



Board of Governors, State University System of Florida
REQUEST TO OFFER A NEW DEGREE PROGRAM

In Accordance with BOG Regulation 8.011

(Please do not revise this proposal format without prior approval from Board staff)

University of Central Florida
 Institution Submitting Proposal

Fall 2023
 Proposed Implementation Term

College of Business Administration
College of Sciences
 Name of College(s) or School(s)

Department of Economics
Department of Statistics and Data Science
 Name of Department(s)/Division(s)

Business Analytics
 Academic Specialty or Field

Master of Science in Business Analytics
 Complete Name of Degree

30.7102 Business Analytics
 Proposed CIP Code (2020 CIP)

The submission of this proposal constitutes a commitment by the university that, if the proposal is approved, the necessary financial resources and the criteria for establishing new programs have been met prior to the initiation of the program.

 Date Approved by the University Board of Trustees

 President's Signature Date

 Board of Trustees Chair's Signature Date

 Provost's Signature Date

PROJECTED ENROLLMENTS AND PROGRAM COSTS

Provide headcount (HC) and full-time equivalent (FTE) student estimates for Years 1 through 5. HC and FTE estimates should be identical to those in Appendix A – Table 1. Indicate the program costs for the first and the fifth years of implementation as shown in the appropriate columns in Appendix A – Table 3A or 3B. Calculate an Educational and General (E&G) cost per FTE for Years 1 and 5 by dividing total E&G by FTE.

Implementation Timeframe	HC	FTE	E&G Cost per FTE	E&G Funds	Contract & Grants Funds	Auxiliary/ Philanthropy Funds	Total Cost
Year 1	20	25	17,344	433,602			433,602
Year 2	25	31.25					
Year 3	30	37.50					
Year 4	35	43.75					
Year 5	40	50	9,420	471,008			471,008

Additional Required Signatures

I confirm that I have reviewed and approved Need and Demand Section III.F. of this proposal.

Pamela Fletcher

Signature of Equal Opportunity Officer

8/4/2022

Date

I confirm that I have reviewed and approved Non-Faculty Resources Section VIII.A. and VIII.B. of this proposal.

Beau Case

Signature of Library Dean/Director

 Digitally signed by Beau Case
Date: 2022.08.02 14:49:20 -04'00'

Date

Introduction

I. Program Description and Relationship to System-Level Goals

A. Describe within a few paragraphs the proposed program under consideration, and its overall purpose, including:

- **degree level(s)**
- **majors, concentrations, tracks, specializations, or areas of emphasis**
- **total number of credit hours**
- **possible career outcomes for each major (provide additional details on meeting workforce need in Section III)**

The proposed Master of Science in Business Analytics (MSBA) program is the final stage of a series of programs developed in the College of Business of the University of Central Florida. It follows from the undergraduate minor in Business Analytics and the Business Analytics track of the BSBA degree in the College of Business. A precursor to the MSBA program is the Business Analytics track of the Professional Master of Science in Management (PMSM-BA) program. That program is a market-rate, part-time program offered to a limited number of business professionals at the downtown campus of UCF.

The current proposal aims to expand this training to a wider audience of students in the College of Business. For some time, the PMSM-BA was complemented by the Business Analytics Track of the Master of Science in Economics (MS Econ) program, which has been in operation for five years. The MS Econ program also appealed to a small number of students because the prerequisite coursework adequate for a master's degree in economics placed additional constraints on the qualifications of incoming students.

Furthermore, the design of the MS Econ program under that track did not allow the full flexibility to concentrate on statistics and computing to the extent that can be achieved with a stand-alone degree program designed explicitly to focus on Business Analytics. The MSBA program is proposed with this goal in mind. It is a full-time, on-campus program that spans 11 months. The proposed program has the following characteristics.

- Level:** This will be an interdisciplinary MS in Business Analytics, offered jointly by the College of Business (Department of Economics) and the College of Sciences (Department of Statistics and Data Science). The degree will be housed in the College of Business.
- Emphases/tracks/specialization:** There will be no explicit tracks or specializations. Students will take the same sequence of courses.
- Credit hours:** This will be a 9-course (30-credit hours) lock-step cohort program with 6 courses (18 credits) in Economics and 3 courses (12 credits) in Statistics.
- Purpose:** The core of the MS in Business Analytics is the application of mathematics and statistics to solve business problems. Students will learn to collect and to organize data. They will learn to select an economic model to add structure to the analysis. The students will learn to analyze data with statistical models and to create graphical and tabular results to communicate recommendations to business stakeholders. As this training is focused on the tools and processes of analysis, it is not specific to a particular industry.

Graduates with this training are employed in industries such as financial services, health care, entertainment, hospitality, and, locally, the aerospace and defense industries. Graduates of the MSBA program can find employment, in the first instance, as Business Analysts, which is a generic term for an employee who studies business decisions and makes recommendations. Many such analysts focus on a particular business discipline, such a marketing or finance, and may obtain employment as a Marketing Analyst, a Financial Analyst, or a Budget Analyst. Others may enter into the consulting industry and obtain employment as a Management Analyst. Other graduates who enter with more training in computing may find employment as Data Scientists. Finally, a large demand exists for managers of business analysts and, for some graduates, much of the appeal of studying business analytics is the prospect of rising into a management position several years after graduation.

B. If the proposed program qualifies as a Program of Strategic Emphasis, as described in the Florida Board of Governors 2025 System Strategic Plan, please indicate the category.

- **Critical Workforce**
 - Education
 - Health
 - Gap Analysis
- **Economic Development**
 - Global Competitiveness
 - Science, Technology, Engineering, and Math (STEM)
- Does not qualify as a Program of Strategic Emphasis.**

The program, which is being developed cooperatively between the College of Business and the College of Sciences, falls into area 5 (Economic Development – STEM, see https://www.flbog.edu/wp-content/uploads/2021/06/Current_PSE_list_approved_by_the_BOG_at_September_2020_meeting__Rev3.pdf). The program is designed to equip students with advanced skills required to succeed in the rapidly evolving business analytics community. These skills revolve around the application of mathematics and statistics to solve business problems. Students will learn to collect and organize data. They will learn to select an economic model to add structure to the analysis. The students will learn to analyze data with statistical models, and create graphical and tabular results to communicate recommendations to business stakeholders.

The program falls under CIP code 30.7102 (Business Analytics) and is thus included in the list of targeted STEM areas in the Florida Board of Governors' areas of strategic emphasis spreadsheet (https://www.flbog.edu/wp-content/uploads/2021/06/Current_PSE_list_approved_by_the_BOG_at_September_2020_meeting__Rev3.pdf).

II. Strategic Plan Alignment, Projected Benefits, and Institutional Mission and Strength

A. Describe how the proposed program directly or indirectly supports the following:

- **System strategic planning goals (see link to the 2025 System Strategic Plan on the [New Program Proposals & Resources](#) webpage)**
- **the institution's mission**
- **the institution's strategic plan**

“The mission of the State University System of Florida is to provide undergraduate, graduate and professional education, research, and public service of the highest quality...”

(https://www.flbog.edu/wpcontent/uploads/2025_System_Strategic_Plan_2019.pdf)

All of the program’s goals relate to the SUS goal of providing the highest quality professional education. The program will also help the SUS goal to “Transform and revitalize Florida’s economy and society through research, creativity, discovery, and innovation.” It will accomplish this by training professionals to be innovative in uses of technology in the context of the business community in general and more specifically, the use of tools for data mining and analysis, to innovate in the creation of new, efficient algorithms, and to be creative and innovative in performing data acquisition and management and in presenting and communicating knowledge.

The Master of Science in Business Analytics program will directly support the SUS goal of “Productivity” in STEM disciplines. The SUS strategic plan dated October 2019 (page 13) has as a 2025 goal for Florida to “increase student access and success in degree programs in the STEM/health fields and other Programs of Strategic Emphasis that respond to existing, evolving, and emerging critical needs and opportunities.” The MS in Business Analytics program will contribute to the awarding of master’s degrees produced at UCF in the high-demand STEM areas of technology and analytics in business. As such, it also contributes to the SUS goal to: “Increase Community and Business Workforce” (page 15). This workforce training aspect of the program also contributes to UCF’s goal of becoming America’s Leading Partnership University®. Several aspects of the degree program, in particular the final capstone project, will connect with the community and industry.

The program will contribute to the SUS goals of increasing the “number of graduate degrees in STEM & Health” fields as well as increasing the number of “graduate degrees in programs of strategic emphasis” (page 19).

The program will support the SUS “Strategic Priorities for a Knowledge Economy” (pages 11-12), goal of “Strengthen Quality & Recognition of Commitment to Community & Business Engagement,” as it will help UCF’s graduate programs in the College of Business and the College of Sciences to increase their ability to engage with companies who will consider supporting faculty teaching in the program with grants and contracts. This will happen both from students taking jobs in industry and becoming potential future sponsors of the faculty teaching in this program, as well as from student projects, conducted in the capstone course. Such collaborations with industry will also contribute

to meeting the goal: “Increase Commercialization Activity.” Such partnerships with industry are also consistent with UCF’s goals of: “achieving international prominence in key programs of graduate study and research” and “becoming America’s leading Partnership University.”

UCF’s mission is to provide “high-quality, broad-based education and experience-based learning; pioneering scholarship and impactful research; enriched student development and leadership growth; and highly relevant continuing education and public service initiatives ...” (<http://www.ucf.edu/mission-statement/>). The program will provide “highly relevant continuing education” to Florida and especially to the Orlando metropolitan area. The program will advance the intellectual and “economic development” of Florida and especially the Orlando “metropolitan region” by helping companies serve their clients and customers better.

The program will also help UCF’s goal of achieving “international prominence in key programs of graduate study and research” (<http://president.ucf.edu/goals/goals.asp>) by training students in the emerging area of data analytics and by fostering connections between UCF faculty and the business community in Florida and especially in the Orlando area. Such connections should also lead to new partnerships between UCF faculty and Orlando area businesses, which will aid the UCF goal of becoming “America’s leading partnership university.” Below we describe how the proposed program aligns specifically to 4 of UCF’s 5 goals:

1. Achieve international prominence in key programs of graduate study and research: The proposed MS in Business Analytics program would be unique among its kind in the SUS and contribute to the increasing visibility of UCF in offering innovative degree programs and attract international students. Further, it will offer great potential for interdisciplinary research.
2. Provide international focus to our curricula and research programs: The MS in Business Analytics has significant potential to attract international students and offer opportunities for funded research from companies engaged in business analytics as well as consulting involving faculty, students, and industry partners. It is anticipated that this program will also create opportunities to degree students for training in the global market.
3. Become more inclusive and diverse: This innovative and unique program would increase student body diversity with respect to areas of interest, strength, and educational and professional goals. There is also potential to increase female students’ participation in technology and finance education, thereby encouraging gender diversity. The interdisciplinary program has potential to attract students from countries with rigorous STEM educational standards (e.g., India, Eastern Europe, China, Russia, Ukraine, Central and South America).
4. Be America’s Leading Partnership University: There are countless opportunities for substantive partnerships between UCF and relevant industries (i.e., technology and financial services companies) and to engage with companies involved in exactly what the proposed program would represent and prepare students for.

These partnerships can lead to scholarships, student internships/employment, research grants/contracts, and development opportunities—representing a seamless collaboration between academia, industry, and government.

Further, economic development partnership opportunities can be leveraged via the UCF Business Incubation Program, which can develop innovative ideas (e.g., apps, sharing businesses) and shepherd them through commercialization. Technological innovations that emerge from the MS in Business Analytics degree program can receive assistance to operate and grow.

The proposed program can also potentially deepen UCF's existing role in the MetroLab Network, a White House initiated city university collaborative for urban innovation, which would have a natural link with the recently sponsored mini-faculty cluster involving interdisciplinary collaboration in SMART-cities. The degree program will help Orlando's vibrant tourism and burgeoning computing industries, which already has some startup companies in the area of data analytics. Other industries in the area, particularly the hospitality industry (Disney World, Universal Studios, etc.) and the electronic video games industry (e.g., Electronic Arts), already make use of data analytics to increase revenues.

We anticipate that these companies will partner with UCF to provide opportunities for both research (in the form of data or problems to solve) to faculty members, and also that they will provide contracts or grants to better understand how to solve problems. Some existing relationships with companies are highlighted in the support letters (Appendix G). We will strengthen these relationships before the program gets underway by forming an Advisory Board and having some meetings to discuss the program and how companies can participate. Furthermore, the benefit to the state will be in increasing the pool of qualified employees in the area of data analytics by approximately 40 people per year. Note that this is a STEM area that is projected to quickly grow and that can help businesses be more competitive. This will help expand the state's high technology business profile and will help encourage more businesses re-locate to Florida.

