



Twin Cities Campus

Data Science M.S.

Computer Science and Engineering Administration

College of Science and Engineering

Link to a [list of faculty](#) for this program.

Contact Information:

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Website: <https://cse.umn.edu/datascience>

- Program Type: Master's
- Requirements for this program are current for Spring 2021
- Length of program in credits: 31
- This program does not require summer semesters for timely completion.
- Degree: Master of Science

Along with the program-specific requirements listed below, please read the [General Information](#) section of the catalog website for requirements that apply to all major fields.

The Data Science MS program provides a strong foundation in the science of Big Data and its analysis by gathering in a single program the knowledge, expertise, and educational assets in data collection and management, data analytics, scalable data-driven pattern discovery, and the fundamental concepts behind these methods.

Students who graduate from this regular 2-year master's program will learn the state-of-the-art methods for treating Big Data, be exposed to the cutting-edge methods and theory forming the basis for the next generation of Big Data technology, and will complete a project demonstrating that they can use the fundamental concepts to design innovative methods for new application areas arising from business, government, security, medicine, biology, physical sciences, and the environment.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)
- partially online (between 50% to 80% of instruction is online)

Prerequisites for Admission

The preferred undergraduate GPA for admittance to the program is 3.00.

A bachelor's degree from an accredited college or university in computer science, math, statistics, engineering, natural sciences, or a related field.

Other requirements to be completed before admission:

The undergraduate degree must include statistics, calculus, multivariable calculus, linear algebra, and mathematical software environments such as Matlab or R or the equivalent, programming languages such as C+, C++, Java, programming experience including algorithms and data structures normally taught in beginning computer science courses either as part of the undergraduate degree or subsequent work experience.

Special Application Requirements:

The application deadline is March 1.

Applicants are only considered for fall admission and decisions are made after all applications are received following the close of the application cycle.

GRE test scores are not required, but are recommended for those applying from international institutions. If submitted, the GRE is only one of many factors considered for admission, and no score will guarantee or preclude admission. Applications without the GRE will be considered based on the material submitted.

International applicants must submit score(s) from one of the following tests:

- TOEFL
 - Internet Based - Writing Score: 23
 - Internet Based - Reading Score: 23



- IELTS
 - Total Score: 6.5
- MELAB
 - Part 1 (Composition) score: 80

Key to [test abbreviations](#) (TOEFL, IELTS, MELAB).

For an online application or for more information about graduate education admissions, see the [General Information](#) section of the catalog website.

Program Requirements

Plan B: Plan B requires 31 major credits and up to null credits outside the major. The final exam is written and oral. A capstone project is required.

Capstone Project: Students must complete 3 credit hours of DSCI 8760 (capstone project) under the supervision of a faculty member.

This program may be completed with a minor.

Use of 4xxx courses towards program requirements is not permitted.

A minimum GPA of 3.25 is required for students to remain in good standing.

Courses offered on both the A-F and S/N grading basis must be taken A-F.

At least 3 8xxx-level credits, either from an emphasis or an elective, are required.

Complete a presentation at the Data Science Poster Fair for Plan B project as part of degree requirements in the semester of anticipated graduation. Consult with the advisor on an appropriate timeline to present.

Statistics (6 credits)

Statistics Tier I (3 to 6 credits)

Select at least 3 credits from the following in consultation with the advisor:

- [PUBH 7401](#) - Fundamentals of Biostatistical Inference (4.0 cr)
- [PUBH 7402](#) - Biostatistics Modeling and Methods (4.0 cr)
- [PUBH 7440](#) - Introduction to Bayesian Analysis (3.0 cr)
- [STAT 5102](#) - Theory of Statistics II (4.0 cr)
- [STAT 5302](#) - Applied Regression Analysis (4.0 cr)
- [STAT 5401](#) - Applied Multivariate Methods (3.0 cr)
- [STAT 5511](#) - Time Series Analysis (3.0 cr)
- [STAT 8051](#) - Advanced Regression Techniques: linear, nonlinear and nonparametric methods (3.0 cr)
- [STAT 8101](#) - Theory of Statistics 1 (3.0 cr)
- [STAT 8102](#) - Theory of Statistics 2 (3.0 cr)
- [MATH 5651](#) - Basic Theory of Probability and Statistics (4.0 cr)
or [STAT 5101](#) - Theory of Statistics I (4.0 cr)

