Data Science and Analytics at Bowie State University

Bowie State University (BSU), the first Historically Black Institution in Maryland, offers undergraduate and graduate programs with a focus on Science, Technology, Economics, Nursing, Business, and Teacher Education. Bowie State University's College of Business (CoB) offers programs in Accounting, Finance, Economics, Management, Marketing, Public Administration, Business and Information Systems, Master's in Business Administration, Human Resources Development, MS Management Information Systems (MIS), and now, Data Analytics. The Bachelor of Science in Business Administration Data Analytics Concentration is located in the Management Information Systems Department, home to the Business Information Systems Concentration, Master of Science in Information Systems (MSMIS), MS in Information Assurance (MSIA), and Graduate Certificate in System Analysis. The MSMIS program, which consists of 36 semester credit hours, offers three tracks: Data Analytics, Information Systems Security, and Enterprise Information Systems; and one concentration: Information Assurance. The MIS programs are classified as STEM and prepare students to become IT and information system analysts, Business Intelligence (BI) Analyst, Data Analytic Specialist, Data Architect, Information Systems Architect, etc. In addition, the MSMIS with Information Assurance concentration (MSMIS-IA) prepares students for professional careers in information and cyber security.

Data Science and Analytics Initiatives

History: In 2017, after discovering that no program at BSU existed, which brought together all elements of knowledge, skill, and abilities (KSA) needed for data science and analytics (DSA), a team of faculty from Economics, Information systems, and Natural Sciences submitted an NSF Targeted Infusion Projects proposal. In 2018, NSF funded the program for about $400K. During the preparation of the project, we recognized that there were several courses and programs across campus using statistics, research, data, analytics, and information technology for answering questions, addressing problems, and seizing opportunities for innovation and entrepreneurship. We also recognized that faculty involvement and ownership are critical for the success of the initiative. Furthermore, through a review of previous literature, we identified that competencies-based learning is the appropriate pedagogy for DSA. Considering all these factors, we developed a comprehensive framework for DSA education and training. The framework closely ties in expertise and guidance from DSA professionals from industry and government and educators who are members of the Advisory Board. Our active faculty learning community of BSU faculty campus-wide worked to develop DSA modules and courses to deliver DSA competencies in existing and new courses. Overall, this framework guided BSU to create five modules, several new courses, research opportunities, and two new academic programs: Area of Concentration in Data Analytics within BS in Business Administration Program and an Upper-Division undergraduate certificate in Data Analytics (UDC-DA) open to students in any major.

Education: During Fall 2021, we began offering Data Analytics Concentration within BS in Business Administration program in Fall 2021 and submitted the Upper Division Data Analytics Certificate (UDC-DA) program proposal for approval by Maryland Higher Education Commission (MHEC) in July 2021. The UDC-DA program is comprised of four 300 and 400 level courses covering data management and processing, data visualization, and data analytics for problem-solving and decision science and analytics. Both programs begin with the Fundamentals of Data Sciences and Analytics (DANL 280) course, which can be satisfied as a general education elective course for any major. The Data Analytics concentration requirements include four required courses, a capstone course, and two elective courses, i.e., a total of 8 three-credit courses (24 credit hours). The four required courses include programming, data processing and management, visualization, decision and analytics, and big data analytics. This Upper-Level Certificate is open to any undergraduate major at Bowie State University.

Research: Ten students with seven mentors in the 2019 Summer semester and ten students with eleven mentors in the 2020 Summer semester participated in the undergraduate research program with DSA. The program engaged students in broad research knowledge, workshops, and presentations. Due to the impact of COVID-19, the Summer 2020 program was virtual. Mentors and mentees continued to connect and work toward their research project 40 hours per week. Students engaged in weekly professional development workshops that covered a variety of areas and participated in bi-weekly research presentation preparation meetings. The student research symposium and the workshops for the 2020

semester were held virtually via a video-conferencing platform that broadcasts to a public audience to share this information. Some of the research topics are listed below.

Research Topics
Summer 2019
Tech Stock Returns and Empirical Analysis of CAPM – Finance
Migration Habits of Single Female-Headed Households in the U.S.: Evidence from the American Housing Survey
Using Data Analytic Tools to Identify Genetic Variation in Diabetes between African-Americans and Caucasian-Americans – Biology
Studying Genetic Variation in Lupus between Ethnic Groups Using Data Science – Biology
Identifying Differences in Wild Dolphin Whistles during Feeding Behavior – Biology
Applying Machine Learning to Classify Player Importance in the NBA - Information Systems
Summer 2020
Uncovering Ethnic Disparities in RSV Infections – Biology
Using Data to Understand the Impact of COVID-19 on the Creation and Destruction of the Small and Medium Enterprises in the United States - Economics
Stock Price Reaction to the Announcement of Mergers and Acquisitions – Finance
The Linkage Among Industries and Service Sectors Within Prince George County and Their Contribution to it's Economic Growth – Economics
COVID-19's Effect on Economically Vulnerable Communities - Information Systems

Opportunities: Some of the significant opportunities garnered from this journey include creating improved curricula across disciplines. Several courses in Biology, Psychology, Information Systems, Accounting, Finance, Economics, Marketing, and Management programs, now offer our DSA modules to students. Access to DSA skills through module infusion and research has provided our students better internship and placement opportunities. It provided opportunities for faculty to innovate and advance their teaching, services, and scholarships- grants and research. For example, two CoB Faculty received $10K to 15k DSA awarded funding from Price Water Cooper (PWC). A Biology faculty submitted and won a 300K DSA grant proposal from NSF. Three other CoB faculty members received a 560K contract from the State of Maryland Behavioral Health to develop a data collection and reporting system to address the opioid crisis.

Challenges: Some of the major challenges we have faced in this journey are a sustainable organizational structure and a willingness from other disciplines to embrace the interdisciplinary nature of Data Science and Analytics. There also have been challenges from the top to mandate the necessary resources to create and lead multi-disciplinary DSA programs and activities. Obtaining faculty buy-in and collaboration with other faculty across disciplines was not easy. Creating a DSA faculty learning community and providing financial incentives from the grant has helped ensure faculty contributions in the development and delivery of modules and courses, participating in workshops, mentoring students in research that uses DSA, etc. The course and program approval process can take a long time at BSU. However, this challenge was minimized because many of our DSA faculty learning community (FLC) members also sat on various curriculum committees, which reviewed and approved our proposals. Finally, marketing the new Data Analytics program and recruiting students during the COVID-19 period has also been challenging.

Sustainability: The sustainability of the DSA curriculum is assured through the integration of DSA in the curricula across programs and colleges through modules infusion, new DSA courses, and the two academic programs. FLC members are also advocates for DSA in their respective programs and colleges. To assist with faculty funding and research involving DSA, BSU will be establishing a Center for Data Analytics. The vision for the Center is to be an interdisciplinary hub in the State of Maryland (particularly for Prince Georges and Baltimore Counties) to assist minority and disadvantaged communities through data-driven research and workforce development.

Translating into Societal Impact: The DSA team identifies and addresses community problems and opportunities through DSA research, providing consulting and contract services in DSA, currently working with the State of Maryland's Department of Behavioral Health to address the opioid crisis. Undergraduate student research, Senior level, and Capstone course projects also uniquely focus on studying and addressing problems and opportunities related to communities of color. In addition, the development of the Center for Data Analytics to garner future funding and support will ensure that the State of Maryland and the communities of Prince Georges and Baltimore Counties will have a path toward greater economic sustainability through data-driven decision making.