Introducing the Multi-Disciplinary Data Science (MDaS) S-STEM Scholarship Program

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Abstract

The Multi-Disciplinary Data Science (MDaS) program assists with filling the growing demand for multi-disciplinary STEM base data science skills by supporting underrepresented minority students with scholarships and professional development activities. The goals of the MDaS program are 1) to establish recruitment and retention programs for the new data science majors and other related STEM disciplines, 2) engage MDaS students in immersive preparation for retention initiatives, 3) engage MDaS students in professional development initiatives, and 4) evaluate program components on the enrollment and graduation of the students. This extended abstract and presentation will provide an overview of the program and its planned initiatives.

Keywords

faculty paper, scholarship program, STEM, data science

Introduction

The demand for STEM-trained professionals with data science skills is booming. STEM-related companies recognize that firms with effective data science capabilities have a significant market advantage. The ability to draw insight from enormous volumes of data helps these companies make effective, time-critical decisions. STEM graduates who can independently apply their critical content knowledge using data analytic models can better identify developmental efficiencies or market advantages. Such insight is fueling a growing demand for STEM graduates with data science training. Recently, data science, considered to be a multidisciplinary STEM-related field, was identified by the Association for Computing Machinery (ACM), the Institute of Electrical and Electronics Engineers (IEEE), and the Institute for Operations Research and the Management Sciences (INFORMS) as one of the top degrees needed for the next decade. As STEM innovation is increasingly driven by data science, training STEM students in data science is critical to keeping our nation's STEM industries globally competitive.

The University of Arkansas (UA) is positioned exceptionally well to provide a viable and sustainable solution to the shortage of professionals with data science skills, as well as help companies drive new business innovations using data science research. Currently, the UA is offering an undergraduate minor in data analytics and a new undergraduate degree in data science to meet this demand. This growing eco-system for data science at the UA and within the Northwest Arkansas community forms the basis for the development of the Multi-Disciplinary Data Science (MDaS) S-STEM Scholarship Program to increase the awareness and success of underrepresented minority STEM students of career opportunities in data science.

Overview of the Program

The MDaS initiatives, many adapted from current College of Engineering activities, are based firmly in empirical evidence, having been shown to increase retention and graduation rates for low-income and other underrepresented students. Key areas that inform the MDaS design include: peer bonding (e.g., social support systems, inclusion activities), academic support systems (e.g., learning communities, tutoring, mentoring), professional advising, and financial support (to decrease need for concurrent employment and to increase participation in unpaid internships, research opportunities, and study abroad programs). The MDaS program incorporates many of these components into an academic and professional program housed within a collaborative learning community, which coordinates academic support, social learning support systems, professional development, and mentoring.

Besides a scholarship, the key initiatives of the MDaS program include:

- A data science bootcamp experience that immerses students in data science concepts and methods prior to engagement with courses and faculty. The bootcamp covers topics such as what data scientists do, the kinds of problems they solve, extracting data from databases, and working with Python libraries. In addition, the bootcamp provides students introductory exposure to methods used in data science such as regression analysis, clustering, and classification.

- Student mentoring from each other, with faculty and with industry partners. Mentoring activities will include engagement with data science faculty on career and research opportunities, meetings with industry representatives to discuss career opportunities, and peer engagement within social settings.

- A data science speaker series hosted during the academic year. The series provides students and faculty with a better understanding of data science from an industry perspective. Business and industry leaders will share their experiences, concerns, and future analytics objectives, while also sharing insight regarding the future job market within their industries. The Speaker Series provides MDaS students an important opportunity to develop industry contacts, critical to their professional development.

Summary and Future Plans

The MDaS program accepted eight students during its first recruiting session. During the upcoming year students will participate in the MDaS bootcamp, mentoring activities, and speaker events. During subsequent years of the 4-year program, a total of 29 students will be recruited and provided scholarships.

The MDaS program will collect data on student perceptions about careers in data science and the barriers they face. The two primary research questions include:

Research question 1: Do students' perceptions of their math-related ability, DS utility value, interest in DS, and their theory of intelligence beliefs predict enrollment, performance, retention, and graduation in the DS coursework series?

Research question 2: Does participation in MDaS activities (academic and professional) account for increased variability in retention, course success, graduation rates, and career/advanced study outcomes beyond personal and academic background variables?

This study will also include the monitoring of participation in MDaS activities for both MDaS students and non-MDaS students enrolled in the data science program and a sample of students enrolled in the primary STEM programs in which most data science students reside. Participation in activities will be used to identify a model that can account for variability in retention and graduation of low-income MDaS students versus low-income non-MDaS students and other underrepresented minority (URM) and non-URM student groups in similar STEM programs.

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References

None

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Dr. Pohl is a Professor and Head of the Industrial Engineering Department and holder of the 21st Century Professorship at the University of Arkansas. He has participated and led reliability, risk and supply chain related research efforts at the University of Arkansas. Before coming to Arkansas, Ed spent twenty-one years in the United States Air Force where he served in a variety of engineering, operations analysis and academic positions during his career. Ed received his Ph.D. in Systems and Industrial Engineering from the University of Arizona. He holds a M.S. in Systems Engineering from the Air Force Institute of Technology, and M.S. in Reliability Engineering from the University of Arizona, an M.S. in Engineering Management from the University of Dayton, and a B.S. in Electrical Engineering from Boston University. Ed is the Co-Editor of the Journal of Engineering Management, on the Editorial Board of the IEEE Transaction on Technology and Engineering Management, Military Operations Research Journal, and Systems. Ed is an Associate Editor for IEEE Transactions on Reliability and the Journal of Risk and Reliability. Ed is a Fellow of Institute of Industrial and Systems Engineering, a Fellow of the Society of Reliability Engineers, a Fellow of the American Society of Engineering Management, a Senior Member of IEEE and ASQ, a member of INCOSE, INFORMS, ASEE, MORS and AHRMM.

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