Master of Science in Data Science & Analytics
Old Dominion University

The Master of Science (M.S.) in Data Science & Analytics is a 30-credit hour, non-thesis degree program. The purpose of the M.S. in Data Science & Analytics is to provide students with the knowledge and skills to use state-of-the-art programming tools (e.g., SAS, JMP, Python, JavaScript, or PHP) and software packages to develop statistical models. Students will learn to use data for identifying trends and patterns, solving problems, communicating results, and recommending optimal solutions. This program provides project-based learning opportunities, and students will discover how to use data to solve real-world business, science, engineering, public policy, or health problems by working with representatives from various industries. Graduates will be knowledgeable and skilled at developing statistical models to detect trends, organizing and managing data, and leading teams in retrieving, cleaning data, and modeling data. This M.S. program will prepare graduates to serve and to lead in business, science & engineering, geographic information sciences, public policy, and health, and to work in public or private settings that seek data-driven solutions.

The M.S. in Data Science & Analytics offers four concentrations to prepare students to apply the programming, statistics, and data processing knowledge and skills required in specific settings of data science and analytics. The students who pursue the concentration in ***Computational Data Analytics*** will possess the knowledge and skills to serve in science and statistical fields. Students who pursue the concentration in ***Business Intelligence and Analytics*** will be prepared to apply their skills to gain insights, make informed decisions, and communicate solutions to various constituents in business, non-profit, and governmental organizations. A concentration in ***Engineering & Big Data Analytics*** will instill engineering-based, problem-solving skills in students that are rooted in big data solutions. The concentration in ***Geospatial Analytics*** will enable students to develop advanced skills and expertise in geographic information systems, and geospatial science and technology.

The program is offered as a "hybrid" of traditional, face-to-face classes and online classes. A capstone project is required. The focus of the Core Courses is to provide students with a foundation to use state-of-the-art (e.g., SAS, JMP, Python, JavaScript, or PHP) programming tools and software packages to develop statistical models. Students will learn how to use data for identifying trends and patterns, solving problems, communicating results, and recommending optimal solutions. Through the core curriculum, students will gain knowledge about using data in various ways to solve problems. Students will choose a concentration area to gain knowledge, skills, and abilities that are more specific to a setting.

Core Courses (18 Credits)
CS 620/DASC 620 Introduction to Data Science and Analytics (3 credits)
CS 624 Data Analytics and Big Data*(3 credits)
CS 625 Data Visualization* (3 credits)
STAT 603 Statistical/Probability Models for Data Science and Analytics* (3 credits)
STAT 604 Statistical Tools for Data Science and Analytics* (3 credits)

Capstone Course (3 credits)
DASC 690 Capstone Project* (3 credits)

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Concentration Areas (12 Credits)

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Computational Data Analytics Concentration
The purpose of this concentration is to prepare students to enter rapidly emerging fields related to data science and analytics. The coursework addresses relevant data analytics topics such as video analytics, algorithms and data structures, and information retrieval. Students learn computational data analysis, data visualization, and natural language processing. Students select four courses from the list below (12 credits) in consultation with the faculty advisor.

CS 522 Machine Learning I (3 credits)
CS 532 Web Science (3 credits)
CS 550 Database Concepts (3 credits)
CS 569 Data Analytics for Cybersecurity (3 credits)
CS 580 Introduction to Artificial Intelligence (3 credits)
CS 722 Machine Learning II (3 credits)
CS 725 Information Visualization (3 credits)
CS 733 Natural Language Processing (3 credits)
CS 734 lnformation Retrieval (3 credits)

Business Intelligence and Analytics Concentration
This concentration prepares students to transform data into actionable information for organizations seeking data-driven recommendations. The coursework addresses methods and tools used to store, access, and analyze data to support business decision-making. Students learn how to identify, manage, retrieve, and analyze data in order to gain insight and use the resulting information to make informed business decisions. Students select four courses (12 credits) in consultation with the faculty advisor.

