Data Science

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The UO's data science program has a data science + domain structure, which means you study core quantitative methods – and apply those methods to your chosen area of emphasis (or "domain").

This gives you a strong understanding of how to extract data using quantitative methods such as math, statistics, and machine learning, and how to visually communicate those results in ways that are relevant to your chosen domain. You'll take two to three core courses, providing insight into the basics of the domain. After completing the quantitative skills in the program, you then take four elective domain courses – providing the opportunity to apply those quantitative skills to data sets within the area.

Undergraduate Degree in Data Science

The data science curriculum combines general principles with domain-specific application. The curriculum is sub-divided into the following categories with the corresponding requirements:

Bachelor's Degree in Data Science

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Code	Title	Credits
Data Science Core Courses:		**16**
DSCI 101	Foundations of Data Science I	
DSCI 102	Foundations of Data Science II	
DSCI 311	Principles and Techniques of Data Science	
Data Science Capstone Project		
Foundations in Mathematics and Computing		
CIS 210 & CIS 211 & CIS 212	Computer Science I and Computer Science II and Computer Science III	
MATH 251 & MATH 252	Calculus I and Calculus II	
MATH 341 & MATH 342	Elementary Linear Algebra and Elementary Linear Algebra	
DSCI 345M	Probability and Statistics for Data Science	
DSCI 372M	Machine Learning for Data Science	
DSCI 410	Experimental Course: [Topic] (Data Science Capstone Project) [1]	
Mathematics Courses:		16
Ethics Course:		**4**
PHIL 423	Technology Ethics: [Topic]	
Computational and Inferential Depth:		
Select three courses from the list below:		12
CIS 314	Computer Organization	
CIS 322	Introduction to Software Engineering	
CIS 330	C/C++ and Unix	
CIS 333	Applied Cryptography	
CIS 415	Operating Systems	
CIS 432	Introduction to Networks	
MATH 253	Calculus III	
MATH 307	Introduction to Proof	
MATH 461	Introduction to Mathematical Methods of Statistics I	
MATH 462	Introduction to Mathematical Methods of Statistics II	
MATH 463	Mathematical Methods of Regression Analysis and Analysis of Variance	
MATH 458	Introduction to Mathematical Cryptography	
Modeling, Learning and Decision Making		
CIS 372M	Machine Learning for Data Science	
Probability		
MATH 345M	Probability and Statistics for Data Science	

Domain Emphasis

The domain emphasis consists of completing 2-3 courses (8-12 credits) in the domain core, followed by a minimum of 4 courses (16 credits) of domain specialization. For each domain emphasis, a curated list of courses has been developed for both the core and specialization component. Please see the previous section (tracks/concentrations) for a detailed list of courses that satisfy each available domain emphasis.

[1] An additional course from the domain specialization list may be taken in place of the capstone project.

An essential aspect of the degree in data science is that data science majors develop critical competencies in a domain emphasis of their choosing. The domain emphasis consists of completing 2-3 courses (8-12 credits) in the domain core, followed by a minimum of 3 courses (12 credits) of domain specialization. For each domain emphasis, a curated list of courses has been developed for both the core and specialization component.

Currently, domain emphases have been established for biology, geography, accounting analytics, marketing analytics, and linguistics. The curated list of domain core and domain specialization courses for each domain is outlined below.

Data Science Domain - Accounting Analytics

Data has proliferated in business as organizations generate large volumes of information within their day to day operations while increasingly having access to externally created information as well.

Data science applied to accounting data can help organizations understand the implications for decision-making and provide better insights. You might delve into company sales data, purchasing data, contracts, or company disclosures to help solve a variety of business problems.

In the data science domain area of accounting analytics, you will learn to search for relationships between different variables and outcomes they influence, driving business decisions and informing success.

Code	Title	Credits
Core Courses:		8-12
BA 101	Introduction to Business	
BA 215	Accounting: Language of Business Decisions	
EC 201	Introduction to Economic Analysis: Microeconomics	
Required		
BA 240	Spreadsheet Analysis and Visualization	
ACTG 350	Intermediate Accounting I	
Take two out the following three		
ACTG 410	Experimental Course: [Topic] (Accounting Data and Analytics)	
ACTG 410	Experimental Course: [Topic] (Accounting Data and Analytics Capstone)	
OBA 410	Experimental Course: [Topic] (Predictive Analytics)	

Data Science Domain - Biology

Recent technological breakthroughs in DNA sequencing mean that scientists can characterize an organism's entire genome in a matter of days. But a great challenge remains in translating that genomic sequence — nature's data set — into biology.

That translation is fundamentally changing how we study biology.

