POLI 272: BAYESIAN METHODS

Morris H. DeGroot
Born: 8 June 1931
Died: 2 November 1989
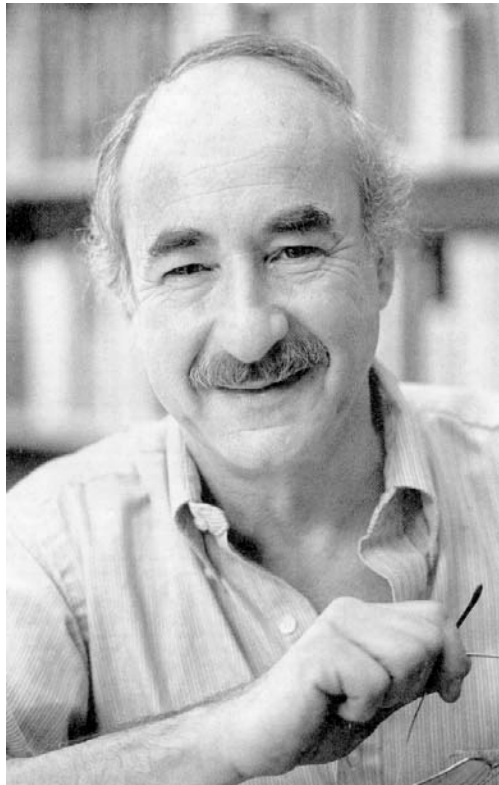
Fall Quarter AY2009-2010
Department of Political Science
University of California, San Diego
La Jolla, CA 92093-0521

Classroom: SSB 104
Time: 3:00PM - 5:50PM Thursday

Instructor: **Keith T. Poole**

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The following texts will be used in this course:

- Gelman, Andrew, John B. Carlin, Hal S. Stern, and Donald B. Rubin. 2004. *Bayesian Data Analysis (2nd Edition)*, New York: Chapman & Hall/CRC.

- Albert, Jim. 2009. *Bayesian Computation With R (2nd Edition)*. New York: Springer.

Requirements

This course is intended as an introduction to modern Bayesian estimation. A working knowledge of the open-source statistical package **R**, OLS multiple regression analysis, and **STATA** is required for this course. Students will also be required to learn **Epsilon (EMACS)**, a screen editor. We will also use the open-source Bayesian statistical package **WINBUGS** along with a variety of "canned" programs that perform various kinds of Bayesian/Optimization analyses.

Grades will be determined by regularly assigned class problems.

Useful Links -- WINBUGS

[WINBUGS Manual](#) (pdf file)

Useful Links -- EPSILON

[EPSILON HomePage -- Lugaru Software Ltd.](#)

[Useful Epsilon Commands and Examples](#)

Useful Links -- R

- *An Introduction to R.* **(Reference Work by R Development Core Team)**
- *Using R for Data Analysis and Graphics: An Introduction*. **(Reference Work by J. H. Maindonald on R Graphics)**

PCH Symbols in R

Octal References for Math Symbols that can be used in PlotMath in R

Course Outline

1. **The Basic Mathematics of Bayesian Analysis**

   Assignment:

   o *Bayesian Computation with R*, pp. 1 - 37
   o *Bayesian Data Analysis*, pp. 1 - 32

   Likelihood Function Confusions
   Binomial Likelihood Function, Beta Prior Distribution

   Chap_1_studentdata.r -- Simple R Program that sets up studentdata in the LearnBayes package for pages 2-8 of *Bayesian Computation with R*
   Chap_1_t_statistic_example.r -- R Program that sets up the t-distribution simulations discussed on pages 8 - 13 of *Bayesian Computation with R*
   Problem_Chap_1_1.r -- R Program to do Problem 1 of Chapter 1 on page 15 of *Bayesian Computation with R*
   Problem_Chap_1_2.r -- R Program to do Problem 2 of Chapter 1 on page 15 of *Bayesian Computation with R*
   Problem_Chap_1_3.r -- R Program to do Problem 3 of Chapter 1 on pages 15-16 of *Bayesian Computation with R*

   Chap_2_Prior.r -- R Program to do work example on pages 21 - 23 of Chapter 2 in *Bayesian Computation with R*
   Chap_2_Prior_2.r -- R Program to do work beta priors and posterior example on pages 23 - 25 of Chapter 2 in

Bayesian Computation with R

🟢Cigarette Example for WINBUGS (PDF) -- Demonstrates Differences in rates of Lung Cancer by Smoking
🔴Cancer.odc -- **WINBUGS** program demonstrating Differences in rates of Lung Cancer by Smoking (code by Simon Jackman)

🟢First Homework Assignment
🟢Second Homework Assignment

🔴Week One Part One (MP3 file for first hour and a half -- 108meg)
🔴Week One Part Two (MP3 file for second hour and a half -- 87meg)

2. **Single Parameter Models**

   Assignment:

   - *Bayesian Computation with R*, pp. 39 - 61
   - *Bayesian Data Analysis*, pp. 33 - 72

     🟢Third Homework Assignment

3. **Multiparameter Models**

   Assignment:

   - *Bayesian Computation with R*, pp. 63 - 86
   - *Bayesian Data Analysis*, pp. 73 - 114

4. **Bayesian Computation and MCMC Methods**

   Assignment:

   - *Bayesian Computation with R*, pp. 87 - 152
   - *Bayesian Data Analysis*, pp. 275 - 310

5. **Heirarchical Modeling**

   Assignment:

   - *Bayesian Computation with R*, pp. 153 - 204

o ***Bayesian Data Analysis*, pp. 117 - 196**

6. **Regression Models**

   Assignment:

   o ***Bayesian Computation with R*, pp. 205 - 264**
   o ***Bayesian Data Analysis*, pp. 353 - 442**