

# 2021 SISG MODULE 8: Bayesian Statistics for Genetics

## Introduction and Overview

Ken Rice and Jon Wakefield

Departments of Statistics and Biostatistics  
University of Washington

# Logistics

**Background Text:** P.D. Hoff (2009), *A First Course in Bayesian Statistical Methods*, Springer.

**Supplementary Text:** J.C. Wakefield (2013), *Bayesian and Frequentist Regression Methods*, Springer.

Demonstrations of methods via R implementations will be carried out in class. Students are encouraged to follow along.

Code and other materials (course notes, papers) are available at the course website:

## Course Details

- Course will be taught remotely over July 14–July 16.
- Break out rooms for exercises/R sessions.
- Class website:  
<http://faculty.washington.edu/kenrice/sisgbayes/>

# Course Outline

## **DAY 1: Wed 14 July**

- **Wed 11:30–12:20** Lecture 1 (Rice): Why Bayes? Introduction. Review of probability
- **Wed 12:20–12:50** R-Demo/Exercises/Solutions
- **Wed 12:50–1:10** Break
- **Wed 1:10–2:00** Lecture 2 (Wakefield): Probability theory; Binomial Sampling 1
- **Wed 2.00–2.30** R-Demos and Practice Sessions

# Course Outline

## DAY 2: Thurs 15 July

- **Thurs 8:00–8:50** Lecture 3 (Wakefield): Binomial Sampling 2
- **Thurs 8:50–9:20** R-Demos and Practice Sessions
- **Thurs 9:20–9:40** Break
- **Thurs 9:40–10:30** Lecture 4 (Rice) Continuous sampling. Linear regression. MCMC.
- **Thurs 10:30–11:00** Demo/Exercises/Solutions
- **Thurs 11.00–11.30** Lunch Break
- **Thurs 11.30–12.20** Lecture 5 (Wakefield): Multinomial Sampling
- **Thurs 12:20–12.50** R-Demos and Practice Sessions
- **Thurs 12.50–13:20** Break
- **Thurs 13.20–14:00** Lecture 6 (Rice): Model selection and averaging
- **Thurs 14:00–14:30** R-Demos and Practice Sessions

# Course Outline

## DAY 3: Fri 16 July

- **Fri 8.00–8.50** Lecture 7 (Wakefield): Generalized linear modeling and mixed modeling
- **Fri 8.50–9.20** R-Demos and Practice Sessions
- **Fri 9.20–9.40:** Break
- **Fri 9.40–10.30** Lecture 8 (Rice): Meta analysis.
- **Fri 10.30–11.00** R-Demos and Practice Sessions
- **Fri 11.00–11.30** Lunch Break
- **Fri 11.30–12.20** Lecture 9 (Wakefield): Bayesian and frequentist testing: Single tests and multiple tests
- **Fri 12.20–12.50** R-Demos and Practice Sessions
- **Fri 12.50–13.10** Break
- **Fri 13:10–14:00** Lecture 10 (Rice): Software (WinBUGS/JAGS/INLA/Stan)
- **Fri 14:00–14:30** Demo/Exercises/Solutions