Senior Capstone Data Science

Professor:
Dr. Joanna Bieri
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Class:
Spring
Tuesday and Thursday 10:50-12:05

Office Hours:
TBA

Welcome to Senior Capstone

My goal is to help each and every student achieve their personal learning goals for this class. I value a diversity of opinions, learning approaches, cultural backgrounds, abilities, and ideas in my class. Classes, lectures, and group interactions should be a safe learning space where each member of the community feels valued, listened to, and respected. It is the responsibility of each of us to ensure that we are lifting up our peers, breaking free from old biases, reaching across cultural, socioeconomic, and other boundaries, and supporting each other. If at any time in the class you feel that there is something that could be done to improve your learning or your experience please let me know. I am here to lift you up and help you learn!

About This Course

This course is the capstone celebration of your time as a Data Science major. My goal for this semester is for each of you to not only meet the course learning objectives but to truly have an experience that is meaningful to your future goals and career path. This means that much of the class will be tailored to your specific needs and goals. The work in this class will model a few months in the life of a data scientist including, finding and cleaning data, presenting results to your boss and colleagues, communicating your results both in detail and as a summary to leadership, and careful and responsible use of data science practices.

Course Learning Objectives

1. **Complete a Science Project** answering a specific, real world, question in your area of interest that demonstrates good data science practices and critical analysis as learned in your major classes. Through your previous data science courses you should already have a start on this. You will be expected to work with at least one other student in a group, although you can each answer slightly different questions. The final portfolio will include

   - A cleaned data set that supports your project along with a ReadMe file explaining the structure of your data set and appropriate citations.
   - A notebook or code that contains exploratory data analysis. predictive data model along with and analysis of that model, and results. This should be written so your results are completely reproducible.
   - Visualizations throughout your notebook that support your data cleaning and modeling decisions and communicate your results
   - A 1-2 page executive summary of your results.
   - A written self reflection of your process of developing and revising your question.
   - A reflection on the ethical impacts of your data project. This might include issues in data collection, bias, different possible interpretations of results, and/or how your results could have ethical consequences.

2. **Support your peers** in the completion of their data science project.

3. **Present your results** in using clear descriptions of modeling and persuasive visualizations.

4. **Publish and share your results** in an appropriate form. (eg GitHub)

5. **Work in a group** to engage in the data science process applied to a real world problem.

6. **Write a professional Data Science Report** using professional language that describes and enhances your data and visualizations.

7. Fall even more in love with data science!

What you would like to achieve by engaging in this capstone experience?

OC and WD Learning Objectives

1. Prepare an organized, coherent, and well-supported oral presentation that is appropriate for its purpose and audience.

2. Effectively communicate ideas and positions orally, while constructively engaging their audience.

3. Address disciplinary questions and projects through writing.

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5. Apply disciplinary writing and research strategies through the integration of feedback across multiple drafts

Technology

Homework and announcements will be posted on the class website. Make sure you have access to a device that can connect to the internet and check daily for updates. You will also need to be able to hand in work on Canvas. Please let me know if this is a problem and I can help make sure you have access to a working computer. Through the generosity of alumni, we have computers available for lending!

Classwork

Class attendance is expected. It is during our class time that we will give feedback and support to our peers, help others with debugging and modeling decisions, and present our results. Each unexcused absence will have a negative impact on your grade. Please contact me immediately if you are missing class for any reason. Excused absences include: illness, important family obligations, mental health needs, religious holidays, and university sponsored events.

The class had three main elements:

- The Data Science Capstone Project:
  A big part of this class is finalizing your Data Science Capstone Project. As the culmination of your data science experience you will complete a start to finish data science project in your application area of interest. This work will be done collaboratively with at least one other peer, but each student will hand in an individual final project portfolio. It must be professionally written and show your ability to respond to feedback on both your written and computational work. This process will include multiple drafts and we explore writing for Data Science in the following areas: Proposal Writing, Writing about Exploratory Data Analysis, Proper referencing and data attribu-

tions, Writing about Modeling and Assumptions, and compiling these parts into a full Data Science report representing the Data Science Lifecycle. Successful completion of each part of the project will demonstrate your ability to meet the WD learning objectives.

- Peer Support and Feedback:
  Working in a group is important to the professional Data Scientists. You will be expected to be a supportive, collaborative, and successful group member. Your final project will be completed in collaboration with at least one other peer in the class. You will give feedback for each of the oral presentations and writing assignments.

