Bayesian Generalized Linear Mixed Effects Models:
Accessible Bayesian inference with the *rstanarm* package

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Generalized linear mixed effects models have become the go-to standard for inferential statistics in phonetics. Many fields, however, have transitioned from the traditional frequentist mixed effects models to more powerful Bayesian ones. This transition in linguistics has been hampered by the complexity required to code Bayesian models in *R*. A new *R* package, *rstanarm* (Jonah & Goodrich 2016), has solved the problem of accessibility by adopting the well-known syntax of *lme4* (Bates et al. 2015) in combination with easy-to-define Bayesian parameters such as prior distributions. In this presentation, I discuss first the advantages and disadvantages of Bayesian inference followed by how to convert an *lme4* workflow to *rstanarm*. As part of the new workflow, I show how to (a) define priors and other model parameters, (b) view model diagnostics, (c) compare models with leave-one-out cross-validation (*loo*: Vehtari et al. 2016), (d) plot posterior distributions (*bayesplot*: Gabry 2016), and (e) interpret and present model results. Overall this presentation provides an introduction to Bayesian inference and the *rstanarm* *R* package for those who are already familiar with generalized linear mixed effects models and *lme4*.

References

Bates, Douglas, Marin Mächler, Ben Bolker & Steve Walker. 2015. Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software*. 67(1). 1–48. doi:10.18637/jss.v067.i01.

Gabry, Jonah. 2016. bayesplot: Plotting for Bayesian Models. R package (version 1.1.0). https://CRAN.R-project.org/package=bayesplot.

Gabry, Jonah & Ben Goodrich. 2016. rstanarm: Bayesian Applied Regression Modeling via Stan. R package (version 2.13.1). https://CRAN.R-project.org/package=rstanarm.

Vehtari, Aki, Andrew Gelman & Jonah Gabry. 2016. loo: Efficient leave-one-out cross-validation and WAIC for Bayesian models. R package (version 1.0.0). https://github.com/stan-dev/loo.