Select two courses from (6 credits):
BNAL 503 Data Exploration and Visualization (3 credits)
BNAL 515 Advanced Business Analytics with Big Data Applications (3 credits)
BNAL 721 Simulation Modeling for Business Systems (3 credits) is preferred but if not offered, BNAL 576 Simulation Modeling and Analysis for Business Systems (3 Credits) may be substituted for BNAL 721 with permission of the concentration coordinator if BNAL 721 is not offered.

Select two courses from (6 credits):
IT 650 Database Management Systems (3 credits)
IT 651 Business Intelligence (3 credits)
IT 652 Information and Communications Technology for Big Data (3 credits)

Engineering & Big Data Analytics Concentration
The purpose of this concentration is to provide students with a thorough understanding of the methods and technologies to handle big data and to instill engineering problem-solving skills

rooted in big data solutions. It will further prepare them to become professionals trained in advanced data analytics, with the ability to transform large streams of multiple data sources into understandable and actionable information for the purpose of making decisions. The coursework (12 credits) will enable students to learn and practice the following competencies: data collection, data storage, processing and analyzing data, reporting statistics and patterns, drawing conclusions and insights and making actionable recommendations.

Select two core courses from (6 credits):
ENMA 754 Big Data Fundamentals (3 credits)
MSIM 715 High Performance Computing and Simulation (3 credits)
ECE 607 Machine Learning 1 (3 credits)

Select two elective courses from (6 credits):
ECE 784 Computer Vision (3 credits)
MSIM 695* Topics in Visualization for Big Data Analytics (3 credits)
MSIM 574 Transportation Data Analytics (3 credits)
MAE 740 Autonomous and Robotic Systems Analysis and Control (3 credits)
CEE 722 Parallel Cluster Computing Methods (3 credits)
ECE 651 Statistical Analysis and Simulation (3 credits)
ECE 780 Machine Learning II (3 credits)

*This course is currently being processed as a regular course by the instructor (March 2021).

Geospatial Analytics Concentration
This concentration enables MS Data Science students to develop advanced skills and expertise in geospatial science and technology. Incorporating Geographic Information Systems (GIS), remote sensing, and location-based data allows data scientists to uncover spatial patterns. The concentration provides for a foundation across the breadth of geospatial technology to prepare data for analysis, perform suitability analysis, spatial predictive modeling, geostatistics, and space-time pattern mining and object detection. The concentration coursework (12 credits) incorporates advanced geovisualization and webmapping technology to also enhance cartography analytics and communications.

Required core courses for this concentration (6 credits):
GEOG 600 Geospatial Data Analysis* (3 credits)
GEOG 601 Spatial Statistics and Modeling* (3 credits)

Select two elective courses (6 credits):
GEOG 525 Internet Geographic Information Systems (3 credits)
GEOG 532 Advanced GIS (3 credits)
GEOG 562 Advanced Spatial Analysis (3 credits)
GEOG 590 Applied GIS/Cartography**(3 credits)
GEOG 5XX Programming GIS*** (3 credits)
GEOG 519 Spatial Analysis of Coastal Environments (3 credits)
GEOG 520 Marine Geography**** (3 credits)
GEOG 573 GIS in Emergency Management (3 credits)

GEOG 595 Topics: Geospatial Field Techniques**** (3 credits)
Total concentration credit hours required: 12

DASC Capstone Project (3 credits)
MS DASC degree also requires a capstone project. For students seeking this concentration, they must complete a project focusing on geospatial analysis when taking the following:
DASC 690 Capstone Project

* New courses
** To be updated to emphasize geovisualization theory and techniques
*** Previously taught as GEOG 595 Topics, to be submitted as a new course
**** In the future GEOG 520 Marine Geography is slated to be renamed and modified (i.e. Marine GIS or Geoinformatics); GEOG 595 Topics in Geospatial Field Techniques is planned for new course catalog AY 2022

