

STAT 7380: Advanced Topics in Statistics
Introduction to Monte Carlo Approaches in Statistics
FALL 2018 (T04)
Tentative Course Outline

Course Details

Course Title & Number:	Advanced Topics in Statistics (STAT 7350)
Credit Hours:	1.5
Class Schedule:	10:30 AM–11:20 AM, Mondays/Wednesdays/Fridays
Start Date of the Class:	October 10th, 2018
Location for Lectures:	418 Machray Hall
Course Material:	All course materials are posted on UMLearn (D2L) web
Pre-Requisites:	Statistical knowledge at the level of STAT 4100 and 4200

Instructor Contact Information

Instructor:	Mohammad Jafari Jozani
Office:	365 Machray Hall
Office Hours & Availability:	Mondays/Wednesdays 13:00–14:00 or by appointment (call or email to confirm).
Office Phone Number:	204-272-1563
E-mail:	m.jafari.jozani@umanitoba.ca
	I will only respond to e-mail from UMLearn ID's
	When feasible, I normally return a call or an email within 24 hours.

General Course Information and Topics To Be Covered

General description: An introduction to some Monte Carlo Computational Techniques in order to learn how to use simulation methods as proper tools to analyze their experiments and/or data sets. List of topics and outline of details:

- 1- Random Variable Generation
(General methods such as transformation, accept-reject methods, etc.)
- 2- Monte Carlo Integration and Variance Reduction
- 3- Controlling and Accelerating Convergence
(Importance sampling; Antithetic variables; Control variables; Stratified Sampling; Stratified Importance Sampling.)
- 4- Monte Carlo Optimization
(EM algorithm, Monte Carlo EM, etc.)
- 5- Metropolis Hastings algorithms
- 6- Gibbs Samplers
- 7- Monitoring and Adaptation for MCMC algorithms (if time permits)

Textbook, Readings, Materials

- Textbook:** My course notes are from the following textbooks. E-book for the first one (which is my main resource) is available through the University of Manitoba Libraries.
- Other Resources:**
1. *Introducing Monte Carlo Methods with R*. By C. Robert and G. Casella. Springer Texts in Statistics: New York (2010). E-book is available through the University of Manitoba Libraries..
 2. *Monte Carlo Statistical Methods*. By C. Robert and G. Casella. Springer Texts in Statistics: New York (2010).

Course Technology

- Course web-page:** Course materials will be made available through the University of Manitoba's UM Learn system (umanitoba.ca/d2l).
- Software:** We will be making use of the R statistical software. R is freely available for Linux, Macintosh and Windows from *The Comprehensive R Archive Network* at <http://cran.r-project.org/>. Please download and install.
- Other Technology:** It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. Students should restrict their use of technology to those approved by the instructor and/or University of Manitoba Accessibility Services for *educational purposes only*. Electronic messaging, e-mail, social networking, gaming, etc. should be avoided during class time. Cell phones should be turned off. If a student is on call for emergencies, his/her cell phone should be on vibrate mode and the student should leave the classroom before using it.

Important Dates

These dates are tentative and subject to change at the discretion of the instructor and/or based on the learning needs of the students but such changes are subject to Section 2.8 of the ROASS Procedure.

Date	Information
October 10, 2018	Classes begin (418 Machray Hall)
November 19, 2018	Last Day for VW
December 5, 2018	End of Classes

Course Work, Examinations & Grading

Assignments and Projects: There are some assignments to be handed in for grading. Lists of problems (some taken from the textbook) will be provided. Keep in mind that "**Practice, Practice, Practice**" is the gold rule for learning statistics. There are also some projects that will be assigned to each student. These projects are dealing with Monte Carlo approaches using rank-based sampling designs. More details will be provided in the class.

Item	Percent
Assignments	30%
Project	30%
Final Exam	40%
Total	100%

Class Communications

The University requires all students to activate an official U of M email account, which should be used for all communications between yourself and the university (including all your instructors). For full details of the Electronic Communication with Students please visit: http://umanitoba.ca/admin/governance/media/Electronic_Communication_with_Students_Policy_-_2014-06-05.pdf All these email communications should comply with the University's policy on electronic communication with students, which can be found at: http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html

Using Copyrighted Material

We will use copyrighted content in this course. I have ensured that the content I use is appropriately acknowledged and is copied in accordance with copyright laws and University guidelines. Copyrighted work must not be distributed in any format without permission.

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Student Accessibility Services

If you are a student with a disability, please contact Student Accessibility Services (SAS) for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

Student Accessibility Services, <http://umanitoba.ca/student/saa/accessibility/>
520 University Centre, (204) 474-7423, Student.accessibility@umanitoba.ca

Academic Integrity

It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. Links to resources that describe academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation, as well as typical penalties) can be found at:

<http://umanitoba.ca/faculties/science/undergrad/resources/webdisciplinedocuments.html>
or
<http://umanitoba.ca/faculties/science/undergrad/resources/webdisciplinedocuments.html>

ROASS Schedule A

Schedule "A" of the *Responsibilities of Academic Staff with regards to Students (ROASS)* policies of the University of Manitoba lists resources and policies for students. It is important that you familiarize yourself with these resources and policies. This document will be posted to the Department of Statistics web page and to the UM Learn system.

<http://umanitoba.ca/science/statistics/files/pages/2016/09/Schedule-A-ROASS-Statistics.pdf>