

# DATA SCIENCE, MS

The MS Data Science is a joint professional program between the Statistics and Computer Sciences Departments and is administered by the Statistics Department. The program provides students with abilities in computational and statistical thinking and skills, which may be combined with domain knowledge to address data-rich problems from diverse fields and various industries. Graduates will acquire data science competencies to think critically about data, and to manage, process, model, and analyze data to obtain meaning and knowledge, and further to use data in responsible, ethical ways. The curriculum addresses emerging and rapidly growing areas of applied statistical and computing research and practice. Graduates seek employment as data analysts and data scientists or pursue further education in data science, statistics, computer science, or related quantitative and computational fields.

## ADMISSIONS

### ADMISSIONS

Please consult the table below for key information about this degree program's admissions requirements. The program may have more detailed admissions requirements, which can be found below the table or on the program's website.

Graduate admissions is a two-step process between academic programs and the Graduate School. **Applicants must meet the minimum requirements (<https://grad.wisc.edu/apply/requirements/>) of the Graduate School as well as the program(s).** Once you have researched the graduate program(s) you are interested in, apply online (<https://grad.wisc.edu/apply/>).

Requirements	Detail
Fall Deadline	February 15
Spring Deadline	The program does not admit in the spring.
Summer Deadline	The program does not admit in the summer.
GRE (Graduate Record Examinations)	Not required.
English Proficiency Test	Every applicant whose native language is not English, or whose undergraduate instruction was not exclusively in English, must provide an English proficiency test score earned within two years of the anticipated term of enrollment. Refer to the Graduate School: Minimum Requirements for Admission policy: <a href="https://policy.wisc.edu/library/UW-1241">https://policy.wisc.edu/library/UW-1241</a> ( <a href="https://policy.wisc.edu/library/UW-1241/">https://policy.wisc.edu/library/UW-1241/</a> ).
Other Test(s) (e.g., GMAT, MCAT)	n/a
Letters of Recommendation Required	2 required, 3 recommended

### REQUISITES FOR ADMISSION

Applicants to the MS Data Science program should have completed the following courses equivalent to the UW-Madison courses listed below:

Code	Title	Credits
<b>Calculus and Mathematical Foundation, complete all below</b>		
MATH 221	Calculus and Analytic Geometry 1	5
MATH 222	Calculus and Analytic Geometry 2	4
MATH 340	Elementary Matrix and Linear Algebra	3
<b>Programming Foundation, select one from the list below</b>		
COMP SCI 220	Data Science Programming I	4
COMP SCI 300	Programming II	3
COMP SCI 320	Data Science Programming II	4
<b>Recommended previous coursework of significant experience in R</b>		
STAT 303 & STAT 304 & STAT 305	R for Statistics I and R for Statistics II and R for Statistics III	3
STAT 433	Data Science with R	3

## FUNDING

### FUNDING

#### GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (<https://grad.wisc.edu/funding/>) is available from the Graduate School. Be sure to check with your program for individual policies and restrictions related to funding.

#### PROGRAM INFORMATION

Students enrolled in this program are not eligible to receive tuition remission from graduate assistantship appointments at this institution.

Additional information about funding for MS Data Science is available on the program website (<https://stat.wisc.edu/graduate-admissions/ms-datascience/#funding-and-cost-of-attendance>).

## REQUIREMENTS

### MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (<http://guide.wisc.edu/graduate/#policiesandrequirementstext>), in addition to the program requirements listed below.

### MAJOR REQUIREMENTS

#### MODE OF INSTRUCTION

Face to Face	Evening/Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	Yes

## Mode of Instruction Definitions

**Accelerated:** Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

**Evening/Weekend:** Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

**Face-to-Face:** Courses typically meet during weekdays on the UW–Madison Campus.

**Hybrid:** These programs combine face-to-face and online learning formats. Contact the program for more specific information.

**Online:** These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

## CURRICULAR REQUIREMENTS

### Requirement Detail

Minimum 30 credits  
Credit Requirement

Minimum 16 credits  
Residence Credit Requirement

Minimum 15 credits must be graduate-level coursework. Refer to the Graduate School: Minimum Graduate Coursework (50%) Requirement policy: <https://policy.wisc.edu/library/UW-1244> (<https://policy.wisc.edu/library/UW-1244/>).

Overall 3.00 GPA required.  
Graduate GPA Refer to the Graduate School: Grade Point Average (GPA) Requirement policy: <https://policy.wisc.edu/library/UW-1203> (<https://policy.wisc.edu/library/UW-1203/>).

