

# Data Science, Undergraduate (DATA)

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## Courses

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### DATA 4AC Data and Justice 4 Units

Terms offered: Spring 2023, Spring 2022, Spring 2021

This course engages students with fundamental questions of justice in relation to data and computing in American society. Data collection, visualization, and analysis have been entangled in the struggle for racial and social justice because they can make injustice visible, imaginable, and thus actionable. Data has also been used to oppress minoritized communities and institutionalize, rationalize, and naturalize systems of racial violence. The course examines key sites of justice involving data (such as citizenship, policing, prisons, environment, and health). Along with critical social science tools, students gain introductory experience and do collaborative and creative projects with data science using real-world data.

Data and Justice: Read More [+]

#### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1.5 hours of discussion per week

#### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

Data and Justice: Read Less [-]

### DATA 6 Introduction to Computational Thinking with Data 3 Units

Terms offered: Not yet offered

An introduction to computational thinking and quantitative reasoning, preparing students for further coursework (especially Foundations of Data Science, Data 8). Emphasizes the use of computation to gain insight about quantitative problems. Uses data from various domains in the social sciences in order to develop an understanding of the societal implications of data science. Expressions, data types, collections, and tables in Python. Programming practices, abstraction, and iteration. The data science lifecycle. Visualizing univariate and bivariate data with bar charts, histograms, plots, and maps. Introduction to statistical concepts including averages and distributions, prediction, causality, probability, sampling, and inference.

Introduction to Computational Thinking with Data: Read More [+]

#### Objectives & Outcomes

**Course Objectives:** C6 also includes quantitative reasoning concepts that aren't covered in Data 8. These include certain topics in: principles of data visualization; simulation of random processes; and understanding numerical functions through their graphs. This will help prepare students for computational and quantitative courses other than Data 8. C6 takes advantage of the complementarity of computing and quantitative reasoning to enliven abstract ideas and build students' confidence in their ability to solve real problems with quantitative tools. Students learn computer science concepts and immediately apply them to plot functions, visualize data, and simulate random events.

Foundations of Data Science (CS/Info/Stat C8, a.k.a. Data 8) is an increasingly popular class for entering students at Berkeley. Data 8 builds students' computing skills in the first month of the semester, and students rely on these skills as the course progresses. For some students, particularly those with little prior exposure to computing, developing these skills benefits from further time and practice. C6 is a rapid introduction to Python programming, visualization, and data analysis, which will prepare students for success in Data 8.

**Student Learning Outcomes:** Appreciate the interdisciplinary nature of data science.

Create and use visualizations to understand univariate data and to identify associations or causal relationships in bivariate data.

Formulate questions about data and perform exploratory data analysis. Perform basic computations in Python, and be able to work with tabular data.

Run and understand basic probabilistic simulations.

Understand the syntactic structure of Python code.

Use good practices in Python programming.

#### Rules & Requirements

**Credit Restrictions:** Students will receive no credit for DATA 6 after completing DATA C8.

#### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture, 1 hour of discussion, and 0 hours of laboratory per week

**Summer:** 6 weeks - 4 hours of lecture, 2 hours of discussion, and 4 hours of laboratory per week

#### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Yan, Hug, Harding

## DATA C8 Foundations of Data Science 4 Units

Terms offered: Fall 2024, Summer 2024 8 Week Session, Spring 2024, Fall 2023, Spring 2023, Fall 2022, Spring 2022, Fall 2021, Summer 2021 8 Week Session, Fall 2020

Foundations of data science from three perspectives: inferential thinking, computational thinking, and real-world relevance. Given data arising from some real-world phenomenon, how does one analyze that data so as to understand that phenomenon? The course teaches critical concepts and skills in computer programming and statistical inference, in conjunction with hands-on analysis of real-world datasets, including economic data, document collections, geographical data, and social networks. It delves into social and legal issues surrounding data analysis, including issues of privacy and data ownership.

