REQUEST FOR AUTHORIZATION TO IMPLEMENT BACHELOR OF ARTS AND BACHELOR OF SCIENCE DEGREES IN DATA SCIENCE AT THE UNIVERSITY OF WISCONSIN-MADISON PREPARED BY UW-MADISON

ABSTRACT

The University of Wisconsin-Madison proposes to establish a Bachelor of Arts/Bachelor of Science (B.A./B.S.) degree major in Data Science (DS). This program will help meet substantial student interest and rapidly increasing employment opportunities across many fields that seek individuals with data science skills. Students will develop abilities in computational, mathematical, and statistical thinking combined with knowledge to apply these abilities to data-rich problems from a variety of fields. Graduates will be equipped to think critically about data, to employ methods from computer science, mathematics, and statistics to manage, process, and model data, to gain meaning and knowledge from data, and to use data in responsible, ethical ways. This will be a 37-credit major (19 credits of foundational data science and 18 credits of electives) within the 120 credit BA/BS degree Graduates may pursue further education in data science, statistics, applied or computational mathematics, computer science, or related quantitative and computational fields. They may also seek employment as data analysts and data scientists.

PROGRAM IDENTIFICATION

Institution Name
University of Wisconsin-Madison

Title of Proposed Program
Data Science

Degree/Major Designations
Bachelor of Arts and Bachelor of Science

Mode of Delivery
Single institution, face-to-face

Projected Enrollments and Graduates by Year Five

Table 1 represents enrollment and graduation projections for students entering the program over the next five years. By the end of Year 5, it is expected 1014 students will have enrolled in the program and 507 students will have graduated from the program. Enrollment projections are based on recent enrollment and graduation data from the office of Academic Planning and Institutional Research (APIR)[1] and on information provided by Letters & Science Academic Information Management (AIM). Assumptions are: (1) the initial enrollment will be 240 students (initially high, to account for pent-up demand for the program); (2) new student enrollments will increase (from 120) by 20 percent each year for five years; (3) students will

[1] https://dataviz.wisc.edu/views/TrendsinDegreesandRelatedData_0/HomePage

enroll in the major at different stages (25/50/25/0% in the first year and 10/30/40/20% for fr./soph./jr./sr. in subsequent years); (4) 85% of students who enroll will graduate in the degree program; and (5) all attrition will occur in the final year. These assumptions are based on actual undergraduate enrollment numbers in total and by level of student in the Departments of Computer Sciences, Mathematics, and Statistics over the past five years, graduation rates within these majors and those in Chemistry and Physics by students who enrolled between 2009 and 2014, and actual timing of the number of terms prior to graduation (1 or 2) that students typically drop one of these majors. It is assumed that DS students will declare the major slightly earlier in their academic career than current rates in Computer Sciences, Mathematics, and Statistics. Each enrollment number in the table contains a partition of the students by level.

Table 1: Five-Year Degree Program Enrollment Projections

Students/Year	2020–2021	2021–2022	2022–2023	2023–2024	2024–2025
New Students (fr/soph/jr/sr)	240 (60/120/60/0)	144 (14/43/58/29)	173 (17/52/69/35)	207 (21/62/83/41)	250 (25/75/100/50)
Continuing Students (fr/soph/jr/sr)	0	240 (0/60/120/60)	295 (0/14/103/178)	255 (0/17/66/172)	249 (0/21/79/149)
Total Enrollment (fr/soph/jr/sr)	240 (60/120/60/0)	384 (14/103/178/89)	468 (17/66/172/213)	462 (21/79/149/213)	499 (25/96/179/199)
Graduating Students (students leaving)	0	76 (13)	181 (32)	181 (32)	169 (30)

Tuition Structure

For students enrolled in the DS program, standard tuition and fee rates will apply. For the current academic year, residential tuition and segregated fees total $5,277.76 per semester for a full-time student enrolled in (12-18) per semester or $487.48 per credit. Of this amount, $386.39 is attributable to tuition and $101.09 is attributable to segregated fees. Nonresident tuition and segregated fees total $18,402.64 per semester for a full-time student enrolled in (12-18) per semester or $1,581.22 per credit. Of this amount, $1480.13 is attributable to tuition and $101.09 is attributable to segregated fees.

