Introduction to Zero Inflated Models with R

- Frequentist approaches -

Provided by: Highland Statistics Ltd

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What is zero inflation?

Suppose you want to study hippos and the effect of habitat variables on their distribution. When sampling, you may count zero hippos at many sites and therefore zero inflated models should be used.

During the course several case studies are presented, in which the statistical theory for zero inflated models is integrated with applied analyses in a clear and understandable manner. Zero inflated models consist of two integrated GLMs and therefore we will start with a revision of GLM.

Zero inflated GLMMs for nested data (repeated measurements, short time series, clustered data, etc.) are discussed in the second part of the course. We will focus on zero inflated count data, zero inflated continuous data and zero-inflated proportional data.

KEYWORDS

Zero inflated GLMs. Zero inflated GLMMs with random effects. lme4, pscl, glmmTMB. Overdispersion and solutions. Poisson, negative binomial, gamma, beta and binomial distributions. for count data, continuous data and proportional data with excessive number of zeros. Dependency. Pseudo-replication.
COURSE CONTENT

Monday:
- General introduction.
- Short revision of Poisson and negative binomial GLMs for count data and Bernoulli GLM for absence and presence data.
  - One Poisson and negative binomial GLM exercise.
  - One Bernoulli GLM exercise.
- Theory presentation on models for zero inflated count data using frequentist tools.
  - Mixture models (ZIP).
  - Hurdle models (ZAP).
- Two exercises on the analysis of zero inflated count data using the \texttt{pscl} package.

Tuesday:
- Finishing ZIP and ZAP exercises.
- Models for zero inflated continuous data (e.g. biomass data) using frequentist tools.
- One exercise.

Wednesday:
- Revision of linear mixed effects models and GLMM.
  - Fitting linear mixed effects models in \texttt{lme4} and \texttt{glmmTMB}.
  - Zero inflated GLMMs for the analysis of count data using frequentist tools.
- Three exercises for the analysis of zero inflated count data (ZIP and ZAP GLMMs using the Poisson and negative binomial distributions).

Thursday:
- Zero inflated GLMMs for the analysis of continuous data with excessive number of zeros (using the gamma distribution).
- Zero inflated GLMMs for the analysis of proportional data with excessive number of zeros (using the binomial distribution and the beta distribution).

R code for all exercises is provided before the start of the course.
GENERAL INFORMATION

COURSE FEE: £550
- 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.
- The course fee excludes refreshments and lunch.
- You need to bring your own laptop.

COURSE TIMES:
- **Monday - Wednesday**: 09.00am to 16.00pm including a 1 hour lunch break and a 20 minutes break both morning and afternoon
- **Thursday**: 09.00am to 14.00pm including a 1 hour lunch break and a 20 minutes break in the morning.

COURSE MATERIAL:
- Pdf files of all powerpoint presentations are provided.
- These powerpoint files are based on various chapters from:
- 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) and mixed effects models. A short revision in GLM and mixed models 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/courses](http://highstat.com/index.php/courses)

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