Finally, the proposed program is a catalyst for potential collaboration with members of the Florida SUS: The curriculum developed for this program is likely to impact engineering, statistics, and business (Finance, Accounting and Marketing) curricula in the SUS—demonstrating a wider impact on programs across Florida—the innovative aspect of the proposed degree program has potential to inspire similar degree programs from other SUS institutions, bringing together the aforementioned departments in interdisciplinary collaborations. There is potential for collaborative opportunities with other SUS institutions in research, consulting, other educational degree programs, and product development that would bridge faculty and students across technical (STEM) and social/organizational (non-STEM) units and with public and private stakeholders across Florida.

B. Describe how the proposed program specifically relates to existing institutional strengths. This can include:

- **existing related academic programs**
- **existing programs of strategic emphasis**
- **institutes and centers**
- **other strengths of the institution**

COLLEGE OF BUSINESS

Faculty in the Department of Economics currently teach in the Business Analytics track

of the Professional Master of Science in Management (PMSM-BA) program. This is a part-time program offered to industry professionals, originally formed as a track of the existing Professional Master of Science in Management degree and housed in the College of Business. It is a partnership between the Department of Management, the Department of Economics and the Department of Statistics and Data Science. The Department of Economics also ran a pilot program, a Business Analytics track of the existing Master of Science in Economics program. This program was a full-time, on-campus program to train recent graduates in business analytics. The initial instance of this program was not specifically designed for students concentrating on business analytics, since it shared coursework with the economics graduate program. The proposed MSBA program, in contrast, is designed to offer a curriculum tailored to students focusing on business analytics, without the constraint of the existing economics program, which included a list of prerequisites not suited to all students who are interested in business analytics.

The proposed MSBA program also serves as a destination for graduates of the Business Analytics track of the BSBA program. An initial pilot of the course Python for Business Analytics indicates a substantive interest in pursuing this course of study among undergraduates in the College of Business. The track is scheduled to teach the first cohort of students in Fall 2021. The first graduates of the business analytics courses in the BSBA—those who currently have the more common first- and second-year prerequisites—are scheduled to graduate in Fall of 2023, in time for the first cohort of students for the proposed MSBA program.

To support these programs at the undergraduate and graduate levels, a host of new faculty have been added to the Department of Economics. Dr. John Solow (Full Professor) was appointed as the Program Director of the Business Analytics program to oversee its development. Previous to Dr. Solow's arrival, the Department hired Dr. Harry J. Paarsch, Professor of Business Analytics, as part of a strategic hiring initiative to strengthen the Department's focus on business analytics. Toward this aim, three new tenure-earning faculty members have been hired in 2018 to develop and teach a set of business analytics courses for the part-time PMSM-BA program. With this experience, these new faculty are also well-prepared to develop and teach new courses dedicated towards servicing the MS in Business Analytics program.

COLLEGE OF SCIENCES

The faculty in the Department of Statistics and Data Science have also been active in the existing Business Analytics track of the Professional Master of Science in Management. This follows the addition of several ground-breaking new programs. One noteworthy addition is the Ph.D. Program in Big Data Analytics, the first Ph.D. of its kind in the state of Florida and only one of a few across the globe. At the master's level, the department also offers the M.S. in Statistics and Data Science, which is aimed at students who have completed an undergraduate program in mathematics, statistics, or computer science. Another program, the M.S. Data Science Track is tailored to a subset of this audience but focuses on data mining, in particular. These programs have been in operation for several years and have enjoyed success in placing students in careers in industry, applying the tools of data mining and machine learning. At the undergraduate level, the B.Sc. Data Science is scheduled to begin training the first cohort in the fall of 2021.

The Department of Statistics and Data Science has also hired several new faculty to support the range of programs related to data science and statistics. In 2016, the department hired Alexander Mantzaris and Mengyu Xu, both as tenure-track assistant professors. Then in 2019, the department hired Rui Xie, also at the tenure-track level. Again, in 2020, the department hired two new faculty members, Mitch Hill and Jongik Chung, both as tenure-track assistant professors. By 2020, Mengyu Xu, who was hired in 2016, left in May 2020 due to a working visa issue, so the department is currently hiring a replacement to maintain the capabilities of the department. Overall, the department of statistics and data science have been making consistent investments in new faculty over the years leading up to the start of the MSBA program.

In order to service this set of specialized programs, the Department of Statistics and Data Science has made several investments in facilities and faculty. The Big Data Lab, led by recently-hired Professor Mitch Hill, will make available computing resources to students taking classes in statistics. The Big Data Lab was made possible with an investment of \$180,000 from UCF and the department.

c. Provide the date the pre-proposal was presented to the Council of Academic Vice Presidents Academic Program Coordination (CAVP ACG). Specify whether any concerns were raised, and, if so, provide a narrative explaining how each concern has been or will be addressed.

The CAVP form was completed through a collaborative effort and submitted in January, 2021. The pre-proposal was approved on February 4th, 2021 and no specific concerns were raised by the CAVP review group.

d. In the table below, provide a detailed overview and narrative of the institutional planning and approval process leading up to the submission of this proposal to the Board office. Include a chronology of all activities, providing the names and positions of both university personnel and external individuals who participated in these activities.

- **If the proposed program is a bachelor's level, provide the date the program was entered into the APPRiSe system, and, if applicable, provide narrative responding to any comments received from APPRiSe.**
- **If the proposed program is a doctoral-level program, provide the date(s) of the external consultant's review in the planning table. Include the external consultant's report and the institution's responses to the report as Appendix B.**

Planning Process

For several years, UCF has been building strength in data science and business analytics through a cluster in data science. As part of this long-term program, several new academic programs were created to achieve this goal. The MSBA program is the last stage of this larger program of development of business analytics and data science programs at UCF. The first in the College of Business was the Business Analytics Track of the Professional Master of Science in Management degree (the PMSM-BA program), initiated by the cluster committee, which included Ronald Michaels, Carol Saunders,

and Richard Hofler. This committee proposed the PMSM-BA as a joint program between the Department of Statistics and Data Science and the College of Business. To kick-start this academic program, the committee proposed to hire Business Analytics faculty through the data science cluster. Bob Porter and Taylor Ellis, under the direction of Dean Paul Jarley, launched the PMSM-BA program in 2015. This is a part-time program offered to industry professionals at the downtown campus.

The next stage was to develop a full-time, on-campus program to train recent graduates in business analytics. The initial instance of this program was a Business Analytics track of the existing Master of Science in Economics program. This program was run for a few years and tested the market for such a full-time program. The strategy of adapting this track from an existing program allowed for a quick entry into this educational market, however, it did have its challenges. In particular, the course requirements for the joint study of business analytics and graduate coursework in economics was a significant constraint in attracting qualified candidates: students had to have a very specific set of prerequisite coursework to be eligible for graduate coursework in economics. As a result, a sizeable fraction of applicants was not admitted.

In order to increase the size of the applicant pool, as well as service the undergraduate population, a Business Analytics track was created for the Bachelor of Science in Business Administration degree. This serves a much larger population of students and is a stand-alone educational track in its own right. A pilot of the course entitled Python for Business Analytics has been delivered to a class size of 35 students—larger than was expected---and, through informal surveys, the majority of these students have expressed an interest in pursuing a career in business analytics. Another course in the program entitled Spreadsheets for Business Analytics is planned to serve the large population of students in the fields of finance and accounting, making it possible to scale this course offering to several hundred students in later cohorts. This Business Analytics track is scheduled to serve the first cohort of students in Fall 2021. A byproduct of this educational track is that it develops the qualifications of a larger pool of potential applicants to the proposed MSBA program.

With the benefit of this experience, the MSBA program was initiated through a meeting attended by Sevil Sonmez, Associate Dean for Faculty, Research, and Graduate Programs; Ron Piccolo, Director of the PMSM degree program and John Solow, Director of the PMSM-BA program with members of the Data Science Advisory Board. Participants in this meeting highlighted the need for a full-time program that had a focus on business training to complement the existing programs in data analytics and data science, which offer more specialized training in statistics and computer science. The group recognized that in the workforce, much of the work is done in cross-functional teams, comprising a variety of performers with a range of technical skills and subject-matter expertise in business disciplines. The MSBA program was proposed to serve this larger business-oriented labor market.

At a meeting in June 2020, Paul Jarley (Dean of the College of Business) appointed faculty to a committee charged with developing the MSBA program: Sevil Sonmez (Associate Dean for Faculty, Research, and Graduate Programs), Harry J. Paarsch (Professor of Business Analytics), Michael Caputo (Chair of the Department of Economics) and Shunpu Wang (Chair of the Department of Statistics and Data Science). It was decided that the MS degree program would reside in the Department of Economics to attract business and economics undergraduates. The first steps, in early

October 2020, were to explore the process and deadlines with Winston Schoenfeld (Associate Dean for Postdoctoral Scholars and Academic Degree Development, College of Graduate Studies) and eventually to compile the information required to write the proposal. In September 2020, Lealand Morin (Assistant Professor in the Department of Economics, also teaching in the PMSM-BA program) joined the committee. In November 2020, Lealand Morin and Michael Caputo developed the pre-proposal (CAVP) with the input from all involved in both Economics and Statistics. By mid-December, all requisite signatures (Department Chair, Dean, Provost) were obtained and sent to Tim Letzring (Vice Provost for Academic Affairs) for review and submission to the Board of Governors for approval, which was granted by April 2021. All involved participated in regular meetings to make progress on the proposal and between November 2020 and January 2021, developed the curriculum. Courses were uploaded to Curriculog, passed through Departmental and then College level curriculum committees for approval. Graduate College level approval will wait until the Curriculog platform is replaced by a new system over the summer, which will be functional in early Fall 2021.

The preparation of this proposal document, first as a CAVP pre-proposal, then as a proposal for a master's degree since 2020 has involved numerous discussions and meetings to clarify its goals, industry opportunities, student demand, the type of students to target, etc. A more detailed chronology of these efforts is presented below:

Date	Participants	Planning Activity
February 2020	Sevil Sonmez, Associate Dean for Faculty, Research, and Graduate Programs; Ron Piccolo, Director of the PMSM degree program, John Solow, Director of the PMSM-BA program; members of the Data Science Advisory Board	First meeting at which the idea of an Economics-Statistics joint MS degree program was discussed with all concerned. Meeting concluded with widespread support and agreement to develop the program.
June 2020	Paul Jarley, Sevil Sonmez, Michael Caputo, Harry J. Paarsch	Paul Jarley appointed faculty to a committee charged with developing the MSBA program
April 2020	Sevil Sonmez met with Tim Letzring and Winston Schoenfeld	Determined the steps involved in the process to develop the program and the timeline for each stage
October 2020	Paul Jarley, Sevil Sonmez, Michael Caputo, Harry J. Paarsch	Dean Paul Jarley appoints Harry J. Paarsch, Michael Caputo and Lealand Morin to represent the Department of Economics in the program development committee. This committee begins work with Shunpu Zhang, Chair of Statistics to continue partnership in new MSBA degree program.

November 2020	Sevil Sonmez, Michael Caputo, Harry J. Paarsch, Shunpu Zhang, Lealand Morin	Kick-off meeting for the committee to give members the charge of developing the program.
November 2020	Lealand Morin, Michael Caputo	Lealand Morin and Michael Caputo worked on CAVP in an iterative process.
December 2020	Michael Caputo, Harry J. Paarsch, Paul Jarley, Sevil Sonmez	CAVP signed by Department Chair, College Dean, and UCF Provost, and submitted
December 2020	Michael Caputo, Chair, and faculty of the Department of Economics	Via email communication, all economics QMB syllabi of relevant course to the MS degree program were shared among the group.
January 2021	Faculty of Department of Economics	Meeting in Department of Economics to approve 6 new QMB courses
February 2021	Faculty of Department of Statistics and Data Science	Via email and Zoom faculty meeting, all syllabi for statistics courses in the MS degree program were shared among the faculty.
February 2021	Faculty of Department of Statistics and Data Science	Approval for new 6 credit course STA5737, new section of STA6136 for the MSBA program and to allow MSBA students to enroll in STA5104 along with other STA5104 students
February 2021	Board of Governors	CAVP approved
February 2021	Peter Spyers-Duran, Ying Zhang, Frank Allen, Sara Duff	Completed library report
February 2021	Dean Paul Jarley, John Solow, Harry J. Paarsch, Lealand Morin, Dean Jens, Michael Tseng	Obtained approval from Dean Jarley on the proposed program objectives and target audience
February 2021	Master's Program Review Committee (MPRC)	Course approvals completed and MS in Business Analytics program is next in line for review by the Graduate College Curriculum Committee in Fall 2021
February 2021	Kelley Dietrich, Director of Admissions at the College of Business, Sevil Sonmez, Lealand Morin, Michael Caputo, Harry J. Paarsch	Kelley Dietrich informed the committee that the Graduate Program Review Committee suggested that instead of creating new courses with QMB prefix, the same courses as in the PMSM-BA program would be used with new course sections rather than separate courses
February 2021	Sevil Sonmez, Lealand Morin, Michael Caputo, Harry J. Paarsch, Kelley Dietrich	Sevil Sonmez emailed the team the curriculum map and course descriptions.
February 2021	Kelley Dietrich	Entered proposal in Curriculog and updated course syllabi
Spring 2021	Lealand Morin	Proposal development
	Shunpu Zhang and Statistics Department faculty	Getting 6-credit course approved, others already exists.
March and April 2021	Lealand Morin, Michael Caputo, Shunpu Zhang	Proposal sections completed by the department chairs from the Department of Economics and the Department of Statistics and Data Science
April 2021	Sevil Sonmez, Harry J. Paarsch, John Solow, Shunpu Zhang, Alex Mantzaris, Aaron Smith, Lealand Morin, Dean Jens, Michael Tseng	Meeting to discuss coordination of topics of study in the curriculum and the distribution of these topics between economics and statistics courses.