In the data science domain area of biology, you will find yourself on the cutting edge of the field, working in the acquisition, analysis, and interpretation of data and how it applies to gene function, disease, microbial ecology, and the assembly and characterization of new genomes.

Code	Title	Credits
Core Courses:		8-12
BI 211	General Biology I: Cells	
BI 212	General Biology II: Organisms	
BI 213	General Biology III: Populations	
Select four of the following		12
BI 320	Molecular Genetics	
BI 360	Neurobiology	
BI 370	Ecology	
BI 399	Special Studies: [Topic] (Computational Genomics)	
BI 399	Special Studies: [Topic] (Modeling in Biology: Deterministic Models)	
BI 410	Experimental Course: [Topic] (Data Management and Visualization)	
BI 410	Experimental Course: [Topic] (Modeling in Biology: Stochastic Models)	
BI 410	Experimental Course: [Topic] (Neural Data Analysis)	
BI 471	Population Ecology	
BI 485	Techniques in Computational Neuroscience	
Data Science Capstone Course		

Data Science Domain - Earth Sciences

Code	Title	Credits
Core Courses:		
ERTH 202	Earth's Surface and Environment	4
PHYS 201	General Physics	4
or PHYS 251	Foundations of Physics I	
ERTH 315	Earth Physics	4
Choose four of the following:		
ERTH 353	Geologic Hazards	
ERTH 415	Field Geophysics	4
ERTH 438	Geobiology	4
ERTH 441	Hillslope Geomorphology	4
ERTH 453	Tectonics	3
ERTH 454	Fluid Dynamics	4
ERTH 455	Mechanical Earth	4
ERTH 467	Fault Mechanics	4
Data Science Capstone Course		

Data Science Domain - Economics

Code	Title	Credits
Core Courses:		
EC 201	Introduction to Economic Analysis: Microeconomics	4
EC 311	Intermediate Microeconomic Theory	4
EC 320	Introduction to Econometrics	4
EC 421	Introduction to Econometrics	4
Choose three from the following:		
EC 422	Economic Forecasting	
EC 428	Behavioral and Experimental Economics	
EC 434	Environmental Economics	
EC 443	Health Economics	
EC 451	Issues in Labor Economics	
EC 460	Theories of Industrial Organization	
EC 482	Economics of Globalization	
EC 490	Economic Growth and Development	

Data Science Domain - Geography

Spatial data is integrated into our everyday lives and employed in a range of professions. We are all integrated into a complex web of movement, place, and discovery, whether we're navigating across town or interpreting maps of election results.

UO geographers use spatial data technologies to focus on remote sensing of the changing environment, climate-change analysis, web-mapping, cartography and data visualization, spatial cognition, and spatial patterns in public health.

In the data science domain area of geography, you will be studying how spatial data can revolutionize business, nonprofit, and government worlds.

Code	Title	Credits
Core Courses:		8-12
GEOG 181	Our Digital Earth	

GEOG 281	The World and Big Data	
GEOG 481	GIScience I	
Select four of the following		12
GEOG 482	GIScience II	
GEOG 485	Remote Sensing I	
GEOG 486	Remote Sensing II	
GEOG 490	GIScience: [Topic]	
GEOG 491	Advanced Geographic Information Systems	
GEOG 493	Advanced Cartography	
GEOG 496	Location-Aware Systems	
GEOG 498	Geospatial Project Design	
Data Science Capstone Course		

Data Science Domain - Linguistics

Usage-based linguistics studies language as a dynamic, constantly changing system. Much of this work involves working with large collections of text or speech – referred to as “corpora.” Examples of readily available real-world corpora include Amazon product reviews and collections of Twitter messages.

Linguists use corpora to help identify patterns and structures in language, providing insights into how we both acquire and lose language skills, how language use varies across people and contexts, and how real-life speech and language evolve.

In the data science domain area of linguistics, you will learn methods to identify linguistic structures within corpora, gleaning new insights while using the best and latest practices in the field. These methods will allow you to answer basic science questions as well as questions that are of interest to marketing firms, political consulting groups, or other commercial enterprises. So, for example, you can use the knowledge you acquire in the linguistics domain to explore how the use of a word like “cool” has changed over time (a basic science question) or to identify linguistic strategies associated with leading positive product reviews for different product types (a marketing question).

Code	Title	Credits
Core Courses:		8
LING 301	Introduction to Linguistics Analysis	
LING 302	Introduction to Linguistic Behavior	
Electives:		
LING 435	Morphology and Syntax	
LING 451	Functional Syntax I	
LING 452	Functional Syntax II	
LING 493	Corpus Linguistics	
CIS 410	Experimental Course: [Topic] (Natural Language Processing)	
Data Science Capstone Course		

Data Science Domain - Marketing Analytics

Marketing analytics is the practice of measuring, managing, and analyzing marketing performance to maximize effectiveness and optimize return on investment. Data science applied to marketing data can help a business predict consumer behavior, improve decision-making, and gauge the success of marketing investments.

