



Course ID and Title: ECON 499 Special Topics: Industry Research in Data Science

Units: 4

Term—Day—Time: Spring 2024, Friday, 3 – 5:40 pm.

For the curriculum committee: Proposed contact hours are 160 minutes per week (1 class session of 2 hours 40 minute). Total hours will easily reach the required 150 per semester, because the non-contact hours will be large. This course revolves around completion—in stages and involving teams of students—of a challenging, real-world project proposed by an industry practitioner. This will involve substantial work outside of class in the form of data preparation and analysis, as well as ongoing review and reassessment of the problem-solving approach and reporting of results in a compelling form. The course will require students to develop and improve their skills with respect to every phase of project design and delivery.

Location:

Instructor: Ida Johnsson

Office Hours: By appointment, via Zoom

Contact Info: ida.b.johnsson@gmail.com

Course Description

This course prepares students for careers in data science by introducing them to work on real-world projects in a setting that mimics a professional setting. The course is centered around a project or projects proposed by one more industry practitioners. Although the course is entirely under the direction of USC faculty, students will have some interaction with industry partners through periodic reporting on progress and the presentation of the final project. Students develop an appreciation for defining research approaches that answer a business question and defining goals and deliverables as well as Objective Key Results (OKRs). Students also become aware of the different aspects involved in presenting technical work and results to business stakeholders such as product managers or other decision makers who rely on the data scientists' work. Finally, although this course is not tied directly to recruitment, it does advertise student skills to practitioners and help students build a professional network.

Learning Objectives

By the end of this course students will be able to work independently with real-world (messy) data and ambiguous business questions. They will be able to assess critically whether a business question can easily be answered with the given data and to ask clarifying questions that help them better define the research method. Students will be able to assess the scope of a project and define key deliverables and deadlines that meet stakeholder requirements. They will be able to deliver their work in formats that are commonly accepted in the industry, such as code in GitHub repositories and clearly written whitepapers. Students will have experience working in teams and will be able to provide constructive feedback on other people's work as well as explain their own work to both technical and non-technical audiences.

Prerequisite(s): Permission of the instructor.

Co-Requisite(s): ECON 460

Course Notes

Format: This course is hybrid. The class and teaching assistant will meet in person for lectures and in-class project work in the assigned room. The instructor, a USC faculty member and industry professional, will join the class via Zoom. LECTURES WILL NOT BE RECORDED.

Grading Option: Letter grade only

Course website: On Blackboard. Assignments and relevant background material, handouts, and prepared lecture notes or slides will be posted on the course website.

Textbooks

Required for purchase: none

Optional or recommended:

Taddy, Matt (2019), *Business Data Science: Combining Machine Learning and Economics to Optimize, Automate, and Accelerate Business Decisions*

Knaflic, Cole Nussbaumer (2015), *Storytelling with Data: A Data Visualization Guide for Business Professionals*

Description and Assessment of Assignments

The assessment of the learning objectives will be based on an applied project, as well as on key components that contribute to the development of this project. Specifically, students will work in groups to complete an empirical project that is submitted at the end of the course. However, the goal of the project is to use it as a learning experience on how to answer a business question. Hence, students will be asked to submit preliminary results throughout the course. This resembles the experience students will have when they work as data scientists and discuss preliminary results with teammates or stakeholders.

Preliminary results are, by nature, exploratory and should not be judged based on their “correctness”. The goal is to encourage exploration of ideas, subject to meeting minimum standards of effort and completeness, the preliminary results will be graded on a binary basis (submitted/not submitted, submission earns full credit). After students submit their results, other students will be asked to prepare discussion questions about the preliminary results. Submission of discussion questions will also constitute an assignment graded on a binary basis (submitted/not submitted). As the students advance in their work on the empirical project, they will be asked to submit a Minimum Viable Product (MVP) type model and results, and again, other students will be asked to submit discussion questions about the results. Both submissions (MVP model and results, discussion questions) will also be graded on a binary basis. At the end of the course, students will submit their final project, and this submission will be graded on a 0–100-point scale.

Participation

Since the goal of the course is for students to gain proficiency in developing, presenting, and discussing data science work, participation is part of the credit. Participation will be assessed based on small group assignments solved during class and performed by the end of the class. The dates of the small group assignments will be announced in advance. The goal of the course is to encourage an environment where students present and freely discuss their work. The goal of the in-class assignments is to learn as a group, rather than get find the best solution right away. Therefore, students will be awarded full credit for presenting their solutions to the assignment, regardless of whether these solutions are “correct”. If a student is not able to attend a class where one of these in-class assignments takes place and has a valid reason for

absence, they will be provided with the opportunity to submit a make-up assignment and earn credit equivalent to the credit awarded for the in-class assignment.

Grading Breakdown

Assessment Tool (assignments)	Points	% of Grade
Preliminary results assignment	20	20
Discussion questions assignment	10	10
In-class participation	10	10
MVP Project submission	10	10
MVP Project feedback	10	10
Final project submission	40	40
TOTAL		

Academic Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Course Content Distribution and Synchronous Session Recordings Policies

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students

or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Course Schedule

	Topics/Daily Activities	Readings/Preparation	Deliverables
Week 1	Introduction: technology stack, implementation of data science in business, course goals, expectations, grading	Athey, Susan, and Michael Luca. "Economists (and economics) in tech companies." <i>Journal of Economic Perspectives</i> 33.1 (2019): 209-30.	
Week 2	Data science lab: data cleaning and summary statistics	Prepared lecture notes.	
Week 3	Data science lab: linear models, tree-based models, time series models	Prepared lecture notes.	
Week 4	Data science lab: prediction, cross-validation in cross-sectional and time series data	Prepared lecture notes.	
Week 5	Project introduction, defining research question, what are KPIs		
Week 6	In-class assignment #1		Presentation of results by the end of the class
Week 7	Common challenges and pitfalls of data science work		
Week 8	In-class assignment #2		Presentation of results by the end of the class
Week 9	How to choose the right model for a business question		Preliminary summary statistics
Week 10	In-class discussion of preliminary results		Preliminary summary statistics – discussion questions
Week 11	Data science in the industry – working with non-data science team members and stakeholders		
Week 12	In-depth discussion of time series prediction		
Week 13	In-depth discussion of cross-sectional models		
Week 14	Presentation of final projects, discussion and feedback		MVP project
Week 15	Feedback, follow-ups, closing thoughts		MVP project discussion questions
FINAL	Final project submission		Refer to the final exam schedule in the USC <i>Schedule of Classes</i> at classes.usc.edu .

Statement on Academic Conduct and Support Systems

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

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

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

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

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 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) 740-0411

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

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

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) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

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) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.