

DATA SCIENCE

<https://www.pacific.edu/academics/bs-data-science>

Degrees Offered

Bachelor of Science

Majors Offered

Data Science (BS)

The Bachelor of Science in Data Science prepares students to analyze complex systems and solve real-world problems through the analysis of data. Many disciplines, including natural sciences, economics, government and politics, and many other industries and firms, rely on data for decision-making and experimental analyses. Data scientists work with a variety of methods including predictive or prescriptive analytics, algorithms, applied machine learning, statistical modeling, and data visualization. The BS in Data Science is unique in that it is accessible to students in the arts, social sciences, and humanities as well as those coming from STEM disciplines. Students can choose tracks based on their interests, including tracks in decision making, storytelling, data engineering, and predictive modeling. Students in this program are encouraged to double major in a second field of interest as gaining depth in one discipline will strengthen and complement a student's skills for data analysis and storytelling. The degree is structured with accessible pathways to double majors in many other programs across the University including economics, political science, art, philosophy, mathematics, and computer science.

Minors Offered

Data Science

Learning Outcomes

Upon completion of this course, you will be able to:

- Describe data concepts and define terminology (P1, P3, P4; CT, QR)
- Select data, visualize, and apply basic statistical methods appropriate to the stated business goals (P1, P2, CT, QR)
- Concisely summarize and interpret results of data analysis (P1, P2, CT, QR, WC)
- Analyze and interpret univariate and multivariate regression analysis using appropriate software (P1, P2, CT, QR)
- Interpret and apply data predictions to stated business goals (P1, P2, CT, QR)

Bachelor of Science in Data Science

Students must complete a minimum of 120 units with a cumulative and major/program grade point average of 2.0 in order to earn the bachelor of science degree with a major in data science.

I. General Education Requirements

For more details, see General Education (<https://catalog.pacific.edu/uop/generalinformation/generaleducation/>)

Minimum 28 units and 9 courses that include:

A. CORE Seminars (2 courses)

CORE 001	Problem Solving & Oral Comm	3
CORE 002	Writing and Critical Thinking	4

Note: 1) CORE Seminars cannot be taken for Pass/No Credit. **2)** Transfer students with 28 or more transfer credits taken after high school are exempt from both CORE seminars.

B. Breadth Requirement (7 courses, at least 3 units each)

At least one course from each of the following areas:

Artistic Process & Creation
Civic & Global Responsibility
Language & Narratives
Quantitative Reasoning
Scientific Inquiry
Social Inquiry
World Perspectives & Ethics

Note: 1) No more than 2 courses from a single discipline can be used to meet the Breadth Requirement.

C. Diversity and Inclusion Requirement

All students must complete Diversity and Inclusion coursework (at least 3 units)

Note: 1) Diversity and Inclusion courses can also be used to meet the breadth category requirements, or major or minor requirements.

D. Fundamental Skills

Students must demonstrate competence in:

Writing
Quantitative Analysis (Math)

Note: 1) Failure to satisfy the fundamental skills requirements by the end of four semesters of full-time study at the University is grounds for academic disqualification.

II. Breadth Requirement

Students must complete 60 units outside the primary discipline of the first major, regardless of the department who offers the course(s) in that discipline. (This includes general education courses, transfer courses, CPCE/EXTN units, internships, etc.)

III. Major Requirements

Students must complete all the required courses and four courses from a selected track.