Department or Functional Equivalent

Department of Statistics

College, School, or Functional Equivalent

College of Letters & Science

Proposed Date of Implementation

Fall term, 2020

DESCRIPTION OF PROGRAM

Overview of the Program

The DS program is designed to provide students with the tools necessary to think critically, to compute efficiently, to model effectively, and to behave ethically with data.

All UW-Madison undergraduates must complete the General Education Requirements. In addition to these foundational requirements, L&S students complete L&S BA or BS degree requirements, (including the requirement to complete at least one major) and to complete at least 120 credits to earn the degree. The DS major requires 37 credits. These credits are divided between two areas: foundational data science courses (19 credits) and electives (18 credits). As they complete these requirements, students gain competence in three areas of foundational mathematics: calculus, probability, and linear algebra. Calculus competence is demonstrated by completing a two-semester course sequence or its equivalent. Probability competence is attained in foundational statistical data modeling courses and may be augmented with additional elective credit. Linear algebra competence may be achieved through completing a course where linear algebra is the primary topic.

The DS major is designed as an L&S major that can be completed as a student's sole program of study, but it may also be completed as an "Additional Major" to complement a wide variety of programs for those students who wish to bring data science skills to their primary major or field of specialization. Within L&S, students interested in Data Science may also pursue majors in computational, quantitative, and physical science (e.g., chemistry, computer sciences, mathematics, physics, statistics), biological science (e.g., biology, biochemistry, psychology), social science (e.g., economics, political science, business), or humanities (e.g, philosophy, history, communication arts, journalism).

Finally, like other undergraduate majors offered in L&S, the program may be completed as an "Additional Major" by students earning degrees from other Schools and Colleges, providing students follow all policies and procedures of their home School/College.

This "Data Science Program Committee" (DSPC) will provide oversight for the DS major. This interdisciplinary program committee will be housed in the Department of Statistics, which will provide necessary administrative functions (e.g., student advising, curricular services, and human resources operations for personnel responsible for these functions.) The DSPC will be responsible for decisions about curriculum and courses used to meet requirements, assessment of student learning, and academic program review. The DSPC will be comprised of faculty members appointed by the chair from each of the departments of Computer Sciences, Mathematics, and Statistics, and from the Information School. To ensure good communication with the DS administrative home, the Department of Statistics may also appoint an additional *ex officio* member to serve as a liaison to the departmental curriculum committee. The committee may also include up to four additional members elected from faculty and academic staff who have taught a course in the program, or who have individually advised or mentored DS students within the most recent three years. One or two academic staff advisors will serve on the DSPC as *ex officio* members. The program director will be elected by the DSPC from faculty serving on the committee. Terms of service will be three years and two consecutive terms may be served. Terms will be staggered so that about 1/3 of the positions end or are renewed each year. The

actions and responsibilities of the DSPC will be governed by program bylaws, which are on file with the participating departments and with the College of Letters & Science.

Student Learning Outcomes and Program Objectives

The DS program integrates computational, mathematical, and statistical thinking about data with areas of application to train students to be knowledgeable and competent with all aspects of the data science process, including data acquisition, management, processing, analysis, and communication, while maintaining an ethical approach to the entire process. Students who complete the program will be prepared for a large variety of jobs in companies and organizations that need employees with data science skills. Furthermore, there are pathways through the DS program that can prepare students for graduate work in areas such as applied and computational mathematics, bioinformatics, biostatistics, computer science, statistics, and other related fields.

Students who successfully complete the DS program will:

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; and
6. demonstrate oral, written, and visual communication skills related to data science.

The learning objectives for students in the proposed DS major are consistent with recommendations by the National Academies of Science, Engineering, and Medicine[2].

