

DATA SCIENCE

Director: Ellen Seljan

Administrative Coordinator: TBD

Data science is an interdisciplinary field of study dedicated to extracting knowledge from data sets. In a world awash with data, nearly every field of endeavor and inquiry is being transformed by data science. This emerging discipline combines coursework in computing, statistics, and various domains of application spanning the arts, humanities, natural sciences, and social sciences. Our coursework will teach you best practices in data collection, management, measurement, visualization, analysis, and inference. Additionally, in our program, you will not only learn to harness data, but also understand its societal consequences. Training in data science at Lewis & Clark will foster quantitative problem-solving skills and cultivate students as lifelong interdisciplinary learners, capable of tackling wicked problems and exploring for the global good.

The interdisciplinary minor is supervised by a group of faculty from several departments. Student advising is provided by faculty teaching courses in the program.

The minor is designed to guide students in the pursuit of the following learning outcomes:

- Obtain, process, and transform complex data sets.
- Develop programming abilities conducive to problem-solving in multiple high-level computer programming languages.
- Build and assess data-based statistical models for both prediction and causal inference.
- Recognize and analyze ethical issues in data science related to algorithmic bias, artificial intelligence, intellectual property, data security, data integrity, and privacy.
- Effectively communicate knowledge extracted from data orally, visually, and in written formats.

Minor Requirements

A minimum of 24 semester credits distributed as follows:

- DSCI 140 Introduction to Data Science
- CS 171 Computer Science I
- One introductory statistics course chosen from the list below.
- One advanced statistics course chosen from the list below.
- One social impact course chosen from the list below.
- One elective course chosen from the list below.

Introductory Statistics Courses

ECON 103	Statistics
HEAL 200	Biostatistics in Public Health
MATH 123	Calculus & Statistics for Modeling the Life Sciences
MATH 255	Statistical Concepts and Methods
POLS 201	Research Methods in Political Science
PSY 200	Statistics I

Advanced Statistics Courses

ECON 303	Econometrics
MATH 351	Linear Models
MATH 352	Simulation-Based Statistical Methods
MATH 451	Probability and Statistics I

MATH 452	Probability and Statistics II
PSY 311	Statistics II

Social Impact Courses

PHIL 241	Data, Privacy, and Ethics
RHMS 241	Data and Democracy

Data Science Electives

ART 212	Digital Media II
ART 312	Digital Media III
BIO 408	Phylogenetic Biology and Molecular Evolution
CS 172	Computer Science II
CS 240	Databases
CS 369	Artificial Intelligence and Machine Learning
CS 383	Algorithm Design and Analysis
DSCI 240	Data for Good
ECON 255	Technology, Institutions, and Economic Growth
ECON 312	Global Health Economics
ESS 170	Climate Science
ESS 340	Spatial Problems in Earth System Science
HEAL 340	Epidemiology
MATH 215	Discrete Mathematics
MATH 225	Linear Algebra
MATH 351	Linear Models
MATH 352	Simulation-Based Statistical Methods
MATH 451	Probability and Statistics I
MATH 452	Probability and Statistics II
PHIL 315	Philosophy of Science
PHYS 380	Topics in Physics (if topic is computational physics)
PHYS 390	Biomedical Imaging
POLS 252	Public Opinion and Survey Research
POLS 420	Policy Analysis
PSY 425	Human-Computer Interaction
RHMS 360	Digital Media and Society
RHMS 408	Science, Technology, and Society
SOAN 390	Cyborg Anthropology

At least 12 semester credits must be exclusive to the minor (may not be used in any other set of major or minor requirements).

Faculty

Cliff T. Bekar. Associate professor of economics. Economic history, industrial organization, game theory. PhD 2000, MA 1992, BA 1990 Simon Fraser University.

Greta J. Binford. Professor of biology. Invertebrate zoology, biodiversity, evolution of spider venoms. PhD 2000 University of Arizona. MS 1993 University of Utah. BA 1990 Miami University.

Moriah Bellenger Bostian. Professor of economics and department chair. Environmental and resource economics, econometrics. PhD 2010 Oregon State University. MS 2005 Auburn University. BS 2003 Florida State University.

Yung-Pin Chen. Professor of statistics. Statistics, Sequential Designs. Probability, Stochastic Processes. PhD 1994 Purdue University. BS 1984 National Chengchi University, Taiwan.

Brian Detweiler-Bedell. Professor of psychology, executive director of the Bates Center for Entrepreneurship and Leadership. Social psychology, statistics. PhD 2001, MPhil 2000, MS 1998 Yale University. MA 1995, BA 1994 Stanford University.