Statistics Tier II (0 to 3 credits)

Select credits from the following, in consultation with the advisor, as needed to meet the 6-credit Statistics requirement:

- [EE 5531](#) - Probability and Stochastic Processes (3.0 cr)
- [EE 5571](#) - Statistical Learning and Inference (3.0 cr)
- [PUBH 7405](#) - Biostatistical Inference I (4.0 cr)
- [PUBH 7406](#) - Biostatistical Inference II (3.0 cr)
- [PUBH 7407](#) - Analysis of Categorical Data (3.0 cr)
- [PUBH 7430](#) - Statistical Methods for Correlated Data (3.0 cr)
- [PUBH 7460](#) - Advanced Statistical Computing (3.0 cr)
- [PUBH 7485](#) - Methods for Causal Inference (3.0 cr)
- [PUBH 8401](#) - Linear Models (3.0 cr)
- [PUBH 8432](#) - Probability Models for Biostatistics (3.0 cr)
- [PUBH 8442](#) - Bayesian Decision Theory and Data Analysis (3.0 cr)
- [STAT 5052](#) - Statistical and Machine Learning (3.0 cr)
- [STAT 5201](#) - Sampling Methodology in Finite Populations (3.0 cr)
- [STAT 5303](#) - Designing Experiments (4.0 cr)
- [STAT 5421](#) - Analysis of Categorical Data (3.0 cr)
- [STAT 5601](#) - Nonparametric Methods (3.0 cr)
- [STAT 5701](#) - Statistical Computing (3.0 cr)



STAT 8112 - Mathematical Statistics II (3.0 cr)
AST 5731 - Bayesian Astrostatistics (4.0 cr)
or STAT 5731 - Bayesian Astrostatistics (4.0 cr)

Algorithmics (6 credits)

Algorithmics Tier I (3 to 6 credits)

Select at least 3 credits from the following in consultation with the advisor:

CSCI 5521 - Machine Learning Fundamentals (3.0 cr)
CSCI 5523 - Introduction to Data Mining (3.0 cr)
CSCI 5525 - Machine Learning: Analysis and Methods (3.0 cr)
EE 8591 - Predictive Learning from Data (3.0 cr)
PUBH 7475 - Statistical Learning and Data Mining (3.0 cr)
PUBH 8475 - Statistical Learning and Data Mining (3.0 cr)

Algorithmics Tier II (0 to 3 credits)

Select credits from the following, in consultation with the advisor, as needed to meet the 6-credit Algorithmics requirement:

CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
CSCI 5304 - Computational Aspects of Matrix Theory (3.0 cr)
CSCI 5511 - Artificial Intelligence I (3.0 cr)
CSCI 5512 - Artificial Intelligence II (3.0 cr)
CSCI 5609 - Visualization (3.0 cr)
CSCI 8314 - Sparse Matrix Computations (3.0 cr)
CSCI 8581 - Big Data in Astrophysics (4.0 cr)
EE 5239 - Introduction to Nonlinear Optimization (3.0 cr)
EE 5251 - Optimal Filtering and Estimation (3.0 cr)
EE 5389 - Introduction to Predictive Learning (3.0 cr)
EE 5391 ~~{Inactive}~~(3.0 cr)
EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
EE 8551 - Multirate Signal Processing and Applications (3.0 cr)
EE 5561 - Image Processing and Applications: From linear filters to artificial intelligence (3.0 cr)
EE 5581 - Information Theory and Coding (3.0 cr)
EE 5585 - Data Compression (3.0 cr)
EE 8231 - Optimization Theory (3.0 cr)
IE 5531 - Engineering Optimization I (4.0 cr)
IE 8521 - Optimization (4.0 cr)
IE 8531 - Discrete Optimization (4.0 cr)

Infrastructure and Large-Scale Computing (6 credits)

Infrastructure and Large-Scale Computing Tier I (3 to 6 credits)

Select at least 3 credits from the following in consultation with the advisor:

CSCI 5105 - Introduction to Distributed Systems (3.0 cr)
CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
CSCI 5707 - Principles of Database Systems (3.0 cr)
CSCI 5708 - Architecture and Implementation of Database Management Systems (3.0 cr)
EE 5351 - Applied Parallel Programming (3.0 cr)
CSCI 8205 - Parallel Computer Organization (3.0 cr)
or EE 8367 - Parallel Computer Organization (3.0 cr)

Infrastructure and Large-Scale Computing Tier II (0 to 3 credits)

Select credits from the following, in consultation with the advisor, as needed to complete the 6-credit Infrastructure and Large-Scale Computing requirement.

