

Stat 5810: Data Dashboard Development

Section 003, Spring Semester 2024

Instructor

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(hours TBD)

Prerequisites

Instructor permission

Course Materials

Textbook: *Mastering Shiny* by Hadley Wickham (<https://mastering-shiny.org/index.html>)

Additional supplementary materials will be provided in Canvas as necessary. Note that the online version of the textbook, which is the version you are encouraged to use, is free.

Introduction

This course will pair undergraduate students with two PhD students (Ben Shaw and Scout Jarman) to work on a real data problem related to water resource management in the Bear Lake. The PhD students will train machine learning and/or deep learning (ML/DL) on measurements of daily temperature and precipitation in the Bear Lake Watershed to predict annual min/max Bear Lake water elevation levels. These models will then be coupled with downscaled estimates of future climate projections to estimate Bear Lake water elevation levels through the end of the century. This course will focus on developing interactive data dashboards that embed these models and allow users to interactively explore changes in projected lake elevation levels to changes in modeling assumptions or future climate scenarios. These dashboards will be given to the Utah Department of Natural Resources to help them make informed decisions for the future of Bear Lake.

After finishing this class, students should be able to:

1. Develop reactive data dashboards that embed dynamic visuals and predictive models.
2. Understand how to work independently on a real data project both individually and in groups.
3. Understand how to use version control to coordinate software development with other people on large and complex programming tasks.

Software

This course will require extensive programming in the R statistical software language. All students will be required to have a working laptop capable of installing R that they can bring to each class period. It is expected that all students will be using a current version of R (R 4.3.x or later) and will be using updated versions (as of 09/01/2023) of all software packages.

Grades

Final scores in this course will be determined by the number of points earned divided by 1000. Thus, each 10 points on an assignment, regardless of category, represents 1% of your final score. The following grade scale is guaranteed, but I reserve the right to adjust this grade scale in favor of the students if necessary. **Note that this grade scale contains no + or - designations.** This means that a 91% is an A, not an A- and an 89% is a B, not a B+, in this course. A breakdown of points is given in the following sub-sections.

Percent	Grade
90-100	A
80-89.9	B
70-79.9	C
60-60.9	D
0-59.9	F

Attendance (350 points)

The final project in this class will be completed in groups. This makes your regular attendance critical to the collective success of the course. As such, you are required to attend all course sessions. To accommodate inevitable extenuating circumstances, all students are given three “excused” absences for the semester. Any absences beyond the three excused absences will result in a 60 point deduction to your attendance score (maximum deduction of 350 points).

The three excused absences are intended to cover family emergencies, illness, and university excused absences. This means that, should a student have to miss for a university excused absence, they only have TWO remaining excused absences for the semester, and not three. Please talk to the instructor during the first week if you anticipate having more than two university-excused absences during the semester.

Final Project (300 points)

This class culminates in an interactive data dashboard suitable for presentation at USU’s Spring Runoff Conference in March. Students will work in groups of three on these dashboards as overseen by a PhD student mentor. Students will be required to make regular contributions to the project and will be required to respond to multiple rounds of feedback from both the PhD student and the instructor.

Spring Runoff Conference Presentation (100 points)

Near the end of March (tentative dates of March 25-26), students will be required to present USU's Spring Runoff Conference and present their data dashboards at this conference.

Research Journal (150 points)

Each student will be required to keep track of their progress in a research journal. This journal should include 1-2 paragraphs of reflection for every day you work on the project (minimum of 3 entries per week). Things to write about include (1) what you worked on that day, (2) what you learned, (3) what you tried that didn't work, and (4) next steps for your work. These research journals will start once the group projects begin and you will be required to submit draft copies of the journal multiple times during the semester.

In-class assignments (100 points)

During the first 3-4 weeks of the semester there will be a series of in-class assignments designed to prepare you to start making a publishable data dashboard. These assignments are based on completion and can be submitted during or after class. Your lowest score in this assignment category will be dropped.

