

# DATA SCIENCE

The exigency for people with data analysis, critical thinking, and communication skills continues as the volume and access to data grows exponentially all around. The Bureau of Labor Statistics projects a 31% growth rate in the employment of data scientists through the year 2029. This is a faster than average growth rate when compared to other occupations, based upon a widespread need for statistical analysis of "the increasing volume of digital and electronic data".<sup>1</sup>

The emergence of "big data" has served as a catalyst for the growth of data science as a discipline, building a solid foundation through the combination of statistics, mathematics, and computer science. Data science captures the already-present interdisciplinary nature of statistics and mixes with it a breadth of knowledge from many other subject domains. A data scientist, grounded within a solid liberal arts education, will continue to have influential roles in discovery and decision-making across the broad spectrum of disciplines and industry. St. Catherine University's mission to educate our students to lead and influence inherently contains our responsibility to learn how to think critically, ethically, and globally about information and data. Our data science students learn to conduct analyses and construct models, to draw conclusions and interpret results, and to allow that thinking to inform the decision-making process - a key component at the heart of ethical, transformational influence and leadership.

<sup>1</sup><https://www.bls.gov/ooh/fastest-growing.htm>

## Major

- Data Science - BS (<http://catalog.stkate.edu/undergraduate/humanities-arts-sciences/data-science/data-science-bs/>)

## Minors

- Data Science (<http://catalog.stkate.edu/undergraduate/humanities-arts-sciences/data-science/data-science-minor/>)

### DSCI 1000 Telling Stories with Data - Introduction to Data Visualization – 4 credits

The amount and extent of data in our world is constantly growing. There is an increasing need to summarize the data, make sense of it, and use it to tell important stories. Visualizations are an immensely popular way to summarize data and communicate it into a narrative. In this course, we will discuss how we perceive information visually, how to identify and avoid pitfalls in data visualization, how we interpret data visualizations to tell a story, and how to create effective visualizations. Through community-engaged work, students will begin to learn to craft summaries and visualizations of data and to use these tools to construct narratives about the data. Community-engaged work is project-based. No prerequisites required; ideal for first year students, but open to all interested students.

### DSCI 2000 Seminar for Data Science – 2 credits

This seminar course offers an introductory insight into data science, exploration of essential concepts and frameworks related to data governance, focusing on the ethical, privacy, and security challenges that arise in the modern data-driven world. Students will learn how organizations can effectively manage data in compliance with ethical standards, legal regulations, and security protocols while maintaining transparency and trust. We will explore some of the professional opportunities associated with the discipline. We will learn from data scientists, statisticians, and analysts as guest speakers and professional panels, learn and practice communication skills through general conversations, book discussions, games, and mock interviews, as well as begin framing the process of e-portfolio and resume construction. Offered every spring semester in the College for Women.

### DSCI 2100 Introduction to Programming: Applied Computing I – 4 credits

This semester course is designed using Google proprietary curriculum. Students will develop problem solving and programming skills, specifically in Python, and will learn to analyze and visualize data in order to drive well-informed decisions, no matter the student's major or course of study. No prerequisites. Offered every odd fall semester in the College for Women.

### DSCI 2684 Directed Study – 4 credits

#### DSCI 2994 Topics – 4 credits

The subject matter of the course is announced in the annual schedule of classes. Content varies from year to year but does not duplicate existing courses. Offered in the College for Women.

#### DSCI 3000 Data Ethics, Governance & Social Impact – 4 credits

This course explores the complex relationships between data, society, and ethical considerations. Students will critically examine the role of data science and artificial intelligence in shaping societal norms, policies, and structures, with a focus on ethical issues such as privacy, bias, accountability, and the social impacts of data-driven technologies. Through case studies, reflective exercises, and class discussions, students will develop a strong foundation in ethical analysis and learn strategies for navigating the challenges of responsible data use.

#### DSCI 3000W Data Ethics, Governance & Social Impact – 4 credits

This course explores the complex relationships between data, society, and ethical considerations. Students will critically examine the role of data science and artificial intelligence in shaping societal norms, policies, and structures, with a focus on ethical issues such as privacy, bias, accountability, and the social impacts of data-driven technologies. Through case studies, reflective exercises, and class discussions, students will develop a strong foundation in ethical analysis and learn strategies for navigating the challenges of responsible data use.

