

# M.S. in Data Science - Computational Track

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## Degree Requirements

Students in the Master of Science in Data Science (MSDS) program must successfully complete 30 credits based on any of the following options:

- Courses (30 credits)
- Courses (27 credits) + MS Project (3 credits)
- Courses (24 credits) + MS Thesis (6 credits)

Independent of the chosen option, all core courses in the respective tracks are required.

At most two courses can be chosen from outside the respective track with approval of the respective Program Co-Directors. Computational track students are allowed at most three electives that are non-Computer Science courses. Statistics track students are allowed at most three electives that are non-Math courses.

If a student chooses the MS project or MS thesis option, the project or thesis must be related to data science and requires approval from one of the Program Co-Directors.

The MSDS program has computational and statistics tracks that students must choose from at admission time. These tracks have different core courses but share the same admission requirements and electives.

Students may choose an elective outside the list after approval of their respective advisor.

## M.S. in Data Science

| Code  | Title   | Credits   |
|---|---|-----------|
| <b>Core Course Requirements for Computational Track</b> |   |           |
| DS 675  | Machine Learning  | 3         |
| DS 644  | Introduction to Big Data  | 3         |
| DS 636  | Data Analytics with R Program   | 3         |
| DS 677  | Deep Learning   | 3         |
| MATH 661  | Applied Statistics  | 3         |
| <b>Code Title Credits</b>                               |   |           |
| <b>Electives and Foundation Courses</b>                 |   | <b>15</b> |
| Computer Science Electives                              |   |           |
| CS 610  | Data Structures and Algorithms  | 3         |
| CS 631  | Data Management System Design   | 3         |
| CS 632  | Advanced Database System Design   | 3         |
| CS 634  | Data Mining   | 3         |
| CS 636  | Data Analytics with R Program (only available to students in the Math core)   | 3         |
| CS 639  | Elec. Medical Records: Med Terminologies and Comp. Imp.                       | 3         |
| CS 643  | Cloud Computing   | 3         |
| CS 645  | Security and Privacy in Computer Systems                                      | 3         |
| CS 656  | Internet and Higher-Layer Protocols   | 3         |
| CS 659  | Image Processing and Analysis   | 3         |
| CS 661  | Systems Simulation  | 3         |
| CS 670  | Artificial Intelligence   | 3         |
| CS 676  | Cognitive Computing   | 3         |
| CS 677  | Deep Learning (Deep Learning(available only to students in statistics track)) | 3         |
| CS 683  | Software Project Management   | 3         |
| CS 684  | Software Testing and Quality Assurance  | 3         |
| CS 681  | Computer Vision   | 3         |
| CS 708  | Advanced Data Security and Privacy  | 3         |
| CS 731  | Applications of Database Systems  | 3         |
| CS 732  | Advanced Machine Learning   | 3         |

|                        |   |           |
|------------------------|---|-----------|
| CS 735                 | High Performance Analytics Dat  | 3         |
| CS 744                 | Data Mining and Management in Bioinformatics  | 3         |
| CS 782                 | Pattern Recognition and Applications  | 3         |
| YWCC 691               | Graduate Capstone Project (Counting towards the elective credits requires the program director's prior approval. In addition, it needs to be completed with an external partner (industry, lab, or government), or with a faculty only if the same faculty is not the student's MS project or MS thesis advisor.) | 3         |
| <b>Math Electives</b>  |   |           |
| MATH 630               | Linear Algebra and Applications   | 3         |
| MATH 631               | Linear Algebra  | 3         |
| MATH 644               | Regression Analysis Methods   | 3         |
| MATH 660               | Introduction to statistical Computing with SAS and R (only available to students in computational track)  | 3         |
| MATH 662               | Probability Distributions   | 3         |
| MATH 664               | Methods for Statistical Consulting  | 3         |
| MATH 665               | Statistical Inference   | 3         |
| MATH 678               | Stat Methods in Data Science  | 3         |
| MATH 680               | Advanced Statistical Learning   | 3         |
| MATH 683               | High Dimensional Stat Inferenc  | 3         |
| MATH 699               | Design and Analysis of Experiments  | 3         |
| MATH 717               | Inverse Problems and Global Optimization  | 3         |
| MATH 786               | Large Sample Theory and Inference   | 3         |
| MATH 787               | Non-Parametric Statistics   | 3         |
| <b>Other Electives</b> |   |           |
| BIOL 638               | Computational Ecology   | 3         |
| BME 698                | Selected Topics   | 3         |
| MGMT 635               | Data Mining and Analysis  | 3         |
| MGMT 630               | Decision Analysis with Quantitative Modeling  | 3         |
| FIN 600                | Corporate Finance I   | 3         |
| FIN 641                | Derivatives Markets   | 3         |
| FIN 642                | Derivatives and Structured Finance  | 3         |
| MRKT 630               | Models Of Consumer Behavior   | 3         |
| IS 601                 | Web Systems Development   | 3         |
| IS 631                 | Enterprise Database Management  | 3         |
| IS 650                 | Data Visualization and Interpretation   | 3         |
| IS 657                 | Spatiotemporal Urban Analytics  | 3         |
| IS 665                 | Data Analytics for Info System  | 3         |
| IS 687                 | Transaction Mining and Fraud Detection  | 3         |
| IS 688                 | Web Mining  | 3         |
| BNFO 601               | Foundations of Bioinformatics I   | 3         |
| BNFO 602               | Foundations of Bioinformatics II  | 3         |
| BNFO 615               | Data Analysis in Bioinformatics   | 3         |
| BNFO 620               | Genomic Data Analysis   | 3         |
| <b>Total Credits</b>   |   | <b>30</b> |

### Recommended course sequence M.S. in Data Science for Computational Track

|        | Fall   | Spring  |
|--------|--|---|
| Year 1 | CS 675 Machine Learning<br>Math 661 Applied Statistics<br>CS 636 R for Data Science              | CS 631 Data Management and System Design<br>CS 644 Big Data<br>CS 677 Deep Learning |
| Year 2 | Free elective or Master thesis course<br>Free elective or Master project course<br>Free elective | Free elective or Masters thesis course  |