MATH 395 (4): Intro to Data Science with R (Spring 2017)

Class Time and Location: TR, 9:55–11:40 AM

Instructor: James D. Wilson **Office:** 203B Harney Science Building **Email:** jdwilson4@usfca.edu

Office Hours: T 12:30 - 1:30 PM, R 1:30 - 2:30 PM

Prerequisites: MATH 108 or approval by instructor.

Course Overview: This course provides an introduction to the world of data science and analytics. This course will provide an overview of the basic tools and techniques available for making informed, data-driven decisions in a complex world. By the end of this semester, you will have a comfortable understanding of how to use the R programming language and RStudio to visualize, wrangle, manipulate, and explore data of many types and sizes. You will have familiarity with the following key aspects of programming and analysis:

- data visualization
- programming basics, workflow, and input/output
- data aggregation
- exploratory data analysis
- writing and applying functions
- vectorized programming
- manipulating and analyzing strings, factors, dates, and numeric data

You will learn how to use an array of modern data analytic packages in R including *ggplot2*, *tibble*, *tidyr*, *dplyr*, *knitr*, and *stringr*. Furthermore, you will learn the basics of *git* and *github* for organizing and sharing code.

Course Learning Outcomes: By the end of this course, students will be able to

- Proficiently wrangle, manipulate, and explore data using the R programming language
- Utilize git and github for version control and code sharing
- Utilize contemporary R libraries including *ggplot2*, *tibble*, *tidyr*, *dplyr*, *knitr*, and *stringr*
- Visualize, present, and communicate trends in a variety of data types
- Communicate results using R markdown and R Shiny graphical user interfaces
- Formulate data-driven hypotheses using exploratory data analysis and introductory model building techniques

Course Website: https://github.com/jdwilson4/Data100_Spring_2017

Required Textbook: *R for Data Science* by Hadley Wickham and Garret Grolemund
Available for free online here: http://r4ds.had.co.nz/index.html

What you are required to bring to class: Please bring a laptop to every class as well as a sunny disposition :)

Attendance: Attendance is required every day and will be recorded and worth 10% of your final grade. It is your responsibility to catch up on any lecture material, homework, or programming lesson that you miss due to an absence.

Topics Covered: Each week two days will be "lecture style" where students and instructor will explore new topics together using R. The remaining day will be devoted to a hands-on programming project using the tools learned that week. We will cover the following topics in accordance with the schedule below.

Week	Topic
1	Introduction – basics of R, RStudio, git, and github
2	Exploratory Data Analysis – data visualization
3	Exploratory Data Analysis – analysis workflow
4	Exploratory Data Analysis – identifying trends in data
5	Data Wrangling – data frames, tibbles, and subsetting data
6	Data Wrangling – input / output and tidying data
7	Data Wrangling – relational data
8	Data Wrangling – manipulating and analyzing strings
9	Data Wrangling – factors, dates, and times
10	Programming – functions and pipes
11	Programming – vectors and iterative programming
12	Modeling – model basics, linear regression
13	Modeling – introduction to model building
14	Communication – R markdown and Shiny
15	Communication – R markdown and Shiny

Assessment:

- **Attendance** (10%): Attendance will be recorded every class. You will lose 1% of this grade for every class that you miss.
- **Quizzes** (20%): There will be approximately one quiz per week that will contain one to two questions about material covered in class up until that point. These are not meant to be difficult, but rather to check your progress on the key ideas covered in class.
- **Assignments** (50%): For each assignment, you will be required to upload a .pdf file to the github site that contains your R code, any analyses, and any visualization used to answer the questions on the assignment. This .pdf file **must** be a result of compiling R code in RStudio using the *knitr* package. These must be submitted before the deadline set on github.
- **Final Exam** (20%): The final exam is a cumulative exam that will assess the concepts learned throughout this course. This will be an in-class written exam given on the scheduled final exam date provided by the University of San Francisco final exam schedule.

Grading Procedure: At the end of the semester, your grade will be calculated according to the following rubric:

A+	97 - 100
A	93 - 96
A-	90 - 92
B+	87 - 89
B	83 - 86
B-	80 - 82
C+	77 - 79
C	73 - 76
C-	70 - 72
D+	67 - 69
D	63 - 66
D-	60 - 62
F	< 60

There will be no curve implemented in this course. Late assignments will not be accepted and will automatically receive a grade of 0.

