MORGAN STATE UNIVERSITY
GROWING THE FUTURE, LEADING THE WORLD

Office of the President

August 16, 2021

The Honorable Dr. James D. Fielder, Jr.
Maryland Higher Education Commission
6 N. Liberty Street, 10th Floor
Baltimore, MD 21201

Dear Dr. Fielder,

On behalf of Morgan State University, please find attached a new academic program proposal to establish the *"Master of Science in Data Analytics and Visualization"* which was approved by the Board of Regents earlier this month.
If additional information is required, please contact me via David.wilson@morgan.edu or (443)885-3200.

Sincerely,

DocuSigned by:
0BE74CEB701B4CE...

Dr. David Kwabena Wilson
President

cc: Dr. Patricia Williams-Lessane, Associate Vice President for Academic Affairs, MSU
Dr. Farzad Moazzami, Associate Vice President for Academic Affairs, MSU
Dr. Fikru Boghossian, Dean, Graves School of Business and Management, MSU
Dr. Emily Dow, Assistant Secretary for Academic Affairs, Maryland Higher Education Commission

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Cover Sheet for In-State Institutions
New Program or Substantial Modification to Existing Program

Institution Submitting Proposal	Morgan State University

Each action below requires a separate proposal and cover sheet.

- (●) New Academic Program
- ( ) New Area of Concentration
- ( ) New Degree Level Approval
- ( ) New Stand-Alone Certificate
- ( ) Off Campus Program
- ( ) Substantial Change to a Degree Program
- ( ) Substantial Change to an Area of Concentration
- ( ) Substantial Change to a Certificate Program
- ( ) Cooperative Degree Program
- ( ) Offer Program at Regional Higher Education Center

Payment Submitted: (●) Yes ( ) No Payment Type: (●) R*STARS # ( ) Check # Payment Amount: $850 Date Submitted: 8/4/2021

Department Proposing Program	Information Sciences & Systems Department	
Degree Level and Degree Type	Master of Science	
Title of Proposed Program	Data Analytics and Visualization	
Total Number of Credits	30	
Suggested Codes	HEGIS: 703.00	CIP: 30.7101
Program Modality	(●) On-campus (Both) (●) Distance Education (*fully online*)	
Program Resources	( ) Using Existing Resources (●) Requiring New Resources	
Projected Implementation Date	( ) Fall (●) Spring ( ) Summer	Year: 2022
Provide Link to Most Recent Academic Catalog	URL: catalog.morgan.edu	
Preferred Contact for this Proposal	Name: Farzad Moazzami	
	Title: Associate Vice President for Academic Affairs	
	Phone: (443) 885-3350	
	Email: farzad.moazzami@morgan.edu	
President/Chief Executive	Type Name: Dr. David Wilson, President	
	Signature: DocuSigned by: 0BE74CEB701B4CE...	Date: 08/16/2021
	Date of Approval/Endorsement by Governing Board:	08/03/2021

Revised 1/2021

Proposal for New Instructional Program
Master of Science in Data Analytics and Visualization (Online and On-Campus)

A. Centrality to Institutional Mission Statement and Planning Priorities

A.1. Program Description and Alignment with Mission

The Department of Information Sciences & Systems at the Graves School of Business at Morgan State University (MSU) is submitting a proposal to offer a Master of Science in Data Analytics and Visualization. The program is transdisciplinary and will enable students from diverse undergraduate backgrounds as well as working professionals across multiple industries to advance their knowledge in data analytics and data visualization meeting the shortage of skill-sets for such knowledge.. Central to the proposal is a demand in a diverse set of fields e.g., journalism, social sciences, urban planning, transportation, etc. for such skill sets, which has not yet been tapped by traditional programs in data analytics and data visualization.

The program will be 30 credits and will be delivered on-campus and in an online format for a 12-month duration. The proposed MS program will be managed by the Department of Information Science & Systems within the Graves School of Business and Management (GSBM).

Data Analytics and their related fields have been the driver of incredible job growth and innovation in recent years. According to a 2018 published report by the World Economic Forum (WEF), it identified that by 2022, 85% of companies will have adopted big data and analytics technologies. The WEF also found that 96% of companies were planning or likely to plan to hire new permanent staff with relevant skills to fill future big data analytics related roles. As a result, the "new role" of Data Analyst is forecast to be one of the most in-demand jobs by 2022. Since then, other sources such as LinkedIn, Glassdoor, US Bureau of Labor and Robert Half have confirmed this to be the case as well. Data analytics bachelor's degree programs have exploded to try and meet the forecast demand for Data Analysts. MBA programs, sports management, finance and accounting degree programs are starting to incorporate data analytics into their curriculum, and specialized Masters programs are increasing as well.

As more and more students seek to graduate with bachelor's degrees in data science, visualization or analytics, the demand for Masters level programs will increase commensurately. Furthermore, as working professionals seek to retool their skill sets, Masters level programs which can be completed quickly and in a virtual format will be in high-demand as holding an MS degree in Data Analytics and Visualization will help individuals stand out and be considered for the most competitive positions. The advantages of a deeper knowledge of data analytics in many domains have also led to the recent emergence of new degree programs at several institutions. An MS in Data Analytics and Visualization program at Morgan provides a specialized focus on an area of science and technology, helping to develop skills and career prospects. Adding a 100% online option increases the possibility for more students, especially professionals currently in the workforce to study in the program with the flexibility of their own time and schedule.

This new program is designed for students who have completed a bachelor's degree program and are interested in furthering their careers within their discipline by adding the theory, tools, methodologies, and processes for data analytics and data visualization which are in high demand. The program will also meet the needs of working professionals who wish to update or improve their knowledge of data analytics and data visualization and apply best practices to strengthen their current roles. Finally, the program also aims to provide a platform for a growing population of students who are under-represented minorities (URM) to

advance their skills necessary for attaining better opportunities in complex and rapidly evolving industry environments. Graduates will be prepared for specialized jobs focused on emerging technology, involving cutting-edge aspects of data analytics and visualization that are fundamentally important and practically relevant to almost all industries. The possibility of completing a Master's degree in Data Analytics and Visualization online in 12 months makes it possible for working professionals to enroll in this program that would otherwise not be possible to study in classrooms during working hours. Our analysis shows that a 12-month 100% online option transdisciplinary program in Data Analytics and Visualization is unique in the State of Maryland.

The program will prepare students to enter the local, national, and global workforce as leaders and innovators, which is in line with MSU's mission to "Serve the community, region, state, nation, and world as an intellectual and creative resource by supporting, empowering and preparing high-quality, diverse graduates to lead the world". This program aligns with the new designation of MSU as Maryland's preeminent public urban research university. It is consistent with the University's Carnegie Foundation classification as a doctoral research university with high research activities (R2) to serve the State of Maryland's urban and underrepresented minority population affordably by "transitioning from a comprehensive university focused primarily on teaching and instruction, to one with an emphasis more on research and innovation".

A.2: Alignment with Institutional Strategic Goals

In MSU's ten-year strategic plan entitled "Growing the Future, Leading the World: The Strategic Plan for Morgan State University, 2011-2021[1] (Goal 2: Enhancing Morgan's status as a Doctoral Research University)" (p. 16), represents the foundation for the role MSU plays in leading the state of Maryland in graduating underrepresented minority students in STEM disciplines. A near-term objective within that overarching goal is to develop a comprehensive suite of contemporary MS degree offerings, for full- and part-time (professional) students that respond to the needs of technical skills in this region. The proposed program will move MSU a step forward toward that direction and is in line with MSU's mission to offer "a select set of graduate programs to a broad cross-section of students in a supportive environment that encourages research and service towards the needs of underserved communities." It is also directly relevant to Strategic Goal I "Enhancing Student Success" in Morgan's current 2011 - 2021 Strategic Plan (p. 14) to "offering challenging, internationally relevant academic curricula". The establishment of an MS degree in Data Analytics and Visualization at MSU will likely attract more underrepresented minority students and increase our enrollment. This program will also contribute to the Strategic Initiatives of the Graves School of Business and Management.

