

**Format: Online live using Zoom**

# GLMs and GAMs with Spatial, Temporal or Spatial-Temporal Correlation using R-INLA

**Provided by: Highland Statistics Ltd**

## Course Overview

This course offers a practical introduction to the analysis of spatial, temporal, and spatial-temporal data using generalised linear models (GLMs) and generalised additive models (GAMs) in R-INLA.

We begin with how to add spatial structure to regression models using frequentist techniques, and then introduce Bayesian methods, focusing on how to implement models with spatial and temporal dependency using R-INLA. The course covers a range of data types and distributions, including Gaussian, Poisson, generalised Poisson, negative binomial, Bernoulli, and Tweedie.

Participants will learn how to build models that incorporate spatial correlation, temporal trends, and spatio-temporal structure, and how to address practical challenges such as modelling in the presence of natural barriers (e.g., coastlines, forests) that prevent spatial correlation from extending freely across space, such as marine/terrestrial boundaries or fragmented habitats. We will also cover the use of more complex spatial meshes and multivariate likelihoods to accommodate study areas with isolated groups of sites.

Through hands-on exercises, you will gain experience in fitting and interpreting models for continuous, count, and binary data, and understand how to adapt your models to the specific structure and distribution of your data.

This is an applied and non-technical course that focuses on the practical implementation in R.

## Dates:

- 6 - 10 October 2025.
- 08.30 - 16.00 UK time.

**Format:** Online live.

## Price:

- Early bird registration (May and June): 450 GBP
- July - October: 500 GBP

**Maximum number of participants:** 12

**Included:** 1 hour face-to-face video chat about your data

## Instructors:

- Dr. Alain Zuur
- Dr. Elena Ieno

Authors of 12 books and providers of over 250 courses.

**Maximum number of participants: 12. Early bird registration with reduction.**



## COURSE CONTENT

### Module 1

- General introduction.
- Theory presentation on adding temporal dependency, and spatial dependency to a regression model using frequentist techniques.
- One exercise showing how to add spatial dependency to a regression model using frequentist tools.
- Brief introduction to Bayesian analysis.
- Conjugate priors. Diffuse versus informative priors.

### Module 2

- Short theory presentation on INLA.
- Exercise showing how to execute a linear regression model in R-INLA.
- Exercise showing how to add spatial correlation to a linear regression model using R-INLA.
- Exercise showing how to execute a Poisson GLM in R-INLA.

### Module 3

- Exercise showing how to add spatial correlation to a Poisson GLM.
- Short theory presentation on GAMs.
- Exercise on executing a Gaussian GAM in R-INLA
- Exercise on adding spatial correlation to a Gaussian GLM/GAM

### Module 4

- Catching up
- Exercise showing how to add spatial correlation to a negative binomial GLM. With a barrier.
- Exercise showing how to add spatial correlation to a Bernoulli GLM.
- Exercise showing how to add temporal correlation to a GLM/GAM.

### Module 5

- Exercise showing how to add spatial-temporal correlation to a Poisson or negative binomial GLM/GAM.
- Exercise showing how to add spatial-temporal correlation to a Tweedie GLM/GAM.
- Exercise showing how to add spatial-temporal correlation to a Bernoulli GLM/GAM.

We reserve the right to change the exercises. Pdf files of all theory material will be provided. All exercises consists of data sets and annotated R scripts. Access to the course website is for 12 months. The course website also contains on demand video.

### PRE-REQUIRED KNOWLEDGE:

Working knowledge of R, data exploration, linear regression and GLM (Poisson, negative binomial, Bernoulli). This is a non-technical course.

The course website provides preparatory materials, including on-demand videos and R scripts covering multiple linear regression, basic matrix notation, generalised linear models, model validation using DHARMA, and the explanation of variograms. If you are not familiar with these methods, please review them before the course begins.

### GENERAL

- Please ensure that you have system administration rights to install R, and R packages on your computer.
- Instructions what to install is on the course website.

## GENERAL INFORMATION

### FEE:

- **Early bird registration (May and June 2025): £450**
- **July -October: £500**

Credit card payments are charged in GBP currency.

VAT Charge:

- UK participants are charged a 20% VAT.
- Non-EU participants (including Norway and Switzerland) are not subject to VAT.
- We do not charge VAT to EU participants who provide their institutional VAT number.
- EU participants who do not provide a VAT number will be charged VAT at their national rate.
- Canadian participants are subject to GST/HST tax.
- Access to the course website is 12 months.

### COURSE TIMES (UK time):

- Monday - Friday: 08.30-16.00
  - Including a 60-minutes lunch break and two short 20 minutes tea/coffee breaks.

### FREE 1-HOUR FACE-TO-FACE MEETING

The course fee includes a 1-hour face-to-face meeting with one or both instructors. You can discuss your own data, but we strongly advice that the statistical topics are within the content of the course. The 1-hour consultancy needs to be consumed in one sessions, and will take place at a mutual convenient time. It is not transferable. The meetings needs to take place within 12 months after the last live zoom module.

## INFORMATION ON COURSE CONTENT

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