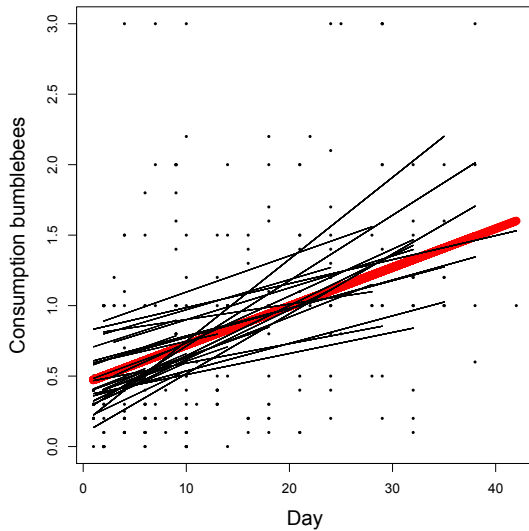


# Introduction to Linear Mixed Effects Models and GLMM with R

Frequentist and Bayesian approaches

**Provided by: Highland Statistics Ltd**

In cooperation with: Jeannine Goehing  
NAIT Boreal Research Institute



The course starts with an introduction to linear mixed effects models and generalised linear mixed effects models (GLMM) to analyse nested (also called hierarchical or clustered) data, e.g. multiple observations from the same animal, site, area, nest, patient, hospital, vessel, lake, hive, transect, etc. In the second part of the course Bayesian statistics and MCMC are explained and used to apply more advanced GLMMs.

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

Throughout the course MCMC is executed in JAGS (free) via the package R2jags from within R. Bayesian and frequentist (lme4, nlme, glmmADMB, glmmTMB) analyses are compared.

## Date & Venue

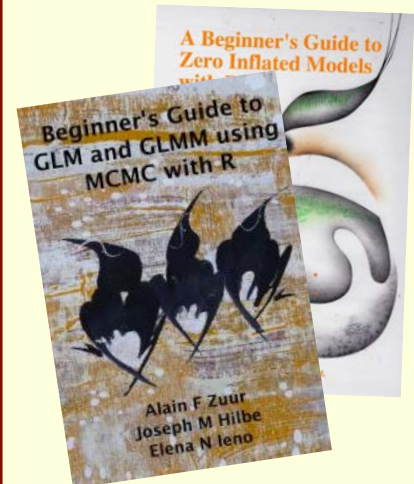
Date: 22 - 26 January 2018

Venue: NAIT main campus,  
Edmonton, Alberta, Canada

Price: 875 CAD + 5% GST

Instructors: Dr. Alain Zuur  
Dr. Elena Ieno

Authors of 9 books and  
providers of over 200  
courses worldwide.



## KEYWORDS

Introduction to Bayesian statistics and MCMC. Linear mixed effects models. GLMM. JAGS. R2jags. lme4. nlme, glmmADMB, glmmTMB.

Nested data. Dealing with pseudo-replication.



**COURSE CONTENT**

**Monday**

- Theory presentation of linear mixed effects models for nested data using frequentist techniques.
- Random intercept models.
- Sketching fitted values.
- Two exercises.
- Random intercept and slope models.
- Based on Chapter 4 in Zuur et al. (2013).

**Tuesday**

- Short revision Poisson GLM and negative binomial GLM.
- Analysis of nested count data using Poisson, negative binomial and Bernoulli GLMM using frequentist tools.
- Three exercises.

**Wednesday**

- Catching up.
- Introduction to Bayesian statistics and MCMC.
- Based on Chapter 10 in Zuur et al. (2016).
- One mixed effects exercise using Bayesian statistics (MCMC).
- One exercise with video solution file is provided.