The GSBM has just completed year ten of the University's 10-year strategic plan. The School's Strategic Plan features a Mission Statement that focuses on the core issues of teaching, research, and community service. The six Core Values of excellence, integrity, respect, diversity, innovation, and leadership underscore the importance of these issues. The School's goals reflect its focus on educational achievement, scholarly research, and community engagement. A total of 12 objectives, 27 strategies and 97 action steps were developed to meet these goals.

The mission of the Graves School of Business & Management (GSBM) is to:

- Offer high quality undergraduate, masters, doctoral, and executive education programs that prepare a diverse student population to succeed as business professionals and become engaged citizens in their neighborhoods and global economy.

- Conduct scholarly research that advances theory and practice in business disciplines, contribute to teaching and learning, enhances the performance of organizations, and inform public policy decision making.
- Contribute to local, state, regional and national economic development initiatives to pursue widely shared prosperity and well-being.

GSBM is dedicated to fulfilling this mission by preparing students to be the next generation of data analysts and professionals who will be able to effectively compete in the challenging global society. The proposed degree program fully supports this mission statement and MSU's vision, "Growing the Future, Leading the World".[1]

B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan

The proposed program is consistent with the State of Maryland's goals for maintaining and strengthening a preeminent statewide array of postsecondary institutions. It responds to the crucial need as highlighted in the 2017-2021 Maryland State Plan for Postsecondary Education: Student Success with Less Debt by ensuring "equitable access to affordable and quality postsecondary education for all Maryland residents" and promoting and implementing "practices and policies that will ensure student success" and fostering "innovation in all aspects of the Maryland higher education to improve access and student success[2]" (p. 27). The State of Maryland enjoys a national and international reputation, "is among the nation's leaders of innovation in higher education, highly ranked in research and development with 72 federal laboratories" (p. 11), which is also one of the core values of MSU. Understanding the importance of computing education and relevant career opportunities in cybersecurity and IT sectors, Maryland is making $7 million investment over the next three years by passing bill HB 281[3].

B. 1. Demonstrate Demand and Need for the Program in Terms of Meeting Present and Future Needs of the Region and the State

Analytics touches all aspects of society and business. As examples, the following bills and appropriations require expertise in data analytics by Maryland agencies: Article II, Section 17(b) Chapter 63 of the Maryland constitution requiring determination of expenditure of over one billion dollars for "certain necessary building, construction, demolition, planning, renovation, conversion, replacement, and capital equipment purchases of the State, for acquiring certain real estate," Maryland's SB 811 requiring appropriation to the Unemployment Insurance Trust Fund, Maryland's SB 415 requires the Board of Elections to make a certain determination regarding the balance of the Fair Campaign Financing Fund, HB 30 (Chapter 607 of the Maryland constitution), requires expertise in the field of climate change. The list is not exhaustive since analytics touches every aspect of society and requires appropriate policy interventions to ensure that Maryland remains at the forefront to make informed decisions. MSU's MS in Data Analytics and Visualization is designed to produce data analytics professionals with the tools, skills, and insights to meet these public sector needs.

Maryland has identified the following industries as the engine to the economic prosperity and growth of the region: BioHealth & Life Sciences, IT & Cybersecurity, Advanced Manufacturing, Military & Federal,

[1] http://issuu.com/morganstateu/docs/strategicplan2011-21_final?e=2119971/60089621

[2] http://www.mhec.state.md.us/About/Pages/2017StatePlanforPostsecondaryEducation.aspx

[3] https://legiscan.com/MD/bill/HB281/2018

Aerospace & Defense, Financial Services, Energy & Sustainability, Agribusiness, and Tourism.[4] The state features a diversified economy with the second highest concentration of professional and technical workers among the states.

Maryland was the first state to map the human genome using advanced techniques that extensively rely on bioanalytics. Biopharma, biodefense, genomics, therapeutics, diagnostics and medical devices, nutraceuticals, vaccines, personalized and regenerative medicine and health IT, all will increasingly rely on a trained workforce on analytics and visualization. The City of Baltimore and adjoining suburbs have the presence of SSA and JHMI, which rely on advanced training of the workforce.

The state of Maryland as a whole benefits from being close to the US Capital, Washington, D.C. and to the sprawling region of Northern Virginia that has a significant presence of the intelligence community. Maryland leads the nation in cybersecurity openings. Analytics is a critical component of proactive defense. Similarly, advanced manufacturing relies extensively on technology assisted by analytics and a highly skilled workforce. Maryland boasts of over 4,000 manufacturing companies, a majority of which are advanced in technology utilization. Located in the Port of Baltimore, Tradepoint Atlantic serves as a natural hub for manufacturing, distribution, and logistics. Close proximity to I-95, I-70 , I-80, I-83, further enables Maryland to meet the needs of the nation, resulting in planned projects such as Eastgate. Under Armour, Stanley Black & Decker, McCormick Corp rely on an advanced workforce that can keep them competitive in a global environment.

Maryland leads the nation in federal obligations for R&D, much of which supports the military, aerospace, and defense needs. Maryland is home to more than 60 federal agencies and twice as many federal laboratories (74) as any other state. Military establishments: RDECOM, CECOM, Naval Air Systems Command, ARL, APL; contractors: Lockheed Martin, Northrop Grumman, and other tech industries are based in Maryland. Federal agencies: NASA, NSA, NSF, NIH, similarly support activities for the nation with a significant amount of impact in the state. Space exploration, weather forecasting, avionics, informatics, weapons and ordnance testing, rely on analysis of big data. 15 of the world's top 20 aerospace and defense companies are based out of Maryland.[5]

Baltimore boasts a strong investment, banking and credit, and insurance sectors with the presence of T. Rowe Price, TransAmerica, Brown Advisory, Morgan Stanley, Bank of America, Carefirst, M&T, PNC, GEICO, Travelers. This competitive service sector, along with the tourism service sector, relies on a trained workforce that is able to work with data.

Maryland's 1,300 energy and alternative energy firms make Maryland the largest powerpool in North America. As North America's largest powerpool, Maryland firms invest in computing infrastructure to keep that powerpool resilient. Real-time analytics, as well as offline data analytics, keep the grid resilient, a grid that has several power generation modalities: nuclear, coal, gas, solar, offshore wind, geothermal and biomass. Maryland is also a significant consumer of energy, where smart energy analytics plays an important role in optimal energy utilization. Large data centers such as the planned Quantum Loophole's data center extensively rely on analytics for energy utilization.

In agribusiness and poultry, Maryland has a robust global presence by way of McCormick and Purdue Farms. These large enterprises drill down data to keep them globally and nationally competitive.

[4] https://open.maryland.gov/industries/
[5] https://issuu.com/stateofmaryland/docs/aerospace_and_defense_2018?e=36413555/67303395

Aquaculture enterprises in the Chesapeake Bay with high operating costs (to ensure water quality, high production goals) will increasingly use analytics to make them more efficient.

