COMPLEX SYSTEMS AND DATA SCIENCE M.S.

All students must meet the Requirements for the Master's Degree (http://catalogue.uvm.edu/graduate/degreerequirements/requirementsforthemastersdegree/)

OVERVIEW

The M.S. in Complex Systems and Data Science is a 2 year degree with optional disciplinary tracks. UVM undergraduates may incorporate the degree as part of an Accelerated Master's Program. Our central goal is to help students become protean data scientists with eminently transferable skills (read: super powers). We provide students with a broad training in computational and theoretical techniques for (1) describing and understanding complex natural and sociotechnical systems, enabling them to then, as possible, (2) predict, control, manage, and create such systems. Students will be trained in: industry standard methods of data acquisition, storage, manipulation, and curation; visualization techniques, with a focus on building high quality web-based applications; finding complex patterns and correlations through, for example, machine learning and data mining; powerful ways of hypothesizing, searching for, and extracting explanatory, mechanistic stories underlying complex systems—not just how to use black box techniques; and combining the formulation of mechanistic models (e.g., toy physics models) with genetic programming.

SPECIFIC REQUIREMENTS

REQUIREMENTS FOR ADMISSION TO GRADUATE STUDIES FOR THE DEGREE OF MASTER OF SCIENCE

The program serves students from a wide variety of backgrounds and therefore deliberately keep the prerequisites to a minimum. Students must have a Bachelor's degree in a relevant field and prior coursework or be able to establish competency in calculus, computer programming, data structures, linear algebra, and probability and statistics. Please note that some electives have additional prerequisites. General GRE scores are not required.

We offer 3 courses for students who may be lacking in these prerequisites:

1. CS 124 Data Structures
2. MATH 122 Applied Linear Algebra, and
3. STAT 211 Statistical Methods I

Note that at most one of CS 124 or MATH 122 may be taken for graduate credit (pending completion of a Permission to take a 100/200 Level Course for Graduate Credit Form at least 1 month before the semester in which the course is taken).

MINIMUM DEGREE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

A total of 30 credits, distributed as shown below:

Common Core (4 courses)		12
CSYS 300	Principles of Complex Systems (Include individual and/or team projects)	3
or MATH 300	Principles of Complex Systems	
CSYS 302	Modeling Complex Systems (Include individual and/or team projects)	3
or CS 302	Modeling Complex Systems	
STAT 287	QR: Data Science I (Include individual and/or team projects)	3
STAT 387	Data Science II (Include individual and/or team projects)	3
Electives		9
6 credits of Complex Systems and/or Data Science Electives		
3 credits of an advisor approved course		
Path Specific		9
The degree program can be completed with one of three options:		
Coursework only: 9 credits of either additional Complex Systems and Data Science courses or an elective path (Biomedical Systems, Distributed Systems, Energy Systems, Environmental Systems, Evolutionary Robotics, Policy Systems, or Self-designed named disciplinary path (requires approval of the CSDS advisor))		
Coursework and project: 3 to 6 credits of project (CSYS 392) plus additional 3 to 6 credits of course work		
Coursework and thesis: 6 to 9 credits of thesis research (CSYS 391) plus additional 3 credits of course work if needed.		

Threaded throughout the coursework, a desired central outcome of each Master's student's training will be their development of a data-intensive, high design portfolio of interactive online visualizations. Students will have many opportunities to work with faculty, researchers, institutions, and corporations, on meaningful, important real-world data sets, drawn from engineering systems, neuroscience, society through the lens of social media, and more. Beyond being a key training mechanism, we envisage these portfolios—in the manner of, for example, a traditional engineering design or artist's set of works—will be instrumental in students achieving outstanding positions in their chosen fields.

Comprehensive Exam

Receiving an A- or above in at least two of the four core courses and a B+ or above in the other two core courses meets the comprehensive exam requirement. If students do not meet this standard, they must demonstrate mastery of the material in which they have not proved to have satisfactory knowledge by one of three possible routes: an oral exam, a written exam, or a paper. The exact format will be decided upon by the Curriculum Committee in consultation with the student. The Curriculum Committee will also designate three relevant faculty

who will create the exam and/or specify the format and content area of the paper and assess the student's performance.

REQUIREMENTS FOR ADVANCEMENT TO CANDIDACY FOR THE DEGREE OF MASTER OF SCIENCE

Successful completion of the comprehensive exam and all required coursework.