Peter Drake. Associate professor of computer science. Artificial Intelligence, Data Science, Software Development. PhD 2002 Indiana University. MS 1995 Oregon State University. BA 1993 Willamette University.

Jeffrey S. Ely. Associate professor of computer science. Computer Graphics, Numerical Analysis. PhD 1990, MS 1981, BS 1976 Ohio State University.

Benjamin Gaskins. Associate professor of political science. American politics, public opinion, media and politics, religion and politics. PhD 2011, MS 2008 Florida State University. BA 2006 Furman University.

Jessica M. Kleiss. Associate professor of environmental studies and program director. Oceanography, interface between the atmosphere and the ocean. PhD 2009 Scripps Institution of Oceanography, University of California at San Diego. BS 2000 Massachusetts Institute of Technology.

Jens Mache. Professor of computer science. Parallel and distributed systems, computer networks, cybersecurity. PhD 1999 University of Oregon. MS 1994 Southern Oregon University. Vordiplom 1992 Universitaet Karlsruhe.

Joel A. Martinez. Associate professor of philosophy and department chair. Ethical Theory, Normative Ethics, Ancient Philosophy, Logic. PhD 2006 University of Arizona. BA 1997 New Mexico State University.

Aine Seitz McCarthy. Associate professor of economics. Applied microeconomics, development economics, labor and demography, economics of education. PhD 2016 University of Minnesota. BA 2006 Colby College.

Erik L. Nilsen. Associate professor of psychology. Cognition, methodology, human-computer interaction. PhD 1991, MA 1986 University of Michigan. BA 1984 Graceland College.

Jay Odenbaugh. James F. Miller Professor of Humanities. Ethics, Philosophy and the Environment, Philosophy of Science, Metaphysics, Logic. PhD 2001 University of Calgary. MA 1996 Southern Illinois University at Carbondale. BA 1994 Belmont University.

G. Mitchell Reyes. Professor of rhetoric and media studies. Rhetoric, public memory, public discourse, rhetoric of science. PhD 2004, MA 2000 Pennsylvania State University. BS 1997 Willamette University.

Ellen C. Seljan. Professor of political science, director of the data science program. American politics and public policy. PhD 2010 University of California at San Diego. BA 2004 Drew University.

Elizabeth A. Stanhope. Professor of mathematics and department chair. Differential geometry, spectral geometry. PhD 2002, AM 1999 Dartmouth College. BA 1995 Carleton College.

Iva Stavrov. Professor of mathematics. Differential geometry, algebraic topology. PhD 2003, MS 2001 University of Oregon. BS 1998 University of Belgrade.

Todd Watson. Associate professor of psychology, co-director of the neuroscience program. Cognitive neuroscience, brain and behavior, statistics. PhD 2005 State University of New York at Stony Brook. MA 2000 Radford University. BS 1997 Pennsylvania State University.

Courses

DSCI 140 Introduction to Data Science

Content: Study of knowledge extraction from data with integrated use of statistics, computer science, and scientific reasoning. Students will gain the foundational skills necessary to solve problems with data, learning how to make quantitative predictions and explain phenomena in numerous applications. Students will be able to access and manipulate publicly available datasets; assess the quality, usefulness, and limitations of real-world data; visualize data in multiple formats; conduct statistical analyses to test hypotheses; and draw causal inferences (and debunk spurious inferences). All analysis will be taught scientifically and reproducibly using R or Python programming.

Prerequisites: None.

Usually offered: Annually, fall and spring semester.

Semester credits: 4.

DSCI 240 Data for Good

Content: Exploration of data science as applied to social, ethical, and moral questions. Through the lens of R programming, students will learn how data science can inform policy decisions, enhance journalism, combat misinformation, and challenge stereotypes. Examination of the identification and mitigation of bias in data science, emphasizing real-world data related to justice, policing, hunger, and poverty.

Prerequisites: DSCI 140.

Usually offered: Annually, spring semester.

Semester credits: 4.

DSCI 244 Practicum/Internship

Content: Supervised practical experience in consultation with a faculty member, or faculty-supervised internship off campus.

Prerequisites: None.

Usually offered: Annually, fall and spring semester.

Semester credits: 1-4.

DSCI 245 Applied Data Science Practicum

Content: Academic and experiential bridge between classroom theory and real-world application in the domain of data science. Students enrolled in this course will work eight to 10 hours per week in small teams to solve problems and extract value from data. The problems and data sets will vary by year and course offering, but will universally provide opportunities to students to frame research questions, manage and clean data, execute analyses, and communicate results.

Prerequisites: None.

Usually offered: Annually.

Semester credits: 2.