MASTER OF SCIENCE IN DATA SCIENCE

Department Website: MS Data Science (https://www.gonzaga.edu/school-of-engineering-applied-science/graduate/ms-data-science/)

Gonzaga's Master of Science in Data Science is a multi-disciplinary degree with a foundation in programming and mathematics. The degree provides students with a foundational understanding of all aspects of the data science lifecycle including data collection and analysis, statistical inference, machine learning, app/model deployment, communication, and project management.

Students in this program are not just end users of existing software, they learn to use their knowledge and skills to design and build analytical tools and models that help make data-driven decisions.

While students will focus on the technical side of data science, they will also tackle ethical implications and responsible use.

Data scientists are needed in nearly every industry as more organizations rely on data to make strategic decisions.

The Bureau of Labor Statistics (https://www.bls.gov/ooh/math/data-scientists.htm) shows jobs for Data Scientists are seeing 35% growth with an average salary of $103,500 a year.

Potential career tracks include: data scientist, machine learning engineer, data engineer, data analyst, and software developer/engineer.

Admissions

1. Students applying to Gonzaga University must submit Gonzaga's Graduate Application, which can be accessed online at https://www.gonzaga.edu/gradapply (https://www.gonzaga.edu/gradapply/)
2. Along with the application for graduate study, each program at Gonzaga has distinct admission requirements. Please refer to the table below to view that detailed information.

Program Name	How to Apply Link
Master of Science in Data Science	https://www.gonzaga.edu/school-of-engineering-applied-science/graduate/ms-data-science/how-to-apply (https://www.gonzaga.edu/school-of-engineering-applied-science/graduate/ms-data-science/how-to-apply/)

Required Qualifications:

The MS Data Science program is open to applicants with a bachelor's degree in any major, so long as the applicant has fulfilled the program prerequisites prior to starting the program. The program prerequisites are:

- Minimum of one semester or quarter of statistics - for example Gonzaga's MATH 121, 221, or 321 or BUSN 230
- Minimum of one semester or quarter of calculus - for example Gonzaga's MATH 114, 148, or 157
- Minimum of one year of computer science coursework or equivalent programming proficiency
  - Including experience programming with Python.

Prerequisite course credits are not counted toward the graduate degree program credits. They must be taken in addition to the 30 credits required for the MS Data Science degree.

Accelerated Program:

The MS Data Science program offers an accelerated option for Gonzaga students to potentially complete their bachelor's degree and master's degree in five years. Details about Gonzaga's accelerated graduate programs are available online at https://www.gonzaga.edu/undergraduate-admission/why-gonzaga/excellent-academic-programs/accelerated-graduate-programs (https://www.gonzaga.edu/undergraduate-admission/why-gonzaga/excellent-academic-programs/accelerated-graduate-programs/)

Degree Requirements:

To complete the MS Data Science degree program, thirty credit hours of courses are required beyond the pre-requisite courses. Students are expected to maintain a minimum grade point average of 3.00. Degree requirements consist of 24 credit hours of core courses and 6 hours of capstone project work.
Minimum of 30 credits that must include:

- 21 credits of core Data Science (DATA) courses, including 3 credits of Statistics (DATA 525 Statistics for Data Scientists) and 3 credits of Ethics (DATA 532 Responsible Data Science)
- 3 credits of Project Management (MBUS 670 Foundations of Project Management or ENGM 505 Project Management)
- 6 credits of a project work (DATA 583 Data Science Capstone I and DATA 584 Data Science Capstone II)

Master of Science in Data Science Program Requirements

Course	Title	Hours
First Year		
Fall		
DATA 522	Foundations of Data Science	3
DATA 525	Statistics for Data Science	3
	Hours	**6**
Spring		
DATA 532	Responsible Data Science	3
DATA 561	Machine Learning	4
	Hours	**7**
Summer		
DATA 581	Data Analytics and Communication	3
	Hours	**3**
Second Year		
Fall		
DATA 572	Databases for Data Science	3
MBUS 670	Foundations of Project Management	3
	Hours	**6**
Spring		
DATA 582	Data-Intensive Systems	3
DATA 583	Data Science Capstone I	3
Course work continues through to DATA 584		
	Hours	**6**

Summer		
DATA 584	Data Science Capstone II	3
	Hours	**3**
	Total Hours	**31**

Courses

DATA 522. Foundations of Data Science. (3 Credits)
This course presents relevant techniques and tools for solving real-world data science problems. Students will learn to apply industry standard libraries and services to build and host data science pipelines in the cloud. Data processing steps in the pipeline include fetching data from SQL databases and the web (via application programming interfaces and web scraping), cleaning and exploring data, applying statistical analyses, training and deploying machine learning models, and presenting insights with interactive dashboarding.

