DASC - Data Science

DASC 157 Introduction to Data Science Programming (4 Credit Hours)
An introduction to computational problem-solving in the context of data science.#This course introduces students to the programming language Python and how to use it as a tool for problem-solving. The course utilizes illustrative examples to help students grasp the fundamental concepts and reinforces their understanding through a variety of practical exercises. No prior programming experience is required to take this course.
Prerequisites: MATH 102M or permission of the instructor

DASC 205S Data, Technology, Society (3 Credit Hours)
This course investigates how data science is transforming not only our sense of science and scientific knowledge, but our sense of ourselves and our communities and our commitments concerning human affairs and institutions generally. Social implications of the digital revolution, including ethical issues associated with algorithmic design and privacy will be examined. Students will use a sociological lens to explore how our increasingly digital lifestyle changes institutions and social relations.

DASC 255 Data Processing with Python (4 Credit Hours)
Python provides several libraries which facilitate data manipulation, processing, analysis, and visualization. This course will introduce standard Python packages used for Data Science, including pandas, numpy, seaborn, matplotlib, and scikit-learn. By the end of the course, students will be equipped to create and modify existing Python code to explore a range of data sets.
Prerequisites: CS 153

DASC 257 Data Science Programming (4 Credit Hours)
This course focuses on problem solving and programming in Python. Emphasis is placed on common algorithms and programming principles utilizing the standard library distributed with Python. Upon completion, students should be able to design, code, test, and debug Python language programs.
Prerequisites: DASC 157

DASC 300 Foundations of Data Science (3 Credit Hours)
This course provides an interdisciplinary overview of data sciences drawing on key elementary topics related to data analytics. A specific focus is given to the way that decisions made about data from those disciplinary pursuits inform policy, product development, and humanity. Topics addressed include elements of data, data collection, the connections between machine learning and data, survey research, programming with Python and R, statistical learning, model evaluations, digital engineering, and ethical uses of data.
Prerequisites: junior standing

DASC 312 The Art of Data Visualization (3 Credit Hours)
This course explores artistic foundations for visualization including art theory and aesthetics, color theory, composition and layout. We will also discuss the psychology of visual perception, and semiotics and the underlying nature of symbolic representation. Students will gain experience applying these principles by sketching and using technological tools, and will also critically evaluate visualizations based on the theories discussed.
Prerequisites: DASC 300

DASC 324 Introduction to Data Visualization (3 Credit Hours)
This course focuses on the design and creation of effective visualizations for communicating data. The Python programming language will be used to create static and interactive visualizations for a variety of data types including tabular, text, and geographic data. Students will develop a portfolio and also will gain experience in analyzing, interpreting, and revising visualizations created by others.
Prerequisites: DASC 300 or permission of the instructor
Pre- or corequisite: CS 153

DASC 357E Ethics and Data (3 Credit Hours)
This course explores, from a philosophical perspective, ethical questions arising from collecting, drawing inferences from, and acting on data, especially when these activities are automated and on a large scale. This course will provide students a framework for considering the ethical implications of data usage. Emphasis will be placed on discussing how historic and contemporary examples of potentially unethical practice could be altered to reduce harm and increase equity. Topics to be covered may include, but are not limited to, systematic approaches to assessing ethical issues; privacy and confidentiality; defining research and the responsibilities associated with conducting ethical research; implicit and structural biases in data collection and analysis; freedom of speech; and consent to data collection.
Prerequisites: ENGL 110C

DASC 368 Data Science Internship (1-6 Credit Hours)
This course allows students to work for an employer in a position related to data science. Students must work for 50 hours per course credit and complete course assignments.
Prerequisites: approval by the program coordinator

DASC 424 Data Storytelling (3 Credit Hours)
Data storytelling combines data, narrative, and visualizations to communicate insights and influence decision-making. This course will present the conceptual basis for storytelling and techniques for narrative development, as well as leverage technical skills to analyze and visualize data. By the end of the course, students will have experience in developing cohesive data-driven stories using a variety of platforms and tools.
Prerequisites: DASC 324 or instructor permission

DASC 434 Data Curation and Management (3 Credit Hours)
Large data sets are rarely ready for analysis after collection. Data must be organized, processed, integrated, and evaluated for accuracy and relevance, and subsequently maintained and enhanced over time. In this course, students will learn how to make data accessible and ensure its validity for analytic projects during course of the data lifecycle.
Prerequisites: DASC 300 or permission of the instructor

DASC 436W Data Science Capstone Project (3 Credit Hours)
Students work individually or in groups to plan, design, and carry out a research project demonstrating expertise with data science. Final papers that report the results for the study are presented in a formal research seminar. The projects reflect knowledge gained from undergraduate work and training received in discipline-specific research methods and statistics courses. This is a writing intensive course.
Prerequisites: ENGL 211C/ENGL 221C/ENGL 231C with a grade of C or better and senior standing

DASC 494 Entrepreneurship in Data Science (3 Credit Hours)
This course is designed to help students enhance their personal and professional development through innovation guided by faculty members and professionals. It offers students an opportunity to integrate disciplinary theory and knowledge through developing a nonprofit program, product, business, or other initiative. The real-world experiences that entrepreneurships provide will help students understand how academic knowledge leads to transformations, innovations, and solutions to different types of problems. The course can be delivered either as an independent project for individual students or as group projects similar to those sometimes offered in topics courses.
Prerequisites: junior standing

DASC 496/596 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.
Prerequisites: junior standing

DASC 497/597 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: senior standing and approval of the program coordinator

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)
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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

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