Hybrid course (onsite for IMR staff and online for external participants)

An introduction to the World of GLMM

Provided by: Highland Statistics Ltd

Organised by: The IMR Academy, Institute of Marine Research, Bergen, Norway

This is an onsite course for IMR staff and students, with the option for non-IMR participants to join online via Zoom.

We will begin our journey into the world of Generalised Linear Mixed-Effects Models (GLMMs) with a step-by-step revision exercise on data exploration and linear regression. Next, we will introduce linear mixed-effects models, which are essential for analysing hierarchical or clustered data, such as multiple observations from the same vessel, catch, pen in a fish farm, animal, site, lake, or area. Keywords at this stage are dependency, pseudo replication, model diagnostics, model interpretation and model visualisation.

In the second part of the course, GLMMs are applied to count data, binary data (e.g. absence/presence of a disease), proportional data (e.g. % coverage), and continuous data with or without zeros, using the Gaussian, Poisson, negative binomial, generalised Poisson, Bernoulli, binomial, beta, gamma, and Tweedie distributions. Time allowing, we also discuss power analysis to determine the optimal number of observations per cluster and the optimal number of clusters.

To reinforce your learning, the course includes approximately 15 practical exercises, allowing you to apply these methods to real fisheries and aquatic datasets, as well as more general ecological datasets. By the end, you will be equipped to analyse and interpret complex ecological data with confidence, providing valuable insights for your research.

The course fee includes a 1-hour face-to-face video chat with the instructors. You can discuss your own data during this session.

Hybrid statistics course

Venue: IMR, Bergen, Norway

Dates and times:
- 19 - 23 May 2025.
- 08.30 - 15.30 (Norwegian time.

Price for non-IMR participants: £500

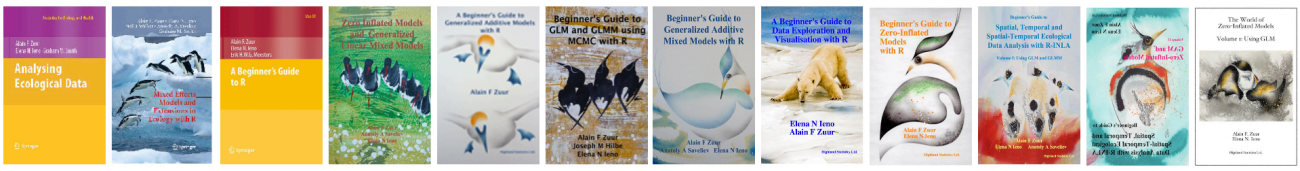
Included: **1 hour face-to-face video chat about your data.**

Instructors:
- Dr. Elena Ieno.
- Dr. Alain Zuur.

Authors of 12 books and providers of over 250 courses.

KEY WORDS

Identifying and managing outliers, data transformations, collinearity, and correlation between covariates. Model selection and evaluation, visualising model results, GLMMs for count data, addressing overdispersion, analysing binary and proportional data with GLMMs, biomass modelling using Tweedie and Gamma distributions, model diagnostics with DHARMa.



COURSE CONTENT

Monday:
- General introduction.
- Exercise revising data exploration and multiple linear regression in R.
- Theory presentation for linear mixed-effects models for nested data.
- Two exercises on linear mixed-effects models with random intercepts.

Tuesday
- Catching up.
- Theory presentation on models with random intercepts and random slopes
- One exercise on linear mixed-effects models with random intercepts and slopes.
- Using multiple variances (Generalised Least Squares) to deal with heterogeneity.
- One exercise using GLS.

Wednesday
- Revision exercise showing how to execute a Poisson GLM and negative binomial GLM.
- Three GLMM exercises:
  - Poisson GLMM for the analysis of count data.
  - Negative binomial GLMM for the analysis of count data.
  - Negative binomial GLMMs with two-way nested and crossed random effects.

Thursday
- Catching up
- Exercise showing how to apply a Bernoulli GLMM for the analysis of absence-presence data.
- Exercise showing how to apply a beta GLMM for the analysis of coverage data.
- Exercise showing how to apply a binomial GLMM for the analysis of proportional data.

Friday:
- Catching up
- Gamma GLMM exercise for the analysis of continuous positive data (without zeros).
- Tweedie GLMM exercise for the analysis of continuous positive data (with zeros).
- Time allowing: Determining optimal number of observations per cluster and the number of clusters using power analysis.

The course material consists of relevant PDF files of presentations, data sets, and clearly documented R code. Course participants will be given access to the course website, which will contain all data sets, R solution code, and course material, one week before the start of the course. Access to the course website will be available for 12 months.

Some material is available as on-demand video.

GENERAL INFORMATION

COURSE FEE for non-IMR staff: £500

- Credit card payments are processed in GBP.
- UK participants: Subject to 20% VAT.
- EU participants (non-UK): Not subject to UK VAT but must provide their institutional VAT number.
- Non-EU participants (including Norway): Not subject to VAT. Canadian participants are subject to GST/HST tax (which they may be able to claim back).

COURSE TIMES:

- Monday-Thursday: 08.30am to 15.30pm including a 45 minute lunch break and a 20 minutes break both morning and afternoon.
- Friday: 08.30am to 15.00pm including a 45 minute lunch break and a 20 minutes break both morning and afternoon.

PRE-REQUIRED KNOWLEDGE:

A working knowledge of R, multiple linear regression, and basic GLMs (such as Poisson, negative binomial, and Bernoulli GLMs) is recommended. This course is designed to be accessible and non-technical, with revision material available through on-demand videos to support your learning.

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 presentations 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 the footer at: https://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 15 fully worked out R exercises. These are all based on published papers and real data sets.

1 hour face-to-face

The course includes a 1-hour face-to-face video chat with the instructors (to be used after the course). A discussion board (access for 12 months) allows for interaction on course content between instructors and participants. You are invited to apply the statistical techniques discussed during the course on your own data and if you encounter any problems, you can ask questions during the 1-hour face-to-face video chat.

REGISTRATION FOR EXTERNAL PARTICIPANTS

https://www.highstat.com/index.php/joine-an-onsite-course

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Payment via credit card or bank transfer