DATA 525. Statistics for Data Science. (3 Credits)
This course covers foundational math and statistics topics for data science. Statistics topics include probability, statistical inference, prediction techniques (e.g., classification, regression), and evaluating the performance of predictive models. Additional topics include study design and evaluation, as well as an introduction to linear algebra and optimization.

DATA 532. Responsible Data Science. (3 Credits)
In-depth examination of the ethical foundations concerning data science and algorithms as well as in-depth examination of the moral problems that arise from the application of such ethical frameworks as utilitarianism, Kantian ethics, and virtue ethics in the context of data science and AI. Topics include: privacy and fairness in data gathering and data (pre)processing; algorithm bias and mitigation of bias amplification, risk, harm and injustice; transparency and explainability in algorithmic decision-making, machine learning, and AI models; identifying responsibility gaps and holding of power in models; ethical evaluation and ethical deployment of data models, including AI models; reflection on and awareness of adverse social consequences of widespread use of machine learning and AI; and critical development of a human-centered and value-focused approach to data science, machine learning, and generative AI.

DATA 561. Machine Learning. (4 Credits)
This course provides a technical introduction to neural networks and their use in building models for classification and regression. Different types of neural network architectures are introduced including recurrent neural networks, convolution neural networks, transformers and attention, deep learning, and relevant application areas such as image classification, natural language processing, and generative modeling.

DATA 572. Databases for Data Science. (3 Credits)
This course covers topics in database management with applications for data science. Topics include database data models, logical database design, physical database design, query languages, and analytical extensions to database systems. Integration of database systems with popular programming environments and libraries is also discussed, including both storage and in-memory open data formats. The course includes a variety of hands-on assignments and projects.
Prerequisites: DATA 522 with a minimum grade of C

DATA 581. Data Analytics and Communication. (3 Credits)
In this course, students will learn a variety of techniques and tools for effectively communicating data analysis questions, results, and insights to a range of audiences. The course will cover techniques related to data storytelling, data visualization, interactive dashboarding, digital portfolio design and development, technical report writing, and technical presentation skills for data science. Students will also learn to effectively use modern tools related to data storytelling and visualization, interactive dashboarding, and project hosting.

DATA 582. Data-Intensive Systems. (3 Credits)
This course covers tools and techniques used in applying statistical and machine learning approaches to real-world data sets. Through hands-on assignments and projects, students learn relevant architectures, programming models, and tools related to data modeling and storage, extract-transform-load (ETL) processes, data warehousing, and data pipeline creation and management. The course also explores scalable, distributed, and cloud-based approaches used in data-intensive applications for accessing, filtering, clustering, and classifying data.
Prerequisites: DATA 572 with a minimum grade of C or (DATA 522 with a minimum grade of C and CPSC 321 with a minimum grade of D)

DATA 583. Data Science Capstone I. (3 Credits)
This course is the first course in a two-course Data Science Capstone sequence. The Capstone sequence provides an overview of how to design a data science system and deploy the system into a production environment. Students complete a large project that involves researching a data science problem, proposing a solution to the problem, implementing the solution, and deploying the solution as a hosted web application. Emphasis is placed on working with web-based application programming interfaces, gathering and processing data, researching and implementing common machine algorithms for data mining and classification, and securely deploying models in the cloud.
Prerequisites: DATA 561 with a minimum grade of C and DATA 572 with a minimum grade of C

DATA 584. Data Science Capstone II. (3 Credits)
A continuation of the project started in DATA 583 Data Science Capstone I.
Prerequisites: DATA 583 with a minimum grade of C

DATA 599. Special Topics. (1-3 Credits)
May be repeated for credit.
These seminars cover topics of importance to tech professionals. This course may be repeated for credit with a change in subject matter. On sufficient demand.