

STAT 4444/5444G: Applied Bayesian Statistics

Spring 2016

Instructor:

Name: Dr. Leanna House

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Office Hours: Wednesdays 3:45-4:45pm or by appointment: www.apps.stat.vt.edu/house/teaching.html. Typical times include: Fri, 8-9am and 3-4pm

Course Information:

Time: Monday and Wednesday, 1:00-2:15pm

Location: 209 Hutcheson Hall

Final Exam: Wednesday, May 6, 2015 at 1:05pm-3:05pm

Textbooks:

Required: Gill, Jeff (2008). *Bayesian Methods, A Social and Behavioral Sciences Approach*, second edition. Chapman & Hall/ CRC, Boca Raton.

Recommended: Everitt, B. and Hothorn, T. (2010) *A Handbook of Statistical Analyses Using R*, second edition, Chapman & Hall/ CRC, Boca Raton.

Recommended: Albert, Jim (2009) *Bayesian Computation with R*, second edition, Springer, New York.

Website: See Scholar

Prerequisite: This course requires multivariable calculus (e.g., MATH 2224), a firm understanding of probability and distribution theory (e.g., STAT 4105 or 4705) and statistical inference (e.g., STAT 3005-3006, 4106, or 4706). Also, proficiency in matrix operations and a programmable language (e.g., R, S+, Matlab) will be helpful. Students should feel comfortable sampling from various distributions and coding loops, functions, etc.. If/when code is presented in class, it will be in R.

Goal:

To introduce the basic ideas of Bayesian statistics, including both foundations of the philosophy and practical aspects of implementation.

Objectives:

- Students understand fundamental differences between Bayesian and Classical inference.
- Given datasets and research questions, students will select appropriate models, write likelihoods, specify appropriate prior distributions, and derive posterior distributions.
- Student will be able to assess posterior distributions and make appropriate inferences.
- The emphasis on computing will depend upon the progression of this course.
- Since this is an introductory course, students will have the vocabulary and fundamental skills to understand scientific papers that use Bayesian methods.

Grading:

The grading will depend on homework (20%) that will occur about every two weeks, class participation (10%), a midterm (20%), a final exam (25%), and a project (25%). The midterm will be in class on either Feb 24 or March 14. I will give two weeks notice. The final exam will take place on May 6 at 1:05pm. Presentations for projects will be April 27, May 2, and May 4. The powerpoint slides for all presentations will be due April 27. Attendance will be graded on Feb 24 and Feb 29. We will not have class on March 2.

Late homework assignments will **NOT** be accepted unless I am approached well in advance and the reason is, what I consider to be, legitimate (life or death). Since I understand that some weeks can get hectic, the lowest homework for each person will be dropped before finalizing a course grade. This means that one homework can be missed without suffering a quantitative penalty (the zero is dropped, as it would be the student's lowest grade).

Computing:

Students are welcome to use any software. Although, the software used in this class is R. This software is free and ready to download at <http://www.r-project.org/>. At this website, click on "CRAN" (on the left); choose a reasonable mirror site (e.g., one that is in the USA); and, click on "windows" or "mac" (whichever is appropriate). If "windows" was chosen, click "base" then "Download R X.X.X for Windows " (note, 'X.X.X' is the latest version available, e.g., an old number was 3.0.2). If "mac" was chosen, click on either "R-X.X.X.pkg (latest version)" or "R-X.X.X.dmg," depending upon your operating system.

Academic Honesty:

The students are expected to abide by Virginia Tech's Community Standard for all work for this course (<http://www.honorsystem.vt.edu/>). Violations of the Standard will result in a failing final grade for this course and will be reported to the Dean of Students for adjudication. Ignorance of what constitutes academic dishonesty is not a justifiable excuse for violations.

For homework problems, students may work with others, but each student must submit his/her own answers for grading. For exams, the students are required to work alone and during the specified time period.

Changes to the Syllabus:

The instructor reserves the right to make changes to the syllabus during the course. Any necessary changes will be announced in class and posted on the course website.

Students:

As supported by Virginia Tech's Principles of Community, all students will be treated equally (<http://www.vt.edu/diversity/principles-of-community.html>). Those with special needs can be accommodated easily. For specific questions, refer to <http://www.ssd.vt.edu/>.