

# Advanced Statistical Computations

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This course will introduce to students some basic statistical computing methods, with an aim to provide them a toolbox for solving computational problems encountered in research.

## Lecture Syllabus:

1. Introduction: Bayesian Inference
2. Monte Carlo Integration
3. Markov chain Monte Carlo: Basic Theory
4. The Gibbs sampler, EM Algorithm and Data Augmentation
5. The Metropolis-Hastings Sampler
6. Linear and Generalized Linear Mixed Effects Models
7. Latent Variable Methods for Ordinal Data
8. Stochastic Approximation Monte Carlo and Applications
9. Adaptive Markov Chain Monte Carlo and applications
10. Resampling-based Methods and Applications

## Recommended texts/references:

1. Hoff, P.D. (2009). *A First Course in Bayesian Statistical Methods*, Springer. (An electronic version of this book is available at the library of TAMU).
2. Liang, F., Liu, C. and Carroll, R.J. (2010). *Advanced Markov Chain Monte Carlo Methods: Learning from Past Samples*, Wiley.
3. Liu, J.S. (2001). *Monte Carlo Strategies in Scientific Computing*, Springer.

**Prerequisites:** STAT610 or approved by instructor.

**Grade:** There will be assigned readings from books and research articles. The course grade will consist of 15% class partition and 85% a semester research project. A part of this project will consist of each student giving a 30-minutes oral presentation.

**Minimal standards for grades:** The following percentage performance (PP) yields grades as follows:

$$90\% \leq PP \leq 100\% \implies A; \quad 80\% \leq PP < 90\% \implies B; \quad 70\% \leq PP < 80\% \implies C;$$
$$60\% \leq PP < 70\% \implies D; \quad 0\% \leq PP < 60\% \implies F;$$

**Lectures:** TR 11:10am–12:25pm    classroom: Bloc 457

**Office hour:** Tuesday 16:00-17:00

**Statements on the Course:**

- No late assignments will be graded.
- A makeup examination will be only given to the students who could provide satisfactory evidence that the absences are due to some causes beyond their control.
- The student's semester grade will be based solely upon on the above grading rule. No exception will be made at the end of the semester for particular students.
- Incomplete grade: A temporary grade of I (Incomplete) at the end of a semester indicates that the student has completed the course with the exception of a major quiz, final exam, or other work. The instructor shall give this grade only when the deficiency is due to an authorized absence or other cause beyond the control of the student.

**ADA, Plagiarism, and Academic Integrity Statement:**

- **STATEMENT ON DISABILITIES:** The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation for their disabilities. If you believe you have a disability requiring an accommodation, please contact the Office of Support Services for Students with Disabilities in Room 126 of the Koldus Student Services Building. The phone number is 845-1637.
- **COPYRIGHT NOTICE:** The handouts used in this course are copyrighted. By “handouts”, I mean all materials generated for this class, which include but are not limited to syllabi, quizzes, exams, lab problems, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless I expressly grant permission.
- **STATEMENT ON PLAGIARISM:** As commonly defined, plagiarism consists of passing off as one's own ideas, words, writing, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have any questions regarding plagiarism,

please consult the latest issue of the Texas A&M University Student Rules, under the section “Scholastic Dishonesty”.

- **ACADEMIC INTEGRITY STATEMENT: “An Aggie does not lie, cheat, or steal or tolerate those who do.”**

The Aggie Honor Council Rules and Procedures are available at the web site:  
[aggiehonor.tamu.edu](http://aggiehonor.tamu.edu).