In the computing space, the vibrant economy in this region includes artificial intelligence, cybersecurity, data mining, data analytics, and cloud computing, dependent upon an educated and professional IT workforce. According to The Computing Technology Industry Association 2017 report, Maryland is fifth in the country for total tech workers in the workforce at 9.5%. Maryland is also third in the nation for the percentage of research and development professionals. Baltimore is the third best city for women in technology based on jobs, which observed a 36% growth in the number of tech sector jobs overall from 2013 to 2016, according to data from the U.S. Census Bureau.[6]

MSU is a significant economic engine for the city and state annually, producing $1 billion in statewide economic impact, supporting 6,500 jobs, and generating $47 million in state tax revenues.[7] Its proximity to Baltimore, Washington DC, Annapolis, and Northern Virginia regions demanding for technology proficient professionals has made the needs of degree programs like this more apparent and will open many opportunities for graduates in federal and state agencies, prominent defense and tech industries, the commercial sector.

B.2. Provide Evidence that the Perceived Need is Consistent with the Maryland State Plan for Postsecondary Education

The need for an MS in Data Analytics and Visualization program is consistent and well-aligned with the three goals: Access, Success and Innovation of Maryland's 2017-2021 State Plan for Postsecondary Education[8]. The proposed program conforms to the first goal **"Access"** which "ensure equitable access to affordable and quality postsecondary education for all Maryland residents". Closing the accessibility and achievement gap is an ongoing endeavor for Maryland, which is a leading state in postsecondary education by maintaining the ongoing commitment to addressing equal access, success, and opportunity through a variety of focused programs. The need for a MS program in Data Analytics and Visualization to serve both under-represented minority student population, white or Hispanic students with affordable and lower educational costs compared to other private and public universities in this region is a step closer to fulfill the goal of the state which has a fundamental commitment to equity, equality, and diversity. The state plan also strives for ensuring student "**Success"** by promoting and implementing practices and policies, such as supporting "the unique missions of Historically Black Colleges and Universities" and enhancing "diversity by fostering collaborations between Historically Black Colleges and Universities and traditionally white institutions" (p. 83). Hence, this proposal from an HBCU for a graduate program will promote the above goal and is consistent with the state plan and commitment to equal education opportunities. This program will also allow "long-term graduate education opportunities when considering a student's career trajectory." It will make it easier to "expand support for research and research partnerships," which are depicted as strategies for fostering innovation in all aspects of the Maryland higher education to improve access and student success. **"Innovation"** is also one of the six core values of MSU that encourages and supports all forms of scholarship, including the discovery and application of knowledge in teaching and learning and developing innovative products and processes of "business-driven credentials."

[6] https://www.bizjournals.com/baltimore/news/2018/02/26/baltimore-ranks-third-best-city-for-women-in.html

[7] https://www.morgan.edu/economicimpact

[8] http://www.mhec.state.md.us/About/Pages/2017StatePlanforPostsecondaryEducation.aspx

C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State

The demand for employees with data analytics and visualization expertise with advanced degrees is high and has grown steadily over time. According to data from the Bureau of Labor Statistics (BLS) employment in computer occupations grew by nearly a factor of 20 between 1975 and 2015, nearly twice as fast as production of Computer Information Systems (CIS) bachelor's degrees. Gartner projects worldwide IT spending will increase from $3.9 trillion in 2020 to $4 trillion in 2021. Data from the recruiting firm Robert Half shows that 69% of IT managers in the first half of 2020 intended to grow their teams in areas like cybersecurity, cloud computing, business intelligence, database management, and DevOps, but 86% had a challenging time finding talented professionals. This indicates a discrepancy in the needs met and potential opportunities waiting in 2021.[9]

According to Burning Glass Labor Insights, the employment demand is particularly intense, and the growth is expected to be even higher for certain occupations: 14% for computer and information research scientists, 20% for software developers, and 23% for computer systems analysts. Moreover, Data Analytics industry need is projected to grow with a CAGR of 28.9% from 2016-2026. (Market Research Future, 2021).[10]

Data from the Conference Board for job demand, the Bureau of Labor Statistics for state salary, and national job projections data indicate that the average salary for a computing occupation in Maryland is $103,646, which is significantly higher than the average salary in the state ($57,270). A recent study by the Southern Regional Education Board projects that 69% of jobs created in Maryland by 2020 will require at least a four-year degree. Maryland's growing reputation as a center of innovation makes it the home of more and more high-tech businesses that demand a highly educated workforce. The challenge for Maryland universities is to widen the pipeline of those workers entering the labor force.

Demand for data analyst workers is expected to grow over the next decade in Maryland. As proof, a recent search by Indeed.com reveals that there are 179 new jobs in Baltimore with a requirement of Data Analyst, and there are close to 12,000 positions throughout the nation, starting at mid-level. In addition, the World Economic Forum projects that by 2022, 85% of companies will adopt data analytics technology, and 96% of companies are planning to add staff with this skill set (DuBois, 2020). [11] The pool of jobs related to Data and Analytics was expected to reach 2.72 million positions by 2020 as projected by IBM (Purdue University Global, 2021).[12]

For individuals already working in the information technology (IT) sector, an MS degree may provide a career boost by enabling professionals to expand their expertise in the field. For example, an MS degree gives students specialized skills in one or more areas of technology, including software development, data science or artificial intelligence and machine learning. A MS degree in Data Analytics can also increase salary potential. The average salary for a data analyst is $70,000 per year (Indeed, 2021). [5] In addition to

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[9] https://lambdaschool.com/the-commons/data-science-job-growth-in-2021-and-beyond

[10] Market Research Future. (2021, Feb 08). Data Analytics Market to Hit USD 132.90 Billion by 2026 . Retrieved from Intrado Global Newswire: https://www.globenewswire.com/news-release/2021/02/08/2171129/0/en/Data-Analytics-Market-to-Hit-USD-132-90-Billion-by-2026-North-America-Region-to-Spearhead-the-Global-Data-Analytics-Industry-with-the-Projected-CAGR-of-26-4.html

[11] DuBois, J. (2020, Feb 3). The Role of Data Analysts in 2020 and Beyond. Retrieved from Quanthub: https://quanthub.com/data-analysts/

[12] Purdue University Global. (2021, Jan 15). Rise of the Data Analyst—What's Behind the Boom? Retrieved from Purdue University Global: https://www.purdueglobal.edu/blog/information-technology/rise-of-data-analyst/

just a Data Analyst, students working as a Financial Analyst can earn $48.55/hr or approximately $100,900/yr. or as a Market Researcher $34.41/hr or $71,570/yr (Depersio, 2020). [13]

Data analysts, machine learning engineers, cloud computing professionals, cybersecurity, data scientists, and big data engineers rank among the top emerging jobs, with companies in a wide range of industries seeking those skills. Data science and machine learning generate more jobs than candidates are right now, making these two areas the fastest growing tech employment areas today. According to LinkedIn's 2017 U.S. Emerging Jobs Report there are 9.8 times more Machine Learning Engineers working today than five years ago with 1,829 open positions listed on the site today. There are 6.5 times more Data Scientists than five years ago, and 5.5 times more Big Data Developers. Based on insights from Glassdoor's 50 Best Jobs In America For 2018, Data Scientist has been named the best job in America for three years in a row, with a median base salary of $110,000 with 4,524 job openings. Six analytics and data science jobs are included in Glassdoor's 50 best jobs In America for 2018. Across all six analytics and data science jobs there are 16,702 openings as of today according to Glassdoor.

MSU should capitalize on the growing interest in data analytics and expand its offerings to accommodate the growing demand of computer skills in those above fields and we expect the degree program to be successful in this regard.

D. Reasonableness of Program Duplication

1. Identify similar programs in the State and/or same geographical area. Discuss similarities and differences between the proposed program and others in the same degree to be awarded.