Program Requirements and Curriculum

There are no specific courses or test scores that must be completed before students can be admitted to this program; that is, students may enroll in the major upon admission to the University as a new freshman, or as a transfer student, or they may declare the major any time prior to completing 86 credits of undergraduate study. The two 200-level required foundational data science courses are open to all students who have satisfied the Quantitative Reasoning-A (QR-A) General Education Requirement. Because some higher level courses require Calculus as a requisite, students will be encouraged to complete Math 114 or an equivalent mathematically focused QR-A course to prepare them for Math 221 (Calculus). The program will inform students about the major through an entry in the Guide, new student advising at SOAR, and participation in campus-wide recruitment activities such as UW Visit Day and the majors fair. Advisors in the program will coordinate with advisors in L&S Academic Advising Services and Cross College Advising Service; information will also be shared with advising units outside L&S, to reach students with an interest toward the program.

As noted above, major requirements are completed in the context of the University-wide General Education requirements and the L&S-specific baccalaureate degree requirements; within

[2] Envisioning the Data Science Discipline: The Undergraduate Perspective, Interim Report.

this L&S context, courses taken in the major may also be used to meet these general degree requirements. Also consistent with other L&S majors, this major governs no more than 60 of the minimum 120 credits required for a BA or BS degree. This format is intended to allow students to pursue breadth of study across the "ways of knowing" essential to undergraduate study in the arts and sciences.

The curriculum includes five foundational data science courses including a two-course data modeling sequence taught in the Department of Statistics (STAT 240 and STAT 340), a two-course data programming sequence taught in the Department of Computer Sciences (COMP SCI 220 and COMP SCI 320), and a data ethics course taught in the Information School (LIS 461). The 18 elective credits must include a course in machine learning, a course in advanced computing, a course in advanced modeling, and a course in linear algebra. It is possible for a single course to satisfy two of these elective category requirements. Calculus (MATH 221 and MATH 222) are requisites to every set of courses that satisfy the major requirements and MATH 234 is a requisite to most, but not all linear algebra elective courses.

Table 2 illustrates the curriculum for the proposed program. The major requirements comprise 37 credits of a 120 credit baccalaureate program.

Table 2: BA or BS in Data Science Program Curriculum	
DATA SCIENCE MAJOR REQUISITE MATHEMATICS COURSES	
Calculus I: MATH 221 (included as part of University General Education QR-B, discussed above)	4 credits
Calculus II: MATH 222, requisite for all linear algebra courses	4 credits
Calculus III: MATH 234, requisite for many linear algebra courses	0-4 credits
DATA SCIENCE MAJOR REQUIREMENTS	**37 Credits**
Core: Data Science Foundations	**19 credits**
STAT 240 Introduction to Data Modeling I	4 credits
STAT 340 Introduction to Data Modeling II	4 credits
COMP SCI 220 Data Programming I	4 credits
COMP SCI 320 Data Programming II	4 credits
LIS 461 Data & Algorithms: Ethics & Law	3 credits
Beyond the Core: Data Science Applications	**18 credits**
Machine Learning: E C E COMP SCI M E 532 Matrix methods in machine learning *or* COMP SCI 539 Intro to Neural Networks *or* COMP SCI 540 Introduction to Artificial Intelligence	3 credits
Advanced Computing: COMP SCI 400 Programming III *or* COMP SCI 412 Introduction to Numerical Methods *or* STAT COMP SCI 471 Introduction to Computational Statistics *or* MATH COMP SCI 513 Numerical Linear Algebra *or* COMP SCI MATH 514 Numerical Analysis *or* COMP SCI E C E I SY E 524 Introduction to Optimization *or* COMP SCI 564 Database Management Systems: Design and Implementation	3 credits
Statistical Modeling:	3 credits

