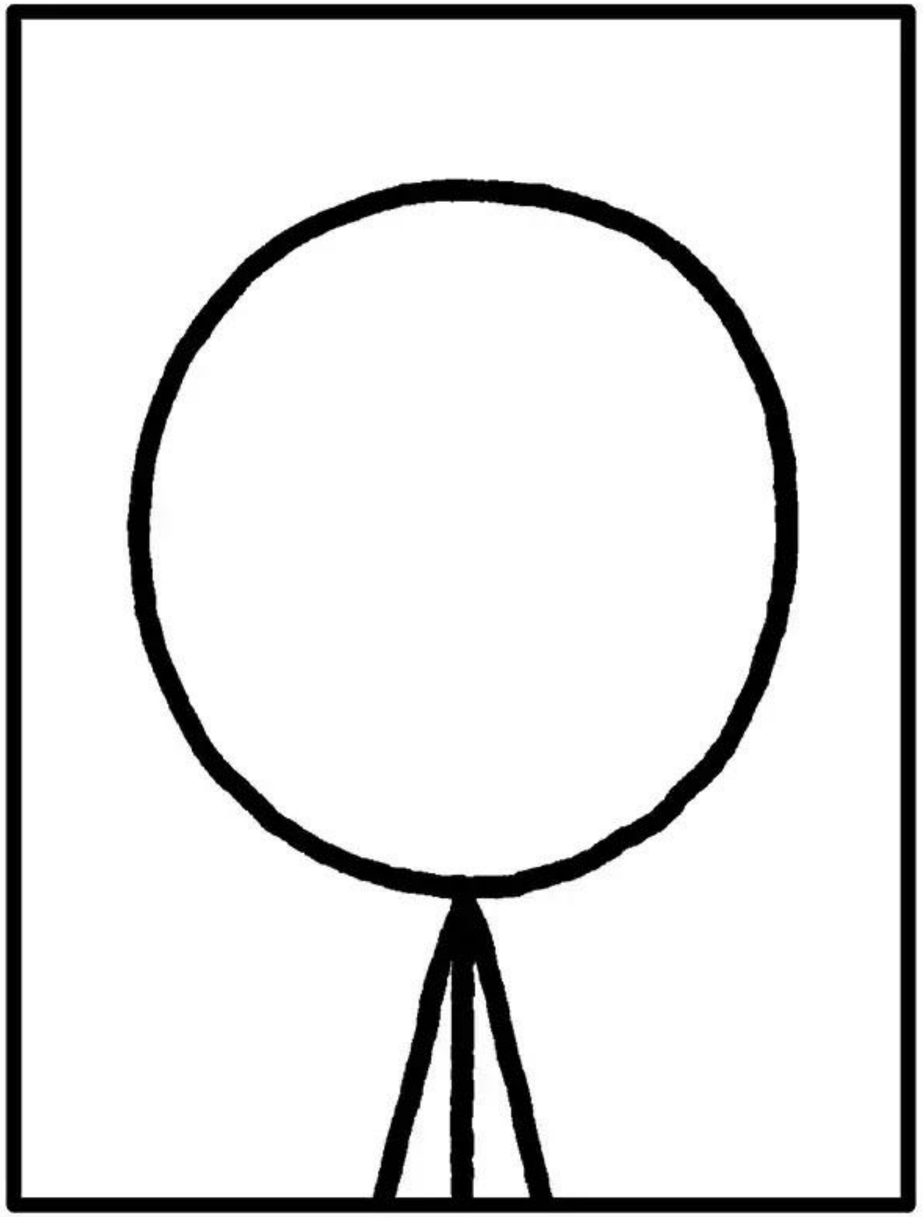
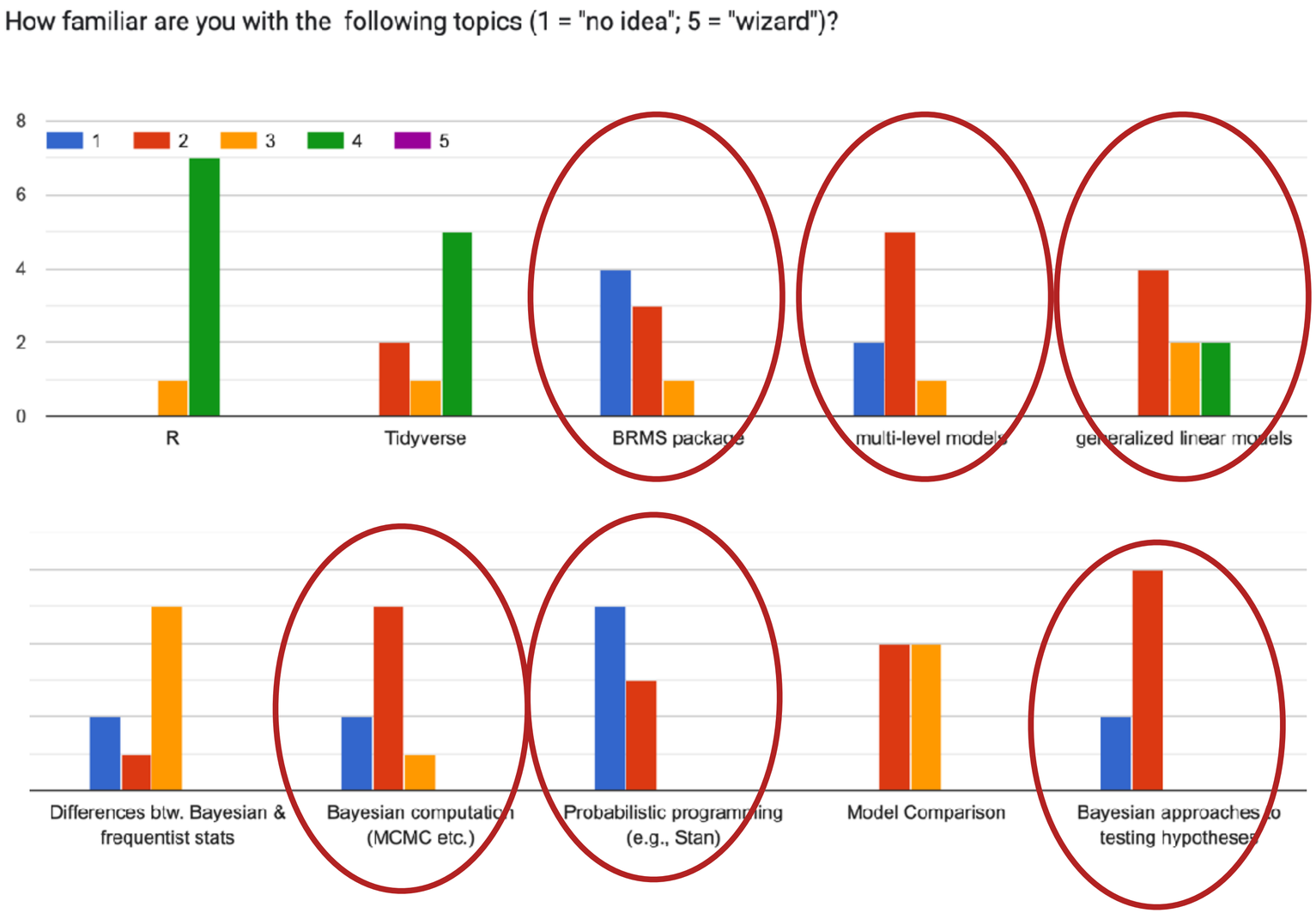
Bayesian data analysis: Theory & practice