Though similar programs like MS in Business Intelligence, Data Science, Data Analytics, AI, Visualization, Information Systems are offered by some institutions in Maryland (see table below), the proposed Data Analytics and Visualization program is unique. MSU's program is transdisciplinary enabling students from diverse industries and diverse undergraduate backgrounds to manage and manipulate data, design data visualization schemas with end-user experience in mind, and make strategic data-driven decisions to influence organizations and communities by getting hands-on experience with a range of analytical tools. Moreover, the program offers students the opportunity to take: 1) 9 credits in one of several tracks, 2) work on an experiential project in the track. The program's goal to engage students and working professionals from a wide variety of industries and backgrounds are lacking in other programs offered in Maryland.

INSTITUTION	PROGRAM TITLE	DELIVERY	CREDITS	DURATION
University of Maryland Global Campus (UMGC)	MS in Data Analytics	Online	36 credits	Variable
	MS in Accounting and Information Systems	Online	30 credits	Variable

[13] Depersio, G. (2020, Sep 25). Data Analyst: Career Path & Qualifications. Retrieved from Investopedia: https://www.investopedia.com/articles/professionals/121515/data-analyst-career-path-qualifications.asp

University of Maryland College Park	MS in Business Analytics	Online/On-Campus	30 credits	12 months
	MS in Master of Information Management	Online	36 credits With tracks in data analytics, strategic management, technology development and user experience	24 months
	MPS in Data Science and Analytics	Online/On-Campus/Hybrid	30 credits	24 months
	MS in Marketing Analytics	Online	30 credits	2-3 semesters
	MS in Information Systems	Online/On-Campus	30 credits	2-3 semesters
Bowie state university	MS Management Information Systems	Online/On-Campus	36 credits With tracks in enterprise information systems, data analytics & business intelligence and information systems security.	18 – 24 months
Capitol Technology University	MS Cyber Analytics	Online	36 Credits With tracks in Cybersecurity	Accelerated with 8 / 16 weeks
	Technical Master of Business Administration in Business Analytics & Data Science	Online	36 Credits With tracks in business administration and data analytics	Accelerated with 8 / 16 weeks
University of Maryland Baltimore County (UMBC)	MPS in Data Science	On-Campus	30 credits With tracks in Data Science Analytics Spatial Analytics	Variable
			39 Credits	24 months

	MS in Information Systems	Online/On-Campus	With tracks in Artificial Intelligence, Data Science and User Experience Design	
John Hopkins University	MS in Artificial Intelligence	Online	30 credits	24 months
	MS in Data Analytics and Policy	Online	36 credits With tracks in political behavior and policy analysis, geospatial analysis, statistical analysis, and public management	12-24 months
	MS in Data Science	Online/On-Campus	34 credits With tracks in Statistics, machine learning, Optimization, and computing	12 months
	MS in Information Systems	Online	36 credits	12 months
	MS in Business Analytics & Risk Management	Online	36 credits	12 months
	MS in Information Systems Engineering	Online		
	MS in Geographical Information Systems	Online	30 credits With tracks in geospatial technology and data science & predictive analytics	12 – 24 months
McDaniel College	MS in Data Analytics	Hybrid	30 credits	18 – 24 months
Loyola University	MS in Data Science	Online	34 credits With tracks in statistics, computer science and business	24 months or Accelerated BS and MS
	MS in Analytics	Online	36 credits	

Notre Dame University of Maryland			With tracks in computer studies, mathematics and management	24 months
Maryland Institute College of Art	MPS in Data Analytics and Visualization	Online	30 credits	15 months
Towson University	MS in Marketing Intelligence	Online	30 credits With tracks in marketing, computer science and project management	12 – 24 months

While there are few similarities between these programs with our proposed program, none of them totally overlap with our proposed Master of Science program in Data Analytics and Visualization. The main focus of this program is to enable students from all disciplines to benefit from Morgan State's transdisciplinary approach to analytics and visualization, which allows for students from diverse industry backgrounds to learn directly from experts on business intelligence and developers of cutting-edge analytics and analytics strategies.

In summary, the proposed MS in Data Analytics and Visualization program which cuts across disciplines for data visualization, statistics, machine learning, and data science with the online and onsite delivery methods is a unique program. It does not duplicate any programs in the State. Instead, it complements the existing programs with a strong workforce development focus and an advanced data analysis foundation.

2. Provide justification for the proposed program.

The role of data analysts, designers, engineers, scientists' importance in today's world cannot be overstated. In our ever-evolving, data-driven world, there is an immense demand for data analysts and highly qualified professionals who can turn the growing amount of institutional data into valuable assets. However, this workforce needs to be trained to serve as a knowledgeable resource. The proposed MS in Data Analytics and Visualization program addresses that demand.

The transdisciplinary, theoretical, and practical nature of this MS program in Data Analytics and Visualization provides a unique platform for underrepresented students at HBCU to enhance their versatility and marketability in the high-tech job market.

E. Relevance to High-Demand Programs at Historically Black Institutions (HBIs)

Despite a growing number of institutions offering programs that somewhat overlap with MSU's proposed program, the offering of such programs for underrepresented minorities are rare. This is due to several issues such as high expenses of studying in private institutions, shortage in capacity of taking larger bodies of students, and affordability for underrepresented minority communities. As such, MSU can play an

important role in addressing these issues. Only 1 of the three HBCUs in Maryland, Bowie State University offers a MS in Management Information Systems with a specialization in Data Analytics, and no other school has any such program. However, the Bowie program does not have significant overlap with our program. The core design of that program is based on managing information systems rather than workforce development for data analytics.

In addition, the offering of MS in Data Analytics provides a platform for possible future extensions for a PhD or MBA program in these fields. The introduction of such programs encourages students to continue their education to attain skills and experience to obtain better positions available at diverse industries, in higher education, and research.

F. Relevance to the Identity of Historically Black Institutions (HBIs)

MSU (MSU) is a historically black university with the unique designation as Maryland's "Preeminent Public Urban Research University." MSU serves an ethnically diverse student body consisting of full-time and part time college age students and adult learners. MSU is committed to the academic success and achievement of all its students[14].

With the growing enrollment at our undergraduate level in information systems and the lack of an MS Program in Data Analytics and Visualization in the other HBCU's in Maryland, our proposed program can play an important role in developing such infrastructure in HBIs at the State of Maryland.

G. Adequacy of Curriculum Design and Delivery to Related Learning Outcomes (as outlined in COMAR 13B.02.03.10)

The Master of Science in Data Analytics and Visualization will be offered on-campus as well as online. Students can complete the accelerated program in 12 months.

Program Objectives:

Enterprise Strategy: Graduates will learn data collection and preparation methodologies including identifying relevant data sources, preparing data for analytics, and automating the data preparation process. They will understand the strengths and limitations on various analytical approaches as well as the environmental, social, and ethical impact these approaches can have on the integrity of operational, tactical and strategic decisions.

Tools and Methods: Graduates will gain an in-depth understanding of established and state-of-the-art statistical modeling, machine learning, and artificial intelligence techniques, and will gain advanced proficiency in applying state-of-the-art data engineering and software skills to support a variety of analytics applications.

Communication: Building effective leadership and communication skills which includes developing impactful, practical solutions and understanding the marriage between business and analytics strategy

[14] www.morgan.edu/Documents/ACADEMICS/Academic.../ucat_AcademicAffairs.pdf

Experiential Learning: Engage in an experiential learning project working with real data sets provided by our industry partners and demonstrating the ability to curate data, model, analyze, and demonstrate teamwork and project management skills.