Required Courses:

DATA 051	Foundations of Data Science	4
DATA 053	Applications of Data Science	4
DATA 199	Capstone	3
Select one of the following:		3-4
ENGR 030	Engineering and Computing Ethics in Society	
PHIL 126	Digital Well-Being	
Select one of the following:		3-4
MATH 035	Elementary Statistical Inference	
MATH 037	Introduction to Statistics and Probability	
Select three of the following:		3
DATA 010	Excel	
DATA 011	Tableau	
DATA 012	Power BI	

DATA 013	SQL	
DATA 014	R	
Data Engineering Track		
COMP 051	Introduction to Computer Science	4
or COMP 061	Introduction to Programming for Data Science	
COMP 053	Data Structures	4
BUSI 100	Management Information Systems	4
COMP 163	Database Management Systems	4
or BUSI 137	Database Management Systems	
ECPE 170	Computer Systems and Networks	4
DATA 161	Introduction to Cloud Computing	4
COMP 173	Operating Systems	4
COMP 175	System Administration and Security	3
or COMP 178	Computer Network Security	
COMP 177	Computer Networking	4
or BUSI 138	Networking and Telecommunications Management	
Decision-Making Track		
ECON 190	Econometrics	4
DATA 190	Time Series Analysis	4
ECON 180	Labor Economics	4
or ECON 131	Public Finance	
or POLS 111	Introduction to Health Policy	
ECON 141	Money and Banking	4
or POLS 128	Introduction to Public Administration	
or ECON 183	Health Economics	
or ECON 154	Industrial Organization and Policy	
DATA 101	Data Visualization and Storytelling	4
BUSI 108	Introduction to Business Analytics	4
GESC 102	Introduction to Geographic Information Systems (GIS) and Spatial Analysis	4
Storytelling Track		
ECON 161	Empirical Methods	4
or POLS 133	Political Science Research	
COMM 050	Digital Communication	3
DATA 101	Data Visualization and Storytelling	4
ARTS 007	Principles of 2-D Design and Color	4
or ARTS 010	Introduction to Digital Design	
or ARTS 075	Introduction to Graphic Design	
ARTS 091	Data Visualization and Infographics	4
ARTS 172	Information Architecture	4
MPRO 005	Principles of Storytelling	3
MPRO 031	3D Modeling and Texturing	4
MPRO 141	Video Game Development 1	4
MPRO 144	3D Historical Reconstruction	4
ENGL 039	Introduction to Digital Humanities	4
or ENGL 106	Content Engineering	
HIST 080	Digital Narratives	4
GESC 102	Introduction to Geographic Information Systems (GIS) and Spatial Analysis	4
Predictive Modeling and Machine Learning Track		
MATH 075	Introduction to Linear Algebra	4
MATH 130	Topics in Applied Statistics	3
MATH 133	Statistical Learning Methods	4
MATH 131	Probability and Mathematical Statistics I	4

MATH 132	Probability and Mathematical Statistics II	4
BUSI 108	Introduction to Business Analytics	4
BUSI 146	Advanced Business Analytics	4
COMP 151	Artificial Intelligence	3
or COMP 152	Machine Learning	
COMP 155	Computer Simulation	4
COMP 162	Data Analytics Programming	4
or EMGT 162	Introduction to Data Analytics for Engineers and Computer Scientists	
DATA 190	Time Series Analysis	4

Programs Offered

Master of Science in Data Science

For detailed program information for this degree please consult the School of Engineering and Computer Science (<https://catalog.pacific.edu/uop/schoolofengineeringandcomputerscience/msdatascience/>) section in this catalog.

Intrdiscip Data Science Courses

DATA 010. Excel. 1 Unit.

This course is designed for any student enrolled at the University since this course introduces students to Excel. Excel is a basic skill all students should know as the software is ubiquitous in the real world. The course will introduce students to the Excel interface, manage worksheets, enter and organize data, use and create formulas, creating and formatting charts and pivot tables.

DATA 011. Tableau. 1 Unit.

This course is designed for any student enrolled at the University since this course introduces students to Tableau. Data visualization is an essential skill required in today's data driven world. Its foundations are rooted in statistics, psychology, communication, and computer science. In almost every discipline we use visualization to explore and present data to explain ideas or tell stories. Students will create their own data visualizations, and learn to use Tableau. The majority of the class requires you to work with data and visualization tools to create visual displays.

DATA 012. Power BI. 1 Unit.