STAT MATH 309 Introduction to Probability and Mathematical Statistics I *or* STAT MATH 310 Introduction to Probability and Mathematical Statistics II *or* STAT 311 Introduction to Theory and Methods of Mathematical Statistics I *or* STAT 312 Introduction to Theory and Methods of Mathematical Statistics II *or* STAT 349 Introduction to Time Series *or* STAT 351 Introductory Nonparametric Statistics *or* STAT 421 Applied Categorical Data Analysis *or* STAT ME 424 Statistical Experimental Design *or* MATH 431 Introduction to the Theory of Probability *or* STAT 456 Applied Multivariate Analysis *or* STAT 461 Financial Statistics *or* MATH 531 Probability Theory *or* MATH 632 Introduction to Stochastic Processes *or* MATH 635 An Introduction to Brownian Motion and Stochastic Calculus	
Linear Algebra: MATH 320 Linear Algebra and Differential Equations *or* MATH 340 Elementary Matrix and Linear Algebra *or* MATH 341 Linear Algebra *or* MATH 375 Topics in Multi-Variable Calculus and Linear Algebra *or* E C E COMP SCI M E 532 Matrix methods in machine learning (Note that E C E COMP SCI M E 532 may count for both machine learning and linear algebra electives requirements.)	0 – 3 credits
Electives in the Major: Any course over and above what is required above, plus any of: E C E 203 Signals, Information, and Computation *or* I SY E 323 Operations Research-Deterministic Modeling *or* I SY E 412 Fundamentals of Industrial Data Analytics *or* COMP SCI I SY E MATH 425 Introduction to Combinatorial Optimization *or* I SY E 512 Inspection, Quality Control, and Reliability *or* COMP SCI I SY E MATH STAT 525 Linear Programming Methods *or* COMP SCI E C E 533 Image Processing *or* COMP SCI 559 Computer Graphics *or* COMP SCI B M I 567 Medical Image Analysis *or* I SY E 575 Introduction to Quality Engineering *or* COMP SCI B M I 576 Introduction to Bioinformatics *or* COMP SCI 577 Introduction to Algorithms *or* I SY E 612 Information Sensing and Analysis for Manufacturing Processes	6-9 credits to achieve 37 credits in the major
Residence & Quality of Work in the Major: 2.000 GPA in all major courses 2.000 GPA on at least 15 Upper-Level credits in the major (LIS 461 and any course taken beyond The Core are considered Upper-Level) 15 credits in major courses taken on the UW-Madison campus	
DEGREE TOTAL	**120 credits**

Assessment of Outcomes and Objectives

The assessment strategy for this program will rely on evidence provided by student work, from foundational and elective course assignments with direct relevance to learning objectives. Post-degree outcomes and attainment of career and academic objectives will also be surveyed. During implementation, the program committee will also monitor course access and capacity to meet student demand. These data will inform program, course and instructional design.

Data collection for the annual review will be orchestrated by the DS program chair with support from the DS program committee and Statistics faculty and staff. Data collection for the annual review will include (a) a review of key assignments from the foundational DS courses

and selected elective courses using a rubric designed around the program learning goals; (b) review of student evaluations of teaching for the most recent academic year; (c) an annual graduating student survey; (d) a periodic comprehensive alumni survey.

In consultation with the DS committee, the chair will prepare an annual report including data summaries and recommendations for program improvement. An abbreviated report will be provided to the Office of the Provost, in accordance with UW-Madison institutional guidelines on student learning assessment[3]. Committee members will serve as liaisons to the participating departments in reviewing and implementing recommended changes to the program. Assessment reports will contribute to the more extensive reviews of program outcomes that will occur after 5 years and then at 10-year (maximum) intervals, as part of the Academic Program Review Process.