Learning Outcomes:

Students pursuing the Master of Science degree in Data Analytics, upon completion of requirements, will be able to:

1 Identify and analyze ethical issues related to bias, data security, intellectual property, integrity, and data privacy.
2 Engage in an experiential learning project demonstrating the ability to identify a relevant problem, curate data, model, analyze, and effectively communicate results to a non-technical audience.
3 Demonstrate critical thinking skills using quantitative and qualitative methods and toolsets in relevant contexts to solve problems.
4 Competently manage data, design, code, implement statistical/machine learning models, visualize, and present results to generate actionable outcomes.
5 Demonstrate teamwork and project management skills.

A list of courses with title, semester credit hours and course descriptions, along with a description of program requirements

MS in Data Analytics students are expected to proactively pave a foundation of knowledge and skills in data analytics out of course work, independent study, projects, and research. Along with completion of the graduate degree, students will identify and address problems in heterogeneous domains, use the foundation and skills to the professional domain, and contribute and disseminate the progress with the community and to the science.

Program Curriculum:

- Total Credit Hours: 30
- Degree:
  MS in Data Analytics :
  Courses: 30 credits (15 core credits, 6 core credits electives, 2 professional development courses of 0 credits each, and 9 electives credits to be taken in a track)
  - Core Courses: 12 credits
  - Core Elective Courses 6 credits
  - Elective Track 9 credits
  - Core Track Capstone 3 credits
  - Professional Development 0 credits

    Total: 30 credits

- Estimated Time to Complete the Degree:
  One year or 12-months (online or face-to-face). The estimated time can be more flexible for those who study part-time or want to take a traditional approach with a slower pace.

- Prerequisites/Admission Requirements:

a. Minimum GPA and application requirements of the School of Graduate Studies determined by the program director
b. BS/BA degree in any discipline from an accredited program.

- Course Requirements:
  - Core Courses (12 credits each):
    One must complete, with a grade of "B" or higher:
    - COSC 615 Data Wrangling for Visualization (3 credits)
    - INSS 694 Data Visualization (3 credits)
    - IEGR 661 Data Engineering and Governance (3 credits)
    - PROJ 600 Project Management (3 credits)

  - Core Elective Courses (6 credits):

    - Statistics (3 credits) Choose one of: PSYM 560 - Principles and Foundations of Statistical Methods; INSS.586 Quantitative and Statistical Analysis; ECON 513 - Statistical Analysis; SOCI 510 - Social Statistics; OMPH/PUBH 501 - Statistical Methods in Public Health; TRSP 603 - Quantitative Methods in Transportation; EEGR 507 - Applied Probability and Statistical Analysis; IEGR 534 - Engineering Statistics & Modeling; MATH 512 - Probability and Statistics

    - Machine Learning (3 credits) Choose one of: IEGR 555 - Artificial Intelligence Programming; CEGR 636 - Artificial Neural Networks I; EEGR 565 - Machine Learning Applications; INSS 698 – Artificial Intelligence for Decisions

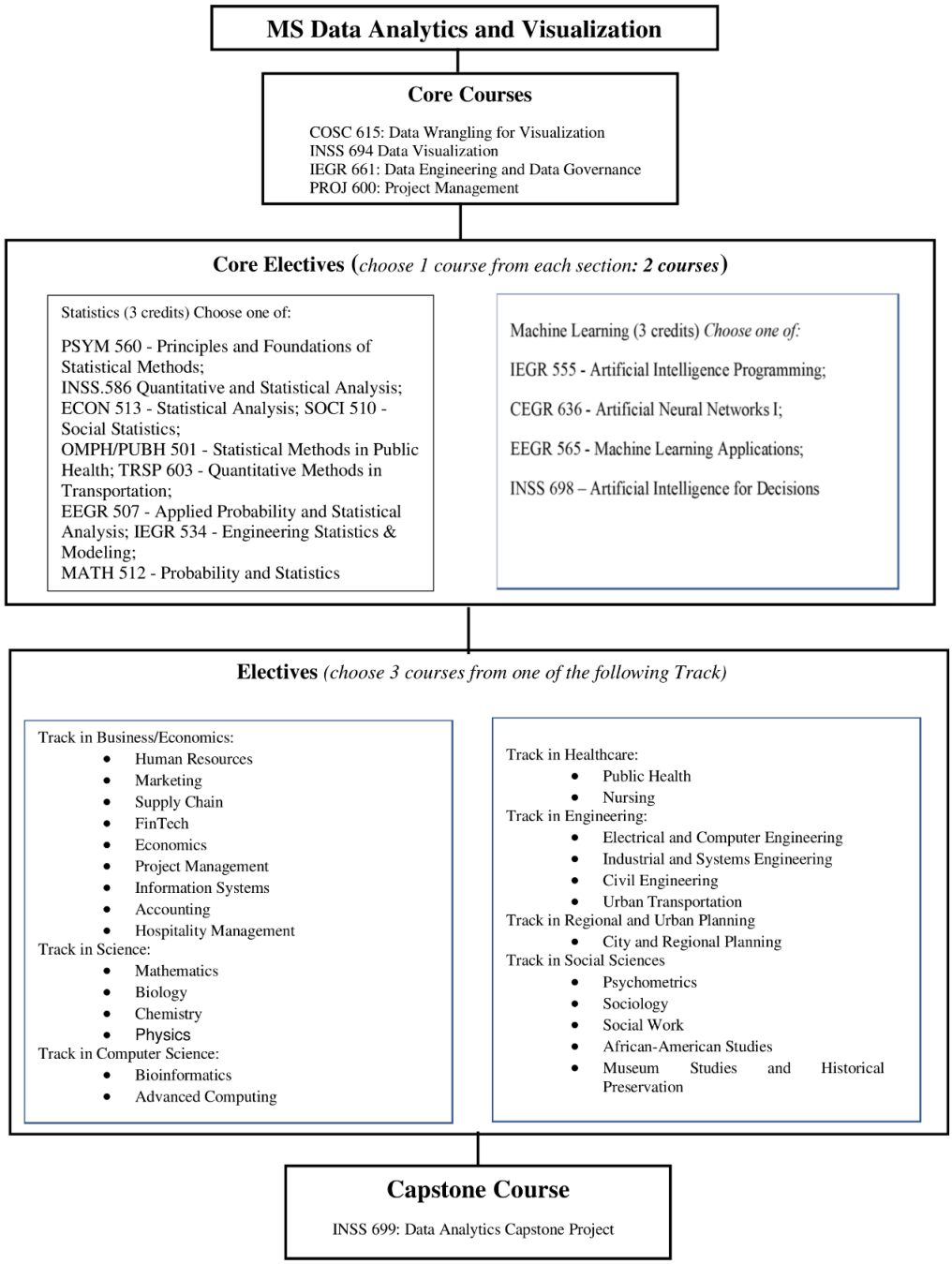
  - Electives (9 credits) - Choose one of the Tracks
    - Track in Business and Economics, with graduate courses, in one or more of the following disciplines:
      - Human Resources
      - Marketing
      - Supply Chain
      - FinTech
      - Economics
      - Project Management
      - Information Systems
      - Accounting
      - Hospitality Management
    - Track in Science, with graduate courses in one or more of the following disciplines:
      - Mathematics
      - Biology
      - Chemistry
      - Physics
    - Track in Computer Science, with graduate courses in one or more of the following disciplines:
      - Bioinformatics
      - Advanced Computing

- Track in Healthcare, with graduate courses in one or more of the following disciplines:
  - Public Health
  - Nursing
- Track in Engineering, with graduate courses in one or more of the following disciplines:
  - Electrical and Computer Engineering
  - Industrial and Systems Engineering
  - Civil Engineering
  - Urban Transportation
- Track in City and Regional Planning
- Track in Social Sciences, with graduate courses in one or more of the following disciplines:
  - Psychometrics
  - Sociology
  - Social Work
  - African-American Studies
  - Museum Studies and Historical Preservation

- Core Capstone from a Track (3 credits)
  - INSS 699: Data Analytics Capstone Project.

