

Online course with on-demand video and live Zoom meetings

Zero-inflated GLMs, GAMs, GLMMs and GAMMs for the analysis of spatial, and spatial-temporal correlated data using R-INLA

Provided by: Highland Statistics Ltd

We will start with a short revision of multiple linear regression, followed by a basic introduction to Bayesian analysis, and we show how to execute a linear regression model in R-INLA.

In the second module we will explain how to deal with zero inflated count data and zero inflated continuous data using zero-inflated Poisson, zero-inflated negative binomial, and zero-inflated Gamma GLMs. We also explain hurdle models.

In the third module, we will introduce generalised additive models (GAM) to model non-linear relationships. We show how to execute these in mcmc and also in R-INLA.

In the fourth part of the course, we will revise linear mixed-effects models and implement these in R-INLA. We also apply generalised linear mixed-effects models (GLMM) and generalised additive mixed-effects model (GAMM) in R-INLA.

In the fifth part of the course, we will apply zero-inflated GAMs and GAMMs (and GLMMs) on various spatial correlated data sets.

In module 6, we apply GAM, GAMM and GLMM on spatial-temporal correlated data. We also deal with natural barriers for the spatial correlation (e.g. benthic species that live on a coral reef around an island). We will use barrier models; these ensure that spatial correlation seeps around a barrier (in this case an island).

All exercises are executed in R-INLA.

KEY WORDS

Zero inflation, GLM, GLMM, GAM, GAMM, spatial correlation, spatial-temporal correlation, barrier models, R-INLA, Bayesian analysis.

Date: 15-29 March 2021
6 months access

Multiple live meetings in different time zones.

Price: £995 + **1 hour free face-to-face video chat about your data**

Instructors:
Dr. Alain Zuur and
Dr. Elena Ieno

Authors of 11 books and providers of over 250 courses



COURSE CONTENT

Module 1: Revision and introduction to R-INLA

We start with a revision of data exploration and linear regression, followed by an introduction to , Bayesian statistics and R-INLA.

- An exercise revising multiple linear regression (frequentist approach).
- A short video explaining basic matrix algebra.
- A video presentation with a short introduction to Bayesian statistics and the role of priors.
- A video presentation explaining the basic principles of INLA.
- One exercise showing how to execute a linear regression model in R-INLA (Bayesian approach).
- **Web meeting 1: A 2-hour web-meeting will be scheduled.**

Module 2: Introduction to zero-inflated models

- A video presentation on the Poisson, negative binomial and Bernoulli distributions.
- A video presentation with a short revision of Poisson, negative binomial and Bernoulli GLM.
- One exercise showing how to execute a Poisson GLM in R-INLA.
- One exercise showing how to execute a negative binomial GLM in R-INLA.
- One exercise showing how to execute a Bernoulli GLM in R-INLA.
- A video presentation explaining models for zero-inflated count data (ZIP, ZINB, ZAP and ZANB models) and continuous data.
- Three exercises on the analysis of zero-inflated count data and continuous data using R-INLA.
- **Web meeting 2: A 2-hour web-meeting will be scheduled. We will summarise module 2.**

Module 3: Generalised additive models in R-INLA

- A video with a theory presentation on generalised additive models (GAM).
- One exercise showing how to execute a GAM with a Gaussian distribution in R-INLA.
- One exercise showing the application of a Poisson GAM in R-INLA.
- One exercise showing the application of a negative binomial GAM in R-INLA.
- One exercise showing the application of a Bernoulli GAM in R-INLA.
- **Web meeting 3: A 2-hour web-meeting will be scheduled. We will summarise module 3.**

Module 4: GAMM with interactions.

- A video presentation with a short revision of linear mixed-effects models.
- One exercise showing how to execute a linear mixed-effects model in R-INLA.
- One exercise showing how to execute a GLMM in R-INLA.
- One exercise showing how to execute a generalised additive mixed-effects model (GAMM) in R-INLA.
- A video presentation showing how to implement an interaction term between a smoother and a categorical covariate in a GAMM.
- One exercise showing how to execute a GAMM with an interaction between a smoother and a categorical covariate in R-INLA.
- **Web meeting 4: A 2-hour web-meeting will be scheduled. We will summarise module 4.**

Module 5: GAM and GAMM (and GLMM) applied to spatial correlated data.