Assessment Plan

Desired Learning Outcome	Method for Assessing Learning (direct methods are italicized)	Timetable for Assessment Activity
Goal 1: integrate foundational concepts and tools from mathematics, computer science, and statistics to solve data science problems	1. course material review 2. *evaluation of student work*	1. every 3 years, 2. every 3 years
Goal 2: demonstrate competencies with tools and processes necessary for data management and reproducibility	1. course material review 2. *evaluation of student work* 3. job continuing education placement data 4. graduating student survey 5. comprehensive alumni survey	1. every 3 years 2. every 3 years 3. yearly 4. yearly 5. every 5 years
Goal 3: produce meaning from data employing modeling strategies	1. course material review 2. *evaluation of student work*	1. every 3 years 2. every 3 years
Goal 4: demonstrate critical thinking related to data science concepts and methods	1. course material review 2. *evaluation of student work*	1. every 3 years 2. every 3 years
Goal 5: conduct data science activities aware of and according to policy, privacy, security and ethical considerations	1. *evaluation of student work* 2. graduating student survey	1. every 3 years 2. yearly

[3] See https://assessment.provost.wisc.edu/institutional-plan-for-assessing-student-learning/

Goal 6: demonstrate oral, written and visual communication skills related to data science	1. *evaluation of student work*	1. every 3 years

Diversity

Science, Technology, Engineering and Mathematics (STEM) fields, such as Data Science, have historically been and are currently lacking in representation of underserved populations. This includes both ethnic minorities and women. Here is a table showing spring graduation (2016-2018) and percentage of minorities and women for the undergraduate statistics, computer sciences, and mathematics majors at UW-Madison.[4]

Major	Total	URM %	Female %
Statistics	112	8.93%	50.00%
Computer Sciences	676	13.02%	14.35%
Mathematics	438	8.22%	34.25%

Increasing representation of women and minorities in the DS major will be important. The DS major plans to partner with a number of existing programs on campus to help move this initiative forward. These include:

- working directly with programs through UW-Madison's Division of Diversity, Equity, and Educational Achievement (DDEEA) to make students aware of the major and discuss ways to make the major an inviting program for students;
- encouraging and reaching out to students participating in Wisconsin Emerging Scholars (WES) both through mathematics and computer sciences;
- offering STAT 240 and or COMP SCI 220 in a summer program specifically for underrepresented minorities;
- working with units like the Center for Academic Excellence (CAE) and other programs that focus on student success for diverse groups of students; and,
- outreach to Wisconsin high schools with high underrepresented minority populations about opportunities in data science at UW-Madison.

The first and second year DS courses have only QR-A prerequisites and can be taken prior to calculus. It is expected that this will help attract students, who might otherwise be disinclined to pursue a STEM major to start exploring the field. Indeed, through these early DS courses, students will be given the opportunity to begin developing practical skills in data analysis and discovery with minimal background and, in the process, may be motivated to pursue the necessary requirements to advance further in data science. Students who need assistance to build skills in calculus will have access to college-supported tutorial programs and other resources.

[4] Information taken from https://registrar.wiscweb.wisc.edu/wp-content/uploads/sites/36/2017/09/report-degree-diversity-major-fiscalyear-term.pdf

A growing concern about the field of data science is ethical practices in data science and the ethical use of data. Some of these concerns can relate to issues such as low samples of certain populations or human biases appearing in machine learning applications. The requirement of LIS 461 will encourage open discussions around these and other complex social issues.

Faculty recruitment into this program will follow campus recommendations for ensuring diverse pools from which qualified candidates are selected. Per College of Letters & Science Policy, search committee chairs participate in training sponsored by the Women in Science and Engineering Leadership Institute. WISELI is a national leader in Higher Education, conducting research and education concerning evidence-based practices for conducting searches in an environment that understands and minimizes implicit bias. The College also participates in, and benefits from, campus-wide faculty diversity initiatives, including "Target of Opportunity" hiring programs that encourage departments to be strategic in seeking out promising new faculty. Other campus programs that support faculty diversity develop the recruitment pipeline, provide salary and other supplemental support to encourage hiring a diverse faculty, and supporting faculty research and teaching in areas related to diversity and inclusion. Finally, because the program is designed to leverage the interests of students across many disciplines where the acquisition, analysis, and responsible stewardship of data are increasingly important, the program and steering committees are expected to be not only to be inclusive of the diversity of disciplinary thought available through these connections, but also inclusive of the diverse array of faculty in those disciplines.

