# Introduction to this Course and Overview of glmmTMB

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# This video covers

- what is and is not covered in this course
- the basics and background of glmmTMB
- installation
- further resources

Section 1

# This course / video series

# What this course covers

- model fitting using `glmmTMB`
  - syntax
  - building up from LMs to more complex models
  - logistic regression
  - presence/ absence data
  - count data
  - random effects
  - zero-inflation
  - models on the dispersion parameter
- extract output from fitted `glmmTMB` models
- further resources
- possibly future extensions

# Prerequisites

- Basic probability theory and statistics
  - random variables (discrete and continuous)
  - probability distributions
  - correlation
- Basic statistics
  - estimation methods: least squares and maximum likelihood
  - simple regression
  - residuals
- R
  - some experience doing statistical analysis in R
  - how to install R
  - R-Studio (recommended, but not required)

# What this course does not cover

- experimental design
- organizing data
- data visualization
- post-model-fitting procedures
- the wide variety of inference methods
- philosophy
- technical details of the estimation algorithm

Section 2

# Overview of glmmTMB

# Basics of glmmTMB

- LMs, GLMs, LMMs, and GLMMs with syntax like `lme4`
- more flexible than `lme4`
- more distributions (e.g. beta)
- more correlation structures for RE (e.g. ar1, spatial exp)
- zero-inflation
- models on the dispersion parameter

# glmmTMB model components

```
glmmTMB(y~x, disp=~d, zi=~z, family=compois, data)
```

- conditional model (formula for the mean on the link scale)
- family (distribution and link of conditional model)
- zero-inflation model (probability of non-structural zeros)
- dispersion model (changes variance of conditional model)

# Background of glmmTMB

- named after `glmmADMB` which uses `ADMB`
- `glmmTMB` uses `TMB`
- `glmmTMB` allows predictors on zero-inflation
- grant from Swiss NSF to bring together `lme4` and `TMB` developers in 2015

# Acknowledgements


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Section 3

# Further resources

# Installation

- download from CRAN or GitHub
- installation instructions on GitHub are always current

https://glmmtmb.github.io/glmmTMB/

# Books we refer to


- Dunn, P. K., & Smyth, G. K. (2018). Generalized linear models with examples in R (Vol. 53). New York: Springer.
- Fox, G. A., Negrete-Yankelevich, S., & Sosa, V. J. (Eds.). (2015). Ecological statistics: contemporary theory and application. Oxford University Press, USA.
- Warton, D.I. (2022) Eco-stats: data analysis in ecology. From t-tests to multivariate abundances. Springer.

# Additional resources

- Bolker's GLMM course notes

  https://bbolker.github.io/goettingen_2019/

- Bolker's FAQ page

  https://bbolker.github.io/mixedmodels-misc/glmmFAQ.html

- `glmmTMB`'s open and closed issues on GitHub

- See "Where to ask questions" on the site

  https://glmmtmb.github.io/glmmTMB/

# Built-in resources

- see `vignette(package="glmmTMB")` for a list of vignettes
- or vignettes on CRAN

  https://CRAN.R-project.org/package=glmmTMB
- see `?family_glmmTMB` for family options and descriptions
- see `?sigma.glmmTMB` for dispersion parameter descriptions

# Recap

- what to expect from this video series
- what glmmTMB can do and how it's so flexible
- background of `glmmTMB`
- other resources you should pursue