

Exercise : INLA and TMB

You might want to look at these two papers, in addition to the Rue et al. (2009) INLA paper:

Recent 'tutorial' of INLA: <https://arxiv.org/pdf/1907.01248.pdf>

A 'gentle tutorial' to INLA: <https://www.precision-analytics.ca/blog/a-gentle-inla-tutorial/>

a) INLA

Download and install the R-INLA package. Look at Martino and Riebler (2019) paper, or these resources:

<http://www.r-inla.org/download>

<https://bitbucket.org/hrue/r-inla/src/default/rinla/>

b) INLA Salmonella example

Consider the dataset with Salmonella in Section 4 of <https://arxiv.org/pdf/1907.01248.pdf>.

- Define the hierarchical latent Gaussian model for the Poisson data.
- Run INLA code and interpret results. See Section 4 of paper <https://arxiv.org/pdf/1907.01248.pdf> and <http://www.r-inla.org/download>
- Try a different correlation structure for the latent Gaussian process, with common latent effects. Play with different prior distributions for the log precision.

c) INLA Tokyo example

<https://folk.ntnu.no/joeid/MA8702/tokyo.pdf>

<https://folk.ntnu.no/joeid/MA8702/Tokyo.txt>

- Define the hierarchical latent Gaussian model for the binomial data.
- Run INLA code and interpret results.
- Try a different correlation structure for the latent Gaussian process (iid, rw, rw2).

```
formula = y ~ f(time, model="rw1", cyclic=TRUE, param=c(1,0.0001)) - 1
result = inla(formula, family="binomial", Ntrials=n, data=Tokyo, verbose
= TRUE)
summary(result)
plot(result)
```

- Try a different correlation structure for the latent Gaussian process (rw1, rw2, iid).

d) TMB (if time)

Prepare for TMB use: http://folk.ntnu.no/joeid/HJS_TMB_prepare.pdf.

<https://cran.r-project.org/web/packages/glmmTMB/vignettes/glmmTMB.pdf>

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- Re-do the Salmonella datasets using Automatic Differentiation in glmmTMB.
- Use a "Matern" covariance for the latent Gaussian process here.
- Compare the results.