#### DSCI 3100 Database Management – 4 credits

An introduction to database concepts, design and implementation. The focus is on database design using the ER model, as well as managing and implementing relational database systems. The design process is iterative and consists of four phases: Requirements, Design, Coding, and Testing. This process is often employed in many project management and technology development projects. Topics include Data Modeling Using Entity-Relationship Model, Chen and Crow's Foot Notation, Relational Database Implementation, Structured Query Language, and schema Normalization. This course is co-convened with LIS 7510. The courses share the same course description, objectives and content, with different course requirements. Offered every odd fall in the College for Women.

**DSCI 3200W Analyzing Social Issues with Data – 4 credits**

Students will gain experience with the entire data science pipeline, including asking a research question, collecting/importing, wrangling/cleaning, visualizing, and modeling data, and communicating results of analysis. Students will learn to use R to wrangle and visualize data from large, complex datasets, with examples related to social issues. In this writing-intensive course, students will gain practice writing about their methods and communicating results to different types of audiences.

**Prerequisite:** STAT 1090 or equivalent. Highly

**recommended:** Some exposure to R. Students without exposure to R will be expected to spend some extra time at the beginning of the semester learning the basics. (The instructor will provide resources.)

**DSCI 3300 Introduction to Machine Learning for Data Science – 4 credits**

Introduction to Machine Learning for Data Science is a foundational course designed to introduce students to the principles, techniques, and applications of machine learning in the context of data science. Through a combination of theoretical lectures, practical exercises, and hands-on interdisciplinary projects, students will learn how to analyze and interpret data using a variety of machine learning algorithms. Topics covered include supervised learning, unsupervised learning, evaluation methods, and practical considerations for applying machine learning to real-world social problems. Emphasis will be placed on understanding the ethical implications, biases, and limitations of using machine learning in the context of social analysis. Offered at the College for Women.

**Prerequisite:** STAT 1090 or equivalent. A grade of C or better in MATH 1130 or permission of instructor. Recommended to have basic understanding of the Python programming language or have taken CSCI 1110 (seek permission from instructor if transferring or would like to take this course).

**DSCI 4100 Introduction to Cloud Computing – 4 credits**

This course provides an introductory overview of cloud computing, covering foundational concepts, service models (IaaS, PaaS, SaaS), deployment models (public, private, hybrid), and core services in popular cloud platforms like AWS, Azure, and Google Cloud. Through hands-on exercises, students will explore cloud infrastructure, data storage, security, and application deployment. Recommended prerequisite is CSCI 1110, but not required.

**DSCI 4200 Introduction to Large Language Models: A Machine Learning Approach – 4 credits**

This course introduces students to the fundamental concepts and practical applications of large language models (LLMs) within a machine learning framework. Students will explore key LLM architectures, such as GPT and BERT, learning how these models work through self-attention and Transformer mechanisms. Through hands-on exercises, students will learn to preprocess text data, apply pre-trained LLMs to real-world tasks like text generation and sentiment analysis, and evaluate model performance. Additionally, the course addresses important ethical considerations, such as bias and responsible AI use. By the end of the course, students will have a foundational understanding of how LLMs function and how to effectively use them in practical applications.

**DSCI 4600 Internship – 0 credits**

This is a structured out-of-class learning experience that takes place on- or off-campus and includes a substantial work component. An internship involves students in a particular profession in an exploratory way to test career interests and potential. To initiate an internship experience, meet with the internship coordinator in the Career Development Office.

**Prerequisites:** Faculty sponsorship and approval by department chair.

**DSCI 4604 Internship – 4 credits**

Structured out-of-class learning experience that takes place on or off campus and includes a substantial work component. An internship involves students in a particular profession in an exploratory way to test career interests and potential. To initiate an internship experience, meet with the internship coordinator in the Career Development Office.

**Prerequisites:** Faculty sponsorship and approval by department chair.

**DSCI 4684 Directed Study – 4 credits****DSCI 4950 Independent Study – 0 credits****DSCI 4951 Independent Study – 1 credit****DSCI 4952 Independent Study – 2 credits****DSCI 4954 Independent Study – 4 credits**