April 2021	Sevil Sonmez, Lealand Morin, Daniel Eileen	Discussion of the proposed idea with potential industry partners; explored the possibility of having the same Data Science Advisory Board for the MSBA program
July 2021	Lealand Morin, Daniel Eileen	Dr. Morin presented a description of the MSBA program, and requested letters of support from industry professionals in attendance.
July 2021	Lealand Morin	Drafted budget worksheets in appendix A
July 2021	Sevil Sonmez, John Weishampel, Dean of Graduate Studies	Sevil forwarded the draft budget for feedback from John Weishampel; John made adjustments to the worksheets and suggested other adjustments.
July 2021	Lealand Morin, Michael Caputo, Shunpu Zhang	Collected additional accounting information for revisions to the budget
July 2021	Lealand Morin	Revised budget worksheets
October 2021	Lealand Morin	Adjustments to budget worksheets with figures from accounting personnel
October 2021	Lealand Morin	Completion of written proposal

Since this is a masters' program, a proposal was not submitted in APPRISE, and a consultant report was not developed.

- E. Provide a timetable of key events necessary for the implementation of the proposed program following approval of the program by the Board office or the Board of Governors, as appropriate, and the program has been added to the State University System Academic Degree Program Inventory.**

Events Leading to Implementation

The MS in Business Analytics program is planned for a Fall 2023 launch, with a series of actions that need to be followed as illustrated in the table below. Beginning in Summer 2022, marketing efforts will be initiated to bring visibility to the degree. Promotional materials and the student handbook for the program will be developed, explaining the curriculum, and recruitment planning will be followed by recruitment activities. Members of the first cohort (Fall 2023) will begin to graduate in Spring 2024. No construction or renovation is necessary for the program to get started.

Date	Implementation Activity
Fall 2023	Full program launch, start of teaching required courses
August 2023	Hold orientation session for incoming students
January-July 2023	Evaluate applicants and make admissions decisions
Spring 2023	Actively recruit students
October-December 2022	As part of marketing efforts, develop promotional materials, including website and flyers.
September 2022	Board of Trustees (BOT) approval
April 2022	Academic Affairs program quality review
March 2022	University GPRC approval (compliance with 8 BOG criteria)
March 2022	University GCCC approval of curriculum
January 2022	College of Business Master's Program Review Committee program approval
December-January 2022	University GCCC (Graduate Council Curriculum Committee) approval of courses
December 2021	DSDS and CBA Graduate Curriculum Committee approvals
October-December 2021	Department approvals (DSDS and Economics)
July-October 2021	Obtain letters of support from industry professionals

Institutional and State Level Accountability

III. Need and Demand

A. Describe the workforce need for the proposed program. The response should, at a minimum, include the following:

- **current state workforce data as provided by Florida's Department of Economic Opportunity**
- **current national workforce data as provided by the U.S. Department of Labor's Bureau of Labor Statistics**
- **requests for the proposed program from agencies or industries in your service area**
- **any specific needs for research and service that the program would fulfill**

The market for Business Analysts has been the focus of much research by government agencies, employment analysts, recruiting consultants and employment search firms. These sources have documented an increase in demand for Business Analysts in the nation-wide market, with a large market in the state of Florida, and promising employment prospects in the city of Orlando.

NATION-WIDE:

The Graduate Management Admissions Council (GMAC) is the agency responsible for administering tests for admissions to graduate business programs. They continuously monitor the employment market for graduates of master's and doctoral degrees in business disciplines. One such presentation of their analysis is the Corporate Recruiters Survey Report (2019). This report documents a 2019 Graduate Management Admission Council (GMAC) survey, in which employers were asked about the job functions they were looking to fill with business school graduates. Analytics was among the top three in the United States.

The GMAC survey had also inquired about employers' hiring needs beyond traditional master's programs in business disciplines. They reported that graduates of data analytics master's programs are the top talent sought by employers in the consulting, finance and accounting, and health care industries.

Data from the Bureau of Labor Statistics (BLS) show similar predictions for the demand for business analysts. In their U.S. Department of Labor, Occupational Outlook Handbook, they present the Job Outlook for Management Analysts. They predict that the demand for management analysts and similar occupations is expected to grow 14 percent between 2018 and 2028.

Salaries are predicted to be very strong for this line of work, particularly as a business analyst gains experience. The employment search Website Glassdoor.com classifies seniority levels in business analytics, along with the corresponding average salaries. After an entry-level position, once an employee has established a career as a Business Analyst, the average annual salary on Glassdoor was \$75,931. For employees one level higher, in a position that Glassdoor names Senior Business Analyst the expected salary rises to \$99,608. At higher levels of responsibility, the salaries are even higher, with a position that Glassdoor calls Business Analyst IV boasting an average salary of \$107,972. The possibility to enter this track is an attractive feature of programs such as the Master of Science in Business Analytics.

Indeed.com is another employment search Website that discusses employment prospects for business analysts. Indeed.com draws a distinction between the job titles of Data Analyst and Data Scientist. Indeed.com notes that the number of open roles for both data analysts and data scientists has increased in recent years and credit this with the incredibly fast pace of data creation. Indeed.com also points out that data science jobs on Indeed.com have increased by nearly 55% from June 2017 to June 2019 but that data analyst jobs have only increased by 7%. Comparing this to the number of available candidates, however, the number of people searching for data science jobs on the Website Indeed.com increased by over 8%, while the number searching for data analyst jobs actually decreased by over 8%. This demonstrates a strong demand for the relatively few candidates who do possess these skills: a growing market with a dwindling number of qualified candidates.

Indeed.com also presents material related to the way that business analysts earn their qualifications. Especially in the early growth stages of this employment market, it is not uncommon for candidates to learn business analytics by self-study. Many self-taught data scientists and data analysts do exist and bootcamp grads have gone on to have successful careers in this labor market. Indeed.com goes on to note, however, that landing these types of roles is much easier when the candidate has a formal college degree, such as the proposed MSBA. In fact, the vast majority of data scientists hold a master's or PhD in computer science, engineering, math or statistics. One report by Burtch Works Executive Recruiting even suggests that 94% of data scientists have master's or PhD degrees. Thus the role of graduate education is very important for entering this labor market.

The recruiting firm Burtch Works Executive Recruiting has extensively studied the market for analytics professionals. It publishes annually the Burtch Works Study: Salaries of Data Science and Analytics Professionals. In their most recent edition (2021) they analyze a sample of 1,228 Analytics Professionals and 339 Data Scientists for a

total sample of 1,567 data professionals. As for hiring prospects, they find that 81% of Data Science and Analytics teams plan to hire in the last half of 2021. They also find that these analytics jobs are more widespread than they once were. For data scientists primarily working with unstructured data, they report a noticeable shift in industry demographics when comparing the sample against previous years: in 2017, 41% of the data scientist sample was employed by Tech firms, whereas the tech industry only comprised 20% of the sample in 2021.

Burtch further documents the changes in levels of education among employees in this field. In both the predictive analytics and data science samples, there was a notable increase in the number of professionals with PhDs, which is a slight reversal of the trend from previous years in which the sample (especially at the early career level) was more heavily weighted towards Bachelor's or Master's degrees. The data science sample increased from 43% PhDs in 2020 to 48% in 2021, while the predictive analytics sample jumped from 15% PhDs in 2020 to 19% in 2021. Overall, data Scientists are more likely to hold a PhD than other Analytics Professionals but roughly 70% of Analytics Professionals held a master's degree, compared to 49% of data scientists with a PhD.

In sum, most data science and analytics professionals hold an advanced degree (master's or PhD). This is important for those who enter the field because education level has a marked effect on salary. Burtch Works classifies early-career analytics professionals as individual contributors (IC) and calculates salary predictions for levels IC1 to IC3, after a few years of experience. They document a substantial increase in salaries for those candidates who attain a master's degree. For level IC1, they document an average annual salary increase of approximately \$5,000, from \$75,000 to \$80,000. At the next level, they observe a larger change in average salary in \$14,000 from \$91,000 to \$105,000. The difference persists into higher levels of experience, with an additional premium of \$5,000 in annual salary, from \$130,000 to \$135,000, for this classified in category IC3. These salary figures are nation-wide averages, however, in the southeastern United States, which includes Florida, analytics professionals at IC2 level earn an average salary of \$101,684, which is only a few thousand different that the nation-wide average, which is lucrative, considering that these jobs are concentrated in areas with much higher cost of living.

Government sources show an equally promising picture for analytics professionals. Although it is difficult to identify all the job categories that would be represented by those who earn the MS in Business Analytics by a singular term, related positions are indicated by the Bureau of Labor Statistics (BLS) in their employment projections (<https://stats.bls.gov/emp/tables/fastest-growing-occupations.htm>). According to the BLS (2019), the fastest growing occupations (2019 projected to 2029) include statisticians, data scientists and mathematical science occupations, software developers/applications, mathematicians, information security analysts, and operations research analysts. Salaries for the potential positions our graduate can seek are: statistician (\$92,270), data scientists (\$98,230), information security analysts (\$103,590), software developers/applications (\$110,140), operations research analysts (\$86,200), and software developers \$110,140). The skill sets in professions are closely related to those attained through training in the MSBA program.

Among the employment categories for which the BLS collects information, two that are most relevant are *Management Analysts* and another category called *Market Research Analysts and Marketing Specialists*. Nation-wide employment and earnings figures for

these professions are as follows.

Occupation Title	Employment	Mean hourly wage	Mean annual wage
<i>Management Analysts</i>	734,000	\$ 46.91	\$ 97,580
<i>Market Research Analysts and Marketing Specialists</i>	690,160	\$ 35.56	\$ 73,970

As we can see, these types of Business Analysts are needed in large numbers and command high salaries. Of course, wages vary across a distribution, by level of experience and education. The distribution of wages for these job categories is captured in the following table.

Percentile	10%	25%	50% (Median)	75%	90%
Percentile wage estimates for Management Analysts:					
Hourly Wage	\$ 24.51	\$ 31.77	\$ 42.14	\$ 56.11	\$ 75.41
Annual Wage	\$ 50,990	\$ 66,080	\$ 87,660	\$ 116,710	\$ 156,840
Percentile wage estimates for Market Research Analysts and Marketing Specialists:					
Hourly Wage	\$ 17.01	\$ 23.10	\$ 31.64	\$ 44.73	\$ 61.26
Annual Wage	\$ 35,380	\$ 48,040	\$ 65,810	\$ 93,030	\$ 127,410

The wages earned by Business Analysts also differ by the industry in which they are employed. In the following table, the BLS has tabulated the industries in which employment is highest for these employment categories.

Industry	Employment	Percent of industry employment	Hourly mean wage	Annual mean wage
Industries with the highest levels of employment in Management Analysts:				
Management, Scientific, and Technical Consulting Services	177,130	11.64	\$ 51.85	\$ 107,850
Federal Executive Branch	63,760	3.06	\$ 47.71	\$ 99,230
State Government, excluding schools and hospitals	55,270	2.51	\$ 33.41	\$ 69,500
Computer Systems Design and Related Services	47,780	2.17	\$ 49.77	\$ 103,520
Management of Companies and Enterprises	46,040	1.90	\$ 45.07	\$ 93,730
Industries with the highest levels of employment in Market Research Analysts and Marketing Specialists:				
Management, Scientific, and Technical Consulting Services	79,200	5.20	\$ 33.61	\$ 69,910
Management of Companies and Enterprises	56,190	2.32	\$ 39.90	\$ 82,990
Computer Systems Design and Related Services	36,230	1.65	\$ 38.58	\$ 80,250
Advertising, Public Relations, and Related Services	29,830	6.57	\$ 34.73	\$ 72,240
Other Professional, Scientific, and Technical Services	19,640	2.70	\$ 33.89	\$ 70,480

As one might expect, the foremost destination for business analysts is in Management, Scientific, and Technical Consulting Services. These graduates are also likely to apply their skills in branches of the government and entities that design computer systems. These are also among the most lucrative of the employment destinations of graduates of programs such as the proposed MSBA program.

