MTH - Data Science Graduate Program

Data Science Program
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Master of Science program

The goal of the Master of Science in Data Science Program is to educate data science leaders. The program prepares students at an advanced level to derive insights from real-world datasets, using the latest tools and analytical methods, and to interpret and communicate their findings effectively. The curriculum closely complements what has been identified as typical data science tasks to include, but not limited to, the identification and interpretation of rich data sources, the management of large amounts of data, the merging of data sources, ensuring consistency of datasets, creating visualizations to aid in understanding data, building mathematical models using the data, and presenting and communicating the data insights/findings to diverse expert and non-expert audiences.

The program features a multidisciplinary curriculum that draws primarily from computer science, math and statistics, management, and communication and represents a fixed curriculum comprising 36 credits (12 three-credit courses), including a required capstone course as the culminating experience for students. The online M.S. in Data Science Program focuses primarily on adult and non-traditional students who hold an undergraduate degree and have the desire to continue their education towards a graduate degree, primarily to expand knowledge and specialized skills in this area and for career advancement.

Certificate program

The graduate Data Science Certificate is a 15-credit program for working professionals who require increased competency in core data science topics including statistics, exploratory data analysis, programming, data warehousing, data mining and machine learning, and communicating about data.

Collaborative programs

Both the M.S. in Data Science and the graduate Data Science Certificate are fully **online** programs offered jointly by UW-Eau Claire, UW-Green Bay, UW-La Crosse, UW-Oshkosh, UW-Stevens Point, and UW-Superior. The programs follows a home-campus model. Candidates apply to one of the six partner institutions. Upon a student's admittance, that institution becomes the student's administrative home for the degree through graduation.

Program length

The Master of Science (M.S.) in Data Science Program is typically a two-year program. The graduate Data Science Certificate is typically a one-year program. The program length is based on how long the required UWL coursework would take to complete for a part-time student taking six credits a term, who does not need to complete any prerequisite coursework. Program length may be extended if students take fewer than six credits per term or due to the requirements of an individual student's plan of coursework, research or capstone project.

Graduate degree

- Data science - MS (https://catalog.uwlax.edu/graduate/programrequirements/datascience/datascience-ms/)

Certificate

- Data science certificate (https://catalog.uwlax.edu/graduate/programrequirements/datascience/datascience-certificate/)

Courses

DS 700 Cr.3
Foundations of Data Science
This course provides an introduction to data science and highlights its importance in business decision making. It provides an overview of commonly used data science tools along with spreadsheets, relational databases, statistics and programming assignments to lay the foundation for data science applications. Prerequisite: admission to a graduate Data Science Program. Consent of department. Offered Fall, Spring.

DS 701 Cr.3
Exploratory Data Analysis
This course introduces data science and highlights its importance in decision making. Students learn how to analyze data using the R programming language. During the course, students learn how to import data into R, tidy it, conduct exploratory data analysis, develop visualizations, and draw statistical inferences. The course teaches data wrangling, visualization, and exploration with R. Prerequisite: admission to a graduate Data Science Program. Consent of department. Offered Fall, Spring, Summer.

DS 705 Cr.3
Statistical Methods
Statistical methods and inference procedures are presented with an emphasis on applications, computer implementation, and interpretation of results. Topics include simple, multiple, and logistic regressions; model selection; one-sample, paired-sample, and two-sample t-tests. Prerequisite: DS 701; admission to graduate Data Science Program. Consent of department. Offered Fall, Spring.

DS 710 Cr.3
Programming for Data Science
Introduction to programming languages and packages used in data science. Prerequisite: admission to a graduate Data Science Program. Consent of department. Offered Fall, Spring.

DS 715 Cr.3
Data Warehousing
Introduce the concepts and techniques to work with and reason about subject-oriented, integrated, time-variant, and nonvolatile collections of data in support of management's decision-making process. Prerequisite: admission to a graduate Data Science Program. Consent of department. Offered Fall, Spring.

DS 716 Cr.3
Data Management for Data Science
This course explores the various approaches for data management used in data science. Students learn how data is collected, transformed, stored, and delivered for use in data science projects. Prerequisite: admission to a graduate Data Science Program. Consent of department. Offered Fall, Spring, Summer.

DS 730 Cr.3
Big Data: High Performance Computing
This course will teach students how to process large datasets efficiently. Students will be introduced to non-relational databases. Students will learn algorithms that allow for the distributed processing of large datasets across clusters. This course will teach students how to process large datasets efficiently. Prerequisite: DS 710 or concurrent enrollment; admission to MS in Data Science. Consent of department. Offered Fall, Spring.