Collaborative Nature of the Program

The DS major will be a collaboration of four UW-Madison departments – Statistics, Math, Computer Science, and Information School. This program is limited to UW-Madison, and will not involve collaboration with other UW System institutions.

Projected Time to Degree

The DS major is designed to be completed in four years by full-time students. DS core courses will be offered on a regular schedule with enrollment priority given to declared majors. The DS major, as required by all L&S majors, will have an example 4-year plan available in the Guide. Students who choose to pursue the degree part-time, who may need additional time, or who wish to pursue an accelerated time-to-degree will work with the DS major advisor to outline a plan that accounts for individual need and timely progress toward completion of the degree.

Program Review

Consideration of assessment information will be will be initiated by the DSPC chair annually, with assistance from the committee; this work will be incorporated into program reviews that are conducted every ten years. Like other new programs, the DS major will undergo an initial, formal program review (chaired by a member of UW-Madison's University Academic Planning Council) approximately five years after the implementation date (i.e., during the 2025-26 academic year), followed by regular reviews initiated by the dean, to be conducted at 10-year intervals. These regular program reviews will follow UW-Madison's Academic Program Review Guidelines, which include the preparation of a self-study by program faculty, a site visit by a

review committee comprised of university faculty and (optionally) outside experts, and a written report from the review team with recommendations to be shared with the dean and with program faculty. (These processes and procedures are familiar to faculty and staff in Mathematics, Computer Sciences, Statistics, and the Information School, all of which have been reviewed in the past five years.)

Similar to the annual review, the committee will take the lead in addressing recommendations arising from these periodic formal reviews and will act as liaisons to the participating department chairs, as needed, to implement changes to program policies and practices.

Accreditation

There are no special accreditation requirements for this program.

JUSTIFICATION

Rationale and Relation to Mission

The BA BS in DS will contribute directly to the mission of the UW System[5] by developing students who will "serve and stimulate society" by gaining "scientific, professional and technological expertise, and a sense of purpose." The UW-Madison mission[6] states that students will learn to "discover, examine critically, preserve and transmit the knowledge, wisdom and values" and will "develop an understanding and appreciation for the complex cultural and physical worlds in which they live". The proposed BA BS in DS program supports the institutional mission of UW-Madison by educating students who will develop the knowledge and technical skills to critically examine data in an ethical manner to better understand the world, the environment, and society, and to communicate to others the meaning produced through the full data science process.

Additionally, the DS major speaks directly to a number of points in the UW-Madison Chancellor's Strategic Framework 2015-2019[7] including the goals to "promote the application of research and teaching to issues of importance for the state, the nation, and the world," "place learning and discovery in the service of political, economic, social, and cultural progress," "leverage our distinctive interdisciplinary strength to address complex problems in the state and the world," and "scale Wisconsin Experience opportunities through innovative classroom environments and active learning, locally and globally, to prepare students for successful careers and lives." 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."[8]

Support has been expressed by participating departments, colleges across the university, the Chancellor, and other leaders at UW-Madison.

Institutional Program Array

[5] https://www.wisconsin.edu/about-the-uw-system/#missions
[6] https://www.wisc.edu/about/mission/
[7] https://chancellor.wisc.edu/strategicplan2/
[8] https://kb.wisc.edu/page.php?id=10452

At UW-Madison, the undergraduate major programs most closely aligned with the proposed DS major are Computer Sciences and Statistics. However, neither major requires the combination of courses across the full range of topics that a data scientist should learn. Several of our peer institutions, including UC Berkeley, Michigan, Purdue, and Penn State recently have added undergraduate majors in data science.