Foundations of Data Science: Read More [+]

### Rules & Requirements

**Prerequisites:** This course may be taken on its own, but students are encouraged to take it concurrently with a data science connector course (numbered 88 in a range of departments)

**Credit Restrictions:** Students will receive no credit for DATA C8\COMPSCI C8\INFO C8\STAT C8 after completing COMPSCI 8, or DATA 8. A deficient grade in DATA C8\COMPSCI C8\INFO C8\STAT C8 may be removed by taking COMPSCI 8, COMPSCI 8, or DATA 8.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

**Summer:** 8 weeks - 6 hours of lecture and 4 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Computer Science C8/Statistics C8/Information C8

**Also listed as:** COMPSCI C8/INFO C8/STAT C8

Foundations of Data Science: Read Less [-]

## DATA 88 Data Science Connector 2 - 4 Units

Terms offered: Spring 2022, Spring 2021, Fall 2020

Designed to be taken in conjunction with the Foundations of Data Science (COMPSCI/INFO/STAT C8) course, each connector course will flesh out data science ideas in the context of one particular field.

Blending inferential thinking and computational thinking, the course relies on the increasing availability of datasets across a wide range of human endeavor, and students' natural interest in such data, to teach students to work actively with data in a field of their interest and to interpret and critique their analyses of data. Topics vary by field, and several topics will be offered each term.

Data Science Connector: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Discuss how to formulate and substantiate an argument with evidence  
Explain a variety of analytic and visualization techniques  
Explore approaches to effective communication  
Explore the challenges with working with primary and secondary data

**Student Learning Outcomes:** Apply data analysis to evaluate everyday problems  
Communicate effectively in written, spoken, and graphical form about specific issues  
Interpret statistical results  
Know how to locate and use primary data sources  
Obtain and/or collect relevant data using specific qualitative and/or quantitative research methods  
Understand how to use empirical evidence to evaluate an argument

### Rules & Requirements

**Prerequisites:** Instructors may require students to enroll concurrently or have completed Data 8 (COMPSCI/STAT/INFO C8)

**Repeat rules:** Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2-4 hours of seminar per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

Data Science Connector: Read Less [-]

## DATA 88E Economic Models 2 Units

Terms offered: Fall 2024, Fall 2023, Fall 2022

This class aims to motivate and illustrate key concepts in economics through a series of exercises and examples that use Python Jupyter notebooks. The class covers concepts from introductory economics, microeconomic theory, econometrics, development economics, environmental economics and public economics. The course provides data science students a pathway to apply Python programming and data science concepts within the discipline of economics. The course will also give economics students a pathway to apply programming to reinforce fundamental concepts and to advance the level of study in upper division coursework and possible thesis work.

Economic Models: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Demonstrate how to construct understanding of concepts in economics by developing and coding examples  
Illustrate topics in economics through coding applications  
Motivate basics of econometrics from a data science perspective

**Student Learning Outcomes:** Programmatically create and interpret graphs of simple equations used in microeconomics  
Reason about and solve simple equations used in microeconomics through coding  
Understand basic concepts in economics

### Rules & Requirements

**Prerequisites:** You must have taken Data C8 or be concurrently enrolled in Data C8 to take this course. That being said, we are able to make exceptions if you have prior programming or data science experience; please email the course staff if you have any questions. Prior economics knowledge may be helpful but is not necessary

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture per week

#### Summer:

6 weeks - 5 hours of lecture per week  
8 weeks - 4 hours of lecture per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

Economic Models: Read Less [-]

## DATA C88C Computational Structures in Data Science 3 Units

Terms offered: Fall 2024, Summer 2024 8 Week Session, Spring 2024, Spring 2023, Fall 2022

Development of Computer Science topics appearing in Foundations of Data Science (C8); expands computational concepts and techniques of abstraction. Understanding the structures that underlie the programs, algorithms, and languages used in data science and elsewhere. Mastery of a particular programming language while studying general techniques for managing program complexity, e.g., functional, object-oriented, and declarative programming. Provides practical experience with composing larger systems through several significant programming projects.

Computational Structures in Data Science: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Develop a foundation of computer science concepts that arise in the context of data analytics, including algorithm, representation, interpretation, abstraction, sequencing, conditional, function, iteration, recursion, types, objects, and testing, and develop proficiency in the application of these concepts in the context of a modern programming language at a scale of whole programs on par with a traditional CS introduction course.

**Student Learning Outcomes:** Students will be able to demonstrate a working knowledge of these concepts and a proficiency of programming based upon them sufficient to construct substantial stand-alone programs.

