USC Marshall School of Business

GSBA 545 – Data Driven Decision Making

Syllabus – Fall 2022

Professor: Inga Maslova
Office: ACC 203
Class: M 12:30 pm – 1:50 pm in JKP 104
Office Hours*:* Monday 9:00 am - 10:00 am PST *on Zoom or by appointment (Click here to schedule)*
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COURSE DESCRIPTION

Data Driven Decision Making will teach students to become more savvy business professionals through quantitative analysis. After this course, students will be able to think quantitatively and properly interpret data-oriented statements. We will cover fundamental statistical techniques in a managerial setting, with examples and concrete exercises from business and non-business settings. Statistical topics include effective use of numerical and graphical summaries, important probability distributions, estimation and confidence intervals, hypothesis testing, categorical data analysis, and multiple linear regression analysis. The important 'big picture' goal of this course is to think aboutthe process of decision making under uncertainty, a necessary skill in all business professions.

Over the last two decades, we have witnessed an explosion in the availability of data. Firms routinely collect point of sales transactions, monitor operating performance throughout their supply-chain, mine website traffic, and track customer engagement. Business analytics and data are transforming modern firms, and, in some cases, disrupting entire industries. Importantly, these changes are not limited to the "back-office" or operations; every aspect of the firm - organizational structure, marketing, product design, and strategic planning – is shifting towards data-driven decision-making. With this shift comes an increased need for "data-savvy" analysts; analysts who are not necessarily data-science experts, but understand what analytics can and cannot do, how to ask the right questions, and, most importantly, how to interpret data to make better decisions.

LEARNING OBJECTIVES

At the end of this course, you will be able to:

- Explain in your own words the key ideas behind fundamental techniques in data analytics
- Identify new opportunities to use these techniques across business domains to guide decision-making
- Confidently apply these techniques to practical problems using R
- Formulate and communicate actionable business recommendations based upon your analysis, including its limitations
- Critically assess the validity of analytics-based recommendations in the context of specific business decisions

COURSE BOOK

- An Introduction to Statistical Learning with Applications in R by James, Witten, Hastie, and Tibshirani. The book's website is http://www-bcf.usc.edu/~gareth/ISL/index.html Also, USC has subscription to Springer, so you should be able to access the book online: http://link.springer.com/book/10.1007/978-1-4614-7138-7/page/1
- Additional resource (optional): I would also recommend that you obtain a copy of "An Introduction to R" by Venables and Smith which we will use as a manual for learning R. You can download it for free from here.

STATISTICAL SOFTWARE

Clearly a statistics package is essential for such an applied course. There are very few packages that can implement all of the different approaches we will cover. Of those that can, most are extremely expensive.
This software is free and can be downloaded at http://www.r-project.org and https://www.rstudio.com/
Students are expected to bring their laptops to class during all class sessions.

GRADES:

Grading policies and practices for the University are described below:

Letter grade A

Work of excellent quality; represents Exceptional work; a grade of "A" will be assigned for outstanding work only.

Letter grade B

Work of good quality; represents Good work; a grade of "B" clearly meets the standards for graduate level work.

Letter grade C

Work of fair quality; represents Adequate work; a grade of "C" counts for credit for the course, minimum passing for graduate credit.

Letter grade C minus

Failing grade for graduate credit.

Grade components and weights are summarized in the table below:

ASSIGNMENTS	% of Grade
IN-CLASS, PRE-CLASS	25 %
LABs	20 %
HOMEWORK	20 %
FINAL PROJECT	35 %
TOTAL	**100 %**

Final grades represent how you perform in the class relative to other students. Historically, the average grade for this class is about a (B+/A-). Three items are considered when assigning final grades:

1. Your average weighted score as a percentage of the available points for all assignments (the points you receive divided by the number of points possible).
2. The overall average percentage score within the class.
3. Your ranking among all students in the class.

IN-CLASS, PRE-CLASS

Preparation for lectures is an extremely important part of the learning experience in this course as the richness of the learning experience will be largely dependent upon the degree of preparation by all students prior to class sessions. Throughout the semester there will be short pre-class assignments based on readings and videos.

Your class preparation is assessed on the completion and quality of the answers to pre-class assignments questions posted on BB. All pre-class is due before the session it is assigned to.

In-class participation is also a critical part of this course's learning experience.

Cold calling will take place to encourage active participation and to gain multiple perspectives and points of view, thus lending itself to the richness of the learning experience. While some students are far more comfortable than others with class participation, all students should make an effort to contribute meaningfully during every class. We will also work on individual analysis during class. You will submit your work on BB which will also count towards your in-class participation credit

Your participation is evaluated on the quality of your contribution, insights and for participation assignments that you will submit on blackboard. All in-class work is due on BB by the end of next day (11:59 pm PST) it was assigned.

