

COMPUTER AND DATA SCIENCE (BA)

Department Website (<http://cs.nyu.edu/>)

NYSED: 40655 HEGIS: 1702.00 CIP: 27.0501

Program Description

The program in computer and data science targets students who seek comprehensive training in two bodies of knowledge: (1) computer science, an established field that advances computing, programming, and building large-scale and intelligent systems, and (2) data science, an emerging field that leverages computer science, mathematics, and domain-specific knowledge to analyze large data collections using data mining, predictive statistics, visualization, and efficient data management. The program in computer and data science trains students to use data science systems, the automated systems that effectively predict outcomes of interest and that extract insights from increasingly large data sets. This training enables students to participate in harnessing the power of data and in influencing policies that will govern the rollout of data science technologies. In addition, students gain the ability to build such systems.

Joint BS/BS Program with the NYU Tandon School of Engineering

The department offers CAS students a dual five-year BS/BS program with the NYU Tandon School of Engineering. Students in the program receive the BS degree in computer science from CAS and the BS degree in computer engineering or electrical engineering from NYU Tandon. See Programs (<https://bulletins.nyu.edu/undergraduate/arts-science/#programstext>) for a list of joint BS/BS programs offered at CAS.

Admissions

New York University's Office of Undergraduate Admissions supports the application process for all undergraduate programs at NYU. For additional information about undergraduate admissions, including application requirements, see How to Apply (<https://www.nyu.edu/admissions/undergraduate-admissions/how-to-apply.html>).

Program Requirements

The prerequisite for declaring this major is completion of (1) either CSCI-UA 101 Intro to Computer Science or CSCI-UA 102 Data Structures (depending on placement) and (2) either DS-UA 111 Data Science for Everyone or DS-UA 112 Principles of Data Science (depending on placement) with a C or better.

Course	Title	Credits
General Education Requirements		
	First-Year Seminar	4
EXPOS-UA 1	Writing The Essay:	4
	Foreign Language ¹	16
	Physical Science	4
	Life Science	4
	Texts and Ideas	4
	Cultures and Contexts	4
	Societies and the Social Sciences	4

Expressive Culture		4
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Major Requirements

Computer Science Requirements

CSCI-UA 2	Introduction to Computer Programming (No Prior Experience) ²	4
CSCI-UA 101	Intro to Computer Science	4
CSCI-UA 102	Data Structures	4
CSCI-UA 201	Computer Systems Org	4
CSCI-UA 310	Basic Algorithms	4
CSCI-UA 473	Fundamentals of Machine Learning	4
CSCI-UA 475	Predictive Analytics	4
or CSCI-UA 476	Processing Big Data for Analytics Applications	
CSCI-UA 479	Data Management and Analysis	4

Data Science Requirements

DS-UA 111	Data Science for Everyone	4
DS-UA 112	Principles of Data Science	4
DS-UA 201	Causal Inference	4
DS-UA 202	Responsible Data Science	4
DS-UA 301	Advanced Topics in Data Science	4

Mathematics Requirements

MATH-UA 120	Discrete Mathematics	4
MATH-UA 121	Calculus I	4
or MATH-UA 131	Mathematics for Economics I	
MATH-UA 122	Calculus II	4
or MATH-UA 132	Mathematics for Economics II	
MATH-UA 140	Linear Algebra	4
or MATH-UA 148	Honors Linear Algebra	
MATH-UA 235	Probability & Statistics	4

Electives

Select one Computer Science elective:		4
CSCI-UA 202	Operating Systems	
CSCI-UA 475	Predictive Analytics	
CSCI-UA 476	Processing Big Data for Analytics Applications	
CSCI-UA 480	Special Topics: (Computer Networks)	
CSCI-UA 480	Special Topics: (Introduction to Numerical Optimization)	
CSCI-UA 480	Special Topics: (Introduction to Social Networking)	
CSCI-UA 480	Special Topics: (Natural Language Processing)	
CSCI-UA 480	Special Topics: (Parallel Computing)	

Other Elective Credits		4
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Total Credits		128
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1

The foreign language requirement is satisfied upon successful completion through the Intermediate level of a language. This may be accomplished in fewer than 16 credits, but those credits must then be completed as elective credit.

2

This course does not count towards the joint major but is a required prerequisite for CSCI-UA 101 Intro to Computer Science.

Note: Students interested in this major should consult with the directors of undergraduate studies in the departments and CDS for additional information. Please note that the CAS minor requirement associated with the major in data science is waived for the computer and data science joint major, just as it is waived for a data science major pursuing a double major.

Sample Plan of Study

Course	Title	Credits
1st Semester/Term		
CSCI-UA 2	Introduction to Computer Programming (No Prior Experience)	4
MATH-UA 121	Calculus I	4
First-Year Seminar	Texts and Ideas	4
	Credits	16
2nd Semester/Term		
CSCI-UA 101	Intro to Computer Science	4
MATH-UA 122	Calculus II	4
EXPOS-UA 1	Writing The Essay:	4
Cultures and Contexts		4
	Credits	16
3rd Semester/Term		
DS-UA 111	Data Science for Everyone	4
CSCI-UA 102	Data Structures	4
MATH-UA 120	Discrete Mathematics	4
Foreign Language I		4
	Credits	16
4th Semester/Term		
DS-UA 112	Principles of Data Science	4
CSCI-UA 201	Computer Systems Org	4
MATH-UA 140	Linear Algebra	4
Foreign Language II		4
	Credits	16
5th Semester/Term		
DS-UA 201	Causal Inference	4
CSCI-UA 310	Basic Algorithms	4
Foreign Language III		4
Expressive Culture		4
	Credits	16
6th Semester/Term		
MATH-UA 235	Probability & Statistics	4
CSCI-UA 475	Predictive Analytics	4
Foreign Language IV		4
Societies and the Social Sciences		4
	Credits	16
7th Semester/Term		
CSCI-UA 479	Data Management and Analysis	4
CSCI-UA 202	Operating Systems	4
Physical Science		4
Other Elective Credits		4
	Credits	16
8th Semester/Term		
DS-UA 202	Responsible Data Science	4
DS-UA 301	Advanced Topics in Data Science	4
CSCI-UA 473	Fundamentals of Machine Learning	4

Life Science	4
Credits	16
Total Credits	128

Learning Outcomes

Upon completion of program requirements, students are expected to have developed:

1. Fundamental theoretical and practical knowledge of the foundational areas of computer science, including algorithm design, machine learning, and programming.
2. Knowledge of current methods and tools used to analyze big data and inferences, and to explore data-driven decision making.
3. Knowledge of ethical issues regarding data science. These include the topics of fairness, diversity, and privacy.
4. The ability to build and use data science systems, the automated systems that effectively predict outcomes of interest and that extract insights from increasingly large data sets.
5. An understanding of what is going on "under the hood" of computer software in terms of the underlying computer architecture and operating systems.

Policies

Policy on Declaration of Major or Minor

Students must complete either CSCI-UA 101 or 102 (depending on placement) with a grade of C or better before they can declare the major or minor in computer science; the joint majors with economics and mathematics; and the joint minor with mathematics. To declare the joint major in computer and data science, students must first meet this prerequisite and also complete either DS-UA 111 or 112 (depending on placement) with a grade of C or better. To declare the minor in web programming and applications, students must first complete their choice of either (1) CSCI-UA 2 or 3 (depending on placement) or (2) CSCI-UA 4 with a grade of C or better. These policies apply to all NYU students, not just to those matriculated in CAS.

Policies Applying to the Major

1. A grade of C or better is necessary in all courses used to fulfill major requirements; courses graded Pass/Fail do not count toward the major.
2. To enroll in Introduction to Computer Science (CSCI-UA 101) students must first fulfill the prerequisite Introduction to Computer Programming (No Prior Experience) (CSCI-UA 2) or Introduction to Computer Programming (Limited Prior Experience) (CSCI-UA 3). Alternatively, they must first present a score of 3 on the AP Computer Science exam; students with a score of 4 or 5 may also register for CSCI-UA 101 (they are encouraged but not obliged to start with CSCI-UA 102), but they will forfeit the AP credit. Finally, students may take a placement test given by the department to enter CSCI-UA 101.
3. Advanced Placement (AP) credit for Computer Science A is the equivalent of CSCI-UA 101 and counts toward the major. However, the AP exam in Computer Science Principles cannot count toward any major or minor in this department.
4. Students who score a 4 or 5 on the AP Computer Science exam are encouraged to register for Data Structures (CSCI-UA 102) but are not obliged to; they may choose to take CSCI-UA 101 before CSCI-UA 102 (and forfeit the AP credit).

5. Students will also lose AP credit if they take certain other courses in the department; this is noted in the relevant course descriptions.
6. Students are required to take CSCI-UA 101 through CSCI-UA 201 in sequence.
7. Note that Albert will automatically block: students who complete CSCI-UA 2 with a C or better from registering for CSCI-UA 3; students who complete CSCI-UA 467 with a C or better from registering for CSCI-UA 61; and students who complete CSCI-UA 479 with a C or better from registering for CSCI-UA 60.
8. CAS students (in any major or minor) are not permitted to take computer science courses in the Tandon School of Engineering.
9. Those interested in the honors program should start the major early enough to take major electives starting in the first semester of junior year.
10. Those interested in spending a semester away should work out their schedule with an adviser as early as possible.

NYU Policies

University-wide policies can be found on the New York University Policy pages (<https://bulletins.nyu.edu/nyu/policies/>).

College of Arts and Science Policies

A full list of relevant academic policies can be found on the CAS Academic Policies page (<https://bulletins.nyu.edu/undergraduate/arts-science/academic-policies/>).