

DATA SCIENCE (BS)

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Introduction

The Data Science major is designed to prepare students to be part of the Big Data movement that is transforming our world. Companies, government agencies, and not-for profit organizations have all realized the tremendous value that in depth understanding of their data holds for organizations.

Students in this major will be well prepared to enter the business world as an analyst, to enter graduate programs in data science, and even continue on into Canisius College's Master of Science in Data Analytics (<http://catalog.canisius.edu/graduate/college-arts-sciences/data-analytics/>) degree program.

At the same time students develop skills in technical areas such as mathematics, computer science and business, they will also benefit from the Canisius Liberal Arts Tradition which develops the critical thinking skills, communications abilities and ethical grounding so much in demand by employers. Like all majors at Canisius, class sizes are small and personal attention is key.

Required Minor or Double Major

In addition to the foundational courses in Data Science, Mathematics and Computer Science, students are required to complete **minor or double major**. The required minor or dual major can be in any field, and not just Mathematics (<http://catalog.canisius.edu/undergraduate/college-arts-sciences/mathematics-statistics/>) or Computer Science (<http://catalog.canisius.edu/undergraduate/college-arts-sciences/computer-science/>). Courses in Psychology (<http://catalog.canisius.edu/undergraduate/college-arts-sciences/psychology/>), Finance, Economics or Marketing (<http://catalog.canisius.edu/undergraduate/wehle-school-business/marketing/>) might be especially useful. This second major or minor may be based on career goals, planned graduate studies, and/or other student interests, and adds flexibility to the program in a way that helps students reach their goals. Before a student declares a double major, it is important to meet with the appropriate academic departments for advisement, as well as the Director of the Data Science Program. In order to declare a double major, the student must complete the appropriate double major request form and get the signature of each department chairperson and the appropriate associate dean.

Per college policy, each additional major requires a minimum of 15 credits that do not apply to the student's first or subsequent major. Some double major combinations can be completed within the minimum 120 credit hour degree requirement, but in other cases additional course work may be required. Please note that students will receive only one degree, regardless of the number of majors they complete.

Minors are an important part of the undergraduate curriculum. If students declare a minor by sophomore year, they can usually complete it in a timely manner. Students should work with their advisor to determine if it is possible that the minor can be completed by graduation.

To receive a minor, a student must complete at least 9 credit hours of coursework distinct from their major(s) and from other minors, and students must complete more than 50% of the coursework required for the minor at Canisius. Please note that "ancillary/supporting" courses required for a major may still count as distinct courses as long as the remaining coursework still meets the 30 credit-hours required for a major. For more information about minor policies, please see the Declaring Majors and Minors ([http://](http://catalog.canisius.edu/undergraduate/academics/student-records/declaring-majors-minors/)

catalog.canisius.edu/undergraduate/academics/student-records/declaring-majors-minors/) page in the catalog.

Qualifications

Students must maintain a 2.0 GPA in the major and a 2.0 overall average to graduate with a degree in Data Science.

Advisement

All students should have an advisor in the major and should contact the department directly to have an advisor assigned if they do not already have one. Meetings with academic advisors are required prior to students receiving their PIN for course registration each semester. All majors should work closely with their advisor in discussing career expectations, choosing their major electives, developing their entire academic program and planning their co-curricular or supplemental academic experiences.

Curriculum

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All undergraduate students must complete either the Canisius Core Curriculum (<http://catalog.canisius.edu/undergraduate/academics/curricular-information/core-curriculum/>) or the All-College Honors Curriculum (<http://catalog.canisius.edu/undergraduate/academics/curricular-information/all-college-honors-program/>). Many schools refer to their college-wide undergraduate requirements as "general education" requirements. We believe that the core curriculum and the honors curriculum are more than a series of required classes; they provide the basis for a Jesuit education both with content and with required knowledge and skills attributes that are central to our mission.

Free Electives

Students may graduate with a bachelor's degree with more but not less than 120 credit hours. Free electives are courses in addition to the Canisius Core Curriculum or All-College Honors Curriculum and major requirements sufficient to reach the minimum number of credits required for graduation. The number of credits required to complete a bachelor's degree may vary depending on the student's major(s) and minor(s).