### Rules & Requirements

**Prerequisites:** This course is a Data Science connector course and may only be taken concurrently with or after COMPSCI C8/DATA C8/INFO C8/STAT C8. Students may take more than one Data Science connector (88) course if they wish, concurrent with or after having taken the C8 course

**Credit Restrictions:** Students will receive no credit for DATA C88C after completing COMPSCI 61A.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2-2 hours of lecture, 2-2 hours of laboratory, and 0-1 hours of supplement per week

**Summer:** 8 weeks - 4-4 hours of lecture, 4-4 hours of laboratory, and 0-2 hours of supplement per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Ball, Culler

**Formerly known as:** Computer Science 88

**Also listed as:** COMPSCI C88C

Computational Structures in Data Science: Read Less [-]

## DATA C88S Probability and Mathematical Statistics in Data Science 3 Units

Terms offered: Spring 2024, Summer 2023 8 Week Session, Spring 2023, Fall 2022

In this connector course we will state precisely and prove results discovered while exploring data in Data C8. Topics include: probability, conditioning, and independence; random variables; distributions and joint distributions; expectation, variance, tail bounds; Central Limit Theorem; symmetries in random permutations; prior and posterior distributions; probabilistic models; bias-variance tradeoff; testing hypotheses; correlation and the regression model.

Probability and Mathematical Statistics in Data Science: Read More [+]

### Rules & Requirements

**Prerequisites:** Prerequisite: one semester of calculus at the level of Math 16A, Math 10A, or Math 1A. Corequisite or Prerequisite: Foundations of Data Science (COMPSCI C8 / DATA C8 / INFO C8 / STAT C8)

**Credit Restrictions:** Students will receive no credit for DATA C88S after completing STAT 134, STAT 140, STAT 135, or DATA C102.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of discussion per week

**Summer:** 8 weeks - 6 hours of lecture and 4 hours of discussion per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Statistics 88

**Also listed as:** STAT C88S

Probability and Mathematical Statistics in Data Science: Read Less [-]

## DATA 94 Special Topics in Data Science 1 - 4 Units

Terms offered: Spring 2021

Topics will vary semester to semester.

Special Topics in Data Science: Read More [+]

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-3 hours of lecture, 0-2 hours of discussion, and 0-2 hours of laboratory per week

**Summer:** 8 weeks - 2-6 hours of lecture, 0-4 hours of discussion, and 0-4 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required, with common exam group.

Special Topics in Data Science: Read Less [-]

## DATA C100 Principles & Techniques of Data Science 4 Units

Terms offered: Fall 2024, Summer 2024 8 Week Session, Spring 2024, Summer 2023 8 Week Session, Fall 2022, Fall 2021, Fall 2020

In this course, students will explore the data science lifecycle, including question formulation, data collection and cleaning, exploratory data analysis and visualization, statistical inference and prediction, and decision-making. This class will focus on quantitative critical thinking and key principles and techniques needed to carry out this cycle.

These include languages for transforming, querying and analyzing data; algorithms for machine learning methods including regression, classification and clustering; principles behind creating informative data visualizations; statistical concepts of measurement error and prediction; and techniques for scalable data processing.

Principles & Techniques of Data Science: Read More [+]

### Rules & Requirements

**Prerequisites:** COMPSCI C8 / DATA C8 / INFO C8 / STAT C8 with a C- or better, or Pass; and COMPSCI 61A, COMPSCI/DATA C88C, or ENGIN 7 with a C- or better, or Pass; Corequisite: MATH 54, 56 or EECS 16A (C- or better, or Pass, required if completed prior to Data C100)

**Credit Restrictions:** Students will receive no credit for DATA C100\STAT C100\COMPSCI C100 after completing DATA 100. A deficient grade in DATA C100\STAT C100\COMPSCI C100 may be removed by taking DATA 100.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3-3 hours of lecture, 1-1 hours of discussion, and 0-1 hours of laboratory per week

**Summer:** 8 weeks - 6-6 hours of lecture, 2-2 hours of discussion, and 0-2 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Gonzalez, Nourozi, Perez, Yan

**Formerly known as:** Statistics C100/Computer Science C100

**Also listed as:** COMPSCI C100/STAT C100

Principles & Techniques of Data Science: Read Less [-]

## DATA 101 Data Engineering 4 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023

This course will cover the principles and practices of managing data at scale, with a focus on use cases in data analysis and machine learning. We will cover the entire life cycle of data management and science, ranging from data preparation to exploration, visualization and analysis, to machine learning and collaboration, with a focus on ensuring reliable, scalable operationalization.

