The inla-program

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Generalised additive (mixed) models

Linear predictor

$$\eta_i = \sum_j w_{ij} f_j(c_{ij}) + \sum_k \beta_j \widetilde{c}_{ij} + \epsilon_i$$

where

- each $f_j(\cdot)$, is a (Gaussian) random "function" at (fixed) c_{ij}
- $\{w_{ij}\}$ are *fixed* weights
- β_j is the linear effect of (fixed) $\widetilde{c}_{ij}$

Observations $\{y_i\}$

$$y_i \mid \ldots \sim \pi(y_i \mid \eta_i)$$

Latent field $\mathbf{x} = \{\{f_j\}, \{\beta_j\}, \{\eta_i\}\}$

Overview I

Define the model

- The model is specified in a `.ini`-file
- Likelihood model
- Each `f`-term
- The covariates $\{c_{ij}\}$ and $\{\widetilde{c}_{ij}\}$
- Priors etc

Do the analysis

- Run the `inla`-program with this `.ini`-file

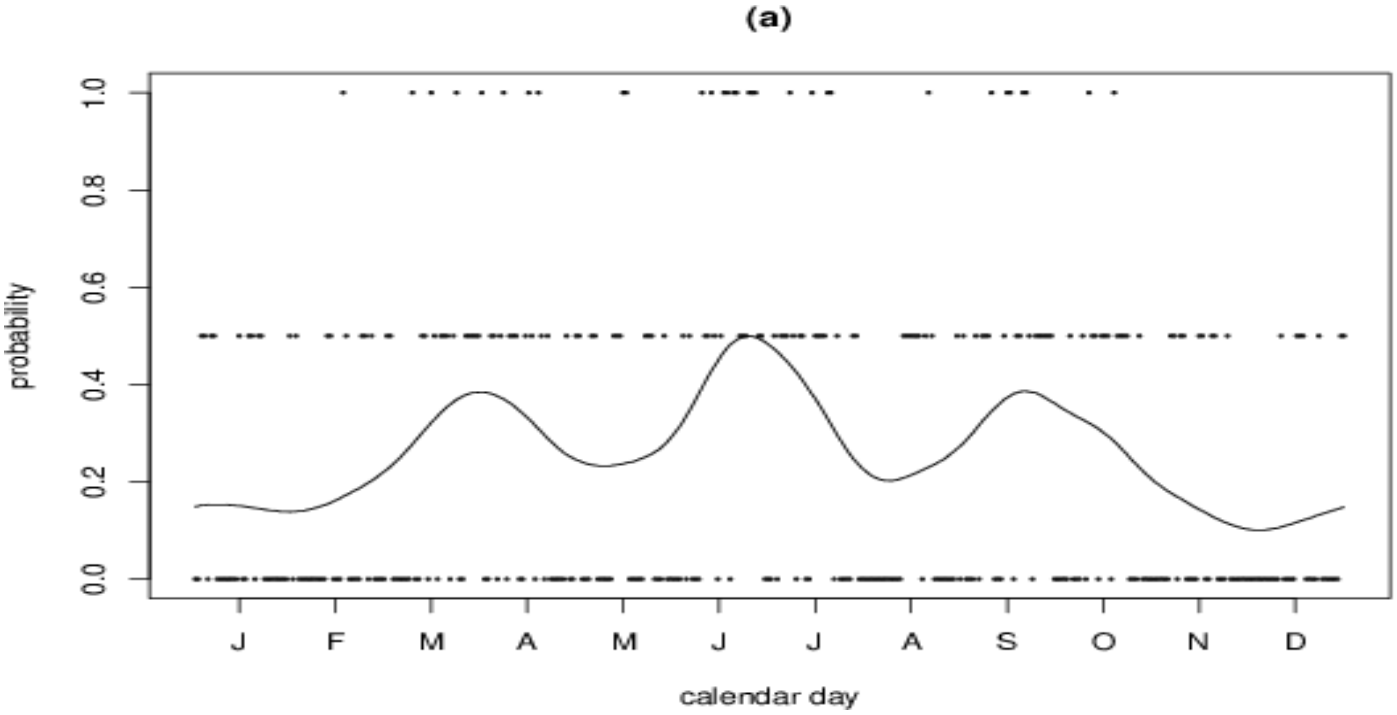
Get the results

- Read the results from the appropriate results-files

Overview II

- The `inla`-program is a standalone program build upon the `GMRFLib`-library
- Precompiled versions for the Intel-processor, available for Linux, Mac and Windows
- Has a nice `R`-interface (after lunch)
- Most of the features are available from the `R`-interface, but not all.
- Sometimes it's more convenient with work with the program directly...

