Bayesian Statistics for Genetics

Lecture 0: Logistics

June, 2024

Welcome!

This course *introduces* Bayesian statistics for genetics. We aim to cover;

- Bayesian reasoning, and how it helps learning from genetic data
- Many widely-used models and priors
- Bayesian calculations, and some of the algorithms and software that implements them

We assume basic knowledge of R, but not more than this. To keep the focus on statistics, the genetic examples are intended to be accessible.

Introduction: Resources

Most importantly, the class site is

https://faculty.washington.edu/kenrice/sisgbayes/

Contains (or will contain);

- Links to all slides – with hyperlinks – and session recordings (for reference)
- All datasets needed for exercises, links to software needed
- Exercises for you to try
- Our solutions to exercises (later!)
- Links to other software, other courses, books, and places to get help

Beware the internet's widespread misinformation on Bayes! (probably well-intentioned, but...)

Schedule

1. Logistics, and non-technical introduction to reasoning with Bayes
2. Binomial models #1
3. Binomial models #2, logistic regression, sampling from posteriors
4. Multinomial models, INLA
5. Linear regression, nuisance parameters, prior influence, MCMC
6. Clustering
7. Meta-analysis
8. Hierarchical models
9. Testing/multiple testing
10. Further software examples, open question time

Introduction: About Steve

- Professor, Emory Biostatistics and Bioinformatics
- Apply statistics and machine learning to genetics, genomics and other omics
- Academic great grandson of Dennis Lindley

Introduction: About Ken

- Professor, UW Biostatistics
- Genetic/Genomic research in Cardiovascular Epidemiology, also polygenic risk scores
- Meta-analysis – combining sources of information
- Fourth-generation Bayesian!

Introduction: About Danwei

- 2nd year PhD student, Emory
- Will be TA for the course
- Computing questions particularly welcome

Introduction: Course structure

10 sessions over 2.5 days

- Day 1; Introduction and first examples
- Day 2; Regression models
- Day 3; More advanced topics

Web page: http://faculty.washington.edu/kenrice/sisgbayes/

Introduction: Session structure

What to expect in a typical 90 minute session;

- 50 mins teaching (please ask questions!)
- 25 mins hands-on; please discuss as you go and work together
- 15 mins summary, discussion/extensions (questions again!)