Major Requirements

Code	Title	Credits
Computer Science Courses		
CSC 111 & 111L	Introduction to Programming and Introduction to Programming Laboratory	4
CSC 112 & 112L	Data Structures and Data Structures Laboratory	4
CSC 310 & 310L	Information Organization and Processing and Information Organization and Processing Laboratory	4
CSC 330 & 330L	Operating System Design and Distributed Computing and Operating System Design and Distributed Computing Laboratory	4
Data Science Courses		
DAT 111-	Intro to Reporting and Analysis	3
DAT 211-	Intro to Statistics with R	3
DAT 411-	Econometrics (cross-list current BUS or DAT course, not a new course)	3
DAT 412-	Machine Learning	3
Mathematics Courses		

MAT 111	Calculus I	4
MAT 112	Calculus II	4
MAT 211	Calculus III	4
MAT 219	Linear Algebra	4
MAT 351	Probability & Statistics I	3
MAT 341	Numerical Analysis	3
Total Credits		50

A minor or double major is required for this program in areas such as Computer Science (<http://catalog.canisius.edu/undergraduate/college-arts-sciences/computer-science/>), Mathematics (<http://catalog.canisius.edu/undergraduate/college-arts-sciences/mathematics-statistics/>), Psychology (<http://catalog.canisius.edu/undergraduate/college-arts-sciences/psychology/>), Business (<http://catalog.canisius.edu/undergraduate/wehle-school-business/business-minor/>), or Marketing (<http://catalog.canisius.edu/undergraduate/wehle-school-business/marketing/#text>). Other areas of studies may be selected based on approval from program director.

Roadmap

Freshman

Fall	Spring
CSC 111 & 111L	CSC 112
MAT 111	MAT 112
	Elective

Sophomore

Fall	Spring
CSC 310 & 310L	DAT 111
MAT 211	Minor Course 1
DAT 211	Minor Course 2

Junior

Fall	Spring
CSC 330 & 330L	MAT 341
MAT 219	MAT 351
Elective	Minor Course 3
Elective	Minor Course 4

Senior

Fall	Spring
DAT 411	DAT 412
Elective	Elective
Minor Course 5	
Minor Course 6	

Learning Goals & Objectives

Data Science: Program Learning Goals

Student Learning Goal 1: Foundations

- Objective 1A: *A Foundation in Computer Science.* Students will be fluent programs, understand database structures and distributed computing concepts. They will be ready to learn new languages and adapt to rapid changes in software.
- Objective 1B: *Adaptable Foundation applied statistics:* Students will be able to use the basic principles of probability theory in a variety

of contexts, including both classical statistical approaches and computational based methods. Students will be familiar with one modern statistical software platform and will be able to readily adapt to others.

Either:

- Objective 1C: *Substantial knowledge of a domain area.* Students who chose this path will have substantial background in an applications area (or domain) to which they can apply data science tactics. {assessment will be based on the outside major or minor}

Or

- Objective 1D: *Additional mathematical or computational studies-*Students who chose this option will demonstrate substantial additional capabilities in Mathematics or Computer Science, preparing them for research and development efforts in Data Science. {Assessment via the Mathematics or Computer Science major or minor}

Student Learning Goal 2: Effective teamwork.

- Objective 2A: Students will demonstrate the ability to work in multi-disciplinary teams to address real-world problems.
- Objective 2B: Students will understand the current theoretical ideas related to the formation of effective collaborative teams.

Student Learning Goal 3: Effective business communication.

- Objective 3A: Students will be able to identify the needs of different audiences, and effectively present complex information in ways that suit the needs of multiple audiences.
- Objective 3B: Students will be able to write effectively to convey data analytic results in business or other domain contexts.
- Objective 3C: Students will be able to create and deliver effective oral presentations, as well as present ideas in less formal oral settings.
- Objective 3D: Students will be able to create effective graphics, both static and real-time active displays, that convey results to business or other domain audiences.

Student Learning Goal 4: Ethical Data Stewardship

- Objective 4A: Students will have an awareness of the ethical and moral issues that arise in working with large data-sets, and understand the steps that need to be taken to protect the rights and privacy of the individuals involved.