DS 735 Cr.3
Communicating about Data
This course will prepare students to master technical, informational and persuasive communication to meet organizational goals. Technical communication topics include a study of the nature, structure and interpretation of data. Informational communication topics include data visualization and design of data for understanding and action. Persuasive communication topics include the study of written, verbal and nonverbal approaches to influencing decision makers. Prerequisite: admission to a graduate Data Science Program. Consent of department. Offered Fall, Spring.

DS 740 Cr.3
Data Mining and Machine Learning
This course covers data mining and machine learning methods and procedures for diagnostic and predictive analytics. Topics include association rules, clustering algorithms, tools for classification, and ensemble methods. Computer implementation and applications will be emphasized. Prerequisite: DS 705, DS 710; admission to graduate Data Science Program. Consent of department. Offered Fall, Spring.

DS 745 Cr.3
Visualization and Unstructured Data Analysis
This course covers two aspects of data analytics. First, it teaches techniques to generate visualizations appropriate to the audience type, task, and data. Second, it teaches methods and techniques for analyzing unstructured data - including text mining, web text mining and social network analysis. Prerequisite: DS 740; admission to MS in Data Science. Consent of department. Offered Fall, Spring.

DS 750 Cr.3
Data Storytelling
Data storytelling involves using data to tell a compelling narrative that helps audiences understand, engage with, and act on the information. This course combines data analysis with communication techniques to present data in an informative and engaging way. This course is specifically designed as a graduate-level requirement for the MSDS degree, focusing on teaching students how to effectively communicate insights through data storytelling techniques. Participants learn to craft engaging stories that resonate with various audiences and drive decision-making. Prerequisite: DS 701; admission to graduate Data Science Program. Consent of department. Offered Fall, Spring, Summer.

DS 760 Cr.3
Ethics of Data Science
This course will focus on the investigation of ethical issues in computer science that ultimately also pertains to data science, including privacy, plagiarism, intellectual property rights, piracy, security, confidentiality and many other issues. Our study of these issues will begin broadly, with a look at ethical issues in computer science at large. We will then make inferences to the narrower field of data science. We will consider ethical arguments and positions, the quality and integrity of decisions and inferences based on data, and how important cases and laws have shaped the legality, if not the morality, of data science related computing. Case studies will be used to investigate issues. Prerequisite: DS 740; admission to MS in Data Science. Consent of department. Offered Fall, Spring.

DS 770 Cr.3
Ethical Decision-Making Using Data
This course examines how data science relates to developing strategies for organizations. The emphasis is on using an organization's data assets to inform better decisions. The course investigates the use of data science findings to develop solutions to competitive organizational challenges. Special attention is given to critically examining decisions to ensure that they are ethical and avoid unfair bias. Professional codes of conduct as well as local and international regulations are also considered. Prerequisite: admission to a graduate Data Science Program. Consent of department. Offered Fall, Spring, Summer.

DS 775 Cr.3
Prescriptive Analytics
This course covers procedures and techniques for using data to inform the decision-making process. Topics include optimization, decision analysis, game theory, and simulation. Case studies and applications will be emphasized. Prerequisite: DS 705, DS 710; admission to MS in Data Science. Consent of department. Offered Fall, Spring.

DS 776 Cr.3
Deep Learning
Introduction to the theory and applications of deep learning. The course begins with the study of neural networks and how to train them. Various deep learning architectures are introduced including convolutional neural networks, recurrent neural networks, and transformers. Applications may include image classification, object detection, and natural language processing. Algorithms are implemented in Python using a high-level framework such as Pytorch or TensorFlow. Prerequisite: DS 740; admission to MS in Data Science. Offered Fall, Spring.

DS 780 Cr.3
Data Science and Strategic Decision Making
This course examines how data science relates to developing strategies for business organizations. The emphasis is on obtaining decision-making value from an organization's data assets. The course will investigate the use of data science findings to develop solutions to competitive business challenges. Case studies will be reviewed to examine how data science methods can support business decision-making. A range of methods the data scientist can use to get people within the organization onboard with data science projects will be reviewed. The future of data science as a decision-making tool will be explored. Prerequisite: admission to MS in Data Science. Consent of department. Offered Fall, Spring.

DS 785 Cr.3
Capstone
This is a capstone course in which students develop and execute a project involving real-world data. Projects include formulation of a question to be answered by the data; collection, cleaning, and processing of data; choosing and applying a suitable model and/or analytic method to the problem; and communicating the results to a non-technical audience. Prerequisite: DS 715, DS 730, DS 735, DS 740, DS 745, DS 775; admission to graduate Data Science Program. Consent of department. Offered Fall, Spring.