STATE-LEVEL:

The geographic distribution of employment for Business Analysts is largely concentrated over relatively few states in the United States. Florida is one of the largest employers of Business Analysts. The BLS has tabulated employment figures by state and states with the highest employment in these job categories is as follows.

State	Employment	Employment per thousand jobs	Hourly mean wage	Annual mean wage
States with the highest employment level in Management Analysts:				
California	101,240	6.16	\$ 47.80	\$ 99,420
Florida	52,670	6.24	\$ 40.44	\$ 84,120
New York	51,820	5.96	\$ 54.60	\$ 113,560
Virginia	46,820	12.65	\$ 51.33	\$ 106,760
Texas	42,470	3.51	\$ 46.02	\$ 95,730
States with the highest employment level in Market Research Analysts and Marketing Specialists:				
California	95,690	5.82	\$ 39.98	\$ 83,150
New York	70,770	8.14	\$ 40.91	\$ 85,090
Florida	43,290	5.13	\$ 29.86	\$ 62,110
Texas	38,800	3.21	\$ 36.94	\$ 76,840
Illinois	35,010	6.22	\$ 32.82	\$ 68,270

From these data, we conclude that Florida has one of the largest labor markets for business analysts nation-wide. Business Analysts are numbered in the hundreds of thousands in the state of Florida, indicating a large potential number of positions for the graduates of the proposed MSBA program. The percentage of employees in Business Analyst categories, among all categories in Florida, compares the same ratio in California, which is a known destination for analytical and technological employment. Among these states, wages in Florida are somewhat lower than in California and New York, but the cost of living is also much lower.

These figures can be combined with research conducted the executive recruiting firm Burtch Works regarding the nation-wide proportion of employees with graduate degrees in this field: according to their research, 70% of analytics professionals hold a master's degree. This suggests a labor market of 37,000 management analysts and 30,000 market researchers with qualifications similar to those from the MSBA program. A sample of such job postings is included in an appendix.

The Florida Department of Economic Opportunity (FDEO) has also analyzed the employment prospects for professions related to Business Analytics. They report the growth rates and number of job openings, as well as the mean hourly wages and entry-level hourly wages.

Occupational Title	Annual Growth Rate (%)	Openings	Mean hourly wage	Entry-level hourly wage
Business Operations Specialists, All Other	1.44	8,846	\$34.17	\$17.14
Computer Programmers	2.17	1,169	41.69	23.31
Computer Occupations, All Other	1.49	1,118	37.67	17.86
Database Administrators	1.52	669	45.51	27.69
Software Developers, Applications	1.93	3,952	47.47	30.42

In this case, the demand for Business Specialists is compared with related positions in the field of Software Development, which has similar labor market characteristics. The number of openings for Business Analysts is comparatively quite strong with a growth rate of 1.44 percent per year, which suggests continued increase in the number of openings. With 8,846 openings across the state, this is a promising picture for graduates of the proposed MSBA program.

The Florida Department of Economic Opportunity has also ranked the occupations in Florida by the number of advertisements for each occupation, comparing the years 2020 and 2021.

Occupational Title	Number of Job Postings 2021	Number of Job Postings 2020
Software Developers, Applications	5,906	4,609
Market Research Analysts and Marketing Specialists	2,991	1,191
Business Intelligence Analysts	1,385	613
Operations Research Analysts	1,325	546
Financial Analysts	1,287	589
Database Administrators	880	627
Computer Programmers	568	384
Computer Occupations, All Other	465	98
Risk Management Specialists	445	252
Search Marketing Strategists	253	106
Business Operations Specialists, All Other	205	72
Credit Analysts	109	65
Budget Analysts	85	35

Many of these employment categories are related to Business Analytics. While the demand for computing-related employment has shown impressive growth over the past year, many categories of positions related to Business Analytics show growth rates of more than 100%, indicating strong employment prospects in the aftermath of the coronavirus pandemic.

The Florida Department of Economic Opportunity has also made predictions concerning the number of positions available along broader categories. Among these, the category of *Professional and Business Services*, is notable in that the FDEO expects a 14.5 percent growth rate in the number of positions in this category, over the eight-year period from 2020 to 2028. This represents an increase on the order of 33,000 new positions. The high rate of 14.5 percent ranks among the highest-growth employment categories in Florida, outside of leisure and entertainment.

LOCAL TO ORLANDO:

The employment search Website Indeed.com tabulates the number of open positions at a particular time in the Orlando area. Recent graduates of the MSBA program can look forward to the following job opportunities. These figures were recorded on July 2, 2021.

Job Title	Annual Salary	Number of Openings
Analyst	\$55,255	823
Data Analyst	\$52,846	152
Business Analyst	\$68,080	13
Business Intelligence Analyst	\$72,307	48
Business Systems Analyst	\$93,233	63

The entry-level positions of Analyst and Data Analysts have a larger number of openings. For the candidates who differentiate themselves, such as the graduates with master's degrees, the more technical positions earn much higher salaries, although these more lucrative positions are found in smaller numbers. This indicates a great potential for graduates of a program such as the MS in Business Analytics.

B. Provide and describe data that support the assumption that students will enroll in the proposed program. Include descriptions of surveys or other communications with prospective students.

We collected data from three sources to assess the degree of interest in enrolling in the MSBA program. The first is taken from a survey of local business professionals, including members of the Data Science Advisory Board. The second is a survey from students in a master's program in accounting. The third is a survey of undergraduates taking an undergraduate course in business.

We surveyed industry professionals within the Data Science Advisory Board for their assessment of the demand for students trained with the skills gained in the MSBA program. Brandon Shelton, Senior Director of the Advanced Analytics Lab at L.A. Care Health Plan describes the roles that graduates of the MSBA program can play:

"[W]e often pair Business Insights Analysts with our Data Scientists on machine learning projects, due to our Analysts' strong understanding of the complex business environment we support and datasets that we work with. To be effective at L.A. Care, our Business Insights Analysts require the ability to work with the specific tools and analytic approaches outlined in the proposed [MSBA] program's curriculum."

Brandon goes on to describe the plans for hiring such graduates.

"L.A. Care has aggressively developed this competency over the last 4 years and will continue to increase its dependency on these skills over the next 3-5 years."

Praveen Rao, Director of Data Science at Spectrum Reach (Charter Communications) shares the same optimism. He distinguishes between the more well-known roles in data science machine learning from the business analysts who work alongside these specialized analysts:

“It is well known that data scientists are in great demand. However, the business analysts who are trained to work alongside the data scientists are especially valuable to us, since these employees have the business acumen to leverage analytics to solve our business problems...we see opportunities in many areas of our company and would recommend this program for many of our current roles, primarily those in marketing, product and financial analysis.”

The Data Science team at Spectrum Reach also anticipates strong demand for graduates of the MSBA program.

“We plan to continue to build competence in business analytics in the future and expect to hire for these skills in an accelerated mode within the next 3-5 years.”

The full letters of support are included in an Appendix; however, we have also engaged in informal communication with members of the Orlando business community. During a recruiting presentation, when shown the curriculum for the MSBA program, Jeff Neville, the General Manager of the Amazon Fulfillment Center in Orlando, said “These are the skills you need if you want my job,” when explaining how his employees apply these skills on a regular basis. When in conversation with executives at NetConversion, an Orlando-based digital marketing firm, Brett Hughes, V.P. of Technology and Analytics, stated that most business problems can be solved with standard statistical methods, rather than the more advanced techniques in data science and machine learning. Frank Vertolli, a Co-Founder and Managing Partner at his firm echoes the same sentiment: “We hired a Data Scientist and I think he was bored...” This indicates that, although advanced technical algorithms have their place in today’s business world, much of the day-to-day marketing analysis is conducted with skills learned in the MSBA program. This is in contrast to much of the attention in this educational market aimed at training graduates in more advanced skills of data science and data analytics: there exists a considerable demand for graduates able to organize and analyze data with standard statistical methods to answer business questions.

The MSBA program is the latest addition to the portfolio of programs at UCF relating to data science and business analytics. With this track record behind us, we benefit from the experience from the preceding programs, including information from the body of educational market research acquired to date. For instance, for the B.S. degree in data science, a survey was conducted among members of the Data Science Advisory Board. We found that Python was the most requested programming language with 95.2% of respondents listing it as a need. Similarly high, 90.5% of respondents requested that employees know SQL, a relational database language. Both of these skills are acquired in the MSBA curriculum. As far as the requested spreadsheet, business intelligence, and reporting tools used, the survey found that 90.5% of respondents used spreadsheets such as Excel, and 85.7% of respondents listed Tableau as the most used visualization tool. These tools form part of the curriculum in statistics courses and the Data Visualization course in the MSBA program. The survey also found that 90% of respondents indicated that data analysis is an important component of their role. Additionally, data cleaning (76.1%) and the ability to create visualizations (80%) were important tasks for data scientists. Again, these skills are acquired through the software and data visualization courses in the MSBA program.

A survey of graduate students was drawn from a class ECO5445 within the Master of

Science in Accounting (MAC) program. As a graduate class in the summer semester, comprising students interested in a specialized business program, the sample was fairly small: eight students responded, which is one third of the size of the anticipated first cohort of the MSBA program. Nevertheless, the results were conclusive. When asked whether they planned to use skills in the workplace chosen from a list, every student listed data preparation and data visualization, which are the focus of two of the courses in the program. Three quarters listed computer programming, which students will learn in the first semester of the MSBA program.

In order to gauge the interests of undergraduate students in learning advanced business analytics, we ran a pilot of a course in business analytics. ECP3004 Python for Business Analytics was the first version of a course that will be part of the Business Analytics track of the BSBA degree, which is scheduled to begin in the fall semester of 2021. The pilot course was taught by Dr. Lealand Morin in the spring semester of 2021. The course was well attended for such a specialized course offered the first time: 48 students registered initially and 36 finished the course, which was considered a success, given the specialized nature of the course.

During the course, Dr. Morin asked a student to post a survey question in an online meeting place frequented by the class. The question was

“After graduation, are you going to pursue (or are you interested in pursuing) a career in Data Analytics, Data Science, or any profession that uses Python?”

Out of a class of 35 students actively involved in the online meeting place, 22 responded. Ten students answered “Yes,” five answered “Maybe,” and the remaining seven students answered “No.” This translates to 45 percent of students who are planning to pursue careers in data science, and two thirds, including those who are considering this career path.

Overall, the feedback from the students about the course was very positive and the students enjoyed the applied nature of the topic. Several students reached out to Dr. Morin for career advice throughout the course. An enthusiastic example includes the following.

*“Hey Dr. Morin,
This is [Student Name], your student from last semesters ECP3004. After taking your class I have had a craving to want more coding I’m Data with Python. I was hoping if you know anyone in your field related to this topic that could mentor me or offer any internships? Please let me know for you have brought something I enjoy!”*

- Student in ECP 3004 Python for Business Analytics

Following such enthusiasm, some students have elected to start a Business Analytics club on campus. Dr. Scrogin and Dr. Morin, both in the Department of Economics, have been approached to serve as faculty liaisons for the club.

Overall, we have observed many signs of the enthusiasm for Business Analytics among the student population. In addition, during information sessions for prospective students considering the PSM-BA program, several students have inquired about the option for full-time study. This suggests a strong interest in further studies, such as the full-time

MSBA program.

C. Complete Appendix A – Table 1 (1-A for undergraduate and 1-B for graduate) with projected student headcount (HC) and full-time equivalents (FTE).

- Undergraduate FTE must be calculated based on 30 credit hours per year
- Graduate FTE must be calculated based on 24 credit hours per year

In the space below, provide an explanation for the enrollment projections. If students within the institution are expected to change academic programs to enroll in the proposed program, describe the anticipated enrollment shifts and impact on enrollment in other programs.

We expect to admit an initial cohort of 20 students and for this headcount to rise to 40 students by year 5 of the program. Of these, we expect half of them to be UCF graduates in the initial cohort, declining to about one third by year 5. We anticipate that between two and six students will enter the MSBA from both public and non-public institutions in Florida. We also expect that from one to three students will enter the program from out of state and that a similar number will be foreign residents. Finally, we expect from four to eight students, roughly 20% of the cohort, will be drawn from local businesses operating in the industries located in the Orlando area. No students are expected to change majors at the program inception; all incoming students will enter the MSBA program directly. As students take 30 credit-hours of training, each graduate of the program represents 1.25 FTE at the rate of 24 credits per FTE. This translates to a FTE count of 25 in year 1 and 50 by year 5.