CSCI 5103 - Operating Systems (3.0 cr)
CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
CSCI 5231 ~~{Inactive}~~(3.0 cr)
CSCI 5271 - Introduction to Computer Security (3.0 cr)
CSCI 5715 - From GPS, Google Maps, and Uber to Spatial Data Science (3.0 cr)
CSCI 5751 - Big Data Engineering and Architecture (3.0 cr)
CSCI 5801 - Software Engineering I (3.0 cr)
CSCI 5802 - Software Engineering II (3.0 cr)
CSCI 8102 - Foundations of Distributed Computing (3.0 cr)
CSCI 8701 - Overview of Database Research (3.0 cr)
CSCI 8715 - Spatial Data Science Research (3.0 cr)
CSCI 8725 - Databases for Bioinformatics (3.0 cr)
CSCI 8735 - Advanced Database Systems (3.0 cr)
CSCI 8801 - Advanced Software Engineering (3.0 cr)
EE 5355 - Algorithmic Techniques for Scalable Many-core Computing (3.0 cr)
EE 5371 - Computer Systems Performance Measurement and Evaluation (3.0 cr)
EE 5381 ~~{Inactive}~~(3.0 cr)



[EE 5501](#) - Digital Communication (3.0 cr)

Electives (9 credits)

Select 9 credits from the following in consultation with the advisor. Courses from above lists that are not applied to other requirements can be selected with advisor approval. Other electives may be selected in consultation with the advisor and director of graduate studies. If 3 credits of DSCI 8760 have already been taken in a semester an additional 3 credits in a subsequent semester can be used towards elective coursework after consultation with the advisor.

[CSCI 5106](#) - Programming Languages (3.0 cr)

[CSCI 5123](#) - Recommender Systems (3.0 cr)

[CSCI 5421](#) - Advanced Algorithms and Data Structures (3.0 cr)

[CSCI 5461](#) - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)

[CSCI 5561](#) - Computer Vision (3.0 cr)

[CSCI 5980](#) - Special Topics in Computer Science (1.0 - 3.0 cr)

[CSCI 8271](#) - Security and Privacy in Computing (3.0 cr)

[CSCI 8363](#) - Numerical Linear Algebra in Data Exploration (3.0 cr)

[CSCI 8980](#) - Special Advanced Topics in Computer Science (1.0 - 3.0 cr)

[DSCI 8760](#) - Data Science M.S. Plan B Project (3.0 cr)

[EE 5393](#) - Circuits, Computation, and Biology (3.0 cr)

[IE 8534](#) - Advanced Topics in Operations Research (1.0 - 4.0 cr)

[IE 8535](#) - Introduction to Network Science (4.0 cr)

[MATH 5467](#) - Introduction to the Mathematics of Image and Data Analysis (4.0 cr)

[PUBH 7445](#) - Statistics for Human Genetics and Molecular Biology (3.0 cr)

[PUBH 7461](#) - Exploring and Visualizing Data in R (2.0 cr)

[PUBH 8445](#) - Statistics for Human Genetics and Molecular Biology (3.0 cr)

[PUBH 8446](#) - Advanced Statistical Genetics and Genomics (3.0 cr)

[PUBH 8472](#) - Spatial Biostatistics (3.0 cr)

Research Colloquium (1 credit)

Select 1 of the following in consultation with the advisor:

[CSCI 8970](#) - Computer Science Colloquium (1.0 cr)

or [DSCI 8970](#) - Data Science M.S. Colloquium (1.0 cr)

Capstone Course (3 credits)

Take the following in consultation with the advisor:

[DSCI 8760](#) - Data Science M.S. Plan B Project (3.0 cr)