- Professional Development (0 credits)
  - BUAD 600 - Design your Life (Semester 1)
  - BUAD 601 - Professional Development Series (Semester 2)

MS Data Visualization Organogram:



Sample Degree Plan:

Degree	Fall	Spring	Summer
MS (Online) and MS (Face-to-Face)	2 Core courses 1 Core elective 1 Elective course 1 Professional Development	1 Core course 1 Core elective 2 Elective courses 1 Professional Development	2 Core courses

Course Descriptions

COSC 615: Data wrangling for Visualization
3 hours per week, 3 Credits
Prerequisite(s) none

Data wrangling entails acquiring and manipulating/formatting data for purposes of visualization and/or analysis. This course methodically examines processes, techniques, and tools for data wrangling with an emphasis on visualizing data. Tools such as Excel, Regex scripting, Python, SQL, Tableau Prep, and Tableau are used to teach data wrangling concepts of getting/reading, cleaning, shaping/structuring, and the storing of data. Various visualizations are created to diagnose and assess the quality of data formats and to guide wrangling activities.

Offered (FALL)

INSS 694 - Data Visualization
3 hours per week, 3 Credits
Prerequisite(s) None

This course introduces data visualization as an analytical tool, a medium of communication, and the basis for interactive information dashboards. Students will learn best practices and communication in data visualization, sharpen analytical skills, and learn how to design dashboards.

Offered (SPRING)

IEGR 661: Data Engineering and Data Governance
3 hours per week, 3 Credits
Prerequisite(s) None

This course introduces the fundamental building blocks to data engineering and data governance. The theoretical aspects of data models, technical aspects of data architectures and their implementation and governance for organizational data infrastructure will be covered in this course. This course enables students to gain an understanding of the various components that allow an enterprise to manage data as a valuable enterprise asset.

Offered (FALL)

PROJ 600 - Foundations in Project, Program, and Portfolio Management
3 hours per week, 3 Credits
Prerequisite(s) None

This course aims to provide students with the principles and concepts of project management and essential skills in project applications. Topics include defining project, estimating time and cost, network computation, risk analysis, scheduling resources, critical chain, and performance measurement.

Offered (FALL/SPRING/SUMMER)

MATH 512 - Probability and Statistics
3 hours per week, 3 Credits
Prerequisite(s) Departmental permission

A study of relation of probability and statistical theory to practical problems, probability theory, infinite sample spaces, random variables distributions, testing hypotheses, sampling, correlation and regression.

Offered (FALL OR SPRING)

PSYM 560 - Principles and Foundations of Statistical Methods
3 hours per week, 3 Credits

This course covers statistical concepts and methods that can be applied in psychological research. The course is intended to provide a conceptual understanding of basic statistical procedures for quantitatively exploring and understanding data in applied research and includes data representation, descriptive statistics, estimation and hypothesis testing. It also helps students develop the computational skills needed to carry out statistical procedures in practical settings. The course will include reading journal articles and using statistical computer packages.

Offered (FALL)

INSS 586 -Fundamentals of Quantitative and Statistical Skill
3 hours per week, 3 Credits

This course highlights the essential skills in mathematics and statistics that are required of the manager. These skills underlie the manager's ability to make sound decisions and solve complex problems.

Offered (FALL)

ECON 513 - Statistical Analysis
3 hours per week, 3 Credits

This course will cover data collection, averages, probability distribution, hypothesis testing, statistical quality control decision theory, time series and correlation analysis.

Offered (FALL/SPRING)

SOCI 510 - Social Statistics
3 hours per week, 3 Credits

This course introduces students to multivariate parametric and non-parametric statistical techniques including multiple and partial correlation, multiple regression, factor analysis and path analysis, as they are applied to socio-cultural phenomena. The major focus will be on the use of computer programs (including SPSS, and SAS) in performing these techniques. This is a required core course.

Prerequisite(s) First Year Graduate Students in Sociology Only

Co-Requisite(s) SOCI 500 and SOCI 511 .

Offered (FALL)

OMPH/PUBH 501 - Statistical Methods in Public Health
3 hours per week, 3 Credits

This is the basic course in Biostatistics, which will cover rates and ratios, data graphs, measures of central tendency and dispersion, probability, probability distributions, sampling distributions, estimations, confidence interval, sampling, odds ratios and relative risks, and an introduction to regression analyses.

Offered (FALL/SPRING)

TRSP 603 - Quantitative Methods in Transportation
3 hours per week, 3 Credits

This course reviews statistical analysis and probability models relevant to transportation systems. Discussions include descriptive statistics, regression and correlation analysis, hypothesis testing using parametric and non-parametric statistics, and probability distribution models.

Offered (SPRING)

EEGR 507 - Applied Probability and Statistical Analysis
3 hours per week, 3 Credits

Modeling and analysis of random processes. Random variables, transforms, and their probability laws will be covered Probability assessment and decision analysis. Applications using numerical methods.

Offered (FALL OR SPRING)

IEGR 534 - Engineering Statistics & Modeling
3 hours per week, 3 Credits

Sampling distributions, estimation, maximum likelihood estimation, confidence intervals, regression, goodness of fit, correlation, tests of hypotheses, nonparametric statistics, introduction to analysis of variance (ANOVA) and design of experiments.

Offered (FALL OR SPRING)

IEGR 555 - Artificial Intelligence Programming
3 hours per week, 3 Credits

Introduction to Lisp programming, early Al programs that use rule-based pattern matching techniques advance Al programs. Topics include building software tools, symbolic mathematics, logic programming, object-oriented programming, knowledge representation and reasoning, expert systems and natural languages.

Offered (FALL OR SPRING)

COSC 502 - Artificial Intelligence / Machine Learning
3 hours per week, 3 Credits

This course presents how Data Science and Artificial Intelligence together can be sued: (1) to solve Classification, Regression, and Recognition; (2) to conduct Supervised, Unsupervised, and Reinforced Learning; (3) to build Neural Network, Convolutional Neural Network, and Recurrent Neural Network

CEGR 636 - Artificial Neural Networks I
3 hours per week, 3 Credits

This course provides graduate students and engineering professionals with the fundamentals of Artificial Neural Networks. This course covers neural network architectures, algorithms, and applications. A wide variety of standard neural networks and training algorithms are covered in relationship to logic functions and other applications. Emphasis is on computational characteristics to illustrate similarities and differences among neural networks.

Offered (FALL OR SPRING)

EEGR 565 - Machine Learning Applications
3 hours per week, 3 Credits

This course provides a broad introduction to machine learning and statistical pattern recognition. The course explores current applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.

Offered (FALL OR SPRING)

INSS 698 - Artificial Intelligence for Decisions
3 hours per week, 3 Credits

This course explores how artificial intelligence can support business to implement data-driven decision-making and planning. In this hands-on course, you will learn how AI algorithms (classification, clustering, temporal, association rules) are utilized to help businesses with automated business planning and decision-making.