D. Describe the anticipated benefit of the proposed program to the university, local community, and the state. Benefits of the program should be described both quantitatively and qualitatively.

The MS in Business Analytics offers many benefits across UCF, Florida, and the state's burgeoning analytics community and all its stakeholders. More specifically:

- The program will increase the much-needed student pipeline to the local analytics community in Florida with a inflow of graduates with higher-level skills.
- It will also increase strong partnerships between UCF and a variety of industries, including tourism, entertainment, health care services, and financial services, at the local, state, and national levels—particularly important for a state whose economy benefits so significantly from these industries.
- It will offer an opportunity to graduates from a variety of STEM disciplines to be employed by the growing business community, which is experiencing significant disruptions from increasing technological innovations (e.g., data science, ML, AI, others).
- Additionally, among the projected benefits of the degree program, the program will produce graduates who will work alongside the graduates of other programs at UCF, such as the MS in Data Analytics, the MS in Data Mining and the PhD in Big Data. Employers with business analytics job families will need all varieties of such analysts, including those graduating from the MSBA program.

The Florida High Tech Corridor is a hub of activity for technological and analytical

research. It is home to the National Center for Simulation, UCF's Institute for Simulation and Training (IST), all branches of the military and 10 other government agencies concentrated on simulation R&D through Team Orlando. Orlando is also home to the head offices of many corporate enterprises, many of which need qualified business analysts. The full list of companies seeking employees with technology skills versed in the Business Analytics is far too lengthy to include in this document, but spans across local, state, national, and international opportunities. Below is an indicative list of names of firms that have a substantial presence in the Orlando area:

- Entertainment companies, such as Walt Disney Company, Disney Parks, Universal Studios
- Hospitality companies, such as Hilton, Marriott, Loews Hotels, Holiday Inn, Darden, PepsiCo, Booking.com, and Wyndham
- Health care companies, such as Advent Health and Orlando Health
- Financial services firms, such as Bank of America, Chase, J.P.Morgan, Charles Schwab, Liberty Mutual, and Sun Trust
- Consulting firms, such as Deloitte, ServiceNow, Kforce, and Concentrix
- Payroll and HR firms, such as ADP, Paychex, and Paylocity
- Technology firms, such as Apple, Amazon, Electronic Arts, T-mobile, Version, and Oracle
- Engineering firms, such as Lockheed Martin, Siemens, and Northrop Grumman

The members of the Data Science Advisory Board, associated with UCF, strongly supported the plan to start the new MSBA program. We also obtained letters of support from leaders in the local data science community. For instance, Praveen Rao, Director of Data Science at Spectrum Reach (Charter Communications), reported that his organization hires for marketing, product, and financial analysis and plans to ramp up their recruiting over the next three to five years. Brandon Shelton, Senior Director at the Advanced Analytics Lab for L.A. Care Health Plan, has a team that is heavily dependent upon "Business Insights Analysts" who create accurate decision-support products through statistical analysis of very large, diverse datasets. In addition, these Business Insights Analysts are often paired with Data Scientists on machine learning projects, in light of the Analysts' strong understanding of the complex business environment. Furthermore, these Business Insights Analysts require training similar to that in the proposed MSBA program and L.A. Care Plan has aggressively hired such analysts and plans to continue this recruiting program over the next three to five years. Overall, in the local economy, we observe a demand for analysts with skills to match the training in the MSBA program.

- E. If other public or private institutions in Florida have similar programs that exist at the four- or six-digit CIP Code or in other CIP Codes where 60 percent of the coursework is comparable, identify the institution(s) and geographic location(s). Summarize the outcome(s) of communication with appropriate personnel (e.g., department chairs, program coordinators, deans) at those institutions regarding the potential impact on their enrollment and opportunities for possible collaboration in the areas of instruction and research.**

Within the College of Business of UCF, the MS in Business Analytics (MSBA) program complements the Business Analytics track of an existing program called the

Professional Master of Science in Management (the PMSM-BA program). The programs are designed to cater to different populations of students. The PMSM-BA program is a part-time, market rate program aimed at working professionals, offered through evening courses at the UCF Downtown campus over 20 months. In contrast, the MSBA program is a full-time, regular-tuition program, offered on campus over 11 months. Several of the same faculty will be involved in both programs because the MSBA program is designed to take full advantage of opportunities for coordination in delivery and course preparation.

At other universities, departments of business, computer science and engineering have assembled master's programs to train students in business analytics. The programs differ in terms of the curriculum, the mode of delivery, the tuition rates and whether the program caters to recent graduates or working professionals. We have collected the following information about competing programs in the geographic area surrounding UCF.

University	School	Program	Delivery	Tuition
Full-Time Programs offered in Business Departments:				
UCF	Business	MS Business Analytics	Full time, 11 months	\$11,090
FSU	Business	MS Business Analytics	Full time, 3 terms	\$15,817
UNF	Business	MS Business Analytics	Full or part time, 12-24 months	\$14,806
UM	Business	MS Business Analytics	Full time, 10 months	\$60,000
UGA	Business	MS Business Analytics	Full time, fall and spring terms	\$23,529
Full-Time Programs offered in Computing, Engineering or Information Systems:				
UCF	Engineering & Computer Science	MS Data Analytics	Full or part time, 16-20 months	\$36,300
GA Tech	Business, Computing, Engineering	MS in Analytics, Business Analytics Track	Full time, 10 months	\$43,812
USF	Business	MS Business Analytics & Information Systems	Full time, 24 months	\$15,422
UF	Business	MS Information Systems & Operations, Business Analytics Track	18-24 months	\$12,470
Part-Time or Executive Programs:				
UCF	Business	Professional MS in Management-Business Analytics	Part time, 20 months	\$30,000
USF	Business	Executive MS Business Analytics & Information Systems	Part time, alternating online, 16 months	\$29,700
FIU	Business	MS Information Systems, Business Analytics Track	Weekends, 14 months	\$15,880

Fully Online Programs:				
GA Tech	Business, Computing, Engineering	Online MS in Analytics	Online, 1 to 2 years	\$9,900

In comparison with the programs at other universities, the MSBA is most similar to the MS in Business Analytics programs at Florida State University, University of North Florida, University of Miami and, in a neighboring state, the University of Georgia. These programs all offer full-time instruction over the course of one year and are offered within a business department. Several programs are offered with a focus on Information Systems, Computer Science, or Engineering. These programs have a different focus and have very little similarity in terms of the preparation of incoming candidates and the expectations in terms of positions attained after graduation. Other programs listed above serve a population of working professionals, through some combination of part-time or online education and do not offer the immersive experience of a full-time program. The PMSM-BA program of UCF, discussed above, is one such example.

The close competitors in the space of full-time, 1-year MS in Business Analytics programs warrant further consideration to compare the curriculum, in order to identify any substantial overlap. The core courses in the MSBA at FSU include Programming for Analytics, Quantitative Methods in Business Analytics, and Data Management in Business Analytics, as in the UCF MSBA. The FSU MSBA also includes coursework in data mining, forecasting, and pricing, as well as electives in HR, marketing, and insurance, which are not offered in the proposed MSBA at UCF. The MSBA at UNF includes core coursework in Data Analytics, Programming for Data Science, and Data Visualization, similar to those in the proposed MSBA at UCF. The UNF program, however, includes additional coursework in computing and IT and offers elective coursework in methods such as data mining, financial modeling, and economics, but also discipline-specific coursework in fields such as social media, real estate, geography, project management and sports management. At the University of Miami, the MSBA program includes courses in Programming for Data Analytics and Data Visualization, matching our proposed MSBA, however, their other coursework focuses on data mining, machine learning, and time-series analysis, as well as elective coursework in fields such as marketing, accounting, and supply chain analytics. At the University of Georgia, the MSBA program includes a two-course sequence in Data Management and Analytics and two courses in econometrics, Causal Inference and Time Series Analysis. In terms of their focus on statistics, this program is most closely aligned to the program at UCF, although our program places more emphasis on traditional statistical procedures and theirs on big data platforms and data mining.

In all cases, these programs have less than a 60 percent overlap in core courses. They are also widely distributed over that state of Florida and beyond, which is also important for our proposal because our target market is the business community in the Orlando area. We conclude that no substantial overlap exists to warrant concern over interference between the programs.

F. Describe the process for the recruitment and retention of a diverse student body in the proposed program. If the proposed program substantially duplicates a program at FAMU or FIU, provide a letter of support from the impacted institution(s) addressing how the program will impact the institution's ability to attract students of races different from that which is predominant on the FAMU or FIU campus. The institution's Equal Opportunity Officer shall review this Section of the proposal, sign, and date the additional signatures page to indicate that all requirements of this section have been completed.

The primary source of candidates for admission to the MSBA program will be the undergraduate population of UCF; however, we do anticipate some applicants to join the program from elsewhere in Florida and internationally. Fortunately, the UCF population is very diverse and represents many different groups. This reflects the diversity of the populations in the state of Florida, the city of Orlando, the population at UCF, the College of Business, and related graduate programs.

According to the 2020 census, the racial distributions in Florida are as follows; 51.5% Non-Hispanic White, 26.6% of the population are Hispanics or Latino (of any race), 14.5% African American, 4% Native American, and 2.3% Asian, Oriental and other. This aligns with the 2018 US Census Bureau estimates, in which Florida's population was projected to be 74.7% White (53.3% Non-Hispanic White), 16.0% Black or African American, 4.3% Native American and Alaskan Native, 0.1% Pacific Islander, 3.3% Some Other Race, and 2.9% from two or more races. Florida has grown more diverse in the past seven years, with the percentage of non-Hispanic whites dropping from 78.4% (2010) to 54.1% (2017) to 51.5% (2020).

Closer to UCF, in the city of Orlando, 57.4% are White, 24.2% are Black or African American, and 4.7% are Asian. Among the 57.4% listed as White, many are Hispanic or Latino, as 36.0% are listed as White alone, not Hispanic or Latino, and 32.7% of Orlando residents are Hispanic or Latino. The population of this metropolitan area, the home of UCF, reflects more diversity than that across the entire state.

Since 2010 at UCF, the Hispanic/Latino, full-time undergraduate student population has steadily increased from 21.2% (2014) to 26.1% (2018) and 27.8% (2021). In February 2019, UCF was awarded the Hispanic Serving Institution designation (under Titles III and V of the Higher Education Act of 1965 as amended by the Higher Education Opportunity Act of 2008). In fact, with figures such as these, UCF set records for diversity in Fall 2021: 49.1% of students are minorities and 27.8% are Hispanic. UCF's student body is composed of 55.68% female, 27.8% Hispanic/Latino, 10.2% Black/African American, 6.8% Asian/Pacific Islander, 4.1% Multi-racial, 26.7% first-generation students) (AY 2020-21).

Within programs more closely related to the MSBA program, UCF has a substantial presence in STEM fields and in business. In 2020-21, UCF awarded 3,626 degrees in STEM fields, one of the leaders in the State University System. Fall enrollment (2020-21) for the College of Business reached 8,199 undergraduates and 764 graduate students (totaling 9,179 currently enrolled). The undergraduate student population of the College of Business is 45.2% underrepresented minorities (26.6% Hispanic/Latino,

6.2% Asian, 8.6% Black/African American, 3.8% Multiracial), 49.9% White, 38.2% women, and 3.6% international and a graduate student population that is 42% underrepresented minorities (21.4% Hispanic/Latino, 10.7% Black/African American, 7.7% Asian, 2.1% Multiracial), 51.6% White, 4.7% international, and 48% women. We would expect the MSBA cohort to be highly diverse reflecting the diversity of the undergraduate and graduate student populations in the College of Business Business Analytics programs.

As an example of a graduate program in the College of Business, the last three cohorts (2019-21, 2020-22, and 2021-23) of the forerunning PMSM-BA program illustrate a track record of success in attracting a diverse group of students. The following table shows the distribution of the population of 40 students over these three cohorts across gender, race, and ethnic categories.

Distribution of PMSM-BA cohorts (2019-21, 2020-22, and 2021-23)					
	White	Black	Hispanic/Latino	S.W. Asian	Totals
Female	58.3	12.5	25.0	4.2	40.0
Male	25.0	12.5	31.3	31.3	60.0
Both genders	45.0	12.5	27.5	15.0	100.0

The gender ratio is fairly high for technology roles at 40% female. Over the three cohorts, one in eight students were African-American, including 30% of the 2020-22 cohort. Over one in four students were of Hispanic origin and 15% of the students each year represent Southwest Asia. We will continue to support this trend in the operation of our MSBA program.