- A short video explaining the essential steps of adding spatial correlation to a linear regression model.
- One exercise showing how to apply a linear regression model with spatial correlation in R-INLA.
- Four exercises on zero-inflated GAMs, GAMMs and GLMMs with spatial correlation in R-INLA.
- **Web meeting 5: A 2-hour web-meeting will be scheduled. We will summarise module 5.**

Module 6: GAM and GAMM (and GLMM) applied to spatial-temporal correlated data. Barrier models.

- Three exercises on the application of zero-inflated GAMs (and GAMMs and GLMMs) to spatial-temporal correlated data in R-INLA.
- Theory presentation on barrier models.
- One exercise showing how to apply a GAM/GLM with spatial correlation and a barrier.
- **Web meeting 6: A 2-hour web-meeting will be scheduled. We will summarise module 6.**

GENERAL INFORMATION

COURSE FEE: 995 GBP

- Credit card payments are charged in GBP currency.
- UK participants are subject to 20% VAT. EU participants (but non-UK) are not subject to UK VAT, but need to provide their institutional VAT number. Non-EU participants are not subject to VAT.

LIVE 2-HOUR ZOOM MEETINGS SUMMARISING THE MODULES

| | Module 1 | Module 2 | Module 3 | Module 4 | Module 5 | Module 6 |
|-----------------|----------|----------|----------|----------|----------|----------|
| 09.00-11.00 GMT | 11 March | 15 March | 18 March | 22 March | 25 March | 29 March |
| 19.00-21.00 GMT | 11 March | 15 March | 18 March | 22 March | 25 March | 29 March |

GMT = Greenwich Mean Time

- 09.00 London (GMT) = 10.00 Amsterdam / 17.00 Perth (Australia) / 19.00 Brisbane (Australia).
- 19.00 London (GMT) = 14.00 New York (US) / 12.00 Edmonton (Canada).
- Please use this link for a time zone converter: <https://www.timeanddate.com/>

[Click here for](#) recommended internet speed (see the text under 'Recommended bandwidth for Webinar Attendees'). We will record the meetings and make them available on the course website.

Course participants will be given access to the course website with all the videos, data sets, R solution code and course material on 1 January 2021.

Some Zoom summary sessions may take slightly longer than 2 hours, depending on the number of questions.

FREE 1-HOUR FACE-TO-FACE MEETING

The course fee includes a 1-hour face-to-face meeting with one or both instructors. The meeting needs to take place within 3 months after the last live zoom meeting. You can discuss your own data, but we strongly advice that the statistical topics are within the content of the course. The 1-hour needs to be consumed in one session, and will take place at a mutual convenient time.

COURSE MATERIAL:

- Pdf files of all presentations are provided. These files are based on various chapters from:
 - *Beginner's Guide to Spatial, Temporal and Spatial-Temporal Ecological Data Analysis with R-INLA. Volume II: GAM and Zero-Inflated Models* (2018). Zuur, Ieno. ISBN: 9780957174146.
 - This book is exclusively available from www.highstat.com
 - This book is not included in the course fee. The course can be followed without purchasing this book.

PRE-REQUIRED KNOWLEDGE:

Good knowledge of R, data exploration, linear regression and GLM (Poisson, negative binomial, Bernoulli). Working knowledge of mixed effects models. Short revisions are provided. This is a non-technical course.

CANCELLATION POLICY:

What if you are not able to participate? Once participants are given access to course exercises with R solution codes, pdf files of certain book chapters, pdf files of powerpoint files and video solution files, all course fees are non-refundable. However, we will offer you the option to attend a future course or you can authorise a colleague to attend this course. Terms and conditions see:

<http://highstat.com/index.php/courses>

RECOMMEND LITERATURE:

- *Beginner's Guide to Spatial, Temporal and Spatial-Temporal Ecological Data Analysis with R-INLA. Volume II: GAM and Zero-Inflated Models* (2018). Zuur and Ieno.
- *Beginner's Guide to Spatial, Temporal and Spatial-Temporal Ecological Data Analysis with R-INLA. Volume I: Using GM and GLMM*. Zuur, Ieno, Saveliev (2017).
- These books are exclusively available from www.highstat.com

GENERAL

- Please ensure that you have system administration rights to install R and R packages on your computer.
- Instructions what to install will be provided before the start of the course.

REGISTRATION

<http://highstat.com/index.php/courses>

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