Offered (SPRING)

INSS 699 - Data Analytics Capstone Project
3 hours per week, 3 Credits
Prerequisite(s): Approval from Chair

This data visualization capstone project is a team-based learning experience that gives students the opportunity to conduct real-world analytics projects on campus or at an agency. The capstone project involves a live data analytics project, where students will need to integrate their knowledge of data analytics and data visualization utilizing project management principles. At the end of the semester, using the skill sets of predictive modeling, data management, process models, and data mining techniques, students will deliver deliverables of a data visualization project: technical (code, cleansed data), dashboard visualization, and an executive deck.

Offered (SUMMER)

H. Adequacy of Articulation

1. If applicable, discuss how the program supports articulation with programs at partner institutions.

There are no articulation agreements in place.

I. Adequacy of Faculty Resources (as outlined in COMAR 13B.02.03.11)

1. Provide a brief narrative demonstrating the quality of program faculty. Include a summary list of faculties with appointment type, terminal degree title and field, academic title/rank, status (full-time, parttime, and adjunct) and the course(s) each faculty member will teach.

MSU has distinguished faculty members in the Graves School of Business & Management, and specifically in the department of Information Science & Systems who have the background and expertise to deliver the MS program in Data Analytics and Visualization. In addition, the program will draw on extensive contacts to bring industry professionals to lecture, present and teach classes as warranted. The department of Information Science & Systems will administer this program through a full-time program director in the Graves School of Business, responsible for administrative duties, including student advising, and by a faculty Program Coordinator who will assist in curriculum related issues such as program assessment and accreditation efforts. In addition to current faculty at MSU, one (1) new full time tenure-track assistant professor, with expertise in analytics and visualization will be recruited to staff the proposed new program. The position will be filled in the fall of 2022.

Information Science and Systems Department Faculty (Faculty Teaching Information Systems and Project Management)			
Name	**Rank**	**Specialization**	**Competency**
Dr. Sanjay Bapna	Chair and Professor	Information Systems	Data Analytics, Machine Learning
Dr. Jigish Zaveri	Professor	Information Systems	Decision Support Systems
Dr. Ganesh Bhatt	Professor	Information Systems	Knowledge Management
Dr. Gregory Ramsey	Associate Professor	Information Systems	Data Analytics, Machine Learning
Dr. Dessa David	Associate Professor	Information Systems	Data Visualization
Dr. Samuel Ejiaku	Associate Professor	Information Systems	Information Systems
Dr. Ziping Wang	Associate Professor	Project Management	Project Management
Dr. Xingxing Zu	Associate Professor	Supply Chain Mgmt	Statistics
Dr. Abirami Radhakrishnan	Associate Professor	Project Management	Project Management
Dr. Mary Dunaway	Assistant Professor	Information Systems	Data Analytics
Dr. Thomas Ngniatedema	Assistant Professor	Information Systems	Information Systems
Assistant Professor (To be Hired)	To be hired after program approval: PhD in Information Systems or a closely related field with expertise and training in Data Analytics, Data Visualization, Data Science, or other related areas		Data Analytics, Data Visualization
Dr. Susan Hendee	Lecturer	Information Systems	Pedagogy
Dr. Marcus Parker	Lecturer (Part-time)	Project Management	Project Management
Dr. Monica Kay	Lecturer (Part-time)	Project Management	Project Management

In addition, the Information Science & Systems department has the support of the President, Provost, and Dean (GSBM) of the University to repurpose current vacant salary lines within GSBM to hire a faculty member.

In addition to courses offered by GSBM, students in this program will take one required core course offered by the Industrial Engineering department in the School of Engineering (SOE), and another required core course offered by the Computer Science department in the School of Computer, Mathematical and Natural Sciences (SCMNS) at MSU. In addition to these, students will take two core courses (Statistics, and Machine Learning/AI) from a choice of several departments. Moreover, as a transdisciplinary program, students have a choice of taking a track from one of several Masters programs that benefit from analytics and visualization, which are offered by different Schools.

The department of Information Science & Systems has an active advisory board of 17 members across several disciplines. On the recommendation of the INSS Advisory Board, the department made INSS.395 (Data Analytics for Enterprises), a required core course for Service and Supply Chain majors. In addition, the departmental faculty teach analytics at the undergraduate (INSS.395), masters (INSS.695) and doctoral level (INSS.795). Data visualization is similarly covered using Tableau and SAP suite of products for all GSBM majors in INSS.360 (Systems Analysis and Design) as well as a special undergraduate course, titled Data Visualization (INSS.394). The departmental faculty also teach statistics at the undergraduate (SSCM.220), masters (INSS.586), and doctoral level (BUAD.703).

J. Adequacy of Library Resources (as outlined in COMAR 13B.02.03.12)

J.1. MSU Library[15]

The students will have access to MSU Earl S. Richardson Library (MSU Library). MSU Library offers a range of resources and services to the MSU community. The library has MIS Quarterly, IEEE, ACM and other common Information Systems, Computer Science, and Engineering full-text databases and journals. Most of library resources (USMAI Catalog, WorldCat MSU, Libguides, Collections, etc.) and services can be accessed remotely.

In addition, the director of Earl S. Richardson Library, Dr. Richard Bradberry, has affirmed that the library resources will be provided to MS program in Data Analytics and Visualization Program in addition to providing additional required materials such as books and journals on: Data Analytics, Project Management, Information Systems, Visualization, Statistical programming, Software Engineering, Data Science, Data Mining, Artificial Intelligence, Machine Learning, etc.

K. Adequacy of Physical Facilities, Infrastructure, and Instruction Equipment (as outlined in COMAR 13B.02.03.13)

K.1. Physical Facilities: No extra facilities other than the existing are required.

In Fall 2015, the GSBM moved into a newly constructed building with state-of-the art technology, modern classrooms, student computer labs, a Capital Markets Lab, A Network Security Simulation lab, an ideation lab/business incubator, demonstration hotel rooms for our hospitality program, an

[15] http://www.morgan.edu/library

amphitheater, and professional offices and meeting spaces. This facility has allowed the GSBM to further advance the mission to pursue excellence in providing a high-quality management education for a diverse student population and to be recognized as a leading school of business in the Mid-Atlantic region.

K.2. Infrastructure Equipment:

The program does not need additional infrastructure equipment.

K.3. Instruction Equipment:

The GSBM has excellent computer and technology resources and infrastructure. In our new building, all faculty members have up-to-date computer systems and printers in their offices. Faculty computers are upgraded and replaced every three years. Classrooms include a video projection system controlled by a standard computerized podium with a touch panel control unit for all connected devices.

We recognize the importance of technology in today's business and society and integrate a wide range of current and emerging technologies throughout our curriculum. They include the application of statistical tools and statistical techniques, data management, data analytics and cloud-based computing. Several open student computer labs with productivity software are used in various courses, including MS Office suite, SAP Business Objects Business Intelligence Suite, SAP Crystal, SAP BW/HANA, Tableau. Students can also access SAP Analytics Cloud, SAP Data Warehouse Cloud, R. The university licenses SAS, SPSS. The INSS department has a license for Microsoft suite of products including MS Project, Visio, MS Access. In addition, the Network Security Simulation lab has specialized software: R, and MongoDB.

At the undergraduate and master levels, we teach our students about using Excel, Access, Tableau, SAP, Panopto, Microsoft Azure Cognitive Services, Python, Microsoft Visio, Trello, MS Project, Amos, Miro, R Programming, Bloomberg terminals, StockTrack, Qualtrics, Cesim Global Challenge simulation and others. Our Network Security Simulation Lab enables students to gain comprehensive knowledge regarding topics such as incident response, threat mitigation, cryptography, malware, log analysis, and encryption. Our goal is to make our students agile and life-long learners in technologies.

