DATA SCIENCE, BA

Students in the Data Science major will be able to apply computational, mathematical, and statistical thinking to data-rich problems in a wide variety of fields in a responsible and ethical manner. This includes the ability to manage, process, model, gain meaning and knowledge, and present data. Data science is one of the fastest growing career sectors in Wisconsin and across the nation.

By its very nature, the field of data science is one that teaches novel and cutting-edge ways to engage in the "continual sifting and winnowing by which alone the truth can be found."

HOW TO GET IN

HOW TO GET IN

To declare the data science major, students must have:

- Fewer than 86 credits (senior standing)
- Attended a data science major declaration event

Students may declare in their first semester on campus, without an established GPA. However, if courses have been completed at UW-Madison, the following applies:

- At least a 2.000 GPA on coursework that would count in the major
- At least a 2.000 GPA on coursework that would count as upper-level work in the major

or

- At least a 2.000 GPA in these preparatory courses: MATH 96, MATH 112, MATH 113, MATH 114, MATH 171, MATH 211, COMP SCI 200, COMP SCI/E C E 252, COMP SCI 310.

Please see the Data Science major page (https://stat.wisc.edu/undergraduate-data-science-studies/) on the Department of Statistics website for information on how to declare the major and meet with advisors.

Students declared in the Data Science certificate or Statistics Certificate may not declare the Data Science major. Students who wish to declare the Data Science major must first cancel their Data Science and/or Statistics certificate.

REQUIREMENTS

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin-Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (https://guide.wisc.edu/undergraduate/#requirementsforundergraduatestudytext) section of the Guide.

General Education	• Breadth—Humanities/Literature/Arts: 6 credits • Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits • Breadth—Social Studies: 3 credits • Communication Part A & Part B * • Ethnic Studies * • Quantitative Reasoning Part A & Part B *

* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

COLLEGE OF LETTERS & SCIENCE DEGREE REQUIREMENTS: BACHELOR OF ARTS (BA)

Students pursuing a bachelor of arts degree in the College of Letters & Science must complete all of the requirements below. The College of Letters & Science allows this major to be paired with either a bachelor of arts or a bachelor of science curriculum.

BACHELOR OF ARTS DEGREE REQUIREMENTS

Mathematics	Complete the University General Education Requirements for Quantitative Reasoning A (QR-A) and Quantitative Reasoning B (QR-B) coursework.
Language	• Complete the fourth unit of a language other than English; OR • Complete the third unit of a language and the second unit of an additional language other than English.
L&S Breadth	• 12 credits of Humanities, which must include 6 credits of literature; and • 12 credits of Social Science; and • 12 credits of Natural Science, which must include one 3+ credit Biological Science course and one 3+ credit Physical Science course.
Liberal Arts and Science Coursework	Complete at least 108 credits.
Depth of Intermediate/Advanced work	Complete at least 60 credits at the intermediate or advanced level.
Major	Declare and complete at least one major.
Total Credits	Complete at least 120 credits.
UW-Madison Experience	• 30 credits in residence, overall; and • 30 credits in residence after the 86th credit.

Quality of Work	• 2.000 in all coursework at UW–Madison • 2.000 in Intermediate/Advanced level coursework at UW–Madison

NON–L&S STUDENTS PURSUING AN L&S MAJOR

Non–L&S students who have permission from their school/college to pursue an additional major within L&S only need to fulfill the major requirements. They do not need to complete the L&S Degree Requirements above.

REQUIREMENTS FOR THE MAJOR

FOUNDATIONAL MATH COURSES

Code	Title	Credits
MATH 221	Calculus and Analytic Geometry 1	5
or MATH 217	Calculus with Algebra and Trigonometry II	
MATH 222	Calculus and Analytic Geometry 2	4
Total Credits		**9**

FOUNDATIONAL DATA SCIENCE COURSES

Code	Title	Credits
STAT 240	Data Science Modeling I	4
STAT 340	Data Science Modeling II	4
COMP SCI 220	Data Science Programming I	4
or COMP SCI 300	Programming II	
COMP SCI 320	Data Science Programming II	4
L I S 461	Data and Algorithms: Ethics and Policy	3-4
or E C E/ I SY E 570	Ethics of Data for Engineers	
or PHILOS 244	Introductory Artificial Intelligence (AI) and Data Ethics	
Total Credits		**19-20**

ELECTIVES

Students must complete 18 credits of upper-level major electives, including at least one course from each of the the following categories: Linear Algebra, Advanced Computing, Statistical Modeling, and Machine Learning, plus additional electives to reach the minimum credits.

Additional courses taken within Advanced Computing, Statistical Modeling, and Machine Learning may count towards other electives.