The foregoing illustrates a significant and diverse pool of potential applicants; however, the smaller percentages of Hispanic/Latino, Black/African American and Asian/Pacific Islander students offers an opportunity to recruit students for this program to increase ethnic diversity and offer opportunities to these student segments. The mutual benefits of recruiting students from Asian, Latin American, and Middle Eastern countries are clear. As for gender diversity: women—historically underrepresented in technology and engineering careers—represent another segment of potential student demand at a time of active initiatives to increase gender diversity in technology organizations. Not surprisingly, “tech industry executives...have an extremely difficult time finding technical talent” (Huffington Post, 2014). On a positive note, the U.S. government recently directed \$200 million to tech education grants for women and minorities to diversity STEM education (Politico, 9/25/2017).

Efforts to recruit women and minority students will involve building a strong partnership with the UCF Office of Diversity and Inclusion (<https://diversity.ucf.edu/>). This approach has already assisted efforts to increase enrollments for graduate programs such as the MS in Data Analytics and to contribute to the success of undergraduate programs. These partnerships will be further strengthened for this new graduate program.

Our plan to recruit women and minority students involves the following initiatives:

1. Because the College of Sciences and the College of Business have very diverse student populations, the MSBA enrollments are expected to reflect this

diversity.

2. Our recruitment efforts will include international education fairs arranged by experienced organizations, such as the Begin Group (www.begingroup.com), currently used by UCF, Florida International University, University of South Carolina, University of Tennessee, and Duke, among others to recruit students from Asian and Central Asian countries. Other examples include (but are not limited to) the International Student Network, Inc. (<https://isnexpo.com>), 10times (<https://10times.com>), WEBAWorld (<http://www.webaworld.com>).

3. Our recruitment efforts will include local companies (e.g., Disney Parks, Universal Studios, Fairwinds, CFE Federal Credit Union, Hilton, Marriott, Darden, ADP and Paychex), whose employees also reflect the demographic diversity of the Central Florida population.

4. We will also have the program director/co-director and/or faculty make annual recruiting trips to various universities around the state, particularly to FAMU and FIU, as well as to UNF, USF, UF, New College, and Florida Polytechnic to recruit women and minority students from their undergraduate population of Business and Statistics students. The director of the program will aid under-represented students in applying to and succeeding in the program. Where possible we will hire women and minority faculty for the program and support them in taking such recruiting trips. We will use data analytics to see which recruiting strategies yield the largest percentages of women and minority recruits admitted into the program.

5. We will also recruit students from historically Black institutions (e.g., Spelman, Morehouse, Bethune Cookman, FAMU) and Hispanic Servicing Institutions (e.g., UCF, FIU, UTSA)

We found no program similar to the MSBA at FAMU, since their graduate degree offering in business is focused on the MBA degree. At FIU, a wider range of graduate business programs are available, many of which are also focused on the MBA degree. Others at FIU are focused on specific business disciplines, such as Marketing, Accounting, Finance, Logistics and Supply-Chain Management. One program at FIU that is oriented toward Business Analytics is the MS in Health Informatics and Analytics. This program is tailored specifically toward the health care industry and there is little overlap between this program and our MSBA degree. Another program at FIU is the Business Analytics Track of the MS in Information Systems, which more closely aligns with the proposed MSBA. As it is taught within a program in Information Systems, the program content more heavily aligns with IT and computing, as opposed to the heavy weight on statistics in the MSBA. Students in the MS Information Systems program at FIU are expected to be familiar with introductory programming languages, HTML and databases, none of which are required as prerequisites of the MSBA program. In conclusion, the program at FIU is catering to a very different audience, with more rigorous computing skills, and we do not anticipate that students with these qualifications would consider the MSBA program as a close alternative.

IV. Curriculum

A. Describe all admission standards and all graduation requirements for the program. Hyperlinks to institutional websites may be used to supplement the information provided in this subsection; however, these links may not serve as a standalone response. For graduation requirements, please describe any

additional requirements that do not appear in the program of study (e.g., milestones, academic engagement, publication requirements).

The MS in Business Analytics program will admit applicants with an undergraduate degree in business, economics, computer science, engineering, mathematics, statistics, and other natural sciences. It is recommended but not required that the applicants should have successfully completed the following courses or their equivalent:

- A mathematics course, such as QMB 3003 (Quantitative Methods for Business I) or MAC 2311C (Calculus with Analytic Geometry I)
- A statistics course, such as QMB 3200 (Quantitative Methods for Business I) or STA 2023 (Statistical Methods I)
- Coursework in economics, such as ECO 2023 (Principles of Microeconomics), ECO 3101 (Microeconomics)

Applicants might also have taken further courses in business analytics, including econometrics, mathematical economics, and other courses in the minor in business analytics or the business analytics track of the BSBA degree at UCF. The admissions committee, comprising the Program Director and the program's faculty, will evaluate student applications. At the discretion of the admissions committee, prospective students with undergraduate degrees in social sciences and other disciplines may be considered for acceptance into the MS in Business Analytics program.

In addition to the general UCF graduate application requirements, applicants to this program must provide:

- A current résumé
- Three letters of recommendation
- A statement of purpose

The letters of recommendation may support academic or professional achievements and may be written by professors as well as current or former supervisors. As for the statement of purpose, applicants should describe their professional goals, how the program furthers these goals, and how their achievements and qualifications will further their success in the program.

Graduation with an MS in Business Analytics requires 30-credit hours beyond the Bachelor's degree. The independent learning requirement is met by successful completion of a capstone project in the required course sequence in the form of an applied empirical project. This culminating experience is a 6-credit-hour, two-course capstone sequence. Students must maintain a GPA of 3.0 or better grade in the program. The required courses are listed in section E below.

B. Describe the specific expected student learning outcomes associated with the proposed program. If the proposed program is a baccalaureate degree, include a hyperlink to the published Academic Learning Compact and the document itself as Appendix C.

Students who have completed the MS in Business Analytics will be able to:

1. Apply mathematical tools and economic concepts to models of decision-making by firms to formulate empirical questions in business analytics.
2. Use programming languages such as R, Python and SQL to collect and prepare data, as well as implement statistical analysis.
3. Produce a written report of an empirical research project and communicate these results in a formal presentation.

Students will be evaluated for their use of economic models to formulate empirical questions in the first part of the capstone course sequence in the last semester of the program. The final evaluation for this course is the assessment of a proposal for an empirical research project. The remaining two learning outcomes will be evaluated in the second capstone course, in which students collect and prepare data, analyze it by estimating statistical models and making business recommendations. The results will be written up in a formal report and will be presented as the final evaluation for the capstone course.

C. If the proposed program is an AS-to-BS capstone, provide evidence that it adheres to the guidelines approved by the Articulation Coordinating Committee for such programs, as outlined in [State Board of Education Rule 6A-10.024](#). Additionally, please list the prerequisites, if any, and identify the specific AS degrees that may transfer into the proposed program.

Not applicable to this program because it is not an AS-to-BS Capstone.

D. Describe the curricular framework for the proposed program, including the following information where applicable:

- **total numbers of semester credit hours for the degree**
- **number of credit hours for each course**
- **required courses, restricted electives, and unrestricted electives**
- **a sequenced course of study for all majors, concentrations, tracks, or areas of emphasis**

The program is a one-year, face-to-face program delivered over eleven months. The format is a cohort or lock-step program in which students take 9 required courses, with no electives. In the first semester, students attain software proficiency, learn mathematical tools, and develop economic intuition. In the second semester, students take courses in data processing, data visualization, and a six-credit course in data analytics. Students complete the program with a two-part capstone project, in which they design and implement a self-directed research project.

The program has one stream with a fixed set of required courses. The program is designed for full-time study. Students earn 30 credit hours by taking 10 courses in the following sequence.

First Semester:

QMB 6358 – Software Tools for Business Analytics

QMB 6010 – Mathematical Tools for Business Analytics
QMB 6357 – Microeconomic Analysis for Business Analytics
STA 6136 – Probability and Statistics for Business Analytics

Second Semester:

QMB 6304 – Data Visualization
STA 5104 – Advanced Computer Processing of Statistical Data
STA 5739 – Fundamental Data Analytical Methodology with Business Applications

Third Semester:

The Master of Science in Business Analytics capstone course sequence is required for all MSBA students. This six-credit, two-course sequence is an integration of all the tools developed in the program to solve an empirical problem.

ECO 6935 – Capstone in Business Analytics I (Summer Semester A)

ECO 6936 – Capstone in Business Analytics II (Summer Semester B)

E. Provide a brief description for each course in the proposed curriculum.

REQUIRED COURSES

As mentioned above, the program is an 11-month lock-step cohort experience with no elective courses. The following courses are required.

QMB 6358 – Software Tools for Business Analytics (3 credit hours) Introduction to the main software tools used in business analytics, specifically, Python, R, and SQLite as well as UNIX.

QMB 6010 – Mathematical Tools for Business Analytics (3 credit hours) Introduction to the most-used mathematical tools in business analytics, specifically differential and integral calculus as well as linear algebra.

QMB 6357 – Microeconomic Analysis for Business Analytics (3 credit hours) Introduction to the main tools of microeconomic analysis for use in business analytics.

STA 6136 – Probability and Statistics for Business Analytics (3 credit hours) Introduction to the main tools of probability and statistics used in business analytics.

QMB 6304 – Data Visualization (3 credit hours) This course uses data visualization tools and technique to translate, summarize, represent and communicate insights from data analysis.

STA 5104 – Advanced Computer Processing of Statistical Data (3 credit hours) Use of statistical software packages; data manipulation; graphical data presentation; data analysis; creating analytical reports.

STA 5739 – Fundamental Data Analytical Methodology with Business

Applications (6 credit hours) The first half of this course is an introduction of methods to prepare structured and unstructured. In the second half, students learn to apply advanced analytical techniques to build models of real-world data collected from a variety of sources.

ECO 6935 – Capstone in Business Analytics I (3 credit hours) Students pose a relevant problem; develop the necessary economic theory; choose an empirical specification; locate the relevant data; and produce an outline for an empirical research project.

ECO 6936 – Capstone in Business Analytics II (3 credit hours) Students perform all the steps necessary to solve a relevant business problem, according to the outline for the empirical research project produced in ECO 6935, and communicate the results in a research paper.

F. For degree programs in medicine, nursing, and/or allied health sciences, please identify the courses that contain the competencies necessary to meet the requirements identified in [Section 1004.08, Florida Statutes](#). For teacher preparation programs, identify the courses that contain the competencies necessary to meet the requirements outlined in [Section 1004.04, Florida Statutes](#).

Not applicable to this program because the program is not a medicine, nursing, allied health sciences, or teacher preparation program.

G. Describe any potential impact on related academic programs or departments, such as an increased need for general education or common prerequisite courses or increased need for required or elective courses outside of the proposed academic program. If the proposed program is a collaborative effort between multiple academic departments, colleges, or schools within the institution, provide letters of support or MOUs from each department, college, or school in Appendix D.

The MSBA program follows naturally from the Business Analytics minor and the Business Analytics track of the BSBA degree, a new track which is admitting students in Fall 2022. Since this is a graduate program, general education and common prerequisites are not applicable. No additional training or coursework is required. The MOU between the College of Business and the College of Sciences is included in Appendix D.

H. Identify any established or planned educational sites where the program will be offered or administered. If the proposed program will only be offered or administered at a site(s) other than the main campus, provide a rationale.

The program will be delivered face-to-face on the UCF Main Campus.

I. Describe the anticipated mode of delivery for the proposed program (e.g., face-to-face, distance learning, hybrid). If the mode(s) of delivery will require specialized services or additional financial support, please describe the projected costs below and discuss how they are reflected in Appendix A – Table 3A or 3B.

The program will be delivered face-to-face on the UCF Main Campus.

- J. Provide a narrative addressing the feasibility of delivering the proposed program through collaboration with other institutions, both public and private. Cite any specific queries made of other institutions with respect to shared courses, distance/distributed learning technologies, and joint-use facilities for research or internships.**

Since this program will be delivered face-to-face on the UCF main campus, collaborating with other institutions was not feasible.

- K. Describe any currently available sites for internship and/or practicum experiences. Describe any plans to seek additional sites in Years 1 through 5.**

Not applicable to this program because the program does not require internships or practicums.

V. Program Quality Indicators - Reviews and Accreditation

- A. List all accreditation agencies and learned societies that would be concerned with the proposed program. If the institution intends to seek specialized accreditation for the proposed program, as described in [Board of Governors Regulation 3.006](#), provide a timeline for seeking specialized accreditation. If specialized accreditation will not be sought, please provide an explanation.**

As the field of business analytics currently has no single, leading accreditation agency, no form of accreditation will be sought for this program. The field is not yet mature enough that there is no leading recognized accreditation agency. As such, the field is largely organized in a more organic fashion, by the guidance of industry professionals. Therefore, the above two-pronged approach, described in part F above, is well-suited to guide the direction of the program.

