

Advanced Biological Statistics Bi 610 Fall 2018

Schedule

Week	Date	Subject	Readings	Assignments
1	Sep 25 th Sep 27 th	R programming and reproducible data analysis Rmarkdown and collaborative analysis Probability and sampling distributions	W & G: Chps 1-8 Logan: Chps 1-3 Q & K: Chps 1	Ungraded
2	Oct 2 nd Oct 4 th	Estimation & confidence intervals Exploratory Data Analysis (EDA) Tidy data and data wrangling	W & G: Chps 9-16 Logan: Chps 4-6 Q & K: Chps 2-4	Ungraded
3	Oct 9 th Oct 11 th	Grammar of Graphics Hypothesis testing and significance Type 1 and Type 2 errors Git, GitHub and collaborative analysis	W & G: Chps 17-29 Logan: Chps 4-6 Q & K: Chps 2-4	Ungraded
4	Oct 16 th Oct 18 th	Modeling basics and ingredients Correlation and covariance Ordinary Linear Models (OLMs) Linear regression	Logan: Chps 7-9 Q & K: Chps 5-6	GRADED - 1
5	Oct 23 rd Oct 25 th	Clinical trials and experimental design Introduction to ANOVA as a GLM Planned and post hoc comparisons	Logan: Chps 10 Q & K: Chps 7-8	Ungraded
6	Oct 30 th Nov 1 st	Multiple factor ANOVA Factorial ANOVA Nested ANOVA Power and False Discovery Rate	Logan: Chps 11 Q & K: Chps 9-13	Ungraded
7	Nov 6 th Nov 8 th	Random effects Hierarchical and mixed models Generalized Liner Models	Logan: Chps 12 Q & K: Chps 14-17	GRADED - 2
8	Nov 13 th Nov 15 th	Stochastic models and Stan Likelihood functions Prior and posterior distributions Credible intervals	Kruschke Chps 5-6 Install Stan https://mc-stan.org	Ungraded
9	Nov 22 nd T-giving	MCMC for finding posterior distributions Why hierarchical models? Shrinkage and sharing of power	Kruschke Chps 7, 9 & 14	Ungraded
10	Nov 27 th Nov 29 th	Simulation Overdispersion and robustness Choosing distributions	Kruschke Chps 13, 16 & 17	GRADED - 3
Finals Week Week of Dec 3 rd				

Week 8: (Kruschke ch. 5 and 6\ and install Stan: <https://mc-stan.org>)

Likelihood functions, prior and posterior distributions, credible intervals
in the context of biased coins

--> introduce models in Stan while writing down the binomial, and then the
beta-binomial models
... and finding the MLE

Week 9: (Kruschke ch. 7 and 9 and 14)

MCMC for finding posterior distributions
why hierarchical models? shrinkage, sharing of power.
in the context of the baseball example

--> include height, weight in baseball, saying this generalizes logistic regression

Week 10: (Kruschke ch. 16 and 17 and 13)

Simulation, overdispersion, robustness, and choosing distributions
in the context of t-test and linear regression using non-Gaussian (overdispersed) noise:
simulate with overdispersed noise, fit the usual way (in Stan, including MLE),
show influence of outliers and that the proper model is better