Important Dates:

- Friday, January 27th - Last day to add
- Friday, February 10th - Census date. Last day to withdraw with tuition reversal
- Monday, February 20th - Presidents' Day (**no class**)
- Monday, March 13th - Friday, March 17th - Spring break (**no class**)
- Monday, April 10th - Last day to withdraw
- Friday, April 14th - Easter Holiday (**no class**)
- Thursday, May 11th - Last day of class!
- Final Exam: this will be scheduled according to university standards and will be held in class. Scheduling information is available at `https://myusf.usfca.edu/onestop/registration/class-schedule-final-exams`.

Academic Integrity

As a Jesuit institution committed to cura personalis - the care and education of the whole person - USF has an obligation to embody and foster the values of honesty and integrity. USF upholds the standards of honesty and integrity from all members of the academic community. All students are expected to know and adhere to the University's Honor Code. You can find the full text of the code online at `www.usfca.edu/academic_integrity`. The policy covers:

- Plagiarism: intentionally or unintentionally representing the words or ideas of another person as your own; failure to properly cite references; manufacturing references.
- Working with another person when independent work is required.
- Submission of the same paper in more than one course without the specific permission of each instructor.
- Submitting a paper written by another person or obtained from the internet.
- The penalties for violation of the policy may include a failing grade on the assignment, a failing grade in the course, and/or a referral to the Academic Integrity Committee.

Students with Disabilities

If you are a student with a disability or disabling condition, or if you think you may have a disability, please contact USF Student Disability Services (SDS) at 415 422-2613 within the first week of class, or immediately upon onset of disability, to speak with a disability specialist. If you are determined eligible for reasonable accommodations, please meet with your disability specialist so they can arrange to have your accommodation letter sent to me, and we will discuss your needs for this course. For more information, please visit: http://www.usfca.edu/sds or call (415) 422-2613.

Behavioral Expectations

All students are expected to behave in accordance with the Student Conduct Code and other University policies (see http://www.usfca.edu/fogcutter/). Open discussion and disagreement is encouraged when done respectfully and in the spirit of academic discourse. There are also a variety of behaviors that, while not against a specific University policy, may create disruption in this course. Students whose behavior is disruptive or who fail to comply with the instructor may be dismissed from the class for the remainder of the class period and may need to meet with the instructor or Dean prior to returning to the next class period. If necessary, referrals may also be made to the Student Conduct process for violations of the Student Conduct Code.

Learning & Writing Center

The Learning & Writing Center provides assistance to all USF students in pursuit of academic success. Peer tutors provide regular review and practice of course materials in the subjects of Math, Science, Business, Economics, Nursing and Languages. `https://tutortrac.usfca.edu`. Students may also take advantage of writing support provided by Rhetoric and Language Department instructors and academic study skills support provided by Learning Center professional staff. For more information about these services contact the Learning & Writing Center at (415) 422-6713, email: `lwc@usfca.edu` or stop by our office in Cowell 215. Information can also be found on our website at `www.usfca.edu/lwc`.

Counseling and Psychological Services

Our diverse staff offers brief individual, couple, and group counseling to student members of our community. CAPS services are confidential and free of charge. Call 415-422-6352 for an initial consultation appointment. Having a crisis at 3 AM? We are still here for you. Telephone consultation through CAPS After Hours is available between the hours of 5:00 PM to 8:30 AM; call the above number and press 2.

Confidentiality, Mandatory Reporting, and Sexual Assault

As an instructor, one of my responsibilities is to help create a safe learning environment on our campus. I also have a mandatory reporting responsibility related to my role as a faculty member. I am required to share information regarding sexual misconduct or information about a crime that may have occurred on USFs campus with the University. Here are other resources:

- To report any sexual misconduct, students may visit Anna Bartkowski (UC 5th floor) or see many other options by visiting our website: `www.usfca.edu/student_life/safer`.
- Students may speak to someone confidentially, or report a sexual assault confidentially by contacting Counseling and Psychological Services at 415-422-6352.
- To find out more about reporting a sexual assault at USF, visit USF's Callisto website at: `www.usfca.callistocampus.org`.
- For an off-campus resource, contact San Francisco Women Against Rape (SFWAR) (415) 647-7273 (`www.sfwar.org`).

Student Accounts - Last day to withdraw with tuition reversal

Students who wish to have the tuition charges reversed on their student account should withdraw from the course(s) by the end of the business day on the last day to withdraw with tuition credit (census date) for the applicable course(s) in which the student is enrolled. Please note that the last day to withdraw with tuition credit may vary by course. The last day to withdraw with tuition credit (census date) listed in the Academic Calendar is applicable only to courses which meet for the standard 15-week semester. To find what the last day to withdraw with tuition credit is for a specific course, please visit the Online Class Schedule at `www.usfca.edu/schedules`.