Data Engineering: Read More [+]

### Rules & Requirements

**Prerequisites:** COMPSCI 61B or INFO 206B or equivalent courses in programming with a C- or better, or Pass; AND COMPSCI C100/ DATA C100/STAT C100 or COMPSCI 189 or INFO 251 or DATA 144 or equivalent upper-division course in data science with a C- or better, or Pass

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Instructors:** Hellerstein, Jain, Parameswaran

Data Engineering: Read Less [-]

## DATA C102 Data, Inference, and Decisions 4 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023

This course develops the probabilistic foundations of inference in data science, and builds a comprehensive view of the modeling and decision-making life cycle in data science including its human, social, and ethical implications. Topics include: frequentist and Bayesian decision-making, permutation testing, false discovery rate, probabilistic interpretations of models, Bayesian hierarchical models, basics of experimental design, confidence intervals, causal inference, Thompson sampling, optimal control, Q-learning, differential privacy, clustering algorithms, recommendation systems and an introduction to machine learning tools including decision trees, neural networks and ensemble methods.

Data, Inference, and Decisions: Read More [+]

### Rules & Requirements

**Prerequisites:** Math 54 or 56 or 110 or Stat 89A or Physics 89 or both of EECS 16A and 16B with a C- or better, or Pass; Data/Stat/CompSci C100 with a C- or better, or Pass; and any of EECS 126, Data/Stat C140, Stat 134, IndEng 172, Math 106 with a C- or better, or Pass. Data/Stat C140 or EECS 126 are preferred

**Credit Restrictions:** Students will receive no credit for DATA C102 after completing STAT 102, or DATA 102. A deficient grade in DATA C102 may be removed by taking STAT 102, STAT 102, or DATA 102.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture, 1 hour of discussion, and 1 hour of laboratory per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Statistics 102

**Also listed as:** STAT C102

Data, Inference, and Decisions: Read Less [-]

## DATA C104 Human Contexts and Ethics of Data - DATA/History/STS 4 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023, Spring 2022, Fall 2020, Spring 2020

This course teaches you to use the tools of applied historical thinking and Science, Technology, and Society (STS) to recognize, analyze, and shape the human contexts and ethics of data. It addresses key topics such as doing ethical data science amid shifting definitions of human subjects, consent, and privacy; the changing relationship between data, democracy, and law; the role of data analytics in how corporations and governments provide public goods such as health and security to citizens; sensors, machine learning and artificial intelligence and changing landscapes of labor, industry, and city life. It prepares you to engage as a knowledgeable and responsible citizen and professional in the varied arenas of our datafied world.

Human Contexts and Ethics of Data - DATA/History/STS: Read More [+]

### Rules & Requirements

**Credit Restrictions:** Students will receive no credit for DATA C104\HISTORY C184D\STS C104D after completing DATA 104. A deficient grade in DATA C104\HISTORY C184D\STS C104D may be removed by taking DATA 104.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3-3 hours of lecture and 0-1.5 hours of discussion per week

### Summer:

6 weeks - 7.5-7.5 hours of lecture and 0-3.5 hours of discussion per week  
8 weeks - 6-6 hours of lecture and 0-3 hours of discussion per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** History C184D/Science and Technology Studies C104D

**Also listed as:** HISTORY C184D/STS C104D

Human Contexts and Ethics of Data - DATA/History/STS: Read Less [-]

## DATA C131A Statistical Methods for Data Science 4 Units

Terms offered: Fall 2024, Fall 2023, Spring 2023

This course teaches a broad range of statistical methods that are used to solve data problems. Topics include group comparisons and ANOVA, standard parametric statistical models, multivariate data visualization, multiple linear regression, logistic regression and classification, regression trees and random forests. An important focus of the course is on statistical computing and reproducible statistical analysis. The course and lab include hands-on experience in analyzing real world data from the social, life, and physical sciences. The R statistical language is used. Statistical Methods for Data Science: Read More [+]