- B. Identify all internal or external academic program reviews and/or accreditation visits for any degree programs related to the proposed program at the institution, including but not limited to programs within academic unit(s) associated with the proposed degree program. List all recommendations emanating from the reviews and summarize the institution's progress in implementing those recommendations.**

COLLEGE OF BUSINESS

All accredited business schools are evaluated and certified by the Association to Advance Collegiate Schools of Business (AACSB). The College of Business was evaluated by an AACSB team from peer institutions and received its most recent accreditation in 2017.

Two recommendations were made by the Peer Review Team, to wit, (i) the accreditation of the undergraduate, master's, and doctoral degree programs in business offered by the University of Central Florida College of Business be extended with the

next accreditation review scheduled for 2023, and (ii) at the time of the next review, the College is to provide the visitation team with an update on the faculty qualifications for faculty teaching in the Integrated Business program, their alignment with AACSB standards, and a greater sense than in the current review as to how faculty teaching in this program will demonstrate on-going professional currency.

In the last continuous improvement review two issues or concerns were raised in which the College was asked to monitor going forward, namely (a) Faculty are maintaining quality in research, teaching and service despite limited resources, but the further loss of tenure track faculty and academically qualified faculty could hamper the College's ability to adequately staff such a broad range of programs, and (b) the College should consider developing written expectations for faculty to progress to tenure and promotion, including to full professor.

Regarding (a), the Peer Review Team noted that the College and University have been responsive, as seven net new tenure track lines were added between Fall 2012 and Fall 2016, and searches were on-going in 2018 for seven net new lines as a result of State targeted funding. As for (b), every department in the College, as well as the College, has clearly identified standards for promotion and tenure that are readily available to all faculty and to all potential hires. The department is already looking toward the next AACSB review which is scheduled to occur in 2023.

A periodic Academic Program Review (APR) review is conducted for each academic department in Florida's State University System (SUS) every seven years. The most recent APR for the Department of Economics was conducted during AY 2018–19, and produced the following recommendations:

1. Prioritize faculty hiring needs, including areas of specialization, and pursue accordingly as resources become available.
2. Devise a succession plan sufficiently in advance of the current department chair's end of term, and consider the need for new department leadership after the current chair retires in a few years.
3. Continue to increase overall externally funded research.
4. Continue to seek out and leverage opportunities that emerge from fintech collaborations.

Progress has been made on the recommendations, as noted below.

1. Faculty hiring has been prioritized to reflect the fact that the Department of Economics is *the* unit in the College that teaches the business analytics courses and runs the business analytics degree programs.
2. Discussions have already taken place between the tenured faculty and current department chair, and the dean and current department chair, in an effort to address the recommendation.
3. Research funding is unlikely to increase in the near term. This is because (i) the recent hires were faculty with either a business analytics background or who conduct research in economic theory, neither area of which has much external money available for research, and (ii) three of the new hires were junior faculty, and junior faculty typically do not stand much of a chance of securing external funding in economics.
4. The FinTech program has yet to fully get off the ground, so the opportunity for

collaboration remains limited. The Department does, however, teach a business analytics course for the program, as noted elsewhere.

COLLEGE OF SCIENCES

In 2016-17, the Department of Statistics and Data Science underwent an external program review, which focused on the active undergraduate (B.S.) and graduate (M.S.) programs. The external consultants were Dr. John Stufken, Charles Wexler Professor in Statistics, Arizona State University and Dr. H. Joseph Newton, Dean Emeritus of Science, Professor Emeritus of Statistics, and Senior Professor of Statistics, Texas A&M University. The final report of the accreditation committee contained the following recommendations.

- develop a department strategic plan within the context of the college's strategic plan; assure clear articulation of program goals and target balance between graduate and undergraduate activities; invest current and new resources in accordance with the plan
- develop and implement a plan to address current and anticipated human-resource needs that aligns with strategic planning priorities, considers the appropriate faculty mix, and takes into account current and future resources
- review and update promotion and tenure guidelines and criteria for faculty annual evaluations as appropriate
- strengthen the junior faculty mentoring program
- pursue opportunities for interdisciplinary research collaborations to secure more external funding
- explore options to meet space needs
- review the department's faculty workload policy and assure that it aligns with the department's goals
- improve the department's web presence to better promote faculty research and programs, improving visibility and recruitment

In response to these recommendations, the department has made progress along the following lines.

- Increased their investment in the field of data mining to continue to strengthen their international reputation in this field.
- Hired several faculty members in the field of big data and data mining, who pursue more interdisciplinary research
- Built the Big Data Lab, which is led by recently hired Professor Mitch Hill, to make available computing resources to students taking classes in statistics.
- Revised and modernized the department Website to increase exposure to faculty, highlight the strengths of the department, and improve accessibility to students.
- Revised the promotion and tenure guidelines, which are now awaiting approval by the College of Sciences.
- In addition to the above, the Department of Statistics and Data Science has also partnered with other faculty in the College of Sciences to develop a joint degree program offering a Bachelor of Science in Data Science.

C. For all degree programs, discuss how employer-driven or industry-driven competencies were identified and incorporated into the curriculum.

Additionally, indicate whether an industry or employer advisory council exists to provide input for curriculum development, student assessment, and academic-force alignment. If an advisory council is not already in place, describe any plans to develop one or other plans to ensure academic-workforce alignment.

Industry-driven competencies were identified through two channels. One is the UCF Data Science Advisory Board, which already provides guidance to the Master of Science in Data Analytics, among other programs at UCF. It is a team of 27 industry professionals representing a variety of industries. Since typical graduates of our program will often work alongside the graduates of the Master of Science in Data Analytics program, this advisory board is well-suited to offer insight into the needs of organizations who hire business analysts as well.

On top of this, the program will benefit from the guidance derived from the personal business experience of the faculty who are teaching and directing the program. Faculty members have experience in data science roles at firms such as Amazon and Capital One Bank, as well as software development roles at Goldman Sachs and a variety of software development companies.

VI. Faculty Participation

A. Use Appendix A – Table 2 to identify existing and anticipated full-time faculty who will participate in the proposed program through Year 5, excluding visiting or adjunct faculty. Include the following information for each faculty member or position in Appendix A – Table 2:

- **the faculty code associated with the source of funding for the position**
- **faculty member's name**
- **highest degree held**
- **academic discipline or specialization**
- **anticipated participation start date in the proposed program**
- **contract status (e.g., tenure, tenure-earning, or multi-year annual [MYA])**
- **contract length in months**
- **percent of annual effort that will support the proposed program (e.g., instruction, advising, supervising)**

This information should be summarized below in narrative form. Additionally, please provide the curriculum vitae (CV) for each identified faculty member in Appendix E.

We have seven (7) faculty involved in the MS Business Analytics program from both the Department of Economics and the Department of Statistics and Data Science.

COLLEGE OF BUSINESS

The Department of Economics has three tenure-earning faculty members who will teach courses in the MS in Business Analytics program: Dr. Dean Jens, Dr. Lealand Morin, and Dr. Michael C. Tseng will teach QMB 6304, QMB 6358 and QMB 6010, respectively. Two Full Professors, Dr. Harry J. Paarsch and Dr. John L. Solow, will also teach in and administer the program: Dr. Solow will serve as the program director and teach an economics course, QMB 6357; Dr. Paarsch will teach the capstone courses

QMB 6935 and 6936.

COLLEGE OF SCIENCES

In the Department of Statistics and Data Science, Dr. Alexander V. Mantzaris is an Assistant Professor who will be teaching a 6-credit course in data methodology, STA5739. Other faculty in the statistics department, including Professor Nizam Uddin, will teach STA 6136 and STA 5104, which also serve students in other programs.

Refer to Table 2 of Appendix A for the remaining information.

B. Provide specific evidence demonstrating that the academic unit(s) associated with the proposed program have been productive in teaching, research, and service. Such evidence may include trends over time for average course load, FTE productivity, student HC in major or service courses, degrees granted, external funding attracted, and other qualitative indicators of excellence (e.g., thesis, dissertation, or research supervision).

COLLEGE OF BUSINESS

Teaching:

- The average annual course load of a faculty member in the Department of Economics has remained constant in recent years. This is because the research-active faculty have remained sufficiently productive with regard to research to maintain their 4 course/year teaching load. The few faculty who do not have a research appointment have an 8 course/year teaching load, which does not change.
- The number of economics majors has trended up in broad step with enrollment at UCF, thereby resulting in an upward trend in degrees granted and SCHs. On the other hand, changes in the GEP in AY 17–18 and College of Business secondary core in AY 18–19 have negatively impacted SCH generation by the Department of Economics. The net effect is that SCH generation by the Department of Economics has remained relatively constant in recent years.
- The Department of Economics provides a great number of service courses to other programs in the College of Business and other departments. As we have done for years, we teach two different courses every semester in the evening MBA, E-MBA, P-MBA, and Sports-MBA programs, two sections of Principles of Economics for the Burnett Honors College, two sections of Principles of Economics for the GEP, two courses in the College of Business core, three courses in the PhD programs in Finance and Marketing, and one course twice per year for the BS degree in Environmental Studies. In the past few years our reach has grown to include two faculty-generated courses for the Burnett Honors College, a business analytics course for the FinTech program in the Department of Finance, five courses for the Professional MS in Management in the Business Analytics track, a course for the PhD program in Mathematical Finance in the Department of Mathematics, two quantitative courses for the BSBA degree in Business Analytics, and a business analytics course for the MS degree in Accounting.
- The Department has been able to meet its teaching obligations because we have successfully hired six faculty members in the past five years. Three were junior

faculty and three were senior faculty (one of which was an endowed chair). Most of the hires were in support of the Department's decision to become the home of the business analytics courses and curriculum in the College.

- It is also noteworthy that several of the faculty have earned a Teaching Incentive Program award or an Excellence in Teaching award.

Research:

- The Department of Economics has increased both the number and quality of its research publications. This has come about because (i) the aforementioned six hires have been productive in publishing their research in peer-reviewed journals, (ii) the junior faculty hired before the aforementioned six have achieved tenure, attesting to their research productivity, and (iii) the long-term senior faculty have remained productive too. Largely, faculty are publishing in the top few journals in their field of economics, or in second-tier general interest journals in economics. This is quite remarkable given that the Department does not currently have an active graduate program.

Service:

- The service productivity of faculty in the Department of Economics has been good, both internally and externally. The external service includes faculty presentations at conferences, invited speaker presentations at various universities, including some with considerably more prestige than UCF, participation in the organization of research sessions at conferences, service as Associate Editors of peer-reviewed journals, and service as referees for peer-reviewed journals, among others.

COLLEGE OF SCIENCES

Teaching:

Between academic years 2016-17 and 2020-21, the Department of Statistics and Data Sciences annually taught over 22,000 student credit hours (SCH). The department further illustrates teaching productivity the ratio of total SCH (including undergraduate and graduate hours) to the number of full-time faculty (tenured, tenure-earning, lecturers and instructors). Between 2016-17 and 2021-22, the per capita productivity SCH was consistently between 1,000 and 2,000 annually.

Total FTE Productivity in Statistics and Data Science (Graduate and Undergraduate)

	2016-17	2017-18	2018-19	2019-20	2020-21
Total SCH	19,032	20,416	21,207	23,203	26,491
Number of Full-Time Faculty	16	14	15	15	15
SCH/F-T Faculty	1,190	1,458	1,414	1,547	1,766

Source: UCF Institutional Knowledge Management

In fall 2020, Statistics and Data Science enrolled 283 undergraduates, 36 master's, and 38 Ph.D. students. In academic year 2020-21, the department graduated 84 undergraduates and 15 master's students.

Research and Funding:

The Department of Statistics and Data Science is also productive in the area of research. Although the department had only an M.S. degree prior to 2018, we had steady output in the numbers of refereed articles, presentations, and contract and grant funding. With the addition of a Ph.D. in 2018, the department expects to see a doubling in the number of refereed articles and grant funding in the next 3 to 5 years.

Department of Statistics and Data Science Publications, Presentations and Grants

	2016-17	2017-18	2018-19	2019-20	2020-21
Number of Refereed Publications	17	17	25	44	53
Number of Non-Refereed Publications	1	0	0	1	2
Number of Presentations	60	16	14	24	18
New Grants (Dept's Portion)	\$917,013 (\$60,178)	\$4,457,130 (\$701,837)	\$744,733 (\$74,477)	\$2,173,029 (\$368,725)	\$968,963 (\$456,005)

The Department of Statistics and Data Science has a strong data-mining component. The data-mining effort at UCF commenced with the establishment of the graduate-level certificate program in Data Mining and strengthened with the Data-Mining track of the Statistical Computing M.S. Several faculty conduct research in pure data mining and many have participated in projects with a big data component (ex: massive data sets, millions of rows and large numbers of variables, hundreds of predictors). Data mining is predicated upon sound statistical methodology for which the faculty have exhibited expertise in top tier journals covering bioinformatics, linear models, decision trees, experimental design, multivariate analysis, dimension reduction, and regression analysis.

