

CoEDL Summer School 2019  
Advanced Statistics for Linguists  
(coedlstatzr)

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# CoEDL Summer School 2019 - Advanced Statistics for Linguists (coedlstatzr)

## Before we begin

- ▶ All you will ever need - for this work shop - is in the folder I sent.
- ▶ If you have not received my email type the following into your browser to automatically download that folder  
<https://martinschweinberger.de/docs/materials/AdvancedStatzForLinguists.zip>
- ▶ Unzip wherever you please and open it!
- ▶ All code and more elaborate explanations of what we will cover is available at the website of the *Language Technology and Data Analysis Laboratory* (LADAL)  
<https://slcladal.github.io/index.html>

LADAL is hosted by the *School of Languages and Cultures* of The University of Queensland, Australia (UQ)

# About this Course

What will we cover?

- ▶ Simple linear regression
- ▶ Fixed-effects regression (linear | logistic)
- ▶ Mixed-effects regression (linear | logistic | quasi-poisson)
- ▶ Tree-based models (Conditional Inference Trees | Random Forests | Boruta)

Aims

- ▶ Understand these methods
- ▶ Use these methods
- ▶ Being aware of their advantages|disadvantages|problems|issues

# About this Course

Why is this course relevant for researchers that already know statistics?

- ▶ Best Practices emerge only with time
- ▶ Different people know different things (I have never not learned anything when I attended a lecture about sth I already “knew”)
- ▶ Tips and tricks about model fitting and model diagnostics
- ▶ Adding and sharing to this course (*please* let us know if you have tips, tricks, or experience with sth: we are *all* here to learn!)

# About this Course

What this course is *not*

- ▶ This is not an introduction to statistics
- ▶ This is not an introduction to R

What will we *not* cover?

- ▶ Basic concepts (probability, significance, etc.)
- ▶ Yes, everything is done in R but we cannot go into how R works
- ▶ Technical trouble shooting (cry for help and the assistants will come and assist in crying)
- ▶ The mathematical underpinning of the models (unless absolutely necessary)

# Timeline

## **Session 1 (Thursday 10:00 to 11:30)**

- ▶ Introduction and set up
- ▶ Simple linear and multiple fixed-effects regression

## **Session 2 (Thursday 9:00 to 10:30)**

- ▶ More multiple fixed-effects regression and start with mixed-effects regression

## **Session 3 (Friday 11:00 to 12:30)**

- ▶ Mixed-effects regression

## **Session 4 (Friday 11:00 to 12:30)**

- ▶ Tree-based models
- ▶ Wrap-up and goodbye

# Why R?

## Good reasons for using R

- ▶ Free open-source software
- ▶ Fully-fledged programming environment
- ▶ Enables and enhances full reproducibility | replicability of your research (enables Best Practices)
- ▶ Can be used for data science | management | processing | visualization | analytics | presentation
- ▶ Massive and friendly support-infrastructure

# Recommendations

Things that I wish I had done | known earlier

- ▶ Use R projects (Rproj)
- ▶ Use tidyverse (yes, i was brought up with base R and still haven't fully adapted)
- ▶ Create a GitHub and/or GitLab account and connect R to Git (version control, forking, cloud storage)
- ▶ You can use R to create websites (LADAL), apps (Shiny), slides (like these), publications (Rpub)
- ▶ You can do NLP, data management, data visualization, data analytics all in R
- ▶ R allows geo-spatial visualizations (maps)



# What will come next?

Trends that - I believe | predict - will become more frequent in the future

- ▶ Mixed-models
- ▶ Bayesian mixed-models (problem with frequentist approach: we evaluate the probability of  $H_1$  via the  $H_0$  rather than directly)
- ▶ Interactive apps (Shiny for public outreach | schools: to allow students to discover language and make things about language more well known)
- ▶ Replication, Open Data | Science, collaborative research (hopefully)
- ▶ Entering new fields (e.g. History, Cultural and Literary Studies)

## Where from here?

Books about statistics that I can recommend (for beginners)

- ▶ Field, Miles, and Field (2012), Levshina (2015), Gries (2009), Agresti (1996)

Books about statistics that I can recommend (for advanced)

- ▶ Baayen (2008), Agresti and Kateri (2011), Pinheiro and Bates (2000), Zuur et al. (2009)

## References

- Agresti, Alan. 1996. *An Introduction to Categorical Data Analysis*. Hoboken, NJ: JohnWiley & Sons.
- Agresti, Alan, and Maria Kateri. 2011. *Categorical Data Analysis*. Springer.
- Baayen, R Harald. 2008. *Analyzing Linguistic Data. A Practical Introduction to Statistics Using R*. Cambridge: Cambridge University press.
- Field, Andy, Jeremy Miles, and Zoe Field. 2012. *Discovering Statistics Using R*. Sage.
- Gries, Stefan Th. 2009. *Statistics for Linguistics Using R: A Practical Introduction*. Berlin & New York: Mouton de Gruyter.
- Levshina, Natalia. 2015. *How to Do Linguistics with R: Data Exploration and Statistical Analysis*. Amsterdam: John Benjamins Publishing Company.
- Pinheiro, Jose C., and Douglas M. Bates. 2000. *Mixed-Effects*