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Long-Term Class Schedule

Course	Title	Fall	Spring	Summer
Core Courses – all concentrations (18 credits)				
CS 620/DASC 620	Introduction to Data Science & Analytics	✓	✓	
CS 624	Data Analytics & Big Data		✓	
CS 625	Data Visualization	✓		
STAT 603	Statistical/Probability Models for Data Science & Analytics	✓		
STAT 604	Statistical Tools for Data Science & Analytics		✓	
Computational Data Analytics Concentration (select 12 credits)				
Four from:				
CS 522	Introduction to Machine Learning I		✓	
CS 532	Web Science	✓	✓	
CS 550	Database Concepts	✓	✓	
CS 569	Data Analytics for Cybersecurity			
CS 580	Introduction to Artificial Intelligence		✓	
CS 722	Machine Learning II	✓		
CS 725	Information Visualization		✓	
CS 733	Natural Language Processing	✓		
CS 734	Information Retrieval		✓	
Business Intelligence & Analytics Concentration (select 12 credits)				
Two from:				
BNAL 503	Data Exploration & Visualization		✓	
BNAL 515	Advanced Business Analytics with Big Data Applications	✓	✓	
BNAL 721	Simulation Modeling for Business Systems[1]	✓		
Two from:				
IT 650	Database Management Systems	✓		
IT 651	Business Intelligence		✓	
IT 652	Information & Communications Technology for Big Data			✓
Engineering and Big Data Analytics Concentration (select 12 credits)				
Two from:				
ENMA 754	Big Data Fundamentals	✓		
MSIM 715	High Performance Computing & Simulation		✓	
ECE 607	Machine Learning I		✓	
Two from:				
ECE 784	Computer Vision		✓	
MSIM 695	Topics in Visualization for Big Data Analytics [2]		✓	
MSIM 762	Applied Medical Image Analysis		✓	
MSIM 574	Transportation Data Analytics		✓	
MAE 740	Autonomous and Robotic Systems Analysis & Control	✓		
CEE 722	Parallel Cluster Computing Methods			✓
ECE 651	Statistical Analysis and Simulation		✓	
ECE 780	Machine Learning II	✓		

Course	Title	Fall	Spring	Summer
Geospatial Analytics Concentration (select 12 credits)				
Required:				
GEOG 600	Geospatial Data Analysis[3]	✔		
GEOG 601	Spatial Statistics & Modeling[3]		✔	
Two from:				
GEOG 532	Advanced GIS	✔	✔	
GEOG 525	Internet Geographic Information Systems	✔		
GEOG 5xx	Programming GIS[5]		✔	
GEOG 519	Spatial Analysis of Coastal Environments		✔	
GEOG 520	Marine Geography – GIS	✔		
GEOG 573	GIS in Emergency Management		✔	
GEOG 590	Applied GIS/Cartography[4]	✔		
GEOG 520	Marine Geography[6]	✔		
GEOG 595	Topics: Geospatial Field Techniquest[7]			✔
DASC 690	Master's Capstone Project	✔	✔	✔

[1] BNAL 721 Simulation Modeling for Business Systems is preferred but if not offered, BNAL 576 Simulation Modeling and Analysis for Business Systems may be substituted.

[2] This course is currently being processed as a regular course by the instructor, and once this is done, the course number and title will be updated in the long-term schedule.

[3] New courses

[4] To be updated to emphasize geovisualization theory & techniques

[5] Previously taught as GEOG 595 Topics, to be submitted as a new course

[6] In the future GEOG 520 Marine Geography is slated to be renamed and modified (i.e., Marine GIS or Geoinformatics)

[7] GEOG Topics in Geospatial Field Techniques is planned to be submitted as a new course.

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Computational Data Analytics Concentration & generic
Sample Plan of Study for Full-Time Students

Course	Credits	Category
Fall I		
CS 620/DASC 620 Introduction to Data Science & Analytics	3	Core
STAT 603 Statistical/Probability Models for Data Science & Analytics	3	Core
CS 625 Data Visualization	3	Core
Concentration elective	3	Elective
TOTAL 12 credits (9 required)		
Spring I		
STAT 604 Statistical Tools for Data Science & Analytics	3	Core
CS 624 Data Analytics and Big Data	3	Core
Concentration elective	3	Elective
Concentration elective	3	Elective
TOTAL 12 credits (6 required)		
Fall II		
DASC 690 Master's Capstone Project	3	Capstone
Concentration elective	3	Elective
TOTAL 6 credits (3 required)		