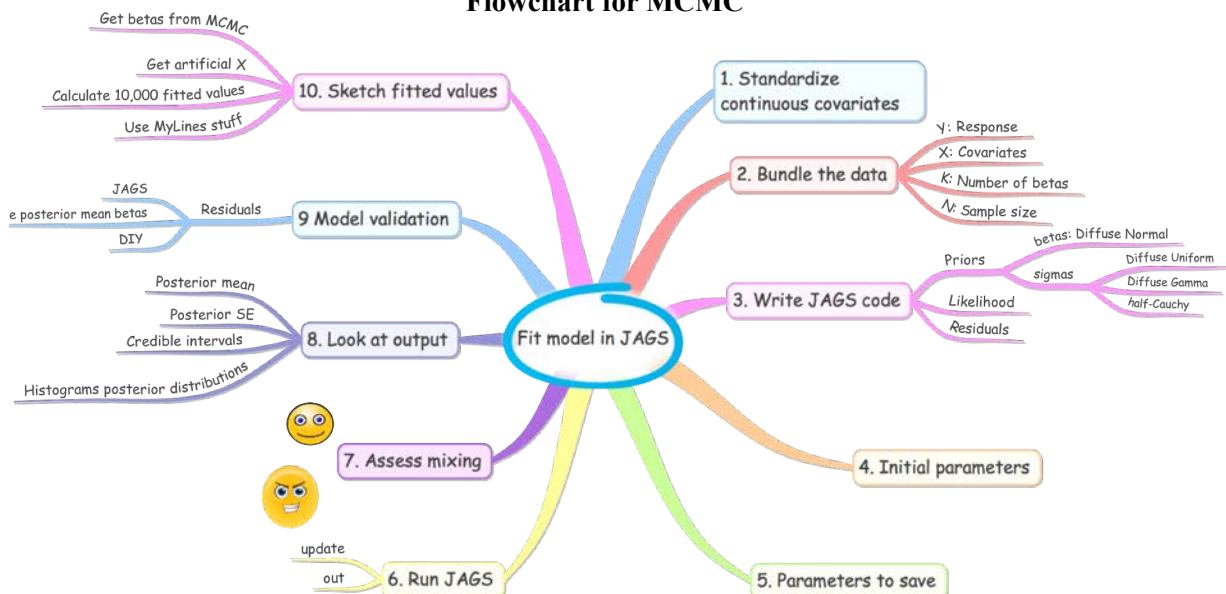
**Thursday**

- Catching up
- Poisson, negative binomial and Bernoulli GLMM exercises using Bayesian analysis (MCMC).
- Introduction to Bayesian model selection (Gibbs variable selection).
- One exercise.

**Friday**

- Catching up
- Analysis of nested data using GLMM with a gamma, binomial or beta distribution (i.e. strictly positive continuous data, proportional data, coverage data).
- Frequentist and Bayesian solution files of 25 - 30 exercises (all based on papers) using GLMMs with Gaussian, Poisson, negative binomial, Bernoulli, binomial, gamma, and beta distributions are provided.

**Flowchart for MCMC**



## GENERAL INFORMATION

### COURSE FEE: 875 CAD + 5% GST

- Credit card payments are charged in CAD 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.
- The course fee excludes refreshments and lunch.
- You need to bring your own laptop.

### COURSE TIMES:

- 09.00am to 16.00pm including 1 hour lunch break and a 20 minutes break both morning and afternoon

### COURSE MATERIAL:

- Pdf files of all powerpoint presentations are provided
- These powerpoint files are based on various chapters from:
  - *A Beginner's Guide to GLM and GLMM using MCMC with R.* (2013).
  - *A Beginner's Guide to Zero Inflated Models with R.* (2016)
  - Books are not included in the course fee. The course can be followed without purchasing these books.

### PRE-REQUIRED KNOWLEDGE:

R, data exploration, multiple linear regression, generalised linear modelling (Poisson, negative binomial, Bernoulli). A short revision is provided. This is a non-technical course.

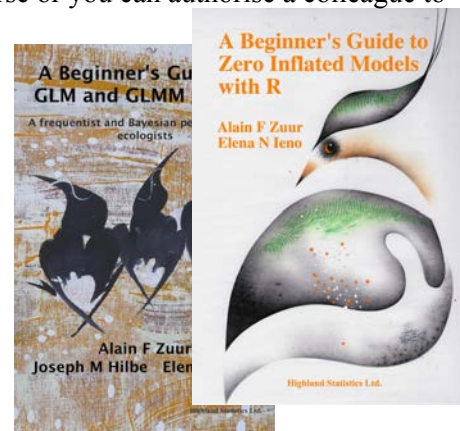
### CANCELLATION POLICY:

What if you are not able to participate? Once participants are given access to course exercises with R solution codes, pdf files of 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/sign-up2>

### RECOMMEND LITERATURE:

- *A Beginner's Guide to GLM and GLMM using MCMC with R.* (2013).
- *A Beginner's Guide to Zero Inflated Models with R.* (2016).
- These books are available from [www.highstat.com](http://www.highstat.com)



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## ORGANISATION

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## REGISTRATION

<http://www.highstat.com> Payment via credit card or bank transfer

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