Experience Cache Valley (10 points extra credit)

Students have the option to participate in an activity unrelated to the coursework in or immediately surrounding Cache Valley and write about their experience. **Note that the report must be submitted within two weeks of the completed activity.** See Canvas for assignment details.

Instructor Commitments

As a research faculty member, I am expected to devote about 50% of my efforts on research, 45% to teaching, and 5% to service activities. This means that I must carefully partition my time so that I provide quality instruction and timely feedback without sacrificing the other aspects of my faculty responsibilities or personal life. For this reason, you can expect to receive a response to me on any email or Canvas discussion within one business day, but may not respond to your requests over the weekend.

Student Expectations

Working Independently

This course is unique in the opportunity it provides you to work on a project independently over an extended period of time. It is designed to mimic the type of experiences you may have engaging in applied research during graduate school. Unlike a regular class, the instructor or the PhD mentors will not be able to outline every step to solve a problem. You will need to learn how to read materials on your own

Course Communication

Students are responsible for all information presented in class and are responsible to regularly check Canvas for announcements, due dates, and other communications from the instructor.

When you need to email the instructor something related to this class, please use the Canvas email feature to do so.

Academic Honesty

In this course, cheating is defined as **any attempt made by a student to deceive the instructor** in the representation of their work. This definition includes all forms of plagiarism, including copying code from other sources or people without attribution. It is natural and encouraged to take programming ideas and small code snippets from online sources or chatGPT. However, when this occurs, **be sure to acknowledge the source of your idea/code snippet in your program comments**. Any observed instances of cheating will be reported to the University and warrants automatic failure from the course.

IDEA Objectives

The university using the IDEA learning objectives to measure the effectiveness of courses. Of the 13 pre-defined learning objectives, the ones most relevant to this course include:

- (3) Learning to apply course material (to improve thinking, problem solving, and decisions)
- (13) Learning appropriate methods for collecting, analyzing, and interpreting numerical information

Disclaimer

This is a new course running in a unique format and may require mid-semester adjustments. As such, the instructor reserves the right to make minor changes to this syllabus as needed throughout the semester. No change in the syllabus will be made without first advertising the proposed change to the students. Students will be given 2-3 days to review any changes and provide comments/objections to the instructor before any change is executed.

University Resources

Disability Resource Center

USU Welcomes students with disabilities. If students have, or suspect they may have, a physical, mental health, or learning disability that may require accommodations in this course, please contact the Disability Resource Center (DRC) as early in the semester as possible (University Inn #101, 435-797-2444, drc@usu.edu, usu.edu/drc). All disability-related accommodations must be approved by the DRC. Once approved, the DRC will coordinate with faculty to provide accommodations.

Office of Equity

USU strives to provide an environment for students and employees that is free from discrimination or harassment, including sexual misconduct. Should students experience harassment or discrimination at any point during the semester inside or outside of class, please reach out to the instructor or to USU's Office of Equity (Old Main #161, 435-797-1266, titleix@usu.edu, equity.usu.edu). As a responsible employee, the instructor is required to share information about any instances of sexual misconduct (sexual harassment, sexual assault, relationship violence (dating and domestic violence, or stalking) with the Office of Equity so that students can get connected to support and reporting resources. Students can learn more about the USU resources available for individuals who have experienced sexual misconduct at sexualassault.usu.edu.

CAPS

Mental health is critically important for the success of USU students. As a student, you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. Utah State University provides free services for students to assist them with addressing these and other concerns. You can learn more about the broad range of confidential mental health services available on campus at Counseling and Psychological Services (CAPS).

Students are also encouraged to download the "SafeUT App" to their smartphones. The SafeUT application is a 24/7 statewide crisis text and tip service that provides real-time crisis intervention to students through texting and a confidential tip program that can help anyone with emotional crises, bullying, relationship problems, mental health, or suicide related issues.