The Department of Statistics will serve as the home of the DS major, but the DSPC with membership from multiple departments takes responsibility for offering a high-quality program. The DS major will leverage existing campus coursework and expertise in foundational and advanced mathematic courses. New foundational data science courses have been developed within Computer Sciences, the Information School, and Statistics and these departments, as well as the Department of Mathematics, are working to develop additional elective courses to add to the array of options. Additional upper-level electives will come from a wider range of departments including Electrical and Computer Engineering, and Industrial and Systems Engineering to start. A number of these courses already exist or are in the process of going through the course proposal process after being offered as special topics courses for a number of semesters. Furthermore, the DSPC will evaluate and approve new additional elective courses from across campus that involve the application of data science tools and methods in a wide variety of domain areas as the DS major evolves. By developing these new foundational courses and pairing them with existing and newer electives, the DS major will prepare students to meet the growing demand for expertise in data analytics in all sectors of employment.

Other Programs in the University of Wisconsin System

Within the UW System, UW-River Falls has an undergraduate program in Data Science and Predictive Analytics. UW-Stevens Point has an undergraduate program in Data Analytics. UW-Platteville has recently circulated a Notice of Intent to Offer an undergraduate major in Data Science. With the intense demand and interest in data science and the employment opportunities for graduates, the creation of multiple new undergraduate programs in data science and related fields across the UW System, tailored for the specific needs of students at each institution, is warranted.

Need as Suggested by Current Student Demand

Demand for a major and expertise in DS is very high. The growing demand from students for skills in the quantitative and computing fields is evident from the growth of enrollment in majors such as Computer Sciences, Mathematics, and Statistics in the past few years[9]. The following table shows declared students in the fall for the past five years (2014-2018) during which time annual enrollments by major increased on average between 14 and 34 percent.

Major	2014	2015	2016	2017	2018
Computer Sciences	495	684	1052	1315	1565
Mathematics	322	313	363	455	547
Statistics	122	127	128	189	294

[9] https://dataviz.wisc.edu/views/TrendsinStudentEnrollments/Degree-MajorEnrollmentComparison. Note that the Information School does not offer an undergraduate major at this time.

The goal is to offer a DS major that meets the desire from both students and employers to provide training to prepare students to enter the field. The understanding is that the new DS major will attract students who might have otherwise declared Computer Sciences, Mathematics, or Statistics, but the program is also expected to attract students that might not otherwise have considered majoring in a STEM discipline. Furthermore, many students are anticipated to use the DS major to add to and enrich study in an existing major. Enrollments in Computer Sciences and Statistics may decline, but overall enrollments in these majors, plus that of the new DS major, is expected to increase.

In Fall 2018, several years after the creation of a campus-level Division of Data Science and the establishment of a new introductory data science course that enrolls over 1000 students per year, UC Berkeley launched a new major in data science with an initial enrollment of 780 students.[10] Many other institutions are also responding to demand by creating new undergraduate data science programs.

Need as Suggested by Market Demand

Data science is one of the fastest growing area of jobs in the nation and in Wisconsin. Data Scientist is the #1 job on the web site Glassdoor[11] with over 27,000 jobs[12] listed. Monster.com[13] lists over 18,000 jobs in data science nationally. Indeed.com has over 270 job listings for data scientists[14] and over 1,200 jobs for data analysts[15] just in the state of Wisconsin. (All counts of job listings are from March 14, 2019.)

Additionally, the Occupational Outlook Handbook (OOH) from the Bureau of Labor Statistics shows the job outlook in the period 2016-26 for Mathematicians and Statisticians to be 33% (much faster than average)[16] and for Computer and Information Research Scientists to be 19% (much faster than average)[17]. There is no specific category titled Data Scientist in the OOH.

[10] https://data.berkeley.edu/news/uc-berkeleys-data-science-major-takes
[11] https://www.glassdoor.com/List/Best-Jobs-in-America-LST_KQ0,20.htm
[12] https://www.glassdoor.com/Job/data-scientist-jobs-SRCH_KO0,14.htm
[13] https://www.monster.com/jobs/search/?q=data-scientist
[14] https://www.indeed.com/jobs?q=data+scientist&l=Wisconsin
[15] https://www.indeed.com/jobs?q=data+analyst&l=Wisconsin
[16] https://www.bls.gov/ooh/math/mathematicians-and-statisticians.htm
[17] https://www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm