School of Data Science

The School of Data Science is designed to organize data science academic and research activities (with degrees and certificates tailored to regional workforce needs) while leveraging research partnerships with nearby national labs (Jefferson Lab, NASA Langley, and Wallops Flight Facility) to develop a targeted scientific focus in data science. The School's objectives include developing high-impact, cross-disciplinary research initiatives that center on data science and conducting outreach and community engagement, being a sources of data science expertise to the community, the Hampton Roads region, the Commonwealth of Virginia, and the nation.

For information, contact the Graduate Program Director: dsgpd@odu.edu

Programs

Master of Science Programs

- Data Science and Analytics with a Concentration in Artificial Intelligence and Machine Learning (MS) (http://catalog.odu.edu/graduate/data-science/data-science-analytics-artificial-intelligence-machine-learning-ms/)
- Data Science and Analytics with a Concentration in Business Intelligence and Analytics (MS) (http://catalog.odu.edu/graduate/data-science/data-science-analytics-business-intelligence-ms/)
- Data Science and Analytics with a Concentration in Engineering and Big Data Analysis (MS) (http://catalog.odu.edu/graduate/data-science/data-science-analytics-engineering-big-ms/)
- Data Science and Analytics with a Concentration in Full Stack (MS) (http://catalog.odu.edu/graduate/data-science/data-science-analytics-full-stack-ms/)
- Data Science and Analytics with a Concentration in Geospatial Analytics (MS) (http://catalog.odu.edu/graduate/data-science/data-science-analytics-geospatial-ms/)
- Data Science and Analytics with a Concentration in Physics (MS) (http://catalog.odu.edu/graduate/data-science/data-science-analytics-physics-ms/)

Certificate Programs

- Artificial Intelligence (AI) in Data Science Certificate (http://catalog.odu.edu/graduate/data-science/artificial-intelligence-in-data-science-certificate/)
- Artificial Intelligence (AI) in Healthcare Certificate (http://catalog.odu.edu/graduate/data-science/artificial-intelligence-in-healthcare-certificate/)

Courses

Data Science (DASC)

DASC 596 Topics in Data Science (3 Credit Hours)
The advanced study of selected topics designed to permit small groups of qualified students to work on subjects of mutual interest which, due to their specialized nature, may not be offered regularly. These courses will appear in the course schedule and will be more fully described in information distributed to academic advisors.

DASC 597 Independent Study (1-3 Credit Hours)
Independent reading and study on a topic to be selected under the direction of an instructor. Conferences and papers as appropriate.
Prerequisites: approval of the program coordinator

DASC 600 Programming for Data Science (3 Credit Hours)
This course provides foundational programming skills essential for future coursework in data science. Designed for students with little to no prior programming experience, it develops essential skills in programming and problem-solving, equipping students with the ability to manipulate data, perform basic analyses, and create visualizations. The course emphasizes writing clean, efficient, and reproducible code.

DASC 605 Advanced Statistical Concepts in Data Science (3 Credit Hours)
This course will cover both classical and modern statistical methods used within data science. Concepts related to hypothesis testing, fundamentals of experimental design and analysis will be discussed along with tests of association for categorical data. Statistical methods that are often included in machine learning methods like sampling and bootstrapping are also included.
Prerequisites: STAT 603; Prior experience with the R language is helpful but not required

DASC 620 Introduction to Data Science and Analytics (3 Credit Hours)
This course will explore data science as a burgeoning field. Students will learn fundamental principles and techniques that data scientists employ to mine data. They will investigate real life examples where data is used to guide assessments and draw conclusions. This course will introduce software and computing resources available to a data scientist to process, visualize, and model different types of data including big data. Cross-listed with CS 620.

DASC 668 Internship (1-3 Credit Hours)
Requirements will be established by the School of Data Science and Career Development Services and will vary with the amount of credit desired. Allows students an opportunity to gain a short duration career-related experience.
Prerequisites: Departmental permission required

DASC 669 Artificial Intelligence (AI) Practicum (3 Credit Hours)
Students demonstrate an ability to integrate and synthesize competencies from their certificate or degree program coursework applied to concentration areas. Students produce high quality written products and an e-portfolio that demonstrate the analysis, synthesis and intersection of AI knowledge with specific domains.
Prerequisites: Good academic standing (Graduate GPA of at least 3.0)

DASC 690 Data Science Capstone Project (3 Credit Hours)
The culminating course in the proposed MS in Data Science and Analytics degree program will bring students together with faculty and external partners. In consultation with a faculty advisor and a business or industry or government representative, students will be required to develop a project that aims to solve a data science/analytics problem in a real-world business, industry, or government setting. Faculty and business/industry/government representatives will serve as external mentors for the students during this experience. Note that an external mentor is not mandatory but encouraged.
Pre- or corequisite: DASC 620/CS 620, CS 624, CS 625, and STAT 603

DASC 695 Topics in Data Science (1-3 Credit Hours)
Provides the advanced student with an opportunity to study and investigate a variety of topics in the field of data science.
Prerequisites: Permission of the instructor

DASC 697 Independent Study in Data Science (1-3 Credit Hours)
Independent study under the direction of an instructor.
Prerequisites: Permission of the instructor

DASC 699 Thesis Research (3 Credit Hours)
Departmental permission required
Prerequisites: Departmental permission required

