Twin Cities Campus

Data Science Postbaccalaureate Certificate

Computer Science and Engineering Administration
College of Science and Engineering

Link to a list of faculty for this program.

Contact Information:
Data Science Graduate Program, Department of Computer Science and Engineering, University of Minnesota, 4-192 Keller Hall, 200 Union Street S.E., Minneapolis, MN 55455 (612- 625-4002; fax: 612-625-0572).
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Website: https://cse.umn.edu/datascience

- Program Type: Post-baccalaureate credit certificate/licensure/endorsement
- Requirements for this program are current for Fall 2023
- Length of program in credits: 12
- This program does not require summer semesters for timely completion.
- Degree: Data Science Postbaccalaureate Certificate

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 post-baccalaureate certificate 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 2-semester certificate program will learn the state-of-the-art methods for treating Big Data and be exposed to the cutting-edge methods and theory forming the basis for the next generation of Big Data technology.

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:
Admission application deadlines: rolling. Applicants are considered for fall or spring admission.

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.

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Program Requirements

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

A minimum GPA of 3.0 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. A minimum GPA of 3.00 is required for students to remain in good standing.

Coursework Requirements (12 credits)

Select at least 3 credits from each of the 3 emphasis areas, plus 3 credits from any of the emphases or the electives list, in consultation with the advisor.

Algorithmics (3 to 6 credits)

Select at least 3 credits from the following in consultation with the advisor. Students may complete PUBH 8475 or STAT 8056 but not both.

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)
or STAT 8056 - Statistical Learning and Data Mining (3.0 cr)

Statistics (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)

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

Select at least 6 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)

Electives (0 to 3 credits)

Select credits as needed, in consultation with the advisor, to complete the 12-credit minimum. Other courses may be selected with advisor and director of graduate studies approval.

CSCI 5103 - Operating Systems (3.0 cr)
CSCI 5106 - Programming Languages (3.0 cr)
CSCI 5123 - Recommender Systems (3.0 cr)
CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
CSCI 5271 - Introduction to Computer Security (3.0 cr)
CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
CSCI 5304 - Computational Aspects of Matrix Theory (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 5511 - Artificial Intelligence I (3.0 cr)
CSCI 5512 - Artificial Intelligence II (3.0 cr)
CSCI 5527 - Deep Learning: Models, Computation, and Applications (3.0 cr)
CSCI 5541 - Natural Language Processing (3.0 cr)
CSCI 5561 - Computer Vision (3.0 cr)

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CSCI 5563 - Multiview 3D Geometry in Computer Vision (3.0 cr)
CSCI 5609 - Visualization (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 8271 - Security and Privacy in Computing (3.0 cr)
CSCI 8314 - Sparse Matrix Computations (3.0 cr)
CSCI 8363 - Numerical Linear Algebra in Data Exploration (3.0 cr)
CSCI 8581 - Big Data in Astrophysics (4.0 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 5239 - Introduction to Nonlinear Optimization (3.0 cr)
EE 5251 - Optimal Filtering and Estimation (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 5389 - Introduction to Predictive Learning (3.0 cr)
EE 5393 - Circuits, Computation, and Biology (3.0 cr)
EE 5501 - Digital Communication (3.0 cr)
EE 5531 - Probability and Stochastic Processes (3.0 cr)
EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
EE 5561 - Image Processing and Applications: From linear filters to artificial intelligence (3.0 cr)
EE 5571 - Statistical Learning and Inference (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)
EE 8551 - Multirate Signal Processing and Applications (3.0 cr)
IE 5531 - Engineering Optimization I (4.0 cr)
IE 8521 - Optimization (4.0 cr)
IE 8531 - Discrete Optimization (4.0 cr)
IE 8535 - Introduction to Network Science (4.0 cr)
IE 8564 - Optimization for Machine Learning (4.0 cr)
MATH 5467 - Introduction to the Mathematics of Image and Data Analysis (4.0 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 7445 - Statistics for Human Genetics and Molecular Biology (3.0 cr)
PUBH 7460 - Advanced Statistical Computing (3.0 cr)
PUBH 7461 - Exploring and Visualizing Data in R (2.0 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)
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)
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)

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