DATA SCIENCE

Faculty

Coordinating Committee: Matthew D. Bailey (Business Analytics), Abby Flynt (Mathematics), Brian R. King (Computer Science)

Data science is a growing field that can be used to reveal insight into authorship of old texts, assist in personalized health care, predict future epidemics, understand customer behavior and provide business insight, quantify and predict effects of climate change, and improve automation via tools like computer vision. On our campus, data science can be used to study food insecurity, final exam scheduling, housing, and traffic flow. This wide variety of applications is what makes data science so important.

This coordinate major (co-major) provides a suite of linked courses that supplement a technical major in business analytics (BSBA), computer science (BS), statistics (BS), or mathematics (BS) by adding breadth and a liberal arts perspective. These courses will supplement a student's technical major by adding the data science knowledge and skills needed to succeed in their chosen field of endeavor while experiencing the interdisciplinarity of the field and its broader impact across various disciplines.

Bachelor of Arts in Data Science

The BA in data science is only available as a co-major to students whose primary major is a BSBA in Business Analytics (https://coursecatalog.bucknell.edu/collegeofmanagementcurricula/areasofstudy/businessanalytics/), BS in Computer Science (https://coursecatalog.bucknell.edu/collegeofartsandsciencescurricula/areasofstudy/computersciencecsci/), BS in Statistics (https://coursecatalog.bucknell.edu/collegeofartsandsciencescurricula/areasofstudy/mathematicsmath/) or BS in Mathematics (https://coursecatalog.bucknell.edu/collegeofartsandsciencescurricula/areasofstudy/mathematicsmath/). These disciplines form the core of data science, so the primary major ensures that students have sufficient depth in a particular field central to data science. Complementing the depth a student receives from their primary major, the BA in data science provides breadth across the interdisciplinary field of data science. The major is not intended as – nor can it be declared as – a stand-alone course of study. No courses may be counted for both majors. Students who have completed this co-major will receive one degree (the BS in their primary major) and have noted on their transcript that they have completed all the major requirements for the BA co-major in data science. They will not receive a BA degree.

The Bachelor of Arts in Data Science requires eight courses.

With a BSBA in Business Analytics

Students majoring in business analytics should choose MATH 201 to satisfy their calculus requirement.

Program Requirements

DATA 200	Fundamentals of Data Science	1
CSCI 204	Data Structures & Algorithms	1
MATH 202	Calculus II	1
MATH 217	Statistics II	1
MATH 245	Linear Algebra	1
Three theme courses		3
Total Credits		**8**

With a BS in Computer Science

Program Requirements

DATA 200	Fundamentals of Data Science	1
MATH 230	Data Visualization & Computing	1
MATH 245	Linear Algebra	1
One technical elective		1
Four theme courses		4
Total Credits		**8**

With a BS in Statistics or BS in Mathematics

Students majoring in statistics should choose MATH 354 as one of their 300-level electives. Students majoring in mathematics must complete MATH 216, MATH 217, MATH 230 and MATH 354 and should choose MATH 354 as one of their 300-level electives. Because of the additional math course requirements, students majoring in mathematics will effectively need to take 10 courses beyond their primary major to fulfill the BA co-major in data science requirements.

Program Requirements

DATA 200	Fundamentals of Data Science	1
CSCI 204	Data Structures & Algorithms	1
One technical elective [1]		1
Four theme courses		4
One ethics course [2]		1
Total Credits		**8**

1 Students majoring in mathematics must use MATH 217 for their technical elective.

2 Students may choose from among PHIL 213, PHIL 220, PHIL 228 or PHIL 274. If a prerequisite course is required, it should be included as one of the theme courses.

Technical Electives

ANOP 330	Predictive Analytics: Machine Learning Fundamentals for Business	1
CSCI 311	Algorithm Design & Analysis	1
CSCI 349	Introduction to Data Mining	1
CSCI 365	Image Processing & Analysis	1
GEOL 230	Environmental GIS	1
GEOL 334	Geophysics	1
GEOG 204	Applied G.I.S.	1
MATH 217	Statistics II	1
MATH 354	Modern Data Analysis	1
SOCI 209	Analyzing the Social World	1

Theme Courses

Students interested in this co-major must prepare a brief proposal for their theme courses in conjunction with their academic adviser and then submit it to the Data Science Coordinating Committee for approval. The courses should be focused around a data science-related theme of their own design (e.g., visualization, ethics, communication) and not a broad discipline, and that theme should be one that allows the possibility of data science-related activities, either within the courses themselves or in the student's future career or further education. The proposal should include a list of at least six potential courses that fit their proposed theme. At least two courses must be in arts & humanities, and students may select at most two 100-level courses. If the chosen ethics course for statistics/mathematics majors requires a 100-level prerequisite, the student may select at most three 100-level theme courses. No more than one theme course may be in ANOP/CSCI/MATH. A list of sample theme courses is available from the Data Science Coordinating Committee.

Students earning a B.A. in Data Science will:

1. Strengthen skills in visualization, writing, and presentation of data (1, 6, 7)
2. Understand both the technical aspects of data science and how human, social, and institutional structures shape technical work. (1, 2, 6, 8, 9)
3. Learn about ethical actions when managing and analyzing data (2, 5)

Numbers in parentheses reflect related Educational Goals (https://coursecatalog.bucknell.edu/educationalgoals/) of Bucknell University.

Courses

DATA 200. Fundamentals of Data Science. 1 Credit.
Offered Either Fall or Spring; Lecture hours:3
An introduction to the concepts, core techniques and software of data science; emphasizing both data science principles and methods. Topics may include: computational libraries for data science and visualization; statistical and machine learning algorithms for regression, classification and clustering. Prerequisite: CSCI 204.