Total Required for Degree—30 credits

Computational Data Analytics Concentration & generic
Sample Plan of Study for Part-Time Students

Course	Credits	Category
Fall I		
CS 620/DASC 620 Introduction to Data Science & Analytics	3	Core
STAT 603 Statistical/Probability Models for Data Science & Analytics	3	Core
TOTAL 6 credits (6 required)		
Spring I		
CS 625 Data Visualization	3	Core
Concentration elective	3	Elective
TOTAL 6 credits (3 required)		
Fall II		
STAT 604 Statistical Tools for Data Science & Analytics	3	Core
CS 624 Data Analytics and Big Data	3	Core
TOTAL 6 credits (6 required)		
Spring II		
Concentration elective	3	Elective
Concentration elective	3	Elective
TOTAL 6 credits		
Fall III		
DASC 690 Master's Capstone Project	3	Capstone
Concentration elective	3	Elective
TOTAL 6 credits		

Total Required for Degree—30 credits

Engineering & Big Data Analytics Concentration
Sample Plan of Study for Full-Time Students

Course	Credits	Category
Fall I		
CS 620/DASC 620 Introduction to Data Science & Analytics	3	Core
STAT 603 Statistical/Probability Models for Data Science & Analytics	3	Core
CS 625 Data Visualization	3	Core
ENMA 754 Big Data Fundamentals	3	Elective*
TOTAL 12 credits (9 required)		
Spring I		
STAT 604 Statistical Tools for Data Science & Analytics	3	Core
CS 624 Data Analytics and Big Data	3	Core
ECE 607 Machine Learning I	3	Elective*
ECE 784 Computer Vision	3	Elective*
TOTAL 12 credits (6 required)		
Fall II		
DASC 690 Master's Capstone Project	3	Capstone
MAE 740 Autonomous and Robotic Systems Analysis and Control	3	Elective*
TOTAL 6 credits (3 required)		

Total Required for Degree—30 credits

*This list does not include all available Elective Courses for Data Science Engineering Concentration.
See the list of all available Elective Courses in the Long Term Class Schedule, or contact the GPD.*

Engineering & Big Data Analytics Concentration
Sample Plan of Study for Part-Time Students

Course	Credits	Category
Fall I		
CS 620/DASC 620 Introduction to Data Science & Analytics	3	Core
STAT 603 Statistical/Probability Models for Data Science & Analytics	3	Core
TOTAL 6 credits (6 required)		
Spring I		
CS 625 Data Visualization	3	Core
ECE 607 Machine Learning I	3	Elective*
TOTAL 6 credits (3 required)		
Fall II		
STAT 604 Statistical Tools for Data Science & Analytics	3	Core
CS 624 Data Analytics and Big Data	3	Core
TOTAL 12 credits (9 required)		
Spring II		
ENMA 754 Big Data Fundamentals	3	Elective*
ECE 784 Computer Vision	3	Elective*
TOTAL 6 credits		
Fall III		
DASC 690 Master's Capstone Project	3	Capstone
MAE 740 Autonomous and Robotic Systems Analysis and Control	3	Elective*
TOTAL 6 credits (3 required)		

Total Required for Degree—30 credits

*This list does not include all available Elective Courses for Data Science Engineering Concentration.
See the list of all available Elective Courses in the Long Term Class Schedule, or contact the GPD.*

Geospatial Analytics Concentration
Sample Plan of Study

Course	Credits	Category
Fall I		
CS 620/DASC 620 Introduction to Data Science & Analytics	3	Core
STAT 603 Statistical/Probability Models for Data Science & Analytics	3	Core
CS 625 Data Visualization	3	Core
GEOG 600 Geospatial Data Analysis	3	Core
TOTAL 12 credits (9 required)		
Spring I		
STAT 604 Statistical Tools for Data Science & Analytics	3	Core
CS 624 Data Analytics and Big Data	3	Core
GEOG 601 Spatial Statistics & Modeling	3	Core
GEOG Elective 1	3	Elective
TOTAL 12 credits (6 required)		
Fall II		
GEOG elective 2	3	Elective
DASC 690 Master's Capstone	3	Capstone
TOTAL 6 credits (3 required)		