- Presentations:
  You will give five presentations in this class. On the first day, you will give a short 3-5 minute description of your data science interests and area of application. After doing a job search you will do an individual presentation about a specific job in Data Science for a general audience. Later in the semester you will do three group presentations. A presentation of your exploratory data analysis for a technical audience, a practice presentation for your final project, and a final presentation to a wider university audience. You will get feedback from your peers to improve you presentations throughout the semester. We will have discussions in class after each presentation about what makes a successful presentation and how to constructively engage your audience. Successful completion of each of the presentations will demonstrate your ability to meet the OC learning objectives.

Evaluation Procedures

There are three elements of the course which contribute to your overall grade, as follows:

Data Science Project	50 %
Peer Support and Feedback	20 %
Presentations	30 %

Grading Scales:

4.0	95-100%
3.7	90-94%
3.3	87-89%
3.0	83-86%
2.7	80-82%
2.3	77-79%
2.0	73-76%
1.7	70-72%
1.3	67-69%
1.0	63-66%
0.7	60-62%

Course Policies

Communication

- The most reliable way to reach me is by email. Please note that my normal working hours are 9 a.m. to 5 p.m., Monday to Friday. I do not respond to emails after 5 p.m. or on weekends, except in an emergency.

- You can make appointments with me via email. Appointments can happen in Duke 209 or on Teams.

- It is important that you communicate throughout the semester. Let me know if there are ways I can improve your learning in the class.

Health Protocols

- In an effort to keep the classroom community safe and healthy, please follow the guidelines outlined here:

  - Wearing a mask is voluntary.
  - Do not come to class if you feel ill or have been exposed to someone who is ill.

- In any case of the above, e-mail me directly to reconcile any class work and/or attendance issues.

Please contact me if you have any concerns as to your health needs and goals for the semester.

Academic Honesty

The University of Redlands enforces strict standards as regards academic honesty, and students may be dismissed for breaches of these standards.
In light of this, please note that:

- intentional plagiarism—i.e. piecemeal or whole-sale appropriation of text from one or more printed or internet source—will result in a fail grade for the course.

- plagiarism by default—i.e. uncredited adoption of ideas from source texts due to carelessness in citation—will result in a fail grade for the project.

Artificial Intelligence: There is no tolerance for the use of generative artificial intelligence in place of individual work and thinking in this course. All work is to be considered a student's own. Any violation of that will result in a failing grade for the work.

If you are still in any doubt about what constitutes plagiarism, please ask me before you hand in your work!

Office of Equity and Title IX

In order to provide a safe and equitable learning environment for all students, faculty, and staff, discrimination, harassment, retaliation, sexual misconduct, and sexual harassment (including sexual assault, dating or domestic violence, and stalking) are not tolerated at the University of Redlands. The University prohibits unlawful discrimination or harassment (as defined in the Policy Prohibiting Discrimination, Harassment, Sexual Misconduct, and Retaliation) on the basis of age, color, race, ethnicity, national origin, ancestry, sex, marital status, pregnancy, status as a complaining party of domestic violence, sexual orientation, gender, gender identity or expression, physical or mental disability,

genetic information, religion/creed, citizenship status (except to comply with legal requirements for employment), military/veteran status, or any other characteristic protected by law. If you or someone you know has experienced or experiences any of these behaviors, know that you are not alone. You can contact the Office of Equity and Title IX for reporting options, supportive measures, and resources to support you.

Many faculty and staff at the University of Redlands are considered "Responsible Employees," which means that if you tell me about a situation involving any of the above, I must report the matter to the Office of Equity and Title IX. Although I make that report, you are in control of how you would like to proceed, including whether or not you wish to pursue a formal complaint. Our goal is to make sure you are aware of the range of reporting options available to you and have access to the support and resources you need.

To report an incident directly, you can:

- Contact the Interim Director of Equity & Title IX, Christopher Jones, at 909-748-8289 or titleix@redlands.edu

- Report online at:
  www.redlands.edu/titleixandequity

You can also report to local law enforcement at 909-798-7681, ext. 1. If you are ever in immediate danger, please call 911 or email/text 911@redlandspolice.org if you cannot call. To reach Public Safety on campus, call 909-748-8888 or use the Rave Gaudian App

If you wish to speak to someone confidentially (meaning not connecting with the Office of Equity and Title IX Office), you can contact the following resources:

- Campus:

  - Counseling Center: 909-748-8108 or 24-Hour Crisis Line: 909-748-8960
  - TimelyCare, 24/7 emotional support; 12 free telehealth counseling sessions

- Community:

  - Partners Against Violence, 24-hour sexual assault crisis line: 909-885-8884
  - Option House, 24-hour dating/domestic violence crisis line: 909-381-3471 Online: https://www.rainn.org/ (sexual assault); https://www.loveisrespect.org/

You can also report to local law enforcement at (909) 798-7681, ext. 1. If you are ever in immediate danger, please call 911 or email/text 911@redlandspolice.org if you cannot call.