### Rules & Requirements

**Prerequisites:** Statistics/Computer Science/Information C8 or Statistics 20; and Mathematics 1A, Mathematics 16A, or Mathematics 10A/10B. Strongly recommended corequisite: Statistics 33A or Statistics 133

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Statistics 131A

**Also listed as:** STAT C131A

Statistical Methods for Data Science: Read Less [-]

## DATA C140 Probability for Data Science 4 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023, Spring 2023

An introduction to probability, emphasizing the combined use of mathematics and programming. Discrete and continuous families of distributions. Bounds and approximations. Transforms and convergence. Markov chains and Markov Chain Monte Carlo. Dependence, conditioning, Bayesian methods. Maximum likelihood, least squares prediction, the multivariate normal, and multiple regression. Random permutations, symmetry, and order statistics. Use of numerical computation, graphics, simulation, and computer algebra.

Probability for Data Science: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Data/Stat C140 is a probability course for Data C8 graduates who have taken more mathematics and wish to go deeper into data science. The emphasis on simulation and the bootstrap in Data C8 gives students a concrete sense of randomness and sampling variability. Data/Stat C140 capitalizes on this, abstraction and computation complementing each other throughout. Topics in statistical theory are included to allow students to proceed to modeling and statistical learning classes without taking a further semester of mathematical statistics.

**Student Learning Outcomes:** Understand the difference between math and simulation, and appreciate the power of both  
Use a variety of approaches to problem solving  
Work with probability concepts algebraically, numerically, and graphically

### Rules & Requirements

**Prerequisites:** DATA/COMPSCI/INFO/STAT C8, or both STAT 20 and one of COMPSCI 61A or COMPSCI/DATA C88C with C- or better, or Pass; and one year of calculus at the level of MATH 1A-1B or higher, with C- or better, or Pass. Corequisite: MATH 54, MATH 56, EECS 16B, MATH 110 or equivalent linear algebra (C- or better, or Pass, required if completed prior to enrollment in Data/Stat C140)

**Credit Restrictions:** Students will receive no credit for STAT C140 after completing STAT 134, or EECS 126.

### Hours & Format

#### Fall and/or spring:

15 weeks - 3-3 hours of lecture, 1-1 hours of discussion, 1-1 hours of supplement, and 0-1 hours of voluntary per week  
15 weeks - 3-3 hours of lecture, 2-2 hours of discussion, 0-0 hours of supplement, and 0-1 hours of voluntary per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Final exam required.

**Formerly known as:** Statistics 140

**Also listed as:** STAT C140

Probability for Data Science: Read Less [-]

## DATA 144 Data Mining and Analytics 3 Units

Terms offered: Fall 2024, Fall 2023, Fall 2022

Data Mining and Analytics introduces students to practical fundamentals of data mining and emerging paradigms of data mining and machine learning with enough theory to aid intuition building. The course is project-oriented, with a project beginning in class every week. The in-class portion of the project is meant to be collaborative and a time for the instructor and GSIs to work closely with project groups to understand the objectives, help work through software logistics, and connect project work to lecture. Lectures will introduce theories, concepts, practical contexts, and algorithms. Students should expect to leave the class with hands-on, contemporary data mining skills they can confidently apply in research and industry.

Data Mining and Analytics: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Conduct manual feature engineering (from domain knowledge) vs. machine induced featurization (representation learning) Develop intuition in various machine learning classification algorithms (e.g. decision trees, feed-forward neural networks, recurrent neural networks, skip-grams) and clustering techniques (e.g. k-means, spectral) Foster critical thinking about real-world actionability from analytics Provide an overview of issues in research and practice that will affect the practice of data science in a variety of domains

**Student Learning Outcomes:** Develop capabilities in a range of data mining techniques  
Gain the ability to solve problems in data mining research and practice  
Think critically about how to assess analytics  
Use data mining and analytics in a domain of application

### Rules & Requirements

**Prerequisites:** Corequisite: Data/CompSci/Stat C100 (C- or better, or Pass, required if completed prior to Data 144)

**Credit Restrictions:** Students will receive no credit for DATA 144 after completing INFO 154. A deficient grade in DATA 144 may be removed by taking INFO 154.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3 hours of lecture per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

**Instructor:** Pardos

Data Mining and Analytics: Read Less [-]

## DATA 188 Advanced Data Science Connector 2 Units

Terms offered: Spring 2024

Designed to be taken concurrently with or after Principles and Techniques of Data Science (Data C100) or Probability for Data Science (Data C140) or both, each connector course consists of an intensive study of data science ideas in a particular field. Topics include the development of the theory of data science and the application of data science in a variety of domains. Topics vary by field, and more than one topic may be offered in a semester.

