

Notice of Intent – M.S. in Data Science

University of Wisconsin–Milwaukee

Name of the proposed program: Master of Science in Data Science

Institutional setting: The degree will be housed in the Graduate School.

Mode of delivery: Face-to-face

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Program and Learning Outcomes

The core objective of the MS in Data Science is to prepare students for careers in data science in multiple fields. The program is designed so that students start with required foundations if they do not have them already. They then progress through seven areas of data science (described in more detail below) each involving distinctive learning outcomes. In a unique feature of this degree, the last of these seven areas named *Specialized Skills in Data Science for Specific Applications and Fields* students have the opportunity to pursue analytics electives related to their primary discipline of interest via courses offered in multiple disciplines including business, biological sciences, computer science, geography, sociology, among others.

The overall targeted outcome of the program is to develop graduates who will

- Apply the concepts of data science inter-disciplinarily to problems in a variety of fields and industries.
- Be equipped to pursue a data science oriented career path in the discipline that they are passionate about such as art, anthropology, atmospheric sciences, biology, business, cinema, criminal justice, design, education, engineering, film, geography, and healthcare to name a few.
- Appreciate and abide by ethical uses of data and insights from the use of data science.

Contents of the Program

Students applying to the program are expected to have proficiency, demonstrated through coursework, exams and/or a portfolio, in the following: Linear Algebra (3 credits), Multivariable Calculus (4), Statistics (3 credits), and Computer Literacy (6 credits). Those without these proficiencies may be admitted when they have only 6 credits remaining to be completed, but those 6 credits do not count towards the MS.

The degree itself consists of 30 credits in all composed of the following areas: 1. Developing insights from data, for applications (3 Credits) 2. Organizing and maintain large data sets. (3 Credits) 3. Methods like AI, and Machine Learning to extract insight from Data (3 Credits) 4. Knowledge and skills for using

probabilistic methods to analyze uncertainty in data and develop insights (3 credits) 5. Advanced Programming for Data Collection and Data Science (3 Credits) 6. Understand the importance of, and skills for, the ethical use of data (3 Credits) 7. Specialized Skills in Data Science for Specific Applications and Fields (12 Credits)

Resources

Courses in this program will not require new resources as the proposed degree comprises courses that are currently offered by different Departments and Colleges at UWM. Resources would however be required for administrative and advising services associated with the degree. Administration of, and advising for, the degree will be by a Faculty Oversight committee consisting of graduate faculty from Colleges and Departments whose courses are part of the program. The Faculty Oversight Committee will select on an annual basis a Program Director from amongst its members. Advising staff would be added on an as needed basis. The committee will appoint the Director and the Advisor(s). The committee's decisions related to the program will be transmitted to the Dean of the Graduate School. The Dean of the Graduate School would then transmit the decisions to the Graduate Curriculum Committee (GCC).

Alignment with institutional mission

The proposed program responds to the following aspects of UWM Select Mission Statement, which can be found at <https://uwm.edu/mission/>:

To fulfill its mission as a major urban doctoral university and to meet the diverse needs of Wisconsin's largest metropolitan area, the University of Wisconsin–Milwaukee must provide a wide array of degree programs [...]. Fulfilling this mission requires the pursuit of these mutually reinforcing academic goals:

- *To develop and maintain high quality undergraduate, graduate and continuing education programs appropriate to a major urban doctoral university.*
- *To attract highly qualified students who demonstrate the potential for intellectual development, innovation, and leadership for their communities.*
- *To further academic and professional opportunities at all levels for women, minority, part-time, and financially or educationally disadvantaged students.*
- *To promote public service and research efforts directed toward meeting the social, economic and cultural needs of the state of Wisconsin and its metropolitan areas.*
- *To provide educational leadership in meeting future social, cultural, and technological challenges.*

The proposed program advances these goals by providing students with the unique knowledge and skills needed in the data science profession. Theoretical knowledge and practical skills are provided in a discipline-agnostic manner, allowing students to translate and apply this material to a wide variety of disciplines and applications. This unique approach will increase their appeal to employers in multiple industries and also ensures that the graduates are flexible and able to practice in several disciplines throughout their career, boosting their employability and adaptability.

Need for the program

Market demand

A report from the employment outlook firm Burning Glass produced jointly with IBM and the Business Higher Education Forum identified several job categories in the data analytics field, including data driven decision makers (“leverage data to inform strategic and operational decisions”) and functional analysts (“utilize data and analytical models to inform specific functions and business decisions”). They estimated a national demand of 1.8 million job postings nationwide for 2020, with a 5-year growth rate of approximately 15%. Importantly, the report also states: “39% of Data Scientists and Advanced Analysts require a Master’s or Ph.D. These degrees take additional years of schooling to complete, so it will take a significant time investment to train a larger pool of workers. Therefore, because these roles are already undersupplied and projected to grow rapidly, the skills shortage is in danger of worsening.”

The Bureau of Labor Statistics (<https://www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm>) also projects that *Computer and Information Research Scientists* category of jobs will grow 15% over the 2019-2029 period and describes this as: “...much faster than average for all occupations. Job prospects are expected to be excellent” and states that the “median annual wage for computer and information research scientists was \$126,830 in May 2020.” BLS also classifies this as a category in which most jobs require a Master’s degree.

Additional evidence of demand is also seen in investments made by employers like Northwestern Mutual that have invested significant resources of \$15 million in the establishment of the Northwestern Mutual Data Science Institute to support the launch and growth of undergraduate and graduate programs related to data including data science and data analytics.

Similar programs in the system and the region

There is only one Master’s degree in Data Science currently being offered through the UW Data Science Collaborative program at UW-Eau Claire, UW-Green Bay, and UW-La Crosse. The degree however focuses on different areas of data science like data mining and visualization and does not include applications to specific disciplines. On the other hand, our program aims to provide multi and inter-disciplinary training. Such training is increasingly sought by employers and advocated by scholars. A workshop convened by the National Research Council’s *Committee on Applied and Theoretical Statistics; Board on Mathematical Sciences and Their Applications; Division on Engineering and Physical Sciences* (<https://www.ncbi.nlm.nih.gov/books/NBK299101/>) recommends that academic data science and data analytics programs should be designed to be inter-disciplinary all through and also foster collaborative skills. This proposed program is thus designed to be consistent with employer needs and recommendations by national scholars and also does not create unnecessary duplication.