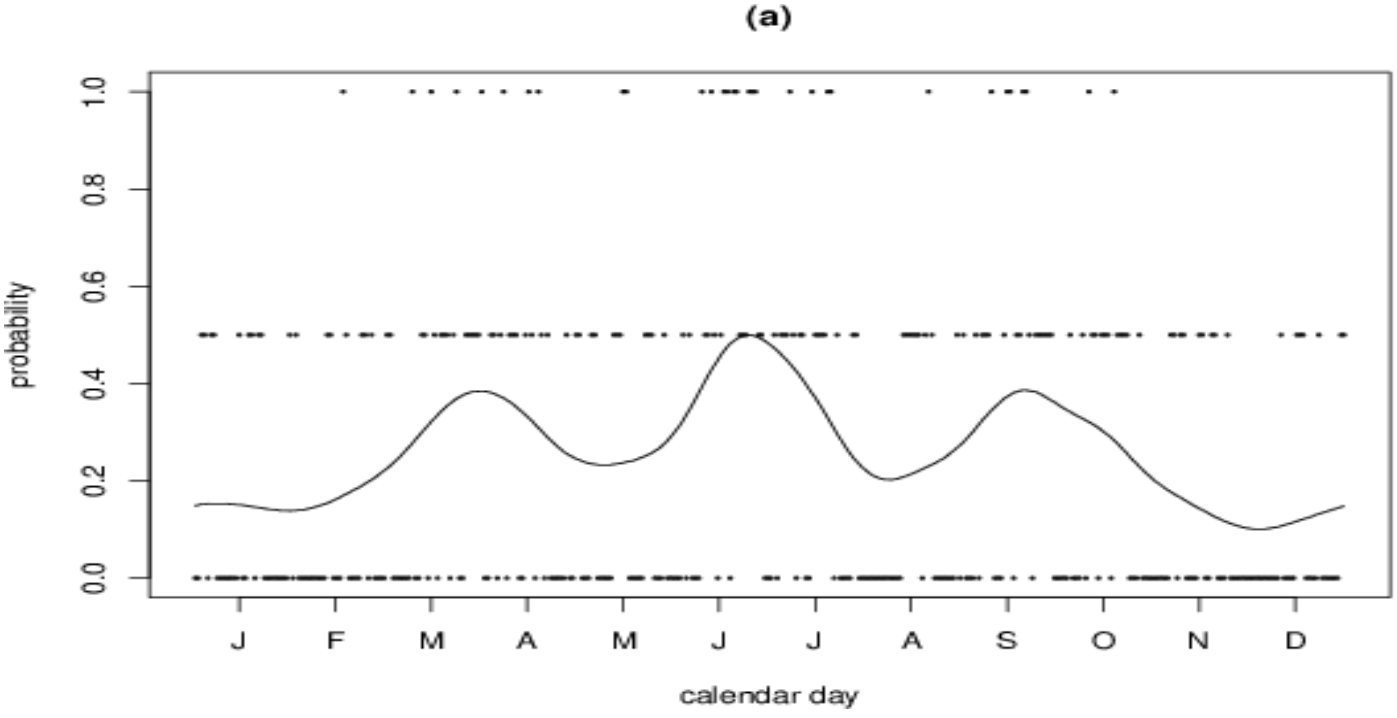
Tokyo rainfall data



Stage 1 Binomial data

$$y_i \sim \begin{cases} \text{Binomial}(2, p(x_i)) \\ \text{Binomial}(1, p(x_i)) \end{cases}$$