Advanced Data Science Connector: [Read More](#) [+]

### Objectives & Outcomes

**Course Objectives:** Develop theoretical mastery in data science topics, address the challenges of gathering data and converting it to usable formats, develop skills in selecting appropriate data science methods, explore approaches to decision-making and effective communication.

**Student Learning Outcomes:** Understand and apply theory in an area of data science, or follow the data science life cycle in a domain of application from question formulation to the use of advanced data science methods and the communication of results.

### Rules & Requirements

**Prerequisites:** Prerequisites or corequisites may vary depending on topic. Consult the Schedule of Classes or department website for details

**Repeat rules:** Course may be repeated for credit when topic changes. Students may enroll in multiple sections of this course within the same semester.

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of seminar and 1 hour of discussion per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Alternate method of final assessment during regularly scheduled final exam group (e.g., presentation, final project, etc.).

Advanced Data Science Connector: [Read Less](#) [-]

## DATA H195A Data Science Honors Thesis Seminar 2 Units

Terms offered: Prior to 2007

The senior honors thesis seminar gives students an opportunity to experience firsthand what it means to do data science research. Over two semesters, students will learn to formulate a research problem, design a research strategy, collect evidence, and write up the findings and analysis. The first semester focuses primarily on the preparation and implementation of a research proposal, as well as data management strategies. During the second semester, we will emphasize analysis and writing. The final result will be a hybrid product with a 20-25 page research paper, with data visualizations and analysis tables, along with a documented data source, annotated code, well documented Github repository, and open science posting of the project.

Data Science Honors Thesis Seminar: [Read More](#) [+]

### Objectives & Outcomes

**Course Objectives:** Assist students with project organization and management.

Convey approaches to effective writing and visual communication. Discuss how to formulate and substantiate an argument with evidence. Explain approaches to designing a research question and project. Explore a variety of analytic and visualization techniques and discuss their appropriateness to different research questions. Identify the challenges in data acquisition and management.

**Student Learning Outcomes:** Communicate effectively in written, spoken, and graphical form. Develop an understanding of data availability, constraints, and ethics. Develop data management skills. Develop reproducible research and interpret results. Formulate a proposal for a research project. Learn how to develop a research question and project. Understand how to organize empirical work into a written document. Understand how to use empirical evidence to construct an argument.

### Rules & Requirements

**Prerequisites:** There are no specific prerequisites. Students must be accepted into the data science honors program in order to take this course. Students must complete H195A in order to enroll in H195B

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of seminar per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

Data Science Honors Thesis Seminar: [Read Less](#) [-]

## DATA H195B Data Science Honors Thesis Seminar 2 Units

Terms offered: Spring 2020

The senior honors thesis seminar gives students an opportunity to experience firsthand what it means to do data science research. Over two semesters, students will learn to formulate a research problem, design a research strategy, collect evidence, and write up the findings and analysis. The first semester focuses primarily on the preparation and implementation of a research proposal, as well as data management strategies. During the second semester, we will emphasize analysis and writing. The final result will be a hybrid product with a 20-25 page research paper, with data visualizations and analysis tables, along with a documented data source, annotated code, well documented Github repository, and open science posting of the project.

Data Science Honors Thesis Seminar: Read More [+]

### Objectives & Outcomes

**Course Objectives:** Assist students with project organization and management.

Convey approaches to effective writing and visual communication.  
Discuss how to formulate and substantiate an argument with evidence.  
Explain approaches to designing a research question and project.  
Explore a variety of analytic and visualization techniques and discuss their appropriateness to different research questions.  
Identify the challenges in data acquisition and management.

**Student Learning Outcomes:** Communicate effectively in written, spoken, and graphical form.  
Develop an understanding of data availability, constraints, and ethics.  
Develop data management skills.  
Develop reproducible research and interpret results.  
Formulate a proposal for a research project.  
Learn how to develop a research question and project.  
Understand how to organize empirical work into a written document.  
Understand how to use empirical evidence to construct an argument.