Technologies such as SPSS, SAS, WRDS, Bloomberg, Mplus, AMOS, Eventus, Endnotes, and MongoDB are incorporated in our instruction at the graduate level. Databases such as COMPUSTAT, CRSP, I/B/E/S and Audit Analytics are available through WRDS. These technologies empower our students to learn how to identify data sources, generate research ideas/models, and gain insights provided by data.

The Data Science and Machine Learning Laboratory is in Calloway Hall, Room 304. It has 20 PCs connected in a network. Each computer has specific computing platforms installed, and Windows 10 and Linux Operating Systems are available. The laboratory has a variety of software for Computer, Network, and Data Science, Bioinformatics and Computational Biology, Concurrent, Parallel, and Distributed Computing, Modeling and Simulation, Visualization. The laboratory also has a great collection of programming languages such as C, C++, Java, C#, Microsoft Visual Programming Language, MATLAB, Mathematica, Perl, etc.

L. Adequacy of Financial Resources with Documentation (as outlined in COMAR 13.B.02.03.14)

1. Resource Allocation

1.1. Resource Allocation Table

TABLE 1: RESOURCES					
Resource Categories	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
1. Reallocated Funds	0	0	0	0	0
2. Tuition/Fee Revenue (c+g)	300,000	450,000	615,000	945,000	1,290,000
a. Number of F/T Students	10	15	20	30	40
b. Annual Tuition/Fee Rate	30,000	30,000	30,750	31,500	32,250
c. Total F/T Revenue (a*b)	300,000	450,000	615,000	945,000	1,290,000
d. Number of P/T Students	0	0	0	0	0
e. Credit Hour Rate	1,000	1,000	1,025	1,050	1,075
f. Annual Credit Hour Rate	0	0	0	0	0
g. Total P/T Revenue (d*e*f)	0	0	0	0	0
3. Grants, Contracts, and other External Sources	0	0	0	0	0
4. Other Sources (State Support)	130,000	195,000	260,000	390,000	520,000
Total (Add 1-4)	430,000	645,000	875,000	1,335,000	1,810,000

1.2. Resource Allocation Justification

1.2.1 Reallocated Funds. Program does not have reallocated funds.

1.2.2 Tuition/Fee Revenue. Revenue projections are based on full time equivalent (FTE) students annual enrollment as the program is 1 year in duration. We project the program to launch with 10 students in the first cohort and grow that to 40 students by year 5. We do not project the program will enroll part-time students. We applied a rounded 2.5% price increase per credit starting in year 3 and continuing for years 4 and 5. We anticipate a annual enrollment of 40-50 students when the program reaches maturity.

1.2.3 Grants, Contracts, and Other External Sources: None
1.2.4 Other Sources: No other sources.

2. Expenditures

2.1. Expenditures Table

TABLE 2: EXPENDITURES					
Expenditure Categories	**Year-1**	**Year-2**	**Year-3**	**Year-4**	**Year-5**
1. Faculty (b+c)	195,250	200,132	205,135	210,262	215,519
a. # FTE	1.1	1.1	1.1	1.1	1.1
b. Total Salary	137,500	140,938	144,461	148,072	151,774
c. Total Benefits	57,750	59,194	60,674	62,190	63,745
2. Administrative Staff (b+c)	0	0	0	0	0
a. # FTE	0	0	0	0	0
b. Total Salary	0	0	0	0	0
c. Total Benefits	0	0	0	0	0
3. Support Staff (b+c)	0	0	0	0	0
a. # FTE	0	0	0	0	0
b. Total Salary	0	0	0	0	0
c. Total Benefits	0	0	0	0	0
4. Equipment	0	0	0	0	0
5. Library	0	0	0	0	0
6. New or Renovated Space	0	0	0	0	0
7. Other Expenses*	132,350	132,350	103,000	106,000	109,000
TOTAL (Add 1–7)	327,600	332,482	308,135	316,262	324,519

2.2. Expenses Justification

1. Faculty: Starting from the initial year, a Program Coordinator will be appointed within the Department. A stipend of equivalent to one-month salary of $ (fringe benefit included) will be provided to the 9.5-month faculty for the summer. One tenure-track faculty with specialization in data analytics and visualization will be recruited initially for a 9.5 month salary of $125,000 + Fringe $52,500 = $177,500. The research and training for the faculty will focus on one of the

following areas: Data Analytics, Data Visualization, Machine Learning/Artificial Intelligence, Data Science.

2. Other Expenses: Advertising fees of $115,000 will be spent for the first two years. Thereafter, starting from year 3 onwards, advertising fees of $85,000 will be budgeted, a decrease of $30,000.
3. Other Expenses: License fees for SAP University Alliance, APlus, Pentahao, MS Imagine, IBM, JMP+ are budgeted at $17,350 for year 1 and 2.
4. Inflation is estimated at 2.5% for wages, and software.

3. Surplus

	Year-1	Year-2	Year-3	Year-4	Year-5
Number of Students (FTE)	**10**	**15**	**20**	**30**	**40**
Tuition	430,000	645,000	875,000	1,335,000	1,810,000
Expenses	327,600	332,482	308,135	316,262	324,519
Surplus	102,400	312,519	566,865	1,018,738	1,485,481

It is expected that the University will accrue some financial surplus in the first three years, significant surplus will start in year 4 and beyond. Due to the unique transdisciplinary nature of the program and the demand for skilled analytics workforce, we anticipate enrollment of at least 40 students beyond year five.

M. Adequacy of Provisions for Evaluation of Program (as outlined in COMAR 13B.02.03.15)

The courses, the program' effectiveness, enrollment, retention and graduation rates, students, instructors, and staff satisfaction will be evaluated using student, faculty, and staff surveys and program committee reviews on a regular basis.

The program faculty will meet each semester for assessment and evaluation of the curriculum. The program committee will meet annually for assessment and evaluation of the program. By needs, the program committee will implement changes to the program.

The program will be subject to external review and evaluation for accreditation by Middle States and the State of Maryland Department of Education.

N. Consistency with the State's Minority Student Achievement Goals (as outlined in COMAR 13B.02.03.05 and in the State Plan for Postsecondary Education)

The State of Maryland has set as its goals for minority achievement implementing policies (Minority Achievement Report Summary, Maryland Community Colleges, University of Maryland System, MSU, St. Mary's College of Maryland, October 1996) to improve recruitment, retention, and graduation of students, particularly minorities and to recruit, promote and retain minorities in faculty and professional

staff positions. The proposed MS in Data Analytics and Visualization program is aimed at the first of those two goals. By providing an easier path toward graduation for nontraditional students, it should significantly increase its retention and graduation rates.

O. Relationship to Low Productivity Programs Identified by the Commission

There is no relationship with low-productivity programs identified by the Commission.

P. If proposing a distance education program, please provide evidence of the Principles of Good Practice (as outlined in COMAR 13B.02.03.22C)

The Master of Science in Data Analytics and Visualization will be offered online as well as face-to-face.

Morgan is experienced and with adequate infrastructure to support online programs. Morgan Online, **https://www.morgan.edu/online**, established several years ago, was created to help launch various online degree programs. Currently, MSU has the following active online programs:

- Community College Leadership Program (Ed.D.), 11 graduates in 2019-2020
- Master of Business Administration (MBA), 17 graduates in 2019-2020
- Master of Social Work (MSW), 64 graduates in 2019-2020
- Master of Science in Project Management (MSPM), 16 graduates in 2019-2020
- Post-Baccalaureate Certificate in Project Management, 0 graduates in 2019-2020
- Post-Baccalaureate Certificate in Sustainable Urban Communities, 0 graduates in 2019-2020

Justifications for curriculum and instruction, roles and mission, faculty support are in the preceding sections B-M.