This course is designed for any student enrolled at the University since this course introduces students to PowerBI. This course will familiarize students with entering and transforming data, building a database, multiple types of data visualization, building dashboards, and writing queries. Before enrolling in this course, students should be familiar with entering and organizing data in Excel.

DATA 013. SQL. 1 Unit.

This course is designed for any student enrolled at the University. It introduces and familiarizes students with SQL (Structured Query Language). Students in this course will learn basic query writing syntax, practice writing queries on complex databases, and will build a simple local database. They will additionally be introduced to common types of remote databases and SQL derivative languages.

DATA 014. R. 1 Unit.

This course is designed for any student enrolled at the University since this course introduces students to R, an opensource language for statistical computing. R is a computational skill of use to any student hoping to work with data. The course will introduce students to the R interface, importing/exporting data, data cleaning and manipulation, subset selection and filtering, data visualization, and model formulae/fitting.

DATA 051. Foundations of Data Science. 4 Units.

This course introduces basic theory and application of data visualization and statistical methods to analyze data to enhance and support decision-making. Data driven decision-making is used in personal, industry, and government policy decision-making. Data science provides the tools for critical thinking by providing precise evidence and quantitative analysis, to draw inference to support conclusions about almost any aspect in the real world, whether it is personal, local, national, or global. In today's society, you will be asked to support your arguments with empirical evidence, and data science will provide the toolkit for you to provide enhanced critical analysis.

DATA 053. Applications of Data Science. 4 Units.

This course will apply and deepen student understanding of predictive models for analyzing data to enhance and support decision-making. Students will learn to distinguish between regression vs classification problems and choose an appropriate statistical model to predict a desired quantity of interest. Techniques for comparing model performance, assessing the validity of models, and making predictions on future data will be developed. Basic terminology and concepts in linear algebra such as matrix-vector operations and linear transformation will also be introduced and applied to develop statistical models. Students will also gain practice in effectively communicating the results of their analysis in written and oral format. The use of technology to perform analyses will be emphasized.

DATA 101. Data Visualization and Storytelling. 4 Units.

This course introduces students to data visualization and storytelling skills. Data visualization is an essential skill required in today's data driven world. Its foundations are rooted in statistics, psychology, communication, and computer science. In almost every discipline we use visualization to explore and present data to explain ideas or tell stories. This course shows you how to better understand your data, present clear evidence of your findings to your intended audience, and tell engaging data stories that clearly depict the points you want to make through data graphics. Students will create their own data visualizations, and learn to use data visualization tools, such as Tableau or Python. The majority of the class requires you to work with data and visualization tools to create visual displays to tell stories to engage the audience in a meaningful way.

DATA 161. Introduction to Cloud Computing. 4 Units.

The adoption and utilization of cloud computing services is on a continual rise, spanning multiple domains. This project-based course covers the foundational aspects of cloud computing from applications and administration to programming and infrastructure. Topics include: overview of cloud computing, cloud service and deployment models, overview of major cloud providers, virtualization and cloud storage technologies. Prerequisites: DATA 053 OR COMP 051 OR COMP 061.

DATA 190. Time Series Analysis. 4 Units.

This course introduces basic theory and application of statistical methods to analyze data observed over time. Students will learn techniques for working with time series data and how to identify the correlation that exists between observations separated by time. The class will concentrate on both univariate, multivariate time series and panel data analysis. We will also use these techniques to develop forecasts of time series and panel (longitudinal) data. Practical application of these techniques will be introduced using R or python. Prerequisites: MATH 037 AND DATA 053.

DATA 197. Independent Research. 1-4 Units.**DATA 199. Capstone. 3 Units.**

The capstone class will be a largely independent empirical project which makes concrete use of all aspects of data science explored in the core and your chosen track, from identifying a data source, cleaning and organizing the data, conducting appropriate statistical analysis, to interpreting and reporting the results of the study in a standard scholarly/industry form. The final product that can be used to highlight your skills to potential employers. Projects will be drawn from real-world problems and will be conducted with industry, government, and academic partners.