Students are only allowed to count one course from each of probability (MATH 331, STAT/MATH 309, STAT 311, or STAT/MATH 431), inference (STAT/MATH 310 or STAT 312), and linear algebra (MATH 320, MATH 340, MATH 341, MATH 345, or MATH 375) towards the major.

Linear Algebra

Code	Title	Credits
Choose one from the following:		3
Only one linear algebra course may count towards the data science major		
MATH 320	Linear Algebra and Differential Equations	
MATH 340	Elementary Matrix and Linear Algebra	
MATH 341	Linear Algebra	
MATH 345	Linear Algebra and Optimization	
MATH 375	Topics in Multi-Variable Calculus and Linear Algebra	
Total Credits		**3**

Advanced Computing

Code	Title	Credits
Complete at least one from the following:		3
COMP SCI 400	Programming III	
COMP SCI 412	Introduction to Numerical Methods	
COMP SCI/ MATH 513	Numerical Linear Algebra	
COMP SCI/ MATH 514	Numerical Analysis	
COMP SCI/E C E/ I SY E 524	Introduction to Optimization	
COMP SCI 544	Introduction to Big Data Systems	
COMP SCI 557	Parallel & Throughput- Optimized Programming	
COMP SCI 564	Database Management Systems: Design and Implementation	
COMP SCI 565	Introduction to Data Visualization	
COMP SCI/ B M I 576	Introduction to Bioinformatics	
GEOG 573	Advanced Geocomputing and Geospatial Big Data Analytics	
GEOG 574	Geospatial Database Design and Development	
MATH 444	Graphs and Networks in Data Science	
STAT/ COMP SCI 471	Introduction to Computational Statistics	
Total Credits		**3**

Statistical Modeling

Code	Title	Credits
Complete at least one from the following:		3
ACT SCI 657	Risk Analytics	
CIV ENGR 516	Hydrologic Data Analysis	
ECON 400	Introduction to Applied Econometrics	
ECON 410	Introductory Econometrics	
ECON 460	Economic Forecasting	
GEOG 560	Advanced Quantitative Methods	
GEOG 579	GIS and Spatial Analysis	
I SY E 575	Introduction to Quality Engineering	
MATH 531	Probability Theory	
MATH/I SY E/ OTM/STAT 632	Introduction to Stochastic Processes	

MATH 635	An Introduction to Brownian Motion and Stochastic Calculus
STAT/MATH 309	Introduction to Probability and Mathematical Statistics I
or STAT 311	Introduction to Theory and Methods of Mathematical Statistics I
or MATH/ STAT 431	Introduction to the Theory of Probability
STAT/MATH 310	Introduction to Probability and Mathematical Statistics II
or STAT 312	Introduction to Theory and Methods of Mathematical Statistics II
STAT 349	Introduction to Time Series
STAT 351	Introductory Nonparametric Statistics
STAT 421	Applied Categorical Data Analysis
STAT/M E 424	Statistical Experimental Design
STAT 436	Statistical Data Visualization
STAT 443	Classification and Regression Trees
STAT 456	Applied Multivariate Analysis
STAT 461	Financial Statistics
STAT 575	Statistical Methods for Spatial Data
Total Credits	**3**

Machine Learning

Code	Title	Credits
Complete at least one from the following:		3
BSE 405	Artificial Intelligence in Agriculture	
CHEM 361	Machine Learning in Chemistry	
COMP SCI/E C E/ M E 532	Matrix Methods in Machine Learning	
COMP SCI/E C E/ M E 539	Introduction to Artificial Neural Networks	
COMP SCI 540	Introduction to Artificial Intelligence	
I SY E 521	Machine Learning in Action for Industrial Engineers	
MATH 535	Mathematical Methods in Data Science	
MATH 616	Data-Driven Dynamical Systems, Stochastic Modeling and Prediction	
PHYSICS 361	Machine Learning in Physics	
STAT 451	Introduction to Machine Learning and Statistical Pattern Classification	
STAT 453	Introduction to Deep Learning and Generative Models	
Total Credits		**3**

