COURSE SYLLABUS

MATH 6382      Statistical Computing    Instructor Name: Xiaohui (Sophie) Wang
Spring 2018     Contact Info: 665-3454, xiaohui.wang@utrgv.edu
Class meet: MW 4:30~5:45pm, EEDUC 1.102    Office location: MAGC 3.802
Office hours: MW 11am-12noon

Textbook and Resource Material

R (required):
We will also use R for some statistical computing, especially if you need to do the computing off-campus. R is publically available statistical software that can be downloaded from: http://cran.revolutionanalytics.com/
Installation is straightforward.

Course Description and Prerequisites
A course in modern computationally-intensive statistical methods including simulation, optimization methods, Monte Carlo integration, maximum likelihood /EM parameter estimation, Markov chain Monte Carlo methods, resampling methods, non-parametric density estimation. Prerequisites: consent of instructor.

Learning Objectives/Outcomes for the Course
- To be able to understand that computational inference is one of important statistical methods;
- To be able to carry out algorithms and programming in R;
- To be able to generate random numbers for simulation study;
- To be able to use some graphical methods for data visualization;
- To be able to estimate density functions;
- To be able to carry out computational inference using resampling and partitioning;
- To be able to perform some fundamental statistical learning and data mining methods.

Grading Policies

<table>
<thead>
<tr>
<th>Attendance</th>
<th>5%</th>
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<tbody>
<tr>
<td>Homework (reading assignment, data analysis, etc.)</td>
<td>25%</td>
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<tr>
<td>Midterm Exam (Mar 21, 2018 during class time)</td>
<td>25%</td>
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<tr>
<td>Computing Project Midterm Report/Presentation</td>
<td>10%</td>
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<tr>
<td>Presentation: TBD during class time</td>
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<tr>
<td>Report due on TBD midnight</td>
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<tr>
<td>Final Exam (May 7, 2018, Mon, 5:45-7:30pm)</td>
<td>10%</td>
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<tr>
<td>Computing Project Final Report/Presentation</td>
<td>25%</td>
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<td>Presentation: Sat, May 5, 2018</td>
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<td>Report due on midnight of final exam day.</td>
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<td>Bonus points for offering help to others</td>
<td>Up to 5 points added to final</td>
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Course grades will be determined by 90~100=A, 80~89=B, 70~79=C, 60~69=D, 50~59=F. In addition, discussion participation (during class or via BB) will be used to determine border grades. Curve may be given for each exam depending on overall performance. There is NO extra credit. A grade of Incomplete (I) can be given ONLY in the event that an authorized absence or circumstances beyond your control were the cause of your missing a small portion of the course. This grade is not to be given because you feel that you have too much other work or study to do or because you think that you will not earn an acceptable grade in the course.
Attendance:
Attendance will be recorded via sign-in paper. If you do homework of other courses during this class meeting time, you will be counted as absent for that class. If you miss four or more class meetings, the instructor may DROP you from the class. Students with no more than 2 missing classes will get full credit for attendance.

Homework:
There will be some reading assignments throughout the semester. Some homework problems are from exercise problems at the end of each chapter. Some homework will be performing some computing and data analysis using R. You will also need to write brief narrative paragraphs based on your analysis results. One lowest homework grade will be dropped when calculating total grades at the end of the semester.

Midterm Exam:
Exam on paper during class time. It will include multiple choice problems and open-end problems.

Final Exam:
Comprehensive exam on paper. It will include multiple choice problems and open-end problems.

Statistical Computing Project:
You will be assigned to do a computing project. Below are some information for the project as of now.

1. Two reports will be collected for grading purpose: Midterm report and Final report.
2. The project reports are required to be written in a WORD file.
3. You will give presentations for the project throughout the semester. Final presentation will be on May 5, Sat, 2018.

Midterm Report/Presentation:
Midterm Report and presentation will due on TBD during class time. Class presentation might be required.

Final Project/Presentation:
Final Report will be due on Monday, May 7, midnight. Presentation will be at Spring Student Statistics Research Conference, Sat, May 5, 2018.

(Continue on next page)
Calendar of Activities
We plan to finish the corresponding chapters in the textbook according to the following timeline (tentative):

**Weeks 1-2: Introduction.** TB1 (Chap 1) and TB2 (chap 3).
Computational Statistics and Statistical Computing; R and other software; algorithms and programming.

**Weeks 2-3: Probability and Statistics Review and Numerical Linear Algebra.** TB1 (Chap 2) and TB2 (chap 1).
Random variables, distributions, Bayes theorem, Bayesian statistics; Markov Chain; Numerical linear algebra.

**Weeks 3-4: Simulation Study Design.** TB1 (Chap 3) and TB2 (chap 6).
Several methods to generating random variables; Aspects to design a simulation study.

**Weeks 5-6: Data Visualization.** TB1 (Chap 4) and TB2 (chap 7).
Graphical methods (1D, 2D and 3D plots); Other approaches to data visualization.