The following are brief faculty bios offering an overview of each faculty member's research:

Alexander Mantzaris. Dr. Mantzaris' research interests are in smart city analytics. The size of data and ubiquity of it allows us to not only look at averages of citizens but also investigate differences according to the spatial coordinates. New questions can be posed and answered about the nature of cross-city communication and affiliation. He is also continuing his work on community connectivity in large graphs constructed within the spheres of social media platforms.

Nizam Uddin. Dr. Uddin's publications have appeared in top tier statistics journals including *Biometrika*, *Annals of Statistics*, *Journal of Statistical Planning and Inference*, *Statistica Sinica*, *Australian Journal of Statistics* and numerous other journals in healthcare, transportation, and business areas. He has received the university Teaching Incentive Program award and a Research Incentive award. He has authored/co-authored over sixty research papers. Dr. Uddin's primary research is in Optimal Experimental Design. He has also contributed to interdisciplinary research projects of other colleagues within UCF and work on their externally funded projects. He was involved with research projects that resulted in cumulative funding of approximately \$1.5 million.

Service:

The faculty in the Department of Statistics and Data Science provide extensive professional service to the scientific community as well as the local community, as referees, editors, associate editors and editorial board members of scientific journals. Some of our faculty members are actively involved in community service, serving as judges in science fairs, coaches and advisors of student clubs.

VII. Budget

A. Use Appendix A – Table 3A or 3B to provide projected costs and associated funding sources for Year 1 and Year 5 of program operation. In narrative form, describe all projected costs and funding sources for the proposed program(s). Data for Year 1 and Year 5 should reflect snapshots in time rather than cumulative costs.

The largest component of the MSBA program budget is the faculty salaries. The Department of Economics provides 18 credit-hours of instruction, some of which is led by senior faculty members, with a total cost of approximately \$255,000 for year 1, which is likely to increase a few percent to as much as \$270,000 in year 5. The Department of Statistics and Data Science provides 12 credit-hours of instruction at a total cost of \$80,000, which is likely to rise to \$85,000 by year 5. The amount of \$80,000 for the department of statistics comprises \$74,000 for full-time tenured or tenure-earning faculty and \$6,000 for adjunct faculty hired on contract.

Other operating expenses will include the Admin & Professional salaries prorated by the time allocated to the administration of this program. We have budgeted \$15,000, rising to \$16,000 over the five-year period.

The library has invested in resources for the latest programs in Business Analytics, Data Analytics and Data Science across the university, and the library report suggested that we need no further library resources. Similarly, the College of Business has already invested in a set of servers for the students' computing needs, so no immediate capital outlay is necessary. We do, however, include an allowance of \$11,000 for replacement or expansion of one of one of the servers, once the program has expanded to full size.

The Department of Economics will also provide four teaching assistantships each semester to the students in the MSBA program. This is expected to amount to \$84,000 in total payroll costs. The teaching assistantship includes a stipend of \$5,000 in the fall and winter semesters or \$3,750 in the summer semesters, as well as a tuition reduction of \$2,593.44 in the fall and winter semesters and \$1,729 in the summer semester. These figures are tabulated in Table 3 of Appendix A in the budget.

Overall, Education and General funds will be shifted from the College of Business, the Department of Economics, and the Department of Statistics and Data Science, to cover these costs. The Department of Economics will shift \$340,000 from their E&G budget. The Department of Statistics and Data Science will shift \$80,000 and the College of Business will cover \$15,000.

B. Use Appendix A – Table 4 to show how existing Education & General (E&G) funds will be reallocated to support the proposed program in Year 1. Describe each funding source identified in Appendix A – Table 4, and provide a justification below for the reallocation of resources. Describe the impact the reallocation of financial resources will have on existing programs, including any possible financial impact of a shift in faculty effort, reallocation of instructional resources, greater use of adjunct faculty and teaching assistants, and explain what steps will be taken to mitigate such impacts.

Costs of the program are divided between the College of Business, for program admissions, and the Department of Economics and the Department of Statistics and Data Science, for the payroll costs of instructors' salaries and benefits. Accordingly, the program will require reallocation of resources from other programs. In particular, of the \$339,062 reallocated from the Department of Economics, \$225,299 represents the proportion of faculty salaries and \$83,764 covers fellowships for students serving as teaching assistants. Similarly, of the \$79,643 reallocated from the Department of Statistics and Data Science, \$73,643 represents the proportion of full-time faculty salaries and \$6,000 covers an adjunct instructor hired on a contract, which is counted under Administrative and Professional Salaries. The faculty who were hired for this program, and other programs, have added to the instructional resources available for classes at the undergraduate level. The Department of Economics currently facing a shortage of teaching assistants: the teaching assistants currently working in the Department of Economics are being drawn from a small pool of candidates, which includes past graduate students and students from other departments. The candidates in the MSBA program should provide a broader pool of candidates for teaching assistantships, which will provide additional instructional resources for the undergraduate programs.

The faculty teaching courses in the program will be drawn from the same pool of faculty as those that teach existing Economics and Statistics courses, which might potentially affect these programs. The justification for using these faculty members to teach in the MS in Business Analytics program is primarily that they have the expertise to teach the subject matter. However, several of the faculty members were hired through strategic investments to expand the departments' capabilities to offer coursework in Business Analytics. In particular, several were deliberately hired to teach in the PMSM-BA program, and to pave the way for the expansion into the MSBA program. In terms of potential research collaboration (e.g., sponsored research projects), faculty members will be able to make contacts through their courses and projects with people and companies in the local industry.

C. If the institution intends to operate the program through continuing education, seek approval for market tuition rate, or establish a differentiated graduate-level tuition, as described in [Board of Governors Regulation 8.002](#), provide a rationale and a timeline for seeking Board of Governors' approval.

Not applicable to this program because the program will not operate through continuing education, seek approval for market tuition rate, or establish a differentiated graduate-level tuition

D. Provide the expected resident and non-resident tuition rate for the proposed program for both resident and non-resident students. The tuition rates should be reported on a per credit hour basis, unless the institution has received approval for a different tuition structure. If the proposed program will operate as a continuing education program per [Board of Governors Regulation 8.002](#), please describe how the tuition amount was calculated and how it is reflected in Appendix A – Table 3B.

The tuition rate for the program will be the standard graduate-level tuition rate, so the Board of Governors' approval is not required. The current rate of tuition and fees is \$369.65 per credit hour for in-state students and \$1,194.05 for out-of-state students.

E. Describe external resources, both financial and in-kind support, that are available to support the proposed program, and explain how this amount is reflected in Appendix A – Table 3A or 3B.

The incremental resources needed to support the program are minimal. The program requires no laboratories but will use existing servers in the College of Business, which are operating well within capacity. The library has invested in resources for the latest programs in Business Analytics, Data Analytics and Data Science across the university, and the library report suggested no further investments in library resources. Our recruitment strategy is focused on the undergraduate population in the College of Business of UCF and we have no plans to travel to recruit students from elsewhere. Our previous efforts to recruit students from elsewhere were not cost effective, as a large fraction of our graduate students are UCF graduates. The enrollments of students who did arrive from other institutions were not attributed to our external recruitment efforts. Overall, the program we have planned is very cost effective and requires little in the way of capital investment. As a result, we know of no other external resources that are needed for the program.

VIII. Non-Faculty Resources

A. Describe library resources currently available to implement and/or sustain the proposed program through Year 5 below, including but not limited to the following:

- **the total number of volumes and serials available in the discipline and related disciplines**
- **all major journals that are available to the university's students**

The Library Director must sign the additional signatures page to indicate that they have review Sections VIII.A. and VIII.B.

The library liaison Peter Spyers-Duran, Associate Librarian, Cataloging Services analyzed library resources for the proposed degree program. This analysis provides resource comparisons with peer institutions to evaluate current library holdings for monographs, periodicals, and databases. In the statements below, in parts VIII A and VIII B, we have included the exact text copied from the *Library Evaluation of the Proposal to add a new MS in Business Analytics degree program in the College of Business Administration*, submitted by the Associate Librarian. Each section includes the findings of the analysis, which is followed by a *Recommendation* statement. This is followed by a *Response* which outlines acceptance of the recommendation, along with

acknowledgement of any qualifications or contingencies.

When reviewing library support for a new MS in Business Analytics degree program in the College of Business, the following institutions were identified as aspirational peers for the library holdings comparison:

- University of Florida (UF)
- Georgia Tech (GT)
- University of Georgia (UGA)

These universities were selected as peers because each has a degree program that is similar to the proposed MS in Business Analytics at UCF.

Comparative Analysis on key library resources supporting the proposed MS in Business Analytics

Databases:

Databases	UCF	UF	GT	UGA
ABI/INFORM Complete	1	1	1	1
ACM Digital Library	1	1	1	1
*Bloomberg Terminal	1	0	1	0
Bloomberg.com	0	0	0	0
Business Source Premier	1	1	1	1
Compendex	1	1	1	1
Datastream	0	1	0	0
Data Citation Index	1	0	1	1
Data-Planet	0	0	1	0
EconLit	1	1	1	1
Factiva	0	1	1	1
Gartner	1	0	0	0
IEEE Xplore	1	Electronic Library	1	1
MathSciNet	1	1	1	1
NBER Working Papers	1	1	1	1
Nexis Uni	1	1	1	0
Science Direct	1	1	1	1
SimplyAnalytics	1	1	1	0
Statista	0	1	1	0
Statistical Insight	0	1	0	0
Web of Science	1	1	1	1
* Available for UCF College of Business faculty/students only and NOT subscribed and maintained by the UCF Libraries.				

Recommendation: The UCF Libraries databases compare favorably with those of the aspirational peer institutions. UCF has the databases needed to support the proposed MS in Business Analytics degree program; however, if a new database were to become critical to the program in the future, additional recurring funding will need to be provided to the Libraries to add this resource.

Response: The availability of databases is sufficient for the MSBA program, since the MSBA program follows several new related programs and the acquisitions for those programs are sufficient. No new databases will be required.

Key Journals:

Journals	ISSN	UCF	UF	GT	UGA
Advances in Data Analysis and Classification	862-5347, 1862-5355.	1	1	1	1
Applied Stochastic Models and Data Analysis	8755-0024, 1099-0747.	1	1	1996 - 1999	1985-1991
Big Data	2167-6461; 2167-647X	03/01/14 - 12/31/17	0	1	0
Big Data and Society	2053-9517	1	1	1	1
Big Data Mining and Analytics	IEEE	1	0	0	0
Big Data Research	2214-5796; 2214-580X	1	1	0	1
Computational statistics & data analysis	0167-9473, 1872-7352.	1	1	1	1
Data	2306-5729	1	1	1	1
Data Science Journal	1683-1470	1	1	1	1
EPJ Data Science Journal	2193-1127	1	1	1	1
IEEE Transactions on Knowledge and Data Engineering	1041-4347	1	1	1	1
Intelligent Data Analysis	1088-467X; 1571-4128	1-year embargo	1	1	1
International Journal of Business Analytics (IJBAN)	2334-4547, 2334-4555	1	0	0	0
International Journal of Business Analytics and Intelligence (IJBAl)	2321-1857	1-year embargo	1	1-year embargo	1-year embargo
Journal of Big Data	2196-1115	1	1	1	1
Journal of Business Analytics	2573-234X, 2573-2358	1	0	1	1
Journal of Data Science	1680-743X, 1683-8602	1	1	1	
Statistical Analysis and Data Mining: The ASA Data Science Journal	1932-1864; 1932-1872	1	1	1	1
The Journal of Finance and Data Science	2405-9188	1	1	1	1

Recommendation: The UCF Libraries provides full-text access to the current issue of sixteen of the nineteen journals provided by aspirational peer institutions. Two of the twenty journals have a one-year embargo (there is no full-text access to the most current 12-months content). UCF lost access to Big Data in 2017 due to cuts.

Overall, the UCF Libraries journals compare favorably with those of aspirational peer institutions. UCF has the journals needed to support the MS in Business Analytics degree program as proposed; however, in the event of program expansion or a new key journal becomes critical for the program in the future, additional recurring funding will need to be provided to the Libraries to add these resources.

Response: The availability of journals is sufficient to support the MSBA program, since the MSBA program follows several new related programs and the acquisitions for those programs are sufficient. No new subscriptions are required.

Books (by subject headings and keywords)

Library of Congress Subject Headings	UCF	UF	GT	UGA
Big data	780	440	893	832
"Business Analytics" keyword search	168	104	232	186
Data mining	4012	1423	3337	2462
Decision making, Mathematical models	319	330	311	512
Econometric models	184	146	1397	2281
Econometrics	899	787	662	1169
Economics, Mathematical	851	625	1127	1532
Game theory	1