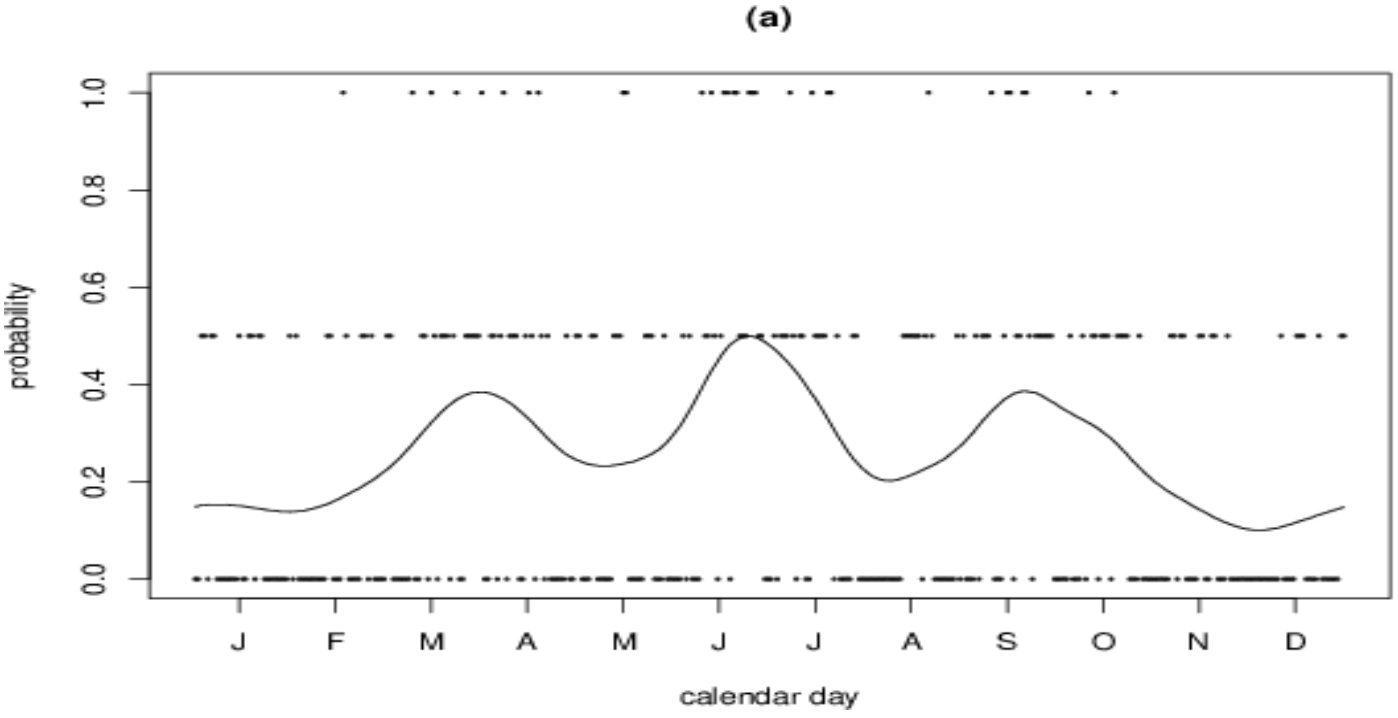
Tokyo rainfall data



Stage 2 Assume a smooth latent $\mathbf{x}$,

$$\mathbf{x} \sim RW2(\kappa), \qquad \text{logit}(p_i) = x_i$$

Tokyo rainfall data



Stage 3 Gamma(α, β)-prior on κ

Likelihood models

- L_GAUSSIAN
- L_T
- L_POISSON
- L_BINOMIAL
- L_STOCHVOL
- L_STOCHVOL_T
- L_STOCHVOL_NIG
- L_LOGPERIODOGRAM
- L_EXPONENTIAL
- L_WEIBULL

"ffield"-models

- F_RW2D
- F_BESAG ("CAR" model)
- F_SEASONAL
- F_IID
- F_2DIID
- F_RW1
- F_RW2
- F_CRW2
- F_AR1
- F_GENERIC