LAB

Labs will generally require you to perform case analysis independently. I will be your chance to try using the techniques introduced in class. It will require use of software, so you will be submitting: your script, your computation results, and your insights and conclusions on the analyzed case. Labs will usually be held on Wednesdays.

Your work is evaluated on both correctness of your calculations and the quality of your insights. You will submit your work on blackboard. All in-class work is due on BB by the end of next day (11:59 pm PST) it was assigned.

HOMEWORK

Students will work on HW assignments individually. Homework assignments will provide an opportunity for you to develop and apply your data analysis skills to various business problems. In many ways, these assignments are a good example of the kinds of analytics work you may expect to do in your job out of Marshall.

Answer the questions that you are asked clearly and concisely. Some questions will ask for code, specific numbers and/or calculations. To receive full credits, you must show your work. In some cases, you may wish to include a chart or graph. Please make sure to format it appropriately. Your scores on each assignment will depend on the quality and clarity of your submission. Finally, there may be questions that ask for you to make business recommendations based on your insights. Persuasive arguments tend to be brief. Long-winded answers often receive poorer scores.

FINAL PROJECT

Students will work in teams to analyze a data set of your choice. Your project will involve a 10 minute recorded PRESENTATION to the assigned target audience, and a write-up/REPORT. Guidelines and requirements for the final project, including grading rubrics, will be distributed later in the semester.

STATEMENT ON ACADEMIC INTEGRITY

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *SCampus*, the Student Guidebook, (www.usc.edu/scampus or http://scampus.usc.edu) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/ . Failure to adhere to the academic conduct standards set forth by these guidelines and our programs will not be tolerated by the USC Marshall community and can lead to dismissal.

EMERGENCY PREPAREDNESS / COURSE CONTINUITY

In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.

INCOMPLETE GRADES

A mark of IN (incomplete) may be assigned when work is not completed because of a documented illness or other "emergency" that occurs after the 12th week of the semester (or the twelfth week equivalent for any course that is scheduled for less than 15 weeks).

An "emergency" is defined as a serious documented illness, or an unforeseen situation that is beyond the student's control, that prevents a student from completing the semester. Prior to the 12th week, the student still has the option of dropping the class. Arrangements for completing an IN must be initiated by the student and agreed to by the instructor prior to the final examination. If an Incomplete is assigned as the student's grade, the instructor is required to fill out an "**Assignment of an Incomplete (IN) and Requirements for Completion"** form (http://www.usc.edu/dept/ARR/grades/index.html) which specifies to the student and to the department the work remaining to be done, the procedures for its completion, the grade in the course to date, and the weight to be assigned to work remaining to be done when the final grade is computed. Both the instructor and student must sign the form with a copy of the form filed in the department. Class work to complete the course must be completed within one calendar year from the date the IN was assigned. The IN mark will be converted to an F grade should the course not be completed.

Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on Research and Scholarship Misconduct.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as

accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org
Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
eeotix.usc.edu
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776
osas.usc.edu
OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.
USC Campus Support and Intervention - (213) 821-4710
campussupport.usc.edu
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101
diversity.usc.edu
Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
dps.usc.edu, emergency.usc.edu
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call
dps.usc.edu
Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)
ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-3340 or otfp@med.usc.edu
chan.usc.edu/otfp
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

COURSE OUTLINE

This is a **tentative** view of the course outline.

I. **Course Introduction**
- Introduction to Modern Statistical Learning Approaches
- Summary of different methods we will cover in the course
- What is Statistical Learning?
    - Inference vs. Prediction
    - Supervised vs. Unsupervised Learning Problems
    - Regression vs. Classification

II. **Assessing the Accuracy of a Statistical Learning Method**
- Less Flexible vs. More Flexible Methods
- Training vs. Test Error Rates

III. **AB testing**

IV. **Linear Regression**
- Linear Regression Model
- Using Least Squares to Fit the Model
- Testing Statistical Significance
- Dealing with Categorical Variables

V. **Time Series**
- Classical models

VI. **Logistic Regression**
- Using the Logistic Function for Classification
- Estimating Regression Coefficients
- Estimating Probabilities

VII. **Resampling Methods**
- Cross Validation
- The Bootstrap

VIII. **Variable Selection**
- Best Subset Regression
- Leave Out Samples
- BIC and AIC
- Cross Validation
- Illustrations on Real Estate Data

IX. **Decision Tree Methods if time permits**
- Decision Trees
- Regression vs. Classification Trees
- Pruning Trees

X. **Clustering Methods if time permits**
- K-means Clustering
- Hierarchical Clustering