DASC 728 Deep Learning Fundamentals and Applications (3 Credit Hours)
This course covers key components of deep learning framework, including loss functions, regularization, training and batch normalization. The course also covers several fundamental deep learning architectures such as multilayer perceptrons, convolutional neural network, recurrent neural network and transformers, as well as some advanced topics such as graph neural network and deep reinforcement learning. The class activities include traditional lectures, paper reading and presentation, and projects.
Prerequisites: CS 422 or CS 522 or CS 480 or CS 580 or CS 722 or CS 822 or CS 733 or CS 833 or CS 620 or DASC 620, or other equivalent courses at the discretion of the instructor

DASC 741 Data-Driven Computational Imaging (3 Credit Hours)
This course introduces the basic concepts of computational imaging. The topics include principles of imaging systems, role of computational methods in enhancing imaging systems, computational imaging inverse problems, and data-driven machine learning approaches to solve inverse problems in computational imaging.
Prerequisites: Knowledge of linear algebra and prior programming experience

DASC 771 Fundamentals of Interpretable Machine Learning and Explainable AI (3 Credit Hours)
Laws in many countries and states within the U.S. require that predictive models impacting humans be accompanied by an understandable interpretation, yet many such models are based on so called black box models that can't be easily interpreted or explained. This course will enable students to produce explanations and interpretations for advanced ML and AI algorithms. It will review the state of the science methods for interpretable ML and explainable AI, including graphical and contextual approaches as well as model agnostic and model specific methods for generating understandable explanations and interpretations. The course will also introduce the concepts of algorithmic bias and model fairness as they relate to explanation and understanding.
Prerequisites: BDA 511/611, or CS 522, or CS 580

DASC 781 AI for Health Sciences (3 Credit Hours)
This course explores the application of AI in health sciences, focusing on machine learning, NLP, computer vision, generative AI techniques for diagnostics, treatment planning, patient monitoring, and biomedical research. It covers precision medicine, ethical AI, and the integration of AI into practice. Students will gain a deep understanding and practical skills to develop innovative AI solutions that address real-world challenges in health sciences.
Prerequisites: Prior programming experience

DASC 782 Generative AI (3 Credit Hours)
This course provides a deep dive into the foundations and current advancements in generative AI. It covers key concepts such as transformer models, GANs, VAEs, LLMs, and their applications across various fields, emphasizing both theory and hands-on learning, including ethical considerations such as fairness and bias mitigation. Students will develop a comprehensive understanding of generative AI and gain practical experience.
Prerequisites: Prior programming experience

DASC 795 Topics in Data Science (3 Credit Hours)
Provides the advanced student with an opportunity to study and investigate a variety of topics in the field of data science.

DASC 828 Deep Learning Fundamentals and Applications (3 Credit Hours)
This course covers key components of deep learning framework, including loss functions, regularization, training and batch normalization. The course also covers several fundamental deep learning architectures such as multilayer perceptrons, convolutional neural network, recurrent neural network and transformers, as well as some advanced topics such as graph neural network and deep reinforcement learning. The class activities include traditional lectures, paper reading and presentation, and projects.
Prerequisites: CS 422 or CS 522 or CS 480 or CS 580 or CS 722 or CS 822 or CS 733 or CS 833 or CS 620 or DASC 620, or other equivalent courses at the discretion of the instructor

DASC 841 Data-Driven Computational Imaging (3 Credit Hours)
This course introduces the basic concepts of computational imaging. The topics include principles of imaging systems, role of computational methods in enhancing imaging systems, computational imaging inverse problems, and data-driven machine learning approaches to solve inverse problems in computational imaging.
Prerequisites: Knowledge of linear algebra and prior programming experience

DASC 871 Fundamentals of Interpretable Machine Learning and Explainable AI (3 Credit Hours)
Laws in many countries and states within the U.S. require that predictive models impacting humans be accompanied by an understandable interpretation, yet many such models are based on so called black box models that can't be easily interpreted or explained. This course will enable students to produce explanations and interpretations for advanced ML and AI algorithms. It will review the state of the science methods for interpretable ML and explainable AI, including graphical and contextual approaches as well as model agnostic and model specific methods for generating understandable explanations and interpretations. The course will also introduce the concepts of algorithmic bias and model fairness as they relate to explanation and understanding.
Prerequisites: BDA 511/611, or CS 522, or CS 580

DASC 881 AI for Health Sciences (3 Credit Hours)
This course explores the application of AI in health sciences, focusing on machine learning, NLP, computer vision, generative AI techniques for diagnostics, treatment planning, patient monitoring, and biomedical research. It covers precision medicine, ethical AI, and the integration of AI into practice. Students will gain a deep understanding and practical skills to develop innovative AI solutions that address real-world challenges in health sciences.
Prerequisites: Prior programming experience

DASC 882 Generative AI (3 Credit Hours)
This course provides a deep dive into the foundations and current advancements in generative AI. It covers key concepts such as transformer models, GANs, VAEs, LLMs, and their applications across various fields, emphasizing both theory and hands-on learning, including ethical considerations such as fairness and bias mitigation. Students will develop a comprehensive understanding of generative AI and gain practical experience.
Prerequisites: Prior programming experience

DASC 895 Topics in Data Science (3 Credit Hours)
Provides the advanced student with an opportunity to study and investigate a variety of topics in the field of data science.