

Interdisciplinary Graduate Programs

M.S. IN DATA SCIENCE

UTA's Master of Science degree in Data Science helps meet the growing need for application-oriented engineers who can use data science tools and techniques to solve complex problems in industries such as manufacturing, logistics, healthcare and energy.

The program is unique for its breadth, offering a widely encompassing set of courses that allows students with or without a programming background to develop the necessary data science skills. It aims to instill the acumen needed to draw insights from data, to make sound decisions using data, and to effectively communicate about data driven findings and decisions.

Students will use real-world problems, methods and data in instruction materials through collaboration with community partners; problem-based, experiential learning which emphasizes hands-on coding exercises; service learning in which students learn while doing for social good; and inclusive learning to broaden student participation and strengthen student retention in data science education.

The degree requires 30 course hours and can be completed in two years. After completion of a set of core courses, students may choose electives from multiple programs to match their career interests. They may also participate in a capstone experience which can be integrated with workplace projects. Elective options offer additional flexibility to craft a degree that fits his or her specific situation.

Students will come from different backgrounds, but the most important factor for their growth and success will be a keen interest in learning the powerful ways in which data can be applied in various fields.

M.S. IN DATA SCIENCE

ADMISSION REQUIREMENTS

Admission to the M.S. in Data Science (MSDS) program is based on the applicant's perceived ability to do graduate work in engineering and data science as shown by the applicant's test scores, transcripts, and other application documents.

To begin the program, an applicant must submit a completed application and fee to the UTA Graduate Admissions Office. When all application materials have been collected by Graduate Admissions, the application is forwarded to the program for evaluation. The admission decision is then communicated to Graduate Admissions, with the final decision sent via email to the applicant.

If there is a delay in receiving materials, the application may be deferred until all required materials are available. The applicant is notified of the deferral by the Graduate Admissions Office via email.

Requirements for the MSDS program include:

- a. An undergraduate degree, preferably in engineering or mathematics, that includes one semester of calculus and experience in programming
- b. A 3.0 grade point average (on a 4.0 scale) on the last two years of undergraduate coursework. In particular, performance in engineering, science and mathematics is emphasized.
- c. A sum of verbal plus quantitative scores of at least 300 on the GRE, with GRE quantitative score of at least 155 and GRE verbal score of at least 145.
- d. International applicants and applicants whose native language is not English will need to take the Test of English as a Foreign Language (TOEFL) and score at least 80 with no area score of less than 20, or take the International English Language Testing System (IELTS) exam and score at least 6.5 in all areas.

Notes:

- An applicant who graduated with a Bachelor's degree from an accredited U.S. or ABET institution within the last three years with a GPA of 3.2 or better on a 4.0 scale, and who is currently conducting professional work in related fields should contact the MSDS graduate advisors about the possibility of a GRE waiver.
- If an applicant has a bachelors or master's degree from an accredited U.S. institution, the English Proficiency requirement on TOEFL/IELTS is waived. However, it is waived for admission purposes only.
- If the applicant wishes to be considered for possible funding as a Graduate Teaching Assistant (GTA) or have any teaching responsibility, the applicant must have a U.S. bachelor's degree or a TOEFL speaking score of at least 23, or an IELTS speaking score of at least 7. A master's degree from a U.S. institution does not suffice for a waiver of the English proficiency requirement for international applicants desiring consideration for GTA support. An applicant who does not achieve the stated English proficiency standards may be required to take the Graduate English Skills Program (GESp) qualifying exam upon arrival at UTA to determine the need for additional English language courses after admission.

- Only the following application documents are required: application, fee, transcripts from all higher education institutions attended, and GRE and TOEFL/IELTS test scores. The MSDS program does not require nor reviews letters of recommendation, statements of purpose, or any other supplemental materials from applicants.

COURSE REQUIREMENTS (30 HOURS)

Core Courses (18 hours)

DASC 5300	FOUNDATION OF COMPUTING
DASC 5301	DATA SCIENCE
DASC 5302	INTRODUCTION TO PROBABILITY AND STATISTICS
DASC 5304	MACHINE LEARNING
DASC 5305	DATA VISUALIZATION
DASC 5306	BIG DATA MANAGEMENT

Electives (9 hours)

- Students may select any DASC course numbered 5000 or higher and/or any course in a related field approved by the student's advisor.
- No more than 3 hours may be Computer Science and Engineering courses.
- Limited additional elective options might be offered as Data Science courses under the following course numbers and will be designated either as CSE or non-CSE elective based on their topics.

DASC 5303	DATA SCIENCE PROJECT MANAGEMENT (Non-CSE Elective)
DASC 5392	TOPICS IN DATA SCIENCE (CSE or Non-CSE Elective depending on topic)

Capstone Project (3 hours)

Select one of the Following

DASC 5309	DATA SCIENCE CAPSTONE PROJECT
DASC 5391	DATA SCIENCE APPLICATIONS

This requirement can be fulfilled by equivalent course approved by the program director or advisor.