For example, machine learning and statistical techniques can be used to classify data and detect patterns that might predict a campaign’s success.

In the data science domain area of marketing analytics, you will learn how to see the future, through the lens of both existing and new methods of predictive analytics.

Code	Title	Credits
Core Courses:		8-12
BA 101	Introduction to Business	
BA 215	Accounting: Language of Business Decisions	
EC 201	Introduction to Economic Analysis: Microeconomics	
Required		
BA 240	Spreadsheet Analysis and Visualization	
BA 317	Marketing: Creating Value for Customers	
MKTG 390	Marketing Research	
Pick one of the following:		
MKTG 395	Marketing Analytics	
OBA 410	Experimental Course: [Topic]	

Data Science Domain - Physics

Code	Title	Credits
Core Courses:		
PHYS 251	Foundations of Physics I	4
PHYS 253	Foundations of Physics I	4
PHYS 290	Foundations of Physics Laboratory	1
PHYS 391	Physics Experimentation Data Analysis Laboratory	4
Choose three of the following:		
PHYS 432	Digital Electronics	
PHYS 481	Design of Experiments	
PHYS 491	Research Project I	
Data Science Capstone Project		

Data Science Domain - Sociology

Code	Title	Credits
Core Courses:		
SOC 204	Introduction to Sociology	4
SOC 310	Social Theory	4
SOC 311	Research Methods	4
SOC 412	Sociological Research Methods	4
SOC 413	Sociological Research Methods	4
Choose two from the following:		
SOC 370	Urban Sociology	
SOC 380	Introduction: Deviance, Control, and Crime	
SOC 416	Issues in Environmental Sociology [Topic]	
SOC 442	Issues in Urban Sociology: [Topic]	
SOC 445	Sociology of Race and Ethnicity: [Topic]	

SOC 451	Social Stratification
SOC 465	Political Sociology
SOC 467	Economic Sociology
SOC 613	Advanced Sociological Methods: [Topic]

Courses

DSCI 101. Foundations of Data Science I. 4 Credits.
This course utilizes a quantitative approach to explore fundamental concepts in data science. Students will develop key skills in programming and statistical inference as they interact with real-world data sets across a variety of domains. Ethical and privacy concerns are explored. Sequence with DSCI 102.

DSCI 102. Foundations of Data Science II. 4 Credits.
This course expands upon critical concepts and skills introduced in DSCI 101. Topics include the normal distribution, confidence intervals, regression, and classifiers. Sequence with DSCI 101.
Prereq: DSCI 101, MATH 101 (or equivalent math placement score).

DSCI 196. Field Studies: [Topic]. 1-12 Credits.
Repeatable.

DSCI 198. Workshop: [Topic]. 1-12 Credits.
Repeatable.

DSCI 199. Special Studies: [Topic]. 1-5 Credits.
Repeatable.

DSCI 299. Special Studies: [Topic]. 1-5 Credits.
Repeatable.

DSCI 311. Principles and Techniques of Data Science. 4 Credits.
Intermediate and advanced techniques in data science. Topics include managing data using software programs, data cleaning, handling text, dimensionality, principle component analysis, regression, classification and inference.
Prereq: DSCI 102, CIS 211, MATH 342.

DSCI 345M. Probability and Statistics for Data Science. 4 Credits.
Introduction to probability and statistics, with an emphasis upon topics relevant for data science. Students cannot get credit for both MATH 343 and DSCI 345M/MATH 345M.
Prereq: MATH 342, CIS 211.

DSCI 372M. Machine Learning for Data Science. 4 Credits.
Introduction to Machine Learning, with an emphasis on topics relevant for data science. Multilisted with CIS 372M.
Prereq: CIS 212, DSCI 345M, MATH 342.

DSCI 399. Special Studies: [Topic]. 1-5 Credits.
Repeatable.

DSCI 401. Research: [Topic]. 1-12 Credits.
Repeatable.

DSCI 403. Thesis. 1-12 Credits.
Repeatable.

DSCI 404. Internship: [Topic]. 1-12 Credits.
Repeatable.

DSCI 405. Reading and Conference: [Topic]. 1-5 Credits.
Repeatable.

DSCI 406. Field Studies: [Topic]. 1-12 Credits.
Repeatable.

DSCI 407. Seminar: [Topic]. 1-5 Credits.
Repeatable.

DSCI 409. Practicum: [Topic]. 1-5 Credits.
Repeatable.

DSCI 410. Experimental Course: [Topic]. 1-5 Credits.
Repeatable.