If you wish to speak to someone confidentially (meaning not connecting with the Office of Equity and Title IX Office), you can contact the following resources:

- Campus: Counseling Service: 909-748-8108 or 24-Hour Crisis Line: 909-748-8960 or Chaplain's Office: 909-748-8368

- Community: Partners Against Violence, 24-hour sexual assault crisis line: 909-885-8884

- Option House. 24-hour dating/domestic violence crisis line: 909-381-3471

- Online chat: https://www.loveisrespect.org/

For more information, visit
www.redlands.edu/titleixandequity

Accommodations

If you are a student with a disability requesting reasonable academic accommodations in this course, please contact Academic Support and Accessibility (ASA). ASA is located in the Student Success Center on the ground floor of the Armacost Library. You can reach the office at 909-748-8069

or asa@redlands.edu. All requests for reasonable accommodations require registration with ASA in advance of need. Faculty, students, and ASA will work together regarding classroom accommodations. You are encouraged to discuss approved accommodations with your faculty. More information is available on the ASA webpage.

If there are ways that simple changes to the class could improve your learning please feel free to reach out to me directly.

Counseling Center

The Counseling Center provides free and confidential mental health services, including short-term individual therapy, group therapy, single-session therapy, consultations, and urgent appointments to all students with in-person or virtual options. Our Counseling Center is committed to inclusivity and to providing a supportive space for everyone. Please call 909-748-8108 to schedule an appointment or email counseling_center@redlands.edu. If a student is in crisis, please call 909-748-8960 for the 24/7 mental health crisis line. For more information on our resources, go here. Another option for individual therapy for all students is TimelyCare, which provides virtual therapy immediately (Talk Now) or up to 12 scheduled virtual therapy sessions per year. Students can choose their therapist from a list of providers for the scheduled therapy option.

Conflict Resolution Center

Experiencing a conflict? Whether it's with a friend, roommate, another member of a student organization, or faculty or staff member, conflicts happen. Learning to navigate conflicts is important to success in virtually any field, and a vital step in being a part of a community and having healthy, meaningful relationships with others.

See https://sites.redlands.edu/conflict-resolution-center/student-resources/ for more information.

The Care Team

The University CARE Team exists to help provide support and resources to students that are overwhelmed, experiencing significant distress, or possibly present some risk to themselves or others. As a faculty member, I may reach out to students about whom I am concerned to talk individually, and/or refer them to the CARE Team. If you have concerns about a fellow student, consider sharing your concern with the CARE Team via their online form. This is part of who we are as a caring, proactive community where we all look out for one another. Additionally, if you feel that you or someone else needs immediate mental health support, the University has a 24/7 mental health crisis line at 909-748-8960, and the Timely Care app, which offers on-demand emotional care. Both services connect to a live, licensed counselor.

Book Lending Program

The Book Lending Program is an initiative to ensure the academic success of First-Generation students (students who are the first to go to college in their families who meet a particular estimated family contribution [EFC] level). Funded through alumni donations, this program provides books and other classroom materials, when needed, for First-Generation students who could not otherwise afford to purchase them. Books are returned at the end of the course, to be used by other First-Generation students the next semester. For more information, click the link above or contact blp@redlands.edu.

Emergency Student Loans

Student Financial Services (SFS) administers a short-term, no-interest loan fund to assist students experiencing an emergency or cash-flow problem. Except in unusual circumstances, these loans do not exceed $200 and are billed to the student's account. Evidence of repayment ability is a prerequisite for all short-term loans made to students. Students are not eligible for more than one emergency student loan per term. Contact: SFS@redlands.edu or x8047

Student Affairs Discretionary Fund

These endowed funds in Student Affairs can be used to support student success and remove impediments that otherwise may cause the student to stop or leave school. To utilize this fund, divisional leadership should be made aware of the student in dire need of financial support. This support can be anything from personal expenses, such as utility bills, gas money, emergency trips home due to family tragedy, off-campus counseling, and other medical costs, and occasionally mental health assessment expenses. Students receive grants based on their financial need. Contact: student_affairs@redlands.edu.