**Weeks 7-8: Density Estimation and Estimation of Functions.** TB1 (Chap 10) and TB2 (chap 9).
Kernel density estimation; Univariate, bivariate and multivariate density estimations;

**Midterm Exam. (Week 9)**

**Weeks 9-10: Data Processing and Computational Inference Using Resampling and Partitioning.** TB1 (chap 7) and TB2 (chaps 12 and 13)
Data randomization, partitioning, and augmentation; Bootstrap methods.

**Weeks 11-12: Statistical Learning and Data Mining.** TB2 (chaps 9, 10, and 16)
Identifying interesting features or structure in data.

**Weeks 13-15: Monte Carlo Methods.** TB1 (chaps 5, 6, 9) and TB2 (chap 11)
Monte Carlo Integration; Monte Carlo methods for estimation and hypothesis tests; MH algorithm, Gibbs sampler; monitoring convergence.

**Review, Final Exam (Week 16)**

Some important dates for Spring 2018 include:

- Jan. 16 (Tues.)  Spring classes begin
- Jan. 31 (Wed.)  Census Day (*last day to drop without it appearing on the transcript*)
- Feb. 12 (Mon.)  Last day to withdraw (drop all classes) and receive a 25% refund
- Mar. 12 – Mar. 16 (M-F)  Spring Break. No classes
- Mar. 30 (Fri.)  Easter Holiday. No classes.
- April 12 (Thurs.)  Last day to drop a class (grade of DR) or withdraw (grade of W)
- May 3 (Thurs.)  Study Day. No classes.

**Other Course Information**
Please check Blackboard and the instructor's teaching website at faculty.utrgv.edu/xiaohui.wang/teaching.html.

**Copyright Statement:**
The handouts and notes used in this class are copyrighted. By handouts and notes, I mean all materials generated for this classes, which include but are not limited to syllabi, quizzes, exams, in-class materials, review sheets and additional problems sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless I expressly grant permission.
UTRGV Policy Statements

The UTRGV disability accommodation, mandatory course evaluation statement and sexual harassment statement are required on all syllabi. Additional policy statements are optional, such as those covering attendance, academic integrity, and course drop policies.

STUDENTS WITH DISABILITIES: Required on all syllabi. Do not modify.
Students with a documented disability (physical, psychological, learning, or other disability which affects academic performance) who would like to receive academic accommodations should contact Student Accessibility Services (SAS) as soon as possible to schedule an appointment to initiate services. Accommodations can be arranged through SAS at any time, but are not retroactive. Students who suffer a broken bone, severe injury or undergo surgery during the semester are eligible for temporary services. Brownsville Campus: Student Accessibility Services is located in Cortez Hall Room 129 and can be contacted by phone at (956) 882-7374 (Voice) or via email at ability@utrgv.edu. Edinburg Campus: Student Accessibility Services is located in 108 University Center and can be contacted by phone at (956) 665-7005 (Voice), (956) 665-3840 (Fax), or via email at ability@utrgv.edu.

MANDATORY COURSE EVALUATION PERIOD:
Students are required to complete an ONLINE evaluation of this course, accessed through your UTRGV account (http://my.utrgv.edu); you will be contacted through email with further instructions. Students who complete their evaluations will have priority access to their grades. Online evaluations will be available: April 11 – May 2, 2018

SCHOLASTIC INTEGRITY:
As members of a community dedicated to Honesty, Integrity and Respect, students are reminded that those who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and expulsion from the University. Scholastic dishonesty includes but is not limited to: cheating, plagiarism (including self-plagiarism), and collusion; submission for credit of any work or materials that are attributable in whole or in part to another person; taking an examination for another person; any act designed to give unfair advantage to a student; or the attempt to commit such acts. Since scholastic dishonesty harms the individual, all students and the integrity of the University, policies on scholastic dishonesty will be strictly enforced (Board of Regents Rules and Regulations and UTRGV Academic Integrity Guidelines). All scholastic dishonesty incidents will be reported to the Dean of Students.

SEXUAL HARASSMENT, DISCRIMINATION, and VIOLENCE:
In accordance with UT System regulations, your instructor is a “Responsible Employee” for reporting purposes under Title IX regulations and so must report any instance, occurring during a student's time in college, of sexual assault, stalking, dating violence, domestic violence, or sexual harassment about which she/he becomes aware during this course through writing, discussion, or personal disclosure. More information can be found at www.utrgv.edu/equity, including confidential resources available on campus. The faculty and staff of UTRGV actively strive to provide a learning, working, and living environment that promotes personal integrity, civility, and mutual respect that is free from sexual misconduct and discrimination.

COURSE DROPS:
According to UTRGV policy, students may drop any class without penalty earning a grade of DR until the official drop date. Following that date, students must be assigned a letter grade and can no longer drop the class. Students considering dropping the class should be aware of the “3-peat rule” and the “6-drop” rule so they can recognize how dropped classes may affect their academic success. The 6-drop rule refers to Texas law that dictates that undergraduate students may not drop more than six courses during their undergraduate career. Courses dropped at other Texas public higher education institutions will count toward the six-course drop limit. The 3-peat rule refers to additional fees charged to students who take the same class for the third time.