Other electives

Code	Title	Credits
For additional electives, complete up to two courses from the list below or additional courses from the required categories above:		6
ACT SCI 655	Health Analytics	
COMP SCI/I SY E/ MATH 425	Introduction to Combinatorial Optimization	
COMP SCI/I SY E/ MATH/STAT 525	Linear Optimization	
COMP SCI/ E C E 533	Image Processing	
COMP SCI 541	Theory & Algorithms for Data Science	
COMP SCI 559	Computer Graphics	
COMP SCI/ B M I 567	Biomedical Image Analysis	
COMP SCI 577	Introduction to Algorithms	
E C E 203	Signals, Information, and Computation	
ECON 315	Data Visualization for Economists	
ECON 570	Fundamentals of Data Analytics for Economists	
ECON 695	Topics in Economic Data Analysis	
F&W ECOL 395	Data and GIS Tools for Ecology	
F&W ECOL 458	Environmental Data Science	
GEN BUS 317	Mathematical Foundations of Business Analytics	
GEOG 378	Introduction to Geocomputing	
GEOG 572	Graphic Design in Cartography	
GEOG 575	Interactive Cartography & Geovisualization	
INFO SYS 322	Introduction to Databases	
INFO SYS 423	Digital Platform Analytics	
I SY E 323	Operations Research-Deterministic Modeling	
I SY E 412	Fundamentals of Industrial Data Analytics	
I SY E/M E 512	Inspection, Quality Control and Reliability	
I SY E 612	Information Sensing and Analysis for Manufacturing Processes	
L I S 407	Data Storytelling with Visualization	
L I S 440	Navigating the Data Revolution: Concepts of Data & Information Science	
L I S 464	Applied Database Design	
L I S 501	Introduction to Text Mining	
LSC 460	Social Media Analytics	
LSC 660	Data Analysis in Communications Research	
MATH 331	Introductory Probability	
SOC 351	Introduction to Survey Methods for Social Research	
SOC/ C&E SOC 618	Social Network Analysis	
SOC/ C&E SOC 693	Practicum in Analysis and Research	
SOIL SCI 585	Using R for Soil and Environmental Sciences	
STAT 405	Data Science Computing Project	

STAT 433	Data Science with R	
Total Credits		**6**

RESIDENCE & QUALITY OF WORK

- 2.000 GPA in all major courses
- 2.000 GPA in all upper level work in the major[1]
- 15 credits in the major, taken on the UW-Madison campus

FOOTNOTES

[1] Upper-level in the major includes L I S 461 and all courses counting towards the Electives requirement (i.e. Machine Learning, Advanced Computing, Statistical Modeling, Linear Algebra, and Other Electives).

UNIVERSITY DEGREE REQUIREMENTS

Total Degree	To receive a bachelor's degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.
Residency	Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. "In residence" means on the UW–Madison campus with an undergraduate degree classification. "In residence" credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.
Quality of Work	Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.

LEARNING OUTCOMES

LEARNING OUTCOMES

1. Integrate foundational concepts and tools from mathematics, computer science, and statistics to solve data science problems.
2. Demonstrate competencies with tools and processes necessary for data management and reproducibility.
3. Produce meaning from data employing modeling strategies.
4. Demonstrate critical thinking related to data science concepts and methods.
5. Conduct data science activities aware of and according to policy, privacy, security and ethical considerations.
6. Demonstrate oral, written, and visual communication skills related to data science.

FOUR-YEAR PLAN

FOUR-YEAR PLAN

This Four-Year Plan is only one way a student may complete an L&S degree with this major. Many factors can affect student degree planning, including placement scores, credit for transferred courses, credits earned by examination, and individual scholarly interests. In addition, many students have commitments (e.g., athletics, honors, research, student organizations, study abroad, work and volunteer experiences) that necessitate they adjust their plans accordingly. Informed students engage in their own unique Wisconsin Experience by consulting their academic advisors, Guide, DARS, and Course Search & Enroll for assistance making and adjusting their plan.

Freshman

Fall	Credits	Spring	Credits
COMP SCI 220	4	COMP SCI 320	4
Communication A	3	MATH 221	5
Biological Science Breadth	3	Ethnic Studies	3
Foreign Language (if needed)	4	Foreign Language (if needed)	4
	14		**16**

Sophomore

Fall	Credits	Spring	Credits
MATH 222	4	STAT 340	4
STAT 240	4	Linear Algebra course	3
Literature Breadth	3	Humanities Breadth	3
Physical Science Breadth	3	Literature Breadth	3
INTER-LS 210	1	Social Science Breadth	3
	15		**16**

Junior

Fall	Credits	Spring	Credits
Advanced Computing course	3	Statistical Modeling course	3
Biological Science Breadth	3	Physical Science Breadth	3
Social Science Breadth	3	Social Science Breadth	3
Elective	6	Electives	6
	15		**15**

Senior

Fall	Credits	Spring	Credits
L I S 461 (Meets Humanities breadth; 4-credit Communication B section optional)	3-4	Data Science elective	3
Machine Learning course	3	Data Science elective	3
Social Science Breadth	3	Electives	7
Electives	6		
	15		**14**

Total Credits 120

THREE-YEAR PLAN

THREE-YEAR PLAN

This Sample Three-Year Plan is a tool to assist students and their advisor(s). Students should use it –along with their DARS report, the Degree Planner, and Course Search & Enroll tools – to make their own three-year plan based on their placement scores, credit for transferred courses and approved examinations, and individual interests.

