STA 6934: Monte Carlo Statistical Methods **Spring 2010**

Professor George Casella
Griffin-Floyd 225
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Credits: 3
Co-requisite: STA 6327 or permission of instructor.
Teaching Assistant: Quan Tran

Lecture and office hours Lectures: MWF Period 5: 11:45-12:35, Griffin- Floyd 230
Office Hours: To be announced

Textbook *Monte Carlo Statistical Methods, Second Edition*, Robert and Casella.

Course Web Page

The web page for the course is

http://www.stat.ufl.edu/ casella/MCSM10/

All important information will be posted there, including assignments and solutions.

There will be no class

(a) January 11,13,15

(b) January 18 (MLK Day)

I will try to find a time to make up the missed classes.

Course Notes Portions of this material have been taught as a short course over the years. There are 299 slides that I will be showing in class, but they will be supplemented, with much of the underlying theory done on the board. You can download the slides if you wish, and have them to take notes on. There are two versions available on the web page. One is formatted as slides, and in the other the slides are smaller with room to write.

Homework

Homework There will be six homework assignments. Due dates are given on the schedule below. Everyone is expected to do every problem that is assigned.

I would like to encourage you to hand in your assignments in Latex, to get you more familiar with it. Latex is available as a free download from http://www.miktex.org/ or TeXshop for LaTeX (Mac) http://www.uoregon.edu/ koch/texshop/obtaining.html

Each HW PROBLEM will be graded on a scale of 0-4. Homework is due in the TA mailbox by 5pm of the due date. If your homework is late it will be graded on a scale of 1-3.

Computing

Throughout the course there will be examples and assignments requiring computing. I will typically illustrate things using R (available as a free download from http://www.r-project.org/). I will also use WinBugs, which is also free from http://www.mrc-bsu.cam.ac.uk/bugs/. You are expected to learn both of these programs

Exams

- Exam 1 Wednesday February 17
- Exam 2 Wednesday March 24
- Final Exam: Thursday April 29 7:30 am

All exams are closed book exams. The exams will consist of 3-4 problems, one of which you have seen before (if you do the homework). Any requested formula will be provided.

Project

There will also be a project. These will be individual projects, and can be of your own choosing. For example, you might do

- A data analysis using a Monte Carlo method
- A critical review of a paper that uses a Monte Carlo method
- A report on a Monte Carlo method not covered in class
- Something of your choosing

I will be available to discuss possibilities and alternatives.

-A one-page outline of your project is due March 26

-The final project report, in pdf format only, not to exceed 5 pages, is due Monday April 26 at 5pm. You need to email me the pdf, and put a hardcopy in my mailbox.

Grades

- Homework: 35%
- Exam 1 : 10%
- Exam 2 : 10%
- One-page outline: 5% (0% if late)
- Final Project: 15%
- Final Exam: 15%
- CLASS PARTICIPATION 10%

The class participation grade will be subjectively assigned. I expect you to come to class prepared, and to answer questions and take part in any dialog that may occur, contributing constructively to the class. Note that 10% is enough to to change a B to an A.

Outline →

Outline

We will cover as much of the textbook as we can.

Chapter	Title	Contents
1	Introduction	Review of Basic Methodology
2	Random Variable Generation	Generating uniform random variables, transformation methods, accept-reject
3	Monte Carlo Integration	Classical, importance sampling, and others
5	Monte Carlo Optimization	EM and related algorithms
6	Markov Chains	Basic theory needed for the next four chapters
7	The Metropolis Hastings Algorithm	The basic M-H algorithm and many variations
8	The Slice Sampler	A first Gibbs sampler
9	The Two-Stage Gibbs Sampler	The basic Gibbs sampler and many variations
10	The Multi-Stage Gibbs Sampler	The workhorse; hierarchical models, etc.
12	Diagnosing Convergence	Methods for detecting convergence of a Markov chain

Schedule

The last page contains a tentative schedule. You are responsible for knowing when assignments are due and when exams are coming!!!

Finally, what follows needs to be here according to UF regulations. Make sure you read it carefully. This is serious stuff.

Academic Honesty: The University of Florida requires all members of its community to be honest in all endeavors. Cheating, plagiarism, and other acts diminish the process of learning. When students enroll at UF they commit themselves to honesty and integrity. Your instructor fully expects you to adhere to the academic honesty guidelines you signed when you were admitted to UF. As a result of completing the registration form at the University of Florida, every student has signed the following statement: "I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University. Furthermore, on work submitted for credit by UF students, the following pledge is either required or implied: On my honor, I have neither given nor received unauthorized aid in doing this assignment. It is to be assumed all work will be completed independently unless the assignment is defined as a group project, in writing by the professor. This policy will be vigorously upheld at all times in this course.

Students with Disabilities Act: The Dean of Students Office coordinates the needed accommodations of students with disabilities. This includes the registration of disabilities, academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services, and mediating faculty-student disability related issues. Dean of Students Office, 202 Peabody Hall, 392-7066. www.dso.ufl.edu

Campus Helping Resources: Students experiencing crisis or personal problems that interfere with their general well-being are encouraged to utilize the universitys counseling resources. Both the Counseling Center and Student Mental Health provide confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career and academic goals, which interfere with their academic performance. The Counseling Center is located at 301 Peabody Hall (next to Criser Hall). Student Mental Health is located on the second floor of the Student Health Services in the Infirmary.

Service	Location	Phone	Services provided
University Counseling Center	301 Peabody Hall	392-1575 www.counsel.ufl.edu	Personal and career counseling
Student Mental Health	Student Health Care Service	392-1171 www.hsc.ufl.edu /shcc/smhs.htm	Personal counseling
Sexual Assault Recovery Services (SARS)	Student Health Care Service	392-1161 counseling	Sexual assault
Career Resource Center	Reitz Union	392-1601	Career development assistance and counseling

Software Use: All faculty, staff and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate.

Week Starting	Tentative Topic	Monday	Wednesday	Friday
1/4/10	1:Review of Basic			
11-Jan	1:Review of Basic	No Class	No Class	No Class
18-Jan	2:Random Variable	No Class-MLK	HW1 Out	
25-Jan	3:Monte Carlo Integration			**HW1 Due**
1-Feb	3:Monte Carlo Integration	HW2 Out		
8-Feb	5:Monte Carlo Optimization			**HW2 Due**
15-Feb	6:Markov Chains	HW3 Out	**Exam 1**	
22-Feb	7:The Metropolis Hastings			**HW3 Due**
1-Mar	7:The Metropolis Hastings	HW4 Out		
8-Mar		Spring Break	Spring Break	Spring Break
15-Mar	8:The Slice Sampler			**HW4 Due**
22-Mar	9:The Two-Stage Gibbs Sample	Review	**Exam 2**	**Project Outline Due - Friday March 26**
29-Mar	9:The Two-Stage Gibbs Sample	HW5 Out		
5-Apr	10:The Multi-Stage Gibbs			**HW5 Due**
12-Apr	10:The Multi-Stage Gibbs	HW6 Out		
19-Apr	12:Diagnosing Convergence		Last Day of Class	**HW6 Due**
	Final Exam - Thursday April 29 7:30-9:30 AM			
	Project Due - Monday April 26			