Student Food Support Pantry

The Student Food Support Pantry is a resource available to all established full and part-time University of Redlands students facing food insecurities. The Pantry is located on the north side of North Hall. This space is an open, no-questions-asked space with dried and canned goods, and non-perishable items, as well as seasonal fresh produce from our sustainable farm and limited refrigerated goods. Food for this distribution is provided in partnership with Feeding America Riverside and San Bernardino. It is also funded through private donations, ASUR, and the Office of Community Service Learning. For more information, please contact SURF@redlands.edu.

Course Schedule

Schedule is subject to change as we progress through the semester. You will be notified of any changes in class.

Data Science – Senior Capstone

BLUE = Content to help meet OC outcomes
PURPLE = Content to help meet WD outcomes

DATE	WEEK	DAY	Class Time	Due Dates
01/06/26	1	Tuesday	Proposal Presentations – Present your individual proposed Data Science project. Communication – Feedback/Discuss/Reflect – what makes a good presentation	Informal (Elevator) Presentations in Class
01/08/26	1	Thursday	Writing – Proposal writing in Data science	
01/13/26	2	Tuesday	Proposal Writing Time**	
01/15/26	2	Thursday	Research – Gathering and Cleaning Data	Hand in Group Organization and Project Implementation Plans and Background (Project Proposal Writing)
01/20/26	3	Tuesday	Updating CV and Online Content for Job Search	
01/22/26	3	Thursday	Research – Exploratory Data Analysis	Update Proposals based on Feedback
01/27/26	4	Tuesday	Individual Work Time** Starting/updating a GIT repo/website for publishing your work.	
01/29/26	4	Thursday	Presentation – General Audience – Job Opportunities in Data Science Communication – Feedback/Discuss/Reflect – what makes a good presentation	General Audience (Short) Job Presentation
02/03/26	5	Tuesday	Individual Work Time**	
02/05/26	5	Thursday	Individual Work Time**	
02/10/26	6	Tuesday	Presentations of EDA results. (5-10 min) Writing - Exploratory Data Analysis	More Technical Audience (Short) EDA presentations
02/12/26	6	Thursday	Research – Data Modeling and Prediction – Programming and Model Development	
02/17/26	7	Tuesday	Individual Work Time**	Hand in Exploratory Data Analysis. (Writing Data Exploration)
02/19/26	7	Thursday	Writing – Modeling process and Assumptions Research – Model Analysis	Update Exploratory Data Analysis based on Feedback
02/24/26	8	Tuesday	Spring Break	
02/26/26	8	Thursday	Spring Break	

03/03/26	9	Tuesday	Individual Work Time**	Hand in Data Modeling and Prediction write Up (Writing Modeling and Assumptions)
03/05/26	9	Thursday	Research – Finalize Project Results – Combining Background, Proposal Intro, Exploratory Data Analysis, and Modeling Results into a final Data Science full Report. Adding Conclusions Writing – the full Data Science Lyfecycle Report	Update Modeling and Predictions Write Up based on Feedback.
03/10/26	10	Tuesday	Individual Work Time**	
03/12/26	10	Thursday	Prepare Presentations Communication – Discuss/Reflect – what makes a good presentation	Hand in First Draft on Final Project Writing for Peer Feedback.
03/17/26	11	Tuesday	Data Management and Publication Planning Writing – finding publication and data management sources	Hand in Posters Advertising Final Presentations
03/19/26	11	Thursday	Individual Work Time**	
03/24/26	12	Tuesday	Practice Presentations Communication – Feedback/Discuss/Reflect – what makes a good presentation	Technical Audience (long format) conference or workshop style presentation. Continue writing and revising your Research Project and Portfolio
03/26/26	12	Thursday	Individual Work Time**	
03/31/26	13	Tuesday	Individual Work Time**	Draft of Final Portfolio Due – including plans for completion. Must include updated draft of Final Project writing and Ethics Reflection
04/02/26	13	Thursday	Individual Work Time**	
04/07/26	14	Tuesday	Final Presentations 6-7:30pm	Revise Final Portfolio based on feedback.
04/08/26	14	Wednesday	Final Presentations 6-7:30pm	
04/09/26	14	Thursday	Final Presentations 6-7:30pm	
04/14/26	15	Tuesday	Individual Work Time**	
04/16/26			Final Portfolios Due:	- Data Set + References - EDA + Visualizations - Data Science Predictive Model + Visualizations - Executive Summary of Results - Self Reflection - Ethics Reflection