Other Grade None.  
Requirements

Assessments None.  
and Examinations

Language No language requirements.  
Requirements

## REQUIRED COURSES

Code	Title	Credits
<b>Statistics Core</b>		

STAT 611	Statistical Models for Data Science	3
STAT 612	Statistical Inference for Data Science	3
STAT 613	Statistical Methods for Data Science	3

### Computer Sciences Core

Complete 1 course from each category for a total of 9 credits

#### Algorithms

COMP SCI/E C E/ I SY E 524	Introduction to Optimization
COMP SCI 577	Introduction to Algorithms

COMP SCI/I SY E/ MATH/STAT 726	Nonlinear Optimization I
--------------------------------	--------------------------

#### Systems

COMP SCI 537	Introduction to Operating Systems
COMP SCI 544	Introduction to Big Data Systems
COMP SCI 564	Database Management Systems: Design and Implementation
COMP SCI 640	Introduction to Computer Networks
COMP SCI 642	Introduction to Information Security
COMP SCI 739	Distributed Systems
COMP SCI 744	Big Data Systems
COMP SCI 764	Topics in Database Management Systems

#### Humans and Data

COMP SCI 765	Data Visualization
COMP SCI/ ED PSYCH/ PSYCH 770	Human-Computer Interaction

### Machine Learning Core

Complete 2 courses from the list below for a total of 6 credits

COMP SCI 540	Introduction to Artificial Intelligence
COMP SCI/ E C E 760	Machine Learning
COMP SCI/ E C E 761	Mathematical Foundations of Machine Learning
COMP SCI 762	Advanced Deep Learning
STAT 451	Introduction to Machine Learning and Statistical Pattern Classification
STAT 453	Introduction to Deep Learning and Generative Models
STAT 615	Statistical Learning

### Data Science Electives

Complete 6 credits from the courses below <sup>1</sup> 6

COMP SCI/E C E/ I SY E 524	Introduction to Optimization
COMP SCI 537	Introduction to Operating Systems
COMP SCI 564	Database Management Systems: Design and Implementation
COMP SCI/ B M I 576	Introduction to Bioinformatics
COMP SCI 577	Introduction to Algorithms
COMP SCI 640	Introduction to Computer Networks
COMP SCI 642	Introduction to Information Security
COMP SCI 702	Graduate Cooperative Education
COMP SCI/I SY E/ MATH/STAT 726	Nonlinear Optimization I
COMP SCI 736	Advanced Operating Systems
COMP SCI 739	Distributed Systems
COMP SCI 744	Big Data Systems
COMP SCI 763	Security and Privacy for Data Science
COMP SCI 764	Topics in Database Management Systems
COMP SCI 765	Data Visualization

COMP SCI/ E C E 766	Computer Vision
COMP SCI 769	Advanced Natural Language Processing
COMP SCI/ ED PSYCH/ PSYCH 770	Human-Computer Interaction
COMP SCI 784	Foundations of Data Management
COMP SCI 799	Master's Research
COMP SCI/E C E/ STAT 861	Theoretical Foundations of Machine Learning
L I S 461	Data and Algorithms: Ethics and Policy
STAT 303 & STAT 304 & STAT 305	R for Statistics I and R for Statistics II and R for Statistics III
STAT 349	Introduction to Time Series
STAT 351	Introductory Nonparametric Statistics
STAT/ COMP SCI 403	Internship Course in Comp Sci and Data Science
STAT 411	An Introduction to Sample Survey Theory and Methods
STAT 421	Applied Categorical Data Analysis
STAT 433	Data Science with R
STAT 443	Classification and Regression Trees
STAT 456	Applied Multivariate Analysis
STAT 461	Financial Statistics
STAT/ COMP SCI 471	Introduction to Computational Statistics
STAT 575	Statistical Methods for Spatial Data
STAT/B M I 620	Statistics in Human Genetics
STAT 701	Applied Time Series Analysis, Forecasting and Control I
STAT 760	Multivariate Analysis I
STAT 761	Decision Trees for Multivariate Analysis
STAT 771	Statistical Computing
STAT/ECON/ GEN BUS 775	Introduction to Bayesian Decision and Control I
I SY E 620	Simulation Modeling and Analysis
I SY E 624	Stochastic Modeling Techniques
I SY E/ COMP SCI 719	Stochastic Programming
I SY E/ COMP SCI 723	Dynamic Programming and Associated Topics
I SY E/COMP SCI/ MATH 728	Integer Optimization

**Total Credits****30**

<sup>1</sup> Courses listed both as core course and as an elective may count toward either the requirement, but not both.

Students in this program may not take courses outside the prescribed curriculum without faculty advisor and program director approval.

Students in this program cannot enroll concurrently in other undergraduate or graduate degree programs.

## POLICIES

### GRADUATE SCHOOL POLICIES

The Graduate School's Academic Policies and Procedures (<https://grad.wisc.edu/acadpolicy/>) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

### MAJOR-SPECIFIC POLICIES

#### PRIOR COURSEWORK

##### Graduate Credits Earned at Other Institutions

With program approval, students are allowed to transfer no more than 9 credits of graduate coursework from other institutions toward the graduate degree credit and graduate coursework (50%) requirements. Coursework earned five or more years prior to admission to a master's degree is not allowed to satisfy requirements.