Michael Franke


Hi! It's me.

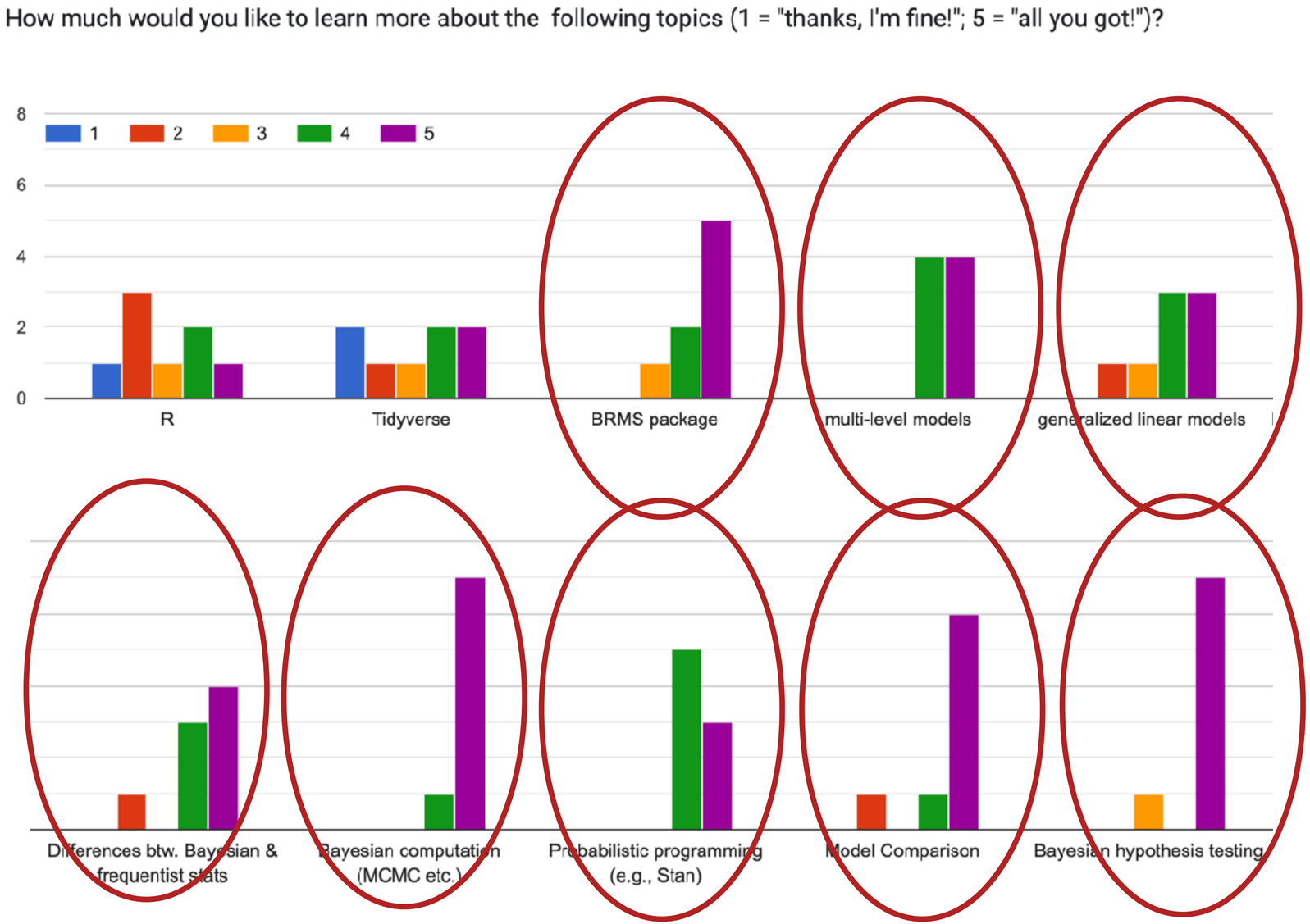
this course

Survey results
where you are at



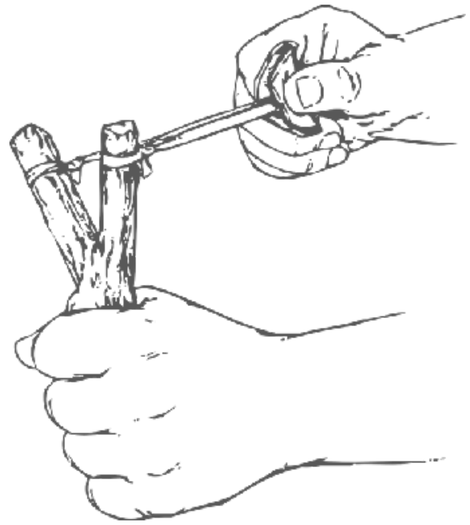
Survey results

what you (seem to) want to learn



Main learning goals

for this course



1. “think (more) computationally Bayesian”
    a. model-centric: explicate data-generating process
    b. sampling-based
2. become (more) comfortable in applying multi-level GLMS
    a. determine the appropriate (kind of) model for a given problem
    b. implement, run and interpret the Bayesian model
    c. draw conclusions regarding evidence for/against research questions
3. understand key concepts of beginners / intermediate BDA
    a. Bayesian computation (MCMC)
    b. priors & predictive functions
    c. model comparison
    d. model checking
    e. Bayesian hypothesis testing

How this works

- class from 2:00 — 6:00 pm
  - w/ some shorter and one longer break
  - some live demos
- web-book w/ tutorials and exercises
  - live version: here
  - GitHub code: here
- discussion of exercises
  - on Slack (or other means)
  - first part of class
- contribute (if you want)
  - e.g., send pull-requests to **populate the cheat sheet**

Here is the plan

Day 1	Day 2	Day 3	Day 4	Day 5
course structure BDA basics	MCMC methods & parameter estimation	multiple regression (w/ categorical predictors) & GLMs	multi-level models	hypothesis testing
data-generating processes in WebPPL simple regression	Big Bayesian 4 for simple regression in BRMS	Beyond GLMs in BRMS (distributional, mixture & non-linear models)	model comparison & model criticism	causal inference

Resources

- GitHub repo for course material:
  - https://github.com/michael-franke/Bayesian-Regression/tree/main
- rendered version of the web-book:
  - https://michael-franke.github.io/Bayesian-Regression/
- presentation slides
  - https://github.com/michael-franke/Bayesian-Regression/tree/main/slides-2025
- coding example demos
  - https://github.com/michael-franke/Bayesian-Regression/tree/main/demos