COURSES FROM OUTSIDE MSDS

Course requirements may be met using coursework from outside the MSDS program, as follows:

- The requirements for DASC 5300 and DASC 5302 can be fulfilled by appropriate undergraduate computing-related and statistics-related courses, respectively. For DASC 5301, DASC 5304, DASC 5305 and DASC 5306, external courses must be at the graduate level and cover all essential topics of the corresponding core course.
- The student must meet the 30-hour degree requirement. In lieu of each core course that is to be fulfilled by an external course, the student must take an extra elective.
- External courses must be vetted by and arrangements must be approved by an MSDS program advisor.

CURRICULUM SCHEDULE

- Students should meet the requirements of DASC 5300, DASC 5301, DASC 5302, before or in the same semester when they are enrolled in any other course for fulfilling MSDS degree requirements.
- Students should only be enrolled in DASC 5309 or equivalent course after completing all core course requirements in the MSDS program.
- Elective courses can be taken in any order, as long as prerequisites are satisfied..

COURSES

DASC 5191. ADVANCED STUDY IN DATA SCIENCE. 1 Hour.

Individual research projects in Data Science. Prior approval of the DASC Graduate Advisor is required for enrollment. A written report is required. Graded F, I, P.

DASC 5300. FOUNDATION OF COMPUTING. 3 Hours.

Basics of programming, data structures, and algorithms. Introduction operating systems. Basics of discrete structures and computability. Course is used for the Master's in Data Science degree program and certificate programs for non-CSE majors. It cannot be taken for credit towards any CSE degree. Prerequisite: DASC Major.

DASC 5301. DATA SCIENCE. 3 Hours.

This inspirational course follows a data-science-for-all perspective that views data acumen as part of literacy. It aims to instill in students the data acumen, i.e., the basic skills to wrestle with data, to draw insights from data, to make sound decisions responsibly using data, and to effectively communicate about data-driven findings and decisions. Topics include 1) data management: data curation, preparation, model, and querying; 2) data description and visualization: exploratory data analysis; graphics; 3) machine learning and knowledge discovery: supervised learning, unsupervised learning, pattern and knowledge extraction, model evaluation and interpretation. Prerequisite: DASC Major, DASC 5300 (or concurrent enrollment) and DASC 5302 (or concurrent enrollment).

DASC 5302. INTRODUCTION TO PROBABILITY AND STATISTICS. 3 Hours.

Topics include descriptive statistics, set theory, combinatorics, mathematical expectation, probability distributions, confidence interval estimation, analysis of variance, random processes, and design of experiments. Prerequisite: DASC Major.

DASC 5303. DATA SCIENCE PROJECT MANAGEMENT. 3 Hours.

Management and control of multifaceted science and engineering projects. Coordination and interactions between client and various service organizations. Project manager selection. Typical problems associated with various phases of project life cycle. Case studies illustrate theories and concepts. Students will be expected to demonstrate an understanding of communication and collaboration, including workflow, reproducibility, codebase management, collaboration tools, oral and written communication, presentation and storytelling, and team management, as well as ethics, such as understanding bias, fairness, credibility and misinformation, security, privacy, and codes of conduct. Prerequisite: DASC Major, DASC 5300, DASC 5301, DASC 5302.

DASC 5304. MACHINE LEARNING. 3 Hours.

Introduction to methods, concepts, analysis, and applications of modern Machine Learning. Topics include Unsupervised as well as Supervised learning with a central focus on practical and application aspects in the area of Data Science. Prerequisite: DASC MAJOR: DASC 5300, DASC 5301, DASC 5302.

DASC 5305. DATA VISUALIZATION. 3 Hours.

Issues, methods, and tools for data visualization for the effective presentation and analysis of data. Covers techniques for the creation and delivery of compelling visual representations and data-driven stories to enhance the delivery of analysis results, as well as visualization methods to extract meaningful information from data and to select appropriate data science methods. Prerequisite: DASC Major, DASC 5304 (or concurrent enrollment).

DASC 5306. BIG DATA MANAGEMENT. 3 Hours.

Introduction to data management and processing techniques in relational and other databases as well as computing systems. Topics include the relational model, query languages and methods, data management approaches, technologies and software tools with a focus on practical data science applications. Prerequisite: DASC Major, DASC 5300, DASC 5301, DASC 5302.

DASC 5309. DATA SCIENCE CAPSTONE PROJECT. 3 Hours.

Students will design, develop and present a substantial data science project by applying the knowledge and skills acquired from relevant courses. The projects will be drawn from real-world applications and data and might involve collaboration with community partners. Prerequisite: DASC 5300, DASC 5301, DASC 5302, DASC 5304, DASC 5305, DASC 5306.

DASC 5391. DATA SCIENCE APPLICATIONS. 3 Hours.

Individually approved research or industry internship in data science. Prerequisite: DASC 5300, DASC 5301, DASC 5302, DASC 5304, DASC 5305, DASC 5306 and Graduate Advisor approval.

DASC 5392. TOPICS IN DATA SCIENCE. 3 Hours.

May be repeated for credit when the topics vary. Prerequisite: DASC Major, DASC 5300, DASC 5301, DASC 5302 and consent of instructor.