### Rules & Requirements

**Prerequisites:** There are no specific prerequisites. Students must be accepted into the data science honors program in order to take this course. Students must complete H195A in order to enroll in H195B

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of seminar per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Letter grade. Alternative to final exam.

Data Science Honors Thesis Seminar: Read Less [-]

## DATA 197 Field Studies in Data Science 1 - 4 Units

Terms offered: Fall 2019

Students take part in organized individual field sponsored programs with off-campus organizations or tutoring/mentoring relevant to specific aspects and applications of data science on or off campus. Note Summer CPT or OPT students: written report required. Course may not count toward major requirements but will be counted in the cumulative units toward graduation.

Field Studies in Data Science: Read More [+]

### Rules & Requirements

**Prerequisites:** Consent of instructor (see department advisor). Upper-division standing

**Repeat rules:** Course may be repeated for credit with advisor consent.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of fieldwork per week

### Summer:

6 weeks - 2.5-10 hours of fieldwork per week  
8 weeks - 2-7.5 hours of fieldwork per week  
10 weeks - 1.5-6 hours of fieldwork per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Alternative to final exam.

Field Studies in Data Science: Read Less [-]

## DATA 198 Directed Group Studies for Advanced Undergraduates 1 - 4 Units

Terms offered: Spring 2024, Fall 2023, Spring 2023

Written proposal must be approved by a faculty sponsor, who will serve as Instructor of Record. Seminars for the group study of selected topics, which will vary from semester to semester. Topics may be initiated by students.

Directed Group Studies for Advanced Undergraduates: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Instructors may require students to enroll concurrently or have completed Data 8 (COMPSCI/STAT/INFO C8). Upper-division standing and consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Final exam not required.

Directed Group Studies for Advanced Undergraduates: [Read Less](#) [-]

## DATA 199 Supervised Independent Study and Research 1 - 4 Units

Terms offered: Prior to 2007

Independent study and research by arrangement with faculty or staff. This course allows students to obtain course credit for participation in undergraduate research. Students may opt either to participate in a semester-long series of workshops which provide a guided research experience with project milestone assignments and regular feedback, or they may opt to work independently with supervision from one faculty research mentor.

Supervised Independent Study and Research: [Read More](#) [+]

### Objectives & Outcomes

**Student Learning Outcomes:** Develop and refine skills acquired in other courses in a hands-on, self-directed research project.

Identify how to properly manage data and describe best practices in programming and analytics.

Integrate feedback from an instructor into research on a regular basis.

Learn how to structure and complete a research project working independently.

### Rules & Requirements

**Prerequisites:** Instructors may require students to enroll concurrently or have completed Data 8 (COMPSCI/STAT/INFO C8). Upper-division standing and consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3-12 hours of independent study per week

### Summer:

6 weeks - 7.5-30 hours of independent study per week

8 weeks - 5.5-22.5 hours of independent study per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Undergraduate

**Grading/Final exam status:** Offered for pass/not pass grade only. Alternative to final exam.

Supervised Independent Study and Research: [Read Less](#) [-]

## DATA 200S Principles and Techniques of Data Science 3 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023

Explores the data science lifecycle: question formulation, data collection and cleaning, exploratory, analysis, visualization, statistical inference, prediction, and decision-making. Focuses on quantitative critical thinking and key principles and techniques: languages for transforming, querying and analyzing data; algorithms for machine learning methods: regression, classification and clustering; principles of informative visualization; measurement error and prediction; and techniques for scalable data processing. Research term project.

Principles and Techniques of Data Science: Read More [+]

### Rules & Requirements

**Prerequisites:** DATA/COMPSCI/INFO/STAT C8; and COMPSCI 61A or COMPSCI/DATA C88C. Corequisites: MATH 54 or EECS 16A

**Credit Restrictions:** Students will receive no credit for DATA 200S after completing DATA C100, or DATA C200. A deficient grade in DATA 200S may be removed by taking DATA C200.

