Schedule

- 16 Jan: Gaussian processes (Jo Eidsvik)
- 23 Jan: Hands-on project on Gaussian processes (Team effort, work in groups)
- 30 Jan: Latent Gaussian models and INLA (Jo Eidsvik)
- **6 Feb: Hands-on project on INLA (Team effort, work in groups)**
- 12-13 Feb: Template model builder. (Guest lecturer Hans J Skaug)
- To be decided...

Install INLA

Go to `http://www.r-inla.org/download`
Download and install R-INLA.

Project A: analyzing dataset with epileptic patients

Consider the example in Sect 5.2 of Rue, Martino and Chopin (2009).

- Write down the latent Gaussian model for the Poisson data.
- What is over-dispersion?
- Download EPIL data and code from R-INLA
  `http://www.r-inla.org/examples/volume-1`
- Run INLA code and interpret results.

Project B: analyzing Tokyo rainfall data

Consider the dataset with rainfall in Tokyo
`https://folk.ntnu.no/hrue/r-inla.org/examples/tokyo/tokyo.pdf`

- Write down the latent Gaussian model for the binomial data.
- Download Tokyo data and code from R-INLA
  `http://www.r-inla.org/examples/volume-1`
- Run INLA code and interpret results.
- Try a different correlation structure for the latent Gaussian $f(t)$.

Project C: Spatial regression model

Consider like in GP project, the spatial regression model:
$Y(\boldsymbol{s}) = \boldsymbol{X}(\boldsymbol{s})\boldsymbol{\beta} + w(\boldsymbol{s}) + \epsilon(\boldsymbol{s})$.
True model:

- $\boldsymbol{s}$ is location on a regular grid in the unit square.
- $Y(\boldsymbol{s}) = \beta + w(\boldsymbol{s}) + N(0, \tau^2)$, $\beta = 1$, $\tau^2 = 0.1^2$.
- Exponential covariance: $\text{Cov}(w(\boldsymbol{s}), w(\boldsymbol{t})) = \sigma^2 \exp(-\phi|\boldsymbol{s} - \boldsymbol{t}|)$, $\sigma^2 = 1^2$, $\phi = 6$.

Project C: Spatial regression model using INLA and SPDE

Use the INLA and SPDE framework for posterior inference of parameters from the data.
`http://www.r-inla.org/examples/tutorials/spde-from-the-isba-bulletin`