CIS 5930/CIS 4930/MAP 5932/ISC 5932: Monte Carlo Methods

What are Monte Carlo Methods?:

Monte Carlo methods are numerical methods that use random numbers to compute quantities of interest. This is normally done by creating a random variable whose expected value is the desired quantity. One then simulates and tabulates the random variable and uses its sample mean and variance to construct probabilistic estimates.

Purpose of the Course:

This course presents the fundamentals of the Monte Carlo method, or as it was originally known, the "method of statistical sampling." This course is meant to take mathematically and computationally mature students and given them a very comprehensive introduction to Monte Carlo methods. The material in this course focuses on:

1. Developing the mathematical background required for understanding and developing Monte Carlo methods. This is primarily probability theory, statistics, the theory of stochastic processes, and connections with functional analysis.

2. Examining Monte Carlo methods from the point-of-view of numerical methods and computing. It should be recalled that Monte Carlo methods developed considerably at the down of the age of electronic computing, and they have blossomed since as potent computational techniques.

3. Reflecting on Monte Carlo methods through specific applications. There are few areas of science and technology where Monte Carlo methods are not used, and understanding how they are used in applications, with an eye on cross-domain fertilization, is a very important way to motivate and reinforce interest in Monte Carlo Methods.

By combining the theoretical background, with the computational approach firmly anchored in applications, the Monte Carlo method can be used to solve many problems that traditional deterministic methods cannot. In addition, there are a wide number of areas where both Monte Carlo and deterministic methods can be used, where the Monte Carlo approach offers a very attractive alternative. Thus, Monte Carlo methods themselves are a fruitful source of research problems, and when combined with deterministic methods have the promise to provide many improved numerical methods.

Secondary Purpose of the Course:

The hope is that the process of teaching this course will produce a set of course notes that can be crafted into a good, intermediate to advanced textbook on Monte Carlo methods. Thus, I expect to ask some things of the students that are going to be a bit out of the norm for students in a typical applied mathematics class.

Meeting Time/Place:

9:30AM to 10:45AM: Monday-Friday, 103 Love Building, Summer Session B (May 9-June 17)

Extra times for class presentations will be found based on student availability

Prerequisites:

This course is open to graduate students in Mathematics and Computer Science, and is listed with course numbers for each of those department. It is also appropriate for graduate students in Physics or Engineering that are using Monte Carlo methods in their work, as well as for SCS graduate students. SCS students can take this for "Class C" credits.

Instructor:

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For the curious, here are links to a brief biography of the Professor, and the Professor's home page.

Office Hours:

I am usually in my 262 Love office, and my office hours are yet to be determined.

Grading Policy:

The grade will be based on class participation and mostly a project. The project will be of the student's choosing, and will require both a written and oral presentation at the end of the term.

E-mail Policy:

All e-mail communication regarding this course must be sent and received from an **fsu.edu** e-mail address.

Warning and Encouragement:

The students are warned that by taking this course they are implicitly submitting themselves in the role of instructional "Guinea Pigs." As such, your constant input is not only permitted, but *strongly encouraged*. Feel free to speak up in class, to visit me in my office with your opinions and criticisms, or to e-mail me with ideas on how to improve this class. Also, if something is not clear to you in class, it is very likely unclear to others. So, students are encouraged to interrupt the lectures and ask questions and to come to see me out of class for clarification.

Academic Honor Policy:

The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to ". . . be honest and truthful and . . . [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at http://dof.fsu.edu/honorpolicy.htm).

Americans with Disabilities Act:

Students with disabilities needing academic accommodation should:
(1) register with and provide documentation to the Student Disability Resource Center; and
(2) bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class.

This syllabus and other class materials are available in alternative format upon request:

For more information about services available to FSU students with disabilities, contact the:

Student Disability Resource Center
97 Woodward Avenue, South
108 Student Services Building
Florida State University
Tallahassee, FL 32306-4167
(850) 644-9566 (voice)
(850) 644-8504 (TDD)
sdrc@admin.fsu.edu
http://www.disabilitycenter.fsu.edu/