### Hours & Format

**Fall and/or spring:** 15 weeks - 3-3 hours of lecture, 1-1 hours of discussion, and 0-1 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Graduate

**Grading:** Letter grade.

Principles and Techniques of Data Science: Read Less [-]

## DATA C200 Principles and Techniques of Data Science 4 Units

Terms offered: Fall 2024, Spring 2024, Fall 2023, Spring 2023, Spring 2022, Spring 2021, Spring 2020

Explores the data science lifecycle: question formulation, data collection and cleaning, exploratory, analysis, visualization, statistical inference, prediction, and decision-making. Focuses on quantitative critical thinking and key principles and techniques: languages for transforming, querying and analyzing data; algorithms for machine learning methods: regression, classification and clustering; principles of informative visualization; measurement error and prediction; and techniques for scalable data processing. Research term project.

Principles and Techniques of Data Science: Read More [+]

### Rules & Requirements

**Prerequisites:** COMPSCI C8 / INFO C8 / STAT C8 or ENGIN 7; and either COMPSCI 61A or COMPSCI 88. Corequisites: MATH 54 or EECS 16A

**Credit Restrictions:** Students will receive no credit for DATA C200\COMPSCI C200A\STAT C200C after completing DATA C100.

### Hours & Format

#### Fall and/or spring:

8 weeks - 6-6 hours of lecture, 2-2 hours of discussion, and 0-2 hours of laboratory per week

15 weeks - 3-3 hours of lecture, 1-1 hours of discussion, and 0-1 hours of laboratory per week

**Summer:** 8 weeks - 6-6 hours of lecture, 2-2 hours of discussion, and 0-2 hours of laboratory per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Graduate

**Grading:** Letter grade.

**Formerly known as:** Statistics C200C/Computer Science C200A

**Also listed as:** COMPSCI C200A/STAT C200C

Principles and Techniques of Data Science: Read Less [-]

## DATA C204 Human Contexts and Ethics of Data 4 Units

Terms offered: Spring 2024

This course teaches you to use approaches from the across the humanities and interpretive social sciences and tools of Science, Technology, and Society (STS) to recognize, analyze, and shape the human contexts, social implications, and ethics of data and data technologies, including data analytics, algorithmic decision systems, machine learning (ML), and artificial intelligence (AI).

Human Contexts and Ethics of Data: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Graduate standing or permission of the instructor. Graduate students without previous (undergraduate or graduate-level) preparation in the interpretive social sciences or humanities are encouraged to confer with the instructor before enrolling

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of seminar per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Graduate

**Grading:** Letter grade.

**Instructor:** Carson

**Also listed as:** STS C204

Human Contexts and Ethics of Data: [Read Less](#) [-]

## DATA 298 Directed Group Studies for Graduates 1 - 4 Units

Terms offered: Prior to 2007

DATA 298 provides credit for directed group study by graduate students working closely with an instructor who is a faculty member. Students are responsible for finding an instructor to supervise their work, and they will meet with that instructor weekly or bi-weekly. Faculty members must commit to supervising and evaluating the students' work and be available to meet regularly as required by the guidelines.

Directed Group Studies for Graduates: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Instructors may require students to enroll concurrently or have completed Data C8 (COMPSCI/STAT/INFO C8) or or Data C200 (COMPSCI C200A/STAT C200C). Graduate standing and consent of instructor

**Repeat rules:** Course may be repeated for credit without restriction. Students may enroll in multiple sections of this course within the same semester.

### Hours & Format

**Fall and/or spring:** 15 weeks - 1-4 hours of directed group study per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Graduate

**Grading:** Letter grade.

Directed Group Studies for Graduates: [Read Less](#) [-]

## DATA 375 Professional Preparation: Teaching of Data Science 2 Units

Terms offered: Spring 2024

Discussion and practice of techniques for effective teaching of student-centered learning, focusing on issues most relevant to teaching assistants in data science courses. Discussion, review and development of formative and summative assessments, guidance of laboratory classes, course development, supervised practice teaching, and culturally relevant pedagogy.

Professional Preparation: Teaching of Data Science: [Read More](#) [+]

### Rules & Requirements

**Prerequisites:** Concurrent Teaching Assistant appointment required

### Hours & Format

**Fall and/or spring:** 15 weeks - 2 hours of lecture per week

### Additional Details

**Subject/Course Level:** Data Science, Undergraduate/Professional course for teachers or prospective teachers

**Grading:** Offered for satisfactory/unsatisfactory grade only.

Professional Preparation: Teaching of Data Science: [Read Less](#) [-]