Macalester College

Data Science Minor
Department of Mathematics, Statistics, and Computer Science

Data Science

Macalester’s data science program develops the concepts and skills needed to extract actionable information from masses of data. New to the liberal arts curriculum, data science is a natural fit. It enables students and researchers to work with data in many disciplines: the social sciences (e.g., census, voting, crime, and survey data), the natural sciences (e.g., gene sequences, remote sensing), humanities (e.g., digitized historical records, archeological data), and the arts (e.g., music databases). Macalester’s data science minor combines course work in computer science and statistics with studies in “domain areas” that make use of data science and are found across the liberal arts curriculum.

Minor Requirements

1) Two Computer Science courses chosen from:
   - COMP 123: Core Concepts in Computer Science
   - COMP 124: Object Oriented Programming
   - COMP 302: Intro to Databases
   - COMP 365: Computational Linear Algebra
   - COMP 440: Collective Intelligence
   - COMP 484: Intro to Artificial Intelligence

2) Two Statistics courses chosen from:
   - MATH 155: Intro to Statistical Modeling
   - MATH 253: Statistical Computing & Machine Learning
   - MATH 353: Survival Analysis
   - MATH 354: Bayesian Statistics

3) Two courses in a Domain Area focused around a thematic area in which data science is being done.

4) A final Integrative Essay which discusses a completed data science project or which proposes an integrative project in the domain area.

More information at http://www.macalester.edu/MSCS

Pre-Approved Domain Areas

Two courses from a domain area below. Other areas approved on a case-by-case basis

Astronomy
   - PHYS 120: Astronomical Techniques
   - PHYS 440: Observational Astronomy

Bioinformatics
   - BIOL 260: Genetics
   - COMP 302: Computational Biology

Computational Linguistics
   - LING 100: Intro to Linguistics
   - LING 294: Computational Methods

Data-Driven Journalism
   - MCST 114: News Reporting and Writing and one of
   - MCST 355: Electronic Journalism
   - MCST 357: New Media

Ecology
   - BIOL 285: Ecology
   - One of BIOL 342: Animal Behavior/Ecology
   - BIOL 344: Aquatic Ecology
   - BIOL 345: Field Botany

Environmental Science and Policy
   - ENVI 231: Environmental Econ and one of
   - ENVI 130: Science of Renewable Energy
   - ENVI 140: The Earth’s Climate System
   - ENVI 150: Climate and Society
   - ENVI 160: Dynamic Earth, Global Change

Geographic Analytics
   - GEOG 225: GIS

Neuroscience
   - NEUR 244: Cognitive Neuroscience
   - NEUR 385: Functional MRI

Political Analytics
   - POLY 214: Cyber Politics
   - POLY 269: Empirical Research Methods

Quantitative Economics
   - ECON 358: Securities Analysis
   - ECON 381: Econometrics
   - ECON 420: Quantitative Macro Analysis
   - ECON 485: Empirical Finance

Quantitative Public Health
   - BIOL 355: Virology
   - BIOL 357: Immunology
   - GEOG 256: Medical Geography
   - MATH 125: Epidemiology
Data Science and the Liberal Arts

Data science seeks to better understand how the world around us works. The field embraces the need for a continuous interdisciplinary cycle that alternates between question formulation, data exploration, and domain insight. Instead of providing methods to answer narrow, rigidly specified questions, data science empowers students with tools to study complex issues and communicate findings via oral, online, and print artifacts.

Why Data Science at Macalester?

- Driven by student interest: many students already are choosing these courses, and an increasing number are pursuing graduate programs and careers in data science.
- Macalester’s combined Math, Stats, & CS Department is an ideal environment for a data science curriculum.
- Many faculty have interests, experience, and degrees in data science.
- Aligns with Macalester’s mission and strategic plan: emphasizes a connection to vocation, entrepreneurship, and service to society; encourages interdisciplinarity; provides an issue-focused program that offers skills to increase learning capacity.
- Resonates with current digital humanities initiatives at Macalester.
- Builds on support from the Howard Hughes Medical Institute that funds data science internships.
- Student projects build on and strengthen connections between the department and partners such as the Minnesota Depts. of Transportation and Health, Target, Thomson Reuters, Children’s Hospital, and many research institutions.
- Our mathematics and statistics courses pervasively include R programming, strengthening the connection between mathematics, statistics, and computer science.