the SPDE approach. The speed and accuracy obtained with the R-INLA package make even complicated and large models that were earlier considered as unpractical, now ready for routine use. A key example here is the class of log-Gaussian Cox processes.

In this talk, I will review the basic ideas behind R-INLA, discuss why it works and show some examples of its usage. I will end by discussing some work-in-progress, like how to deal with joint survival models of various types, and how to construct good models for non-separable space-time models based on time-dependent stochastic partial differential equations.