Three-year plans may vary considerably from student to student, depending on their individual preparation and circumstances. Students interested in graduating in three years should meet with an advisor as early as possible to discuss feasibility, appropriate course sequencing, post-graduation plans (careers, graduate school, etc.), and opportunities they might forgo in pursuit of a three-year graduation plan.

DEPARTMENTAL EXPECTATIONS

A three-year degree is feasible for students with a variety of backgrounds and specific preparation. Students should ideally be entering the University with a minimum of 30 advanced standing credits, and have satisfied the following requirements with course credit or via placement examination:

- MATH 221 Calculus and Analytic Geometry 1
- MATH 222 Calculus and Analytic Geometry 2
- 3-4 units of foreign language

First Year

Fall	Credits	Spring	Credits
STAT 240	4	STAT 340	4
COMP SCI 220	4	COMP SCI 320	4
Communications A complete during first year	3	Ethnics Studies complete within first 60 credits	3
Social Science Breadth	3	Humanities Breadth	3
	14		**14**

Second Year

Fall	Credits	Spring	Credits
Linear Algebra Course	3	Advanced computing course	3
Statistical Modeling course	3-4	Data Science elective	3
Biological Science Breadth	3	Literature Breadth	3
Social Science Breadth	3	Physical Science Breadth	3
Elective	3-4	INTER-LS 210	1
		Elective	3
	15		**16**

Third Year

Fall	Credits	Spring	Credits
L I S 461 (Meets Humanities breadth; 4-credit Communication B section optional)	3-4	Data Science Elective	3
Machine Learning course	3	Literature Breath	3
Science Breadth	3	Science Breadth	3
Social Science Breadth	6	Electives	6
	16		**15**

Total Credits 90

ADVISING AND CAREERS

ADVISING AND CAREERS

Information on group declaration sessions, individual advising appointments, drop-in advising, and contact information for advisors is available on our website (https://stat.wisc.edu/undergraduate-data-science-studies/).

WHAT DO DATA SCIENTISTS DO?

Data scientists are trained to manage, process, model, gain meaning and knowledge, and present data. These skills can be employed in a wide variety of different sectors of employment. Examples of interests of our students include finance, banking, sports analytics, marketing, retail, humanities, psychology, biosciences, healthcare, and consulting, just to name a few. Students are encouraged to combine Data Science with majors, certificates, and courses from differing areas to best be able to apply their data science in the area of their choosing.

Data science is one of the fastest-growing areas of jobs in the United States and in Wisconsin. The Occupational Outlook Handbook (OOH) from the Bureau of Labor Statistics (https://www.bls.gov/ooh/math/data-scientists.htm) shows the job growth outlook from 2023-33 for Data Scientists to be 36% (much faster than average).

Some students may want to continue to develop additional advanced data science skills through graduate education.

DEPARTMENTAL RESOURCES

- Data Science Skills Sheet (https://drive.google.com/file/d/1Srak_e7Arr4XA9WBZ0xiOTPZnIUxPfsE/view/), aka What you can do with your Data Science major
- Career Pathways for Statistics and Data Science Canvas Course (https://canvas.wisc.edu/enroll/3JWLRW/)
- Department of Statistics Student Career Resources webpage (https://stat.wisc.edu/student-career-resources/)

SUCCESSWORKS

SuccessWorks (https://successworks.wisc.edu/) at the College of Letters & Science helps you turn the academic skills learned in your classes into a fulfilling life, guiding you every step of the way to securing jobs, internships, or admission to graduate school.

Through one-on-one career advising, events, and resources, you can explore career options, build valuable internship and research experience, and connect with supportive alumni and employers who open doors of opportunity.

- What you can do with your major (https://successworks.wisc.edu/what-you-can-do-with-your-major/) (Major Skills & Outcomes Sheets)
- Make a career advising appointment (https://successworks.wisc.edu/make-an-appointment/)
- Learn about internships and internship funding (https://successworks.wisc.edu/finding-a-job-or-internship/)

- Try "Jobs, Internships, & How to Get Them," (https://successworks.wisc.edu/canvas/) an interactive guide in Canvas for enrolled UW–Madison students

RESOURCES AND SCHOLARSHIPS

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Helpful resources can be found at scholarships (https://financialaid.wisc.edu/types-of-aid/scholarships/) and the Wisconsin Scholarship Hub (https://wisc.academicworks.com/). Additional information specific to Data Science students can be found on our major webpage (https://stat.wisc.edu/undergraduate-data-science-studies/) and opportunities are regularly sent to declared students via our weekly newsletter.