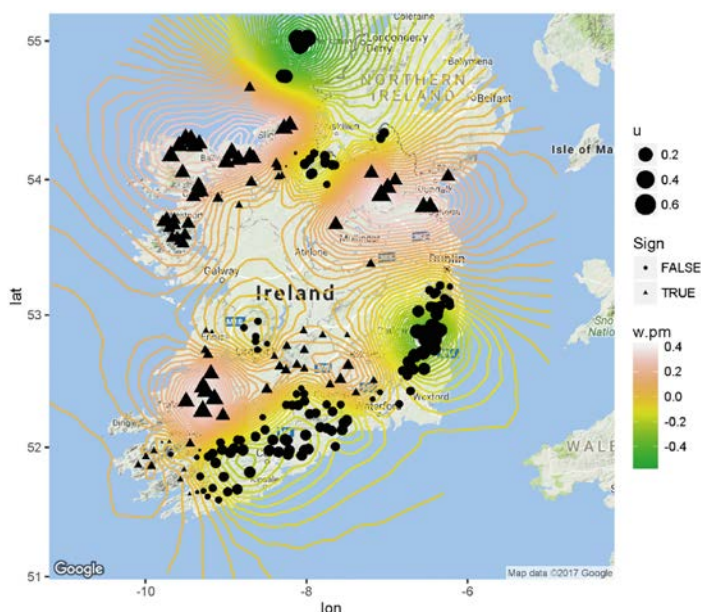# Introduction to Regression Models with Spatial and Temporal Correlation

Provided by: Highland Statistics Ltd

In cooperation with: Universiteit Antwerpen (Dr Lucinda Kirkpatrick)

Date & Venue

Date: 9 - 13 April 2018

Venue: D.012, Campus Drie Eiken, Universiteit Antwerpen, Antwerpen, Belgium

Instructors: Dr. Alain Zuur
　　　　　 Dr. Elena Ieno
Authors of 10 books and providers of over 250 courses

We begin with an introduction how to add dependency to regression models using frequentist tools. After discussing the limitations of this approach we switch to Bayesian techniques. R-INLA is used to implement regression models, generalised linear models (GLM) and generalised linear mixed models with spatial, temporal and spatial-temporal dependency. We will also discuss how to deal with dependency and islands, fjords and rivers.

During the course several case studies are presented, in which the statistical theory is integrated with applied analyses in a clear and understandable manner.
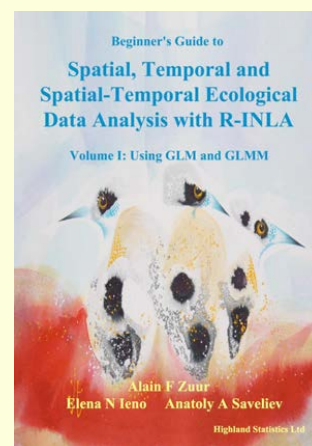
KEYWORDS

Adding spatial, temporal and spatial-temporal correlation to regression models, GLMs and GLMMs using R-INLA. Introduction to Bayesian analysis. Diffuse versus informative priors. Mixed effects models with spatial/temporal dependency. Dealing with islands, fjords and rivers.

COURSE CONTENT

Monday:
- General introduction.
- Theory presentation on options and limitations of adding dependency to a regression model using frequentist techniques: Temporal correlation, spatial correlation, mixed effects models.
- Short introduction to mixed effects models.
- Various exercises.
- Short introduction to Bayesian analysis.
- Conjugate priors.
- Diffuse versus informative priors.

Tuesday and Wednesday:
- Theory presentation on INLA.
- Fitting linear regression, mixed effects models and GLMs in R-INLA.
- Theory presentation on adding spatial correlation to regression models in R-INLA.
- Various exercises showing how to add spatial correlation to linear regression models, Poisson, negative binomial and Bernoulli GLMs. Solution files for applying gamma and binomial GLMs in R-INLA are provided.

Thursday - Friday:
- Theory presentation on temporal correlation in R-INLA.
- Various exercises.
- Theory presentation on adding spatial-temporal correlation in R-INLA.
- Various exercises showing how to add spatial-temporal correlation to GLM and GLMMs.

Posterior mean spatial random fields
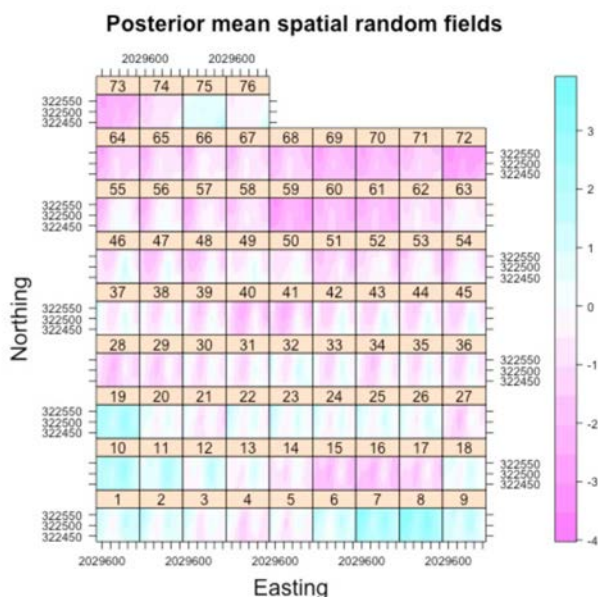
GENERAL INFORMATION

COURSE FEE: In-house

COURSE TIMES:
- Monday - Thursday: 09.00am to 16.00pm including 1 hour lunch break and a 20 minutes break both morning and afternoon.
- Friday: 09.00am to 12.45pm including a 20 minutes break.

COURSE MATERIAL:
- Pdf files of all powerpoint presentations are provided
- The powerpoint files are based on various chapters from:
  - Zuur, Ieno, Saveliev (2017). *Beginner's Guide to Spatial, Temporal and Spatial-Temporal Ecological Data Analysis with R-INLA*.
  - 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, GLM (Poisson, negative binomial, Bernoulli). Working knowledge of mixed effects is beneficial (though not required). 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:
- Zuur, Ieno, Saveliev (2017). *Beginner's Guide to Spatial, Temporal and Spatial-Temporal Ecological Data Analysis with R-INLA*.
- This book is exclusively available from www.highstat.com

GENERAL
- You need to bring your own laptop.
  - 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.
- You will be given access to a course website with around 20 - 25 fully worked out R exercises. These are all based on published papers and real data sets.
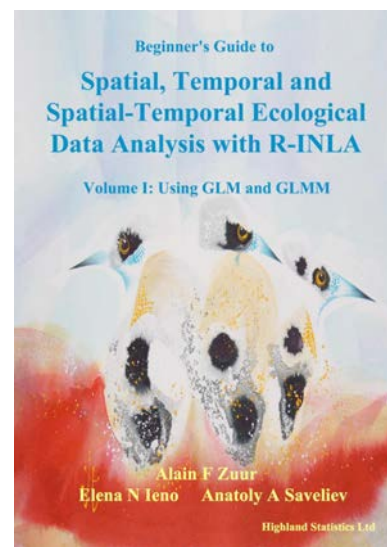
REGISTRATION

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