##### Undergraduate Credits Earned at Other Institutions or UW-Madison

With program approval, up to 7 credits from a UW-Madison undergraduate degree are allowed to transfer toward minimum graduate degree credits. Coursework earned five or more years prior to admission to a master's degree is not allowed to satisfy requirements.

##### Credits Earned as a Professional Student at UW-Madison (Law, Medicine, Pharmacy, and Veterinary careers)

Refer to the Graduate School: Transfer Credits for Prior Coursework (<https://policy.wisc.edu/library/UW-1216/>) policy.

##### Credits Earned as a University Special Student at UW-Madison

With program approval, up to 14 credits completed at UW-Madison while a University Special student numbered 300 or above are allowed to transfer toward minimum graduate degree requirements. Of these credits, those numbered 700 or above may also transfer to fulfill the minimum graduate coursework (50%) requirement. Coursework earned five or more years prior to admission to a master's degree is not allowed to satisfy requirements.

#### PROBATION

Refer to the Graduate School: Probation (<https://policy.wisc.edu/library/UW-1217/>) policy.

#### ADVISOR / COMMITTEE

Students are required to communicate with their advisor near the beginning of each semester to discuss course selection and progress.

#### CREDITS PER TERM ALLOWED

15 credits

## TIME LIMITS

Students are expected to complete the program in 3–4 semesters.

Students who wish to pursue the program part time must receive permission from the program chair.

## GRIEVANCES AND APPEALS

These resources may be helpful in addressing your concerns:

- Bias or Hate Reporting (<https://doso.students.wisc.edu/bias-or-hate-reporting/>)
- Graduate Assistantship Policies and Procedures (<https://hr.wisc.edu/policies/gapp/#grievance-procedure>)
- Hostile and Intimidating Behavior Policies and Procedures (<https://hr.wisc.edu/hib/>)
  - Office of the Provost for Faculty and Staff Affairs (<https://facstaff.provost.wisc.edu/>)
- Dean of Students Office (<https://doso.students.wisc.edu/>) (for all students to seek grievance assistance and support)
- Employee Assistance (<http://www.eao.wisc.edu/>) (for personal counseling and workplace consultation around communication and conflict involving graduate assistants and other employees, post-doctoral students, faculty and staff)
- Employee Disability Resource Office (<https://employee disabilities.wisc.edu/>) (for qualified employees or applicants with disabilities to have equal employment opportunities)
- Graduate School (<https://grad.wisc.edu/>) (for informal advice at any level of review and for official appeals of program/departmental or school/college grievance decisions)
- Office of Compliance (<https://compliance.wisc.edu/>) (for class harassment and discrimination, including sexual harassment and sexual violence)
- Office of Student Conduct and Community Standards (<https://conduct.students.wisc.edu/>) (for conflicts involving students)
- Ombuds Office for Faculty and Staff (<http://www.ombuds.wisc.edu/>) (for employed graduate students and post-docs, as well as faculty and staff)
- Title IX (<https://compliance.wisc.edu/titleix/>) (for concerns about discrimination)

Students should contact the department chair or program director with questions about grievances. They may also contact the L&S Academic Divisional Associate Deans, the L&S Associate Dean for Teaching and Learning Administration, or the L&S Director of Human Resources.

## OTHER

Not applicable.

one-on-one, with advisors as well. Information about events and resources will be made available to currently enrolled students via email.

## LEARNING OUTCOMES

### LEARNING OUTCOMES

1. Demonstrates understanding of theories, methodologies, and computation as tools to solve complex problems in data science.
2. Selects or adapts appropriate data science approaches and uses or develops best practices in data-driven applications.
3. Synthesizes information, organizes insights, and evaluates impact pertaining to questions for studies involving empirical data.
4. Communicates data science concepts and results clearly.
5. Adheres to principles of ethical and professional conduct in data science.

## PEOPLE

### PEOPLE

#### MS DATA SCIENCE PROGRAM COMMITTEE

Bret Larget, Professor

Yong Jae Lee, Associate Professor

Yazhen Wang, Professor and Statistics Department Chair

Stephen Wright, Professor and Computer Sciences Department Chair

Jinda Moore, Professional Programs Specialist

## PROFESSIONAL DEVELOPMENT

### PROFESSIONAL DEVELOPMENT GRADUATE SCHOOL RESOURCES

Take advantage of the Graduate School's professional development resources (<https://grad.wisc.edu/pd/>) to build skills, thrive academically, and launch your career.

### PROGRAM RESOURCES

Students in the Data Science, MS program are encouraged to participate in program-specific professional development events and work directly,