COMPUTER AND DATA SCIENCE (BA)

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

NYSED: 40655 **HEGIS:** 1702.00 **CIP:** 30.7001

Program Description

This is an interdisciplinary major offered by the Department of Computer Science and the Center for Data Science. Students in this program build a strong foundation in data science and are also required to take additional course work in algorithms, computer systems, and other electives from a suite of 400-level computer science courses (particularly in the areas of computer science most relevant to data science, machine learning, and artificial intelligence).

Honors Program

This major program of study does not currently offer an honors track.

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 joint major in Computer and Data Science requires eighteen 4-credit courses (72 credits) as outlined below.

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 Principles of Data Science I or DS-UA 112 Principles of Data Science II (depending on placement) with a C or better.

Course	Title	Credits
General Education Requirements		
First-Year Seminar		4
EXPOS-UA 1	Writing as Inquiry	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
Major Requirements		
Computer Science Requirements		
CSCI-UA 101	Intro to Computer Science [2]	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 479	Data Management and Analysis	4
Data Science Requirements		
DS-UA 111	Principles of Data Science I (offered every semester)	4
DS-UA 112	Principles of Data Science II (offered every semester)	4
DS-UA 201	Causal Inference (offered every semester)	4
DS-UA 202	Responsible Data Science (offered every Spring)	4
DS-UA 301	Advanced Topics in Data Science (offered every semester)	4
Mathematics Requirements		
MATH-UA 120	Discrete Mathematics	4
MATH-UA 121	Calculus I [3]	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 185	Probability & Statistics (formerly UA 235)	4
Computer Science Electives		
Select two Computer Science electives:		8
CSCI-UA 202	Operating Systems	
CSCI-UA 469	Natural Language Processing	
CSCI-UA 475	Predictive Analytics	
CSCI-UA 476	Processing Big Data for Analytics Applications	
CSCI-UA 480	Special Topics: (Depending on semester offerings, topics include: Computer Networks, Social Networking, Numerical Optimization, & Parallel Computing)	
Electives		
Other Elective Credits		8
Total Credits		**128**

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. Prerequisite: CSCI-UA 2 Introduction to Computer Programming (No Prior Experience).
3. Students must choose one of the two calculus tracks and cannot take courses from both tracks.

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) [1]	4

MATH-UA 121	Calculus I	4
First-Year Seminar		4
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 as Inquiry	4
Cultures and Contexts		4
	Credits	**16**
3rd Semester/Term		
DS-UA 111	Principles of Data Science I	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 II	4
CSCI-UA 201	Computer Systems Org	4
MATH-UA 185	Probability & Statistics ((formerly UA 235))	4
Foreign Language II		4
	Credits	**16**
5th Semester/Term		
CSCI-UA 310	Basic Algorithms	4
MATH-UA 140	Linear Algebra	4
DS-UA 201	Causal Inference	4
Foreign Language III		4
	Credits	**16**
6th Semester/Term		
CSCI-UA 479	Data Management and Analysis	4
CS Elective 1		4
Foreign Language IV		4
Societies and the Social Sciences		4
	Credits	**16**
7th Semester/Term		
CSCI-UA 473	Fundamentals of Machine Learning	4
CS Elective 2		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
Life Science		4
Expressive Culture		4
	Credits	**16**
	Total Credits	**128**

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

Learning Outcomes

Upon completion of program requirements, students are expected to:

1. Achieve a rigorous understanding of the mathematical, statistical, and computational principles that underpin data science, so that students will have the foundational mastery to pursue of the many applications of data sciences without limitation.
2. Understand approaches such as causal inference, machine learning, and data management that are involved in different settings across varied academic and applied contexts.
3. Examine the relationship between data science and society by addressing ethical and philosophical issues in modern statistics, data science, and AI, and develop the ability not only to design data models but also to communicate effectively about these models and their outputs.
4. Develop fundamental theoretical and practical knowledge of the foundational areas of computer science, including algorithm design, machine learning, and programming.
5. Achieve an understanding of what is going on "under the hood" of computer software in terms of the underlying computer architecture and operating systems.

Policies

Program Policies

Major Policies

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 spending a semester away should work out their schedule with an adviser as early as possible.

Policy on Declaration of Major

Students must complete either CSCI-UA 101 or 102 (depending on placement) and also complete either DS-UA 111 or 112 with a grade of C or better before declaring the joint major in Computer and Data Science. This policy applies to all NYU students, not just to those matriculated in CAS. Note that students are not permitted to double major in Computer

Science and Data Science. To pursue both disciplines, students must declare this joint major.

Students may declare at any time during the academic year using the links below. Any questions or concerns regarding the declaration process should be directed to cds-undergraduate@nyu.edu.

- Data Science Major or Minor (https://docs.google.com/forms/d/e/1FAIpQLSdvU0oTPxa_c8DPzyywxw7LNmofGbfoSaVhz0Dcx4SuksgixA/viewform/?usp=sf_link)
- Joint Major in Computer and Data Science (https://docs.google.com/forms/d/e/1FAIpQLSfq5ZHkrnd0jvST5Mq_dF1bEfHYVolAxJ_y-9pMuPgGdZoZpQ/viewform/?usp=sf_link) (all NYU students must complete both DS-UA 111 Principles of Data Science I and CSCI-UA 101 Introduction to Computer Science with a grade of C or better before declaring this major)
- Joint Major in Data Science and Mathematics (https://docs.google.com/forms/d/e/1FAIpQLSffkc8dTgivZTNrToggDAXOtniEwPMr82EqSxOcSPZExReaUg/viewform/?usp=sf_link)

College of Arts and Science students cannot enter their junior year undeclared and must begin their data science and computer science course sequences no later than the spring semester of their sophomore year, which will allow them to declare the major or minor during the summer before their junior year. The Center for Data Science (CDS) and CAS both advise that students begin their data science courses earlier and declare the major in the spring of their sophomore year. Although students may begin their data science courses later than this point, there is no guarantee they will finish their major requirements in time to graduate within four years. Students cannot declare any major or joint major with CDS after completion of their junior year.

Required Coursework in CAS (-UA) for all Majors and Minors in Courant

At least half of the courses applied to the Courant requirements of the CAS majors and minors in Computer Science and in Mathematics (including joint programs) must be CSCI-UA and MATH-UA courses taken in New York or at NYU study away sites**.** This is a built-in limit on how many courses students may take in these subjects that are (for example) sponsored by NYU Abu Dhabi and NYU Shanghai under CS-UH, MATH-UH, CENG-SHU, CSCI-SHU, and MATH-SHU. Internal and external transfers must pay close attention to this policy, but it also applies to students who matriculate as first-years.

The usual CAS policies on -UA residency for the baccalaureate degree still apply.

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/).