DATA ENGINEERING, MS

The Department of Computer Sciences (CS) offers a dynamic environment for study, research, and professional growth.

The MS in Data Engineering program focuses on the principles and practices of managing data at scale. It emphasizes the valid and efficient collection, storage, management, and processing of datasets to support computation and data driven systems important to data science and data analytics functions. Given the increasing amounts of data being generated and processed daily, almost all industries need data engineers to build and maintain robust data-handling systems. There is a strong workforce demand for data engineering expertise.

Visit the department website (https://www.cs.wisc.edu/) for faculty interests, research activities, courses, and additional program information. Students may also be interested in other programs offered by the Department of Computer Sciences, including:

- Computer Sciences Master's Program (http://guide.wisc.edu/graduate/computer-sciences/computer-sciences-ms/computer-sciences-computer-sciences-ms/) (MS Computer Sciences: Computer Sciences): A research-oriented master's degree that prepares students for careers in industry research or for PhD level education in Computer Sciences.
- Professional Master's Program (http://guide.wisc.edu/graduate/computer-sciences/computer-sciences-ms/computer-sciences-professional-program-ms/) (MS Computer Sciences: Professional Program): This degree is designed for students who are primarily interested in a professional career as a computer scientist in a variety of industries.

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/).

REQUISITES FOR ADMISSION

Applicants to the MS Data Engineering program should have completed a bachelor's degree in computer science or a related field.

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.

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 Credit Requirement	30 credits
Minimum Residence Credit Requirement	16 credits
Minimum Graduate Coursework Requirement	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 Graduate GPA Requirement	3.00 GPA required. 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 Requirements	None.
Assessments and Examinations	None.
Language Requirements	None.

REQUIRED COURSES

Code	Title	Credits
Data Engineering Foundations: Complete all classes.		**12**
COMP SCI 739	Distributed Systems	
COMP SCI 744	Big Data Systems	
COMP SCI 764	Topics in Database Management Systems	
COMP SCI 774	Data Exploration, Cleaning, and Integration for Data Science	
Machine Learning Requirement: Select a minimum of 2 courses from the list below.		**6**
COMP SCI 540	Introduction to Artificial Intelligence	
COMP SCI/ E C E 760	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	
Algorithms Requirement: Select a minimum of one class from below.		**3**
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 Requirement: Select a minimum of one class from below.		**3**
COMP SCI 407	Foundations of Mobile Systems and Applications	
COMP SCI 537	Introduction to Operating Systems	
COMP SCI 564	Database Management Systems: Design and Implementation	
COMP SCI 640	Introduction to Computer Networks	
COMP SCI/ E C E 707	Mobile and Wireless Networking	
COMP SCI 740	Advanced Computer Networks	
Humans and Data Requirement: Select a minimum of one class from below.		**3**
COMP SCI 765	Data Visualization	
COMP SCI/ ED PSYCH/ PSYCH 770	Human-Computer Interaction	
Approved Electives: Select any course from above or from the list below.		**3**
COMP SCI 642	Introduction to Information Security	
COMP SCI 702	Graduate Cooperative Education [1]	
COMP SCI 790	Master's Thesis [1]	
COMP SCI 799	Master's Research [1]	
COMP SCI 900	Advanced Seminar in Computer Science [1]	
STAT 611	Statistical Models for Data Science	
STAT 612	Statistical Inference for Data Science	
STAT 613	Statistical Methods for Data Science	
Total Credits		**30**

[1] COMP SCI 799 Master's Research, COMP SCI 790 Master's Thesis, COMP SCI 702 Graduate Cooperative Education, and COMP SCI 900 Advanced Seminar in Computer Science can be taken for a combined total of at most three elective credits.

- Courses used as an elective cannot also be used to fulfill data engineering fundamentals requirements or breadth requirements for machine learning, algorithms, systems, and humans and data.

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

This program does not accept graduate transfer credits from other institutions.

Undergraduate Credits Earned at Other Institutions or UW-Madison

With program approval, up to 7 STAT credits from a UW–Madison undergraduate degree are allowed to transfer for minimum graduate degree credits. Coursework earned ten or more years prior to admission to a master's degree is not allowed to satisfy requirements. This program does not accept undergraduate transfer credits from other institutions.

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 15 STAT credits completed at UW–Madison while a University Special student numbered 300 or above are allowed to transfer for minimum graduate degree requirements. Of these credits, those numbered 700 or above may also transfer for the minimum graduate coursework (50%) requirement. Coursework earned ten 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

This program follows the Graduate School's Time Limits policy (https://policy.wisc.edu/library/UW-1221/).

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://employeedisabilities.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.

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

The Department of Computer Sciences hosts many professional development opportunities, including job fairs, workshops, seminars, talks, employer information sessions, mentoring, and student socials. The Department of Computer Sciences' student organizations, Student-ACM (SACM) and Women's ACM (WACM), are active partners in providing professional development opportunities for computer sciences graduate students.

LEARNING OUTCOMES

LEARNING OUTCOMES

1. Design, implement and evaluate the use of analytic algorithms on sample datasets.
2. Explain how a machine-learning model is developed for and evaluated on real world datasets.
3. Design and execute experimental data collection and processing, and present resulting analyses using best practices in human-centered data communications.
4. Apply and customize analytics, systems and human-centered techniques to application-specific data engineering requirements and objectives.
5. Identify tradeoffs among data engineering techniques (analytics, systems and/or human-centered) and contrast design alternatives, within the context of specific data engineering application domains.
6. Survey, interpret and comparatively criticize state of the art data engineering research talks and papers,with emphasis on constructive improvements.
7. Organize, execute, report on, and present a real world data engineering project in collaboration with other researchers/programmers.

PEOPLE

PEOPLE

Visit the CS website to view our department faculty (https://www.cs.wisc.edu/people/faculty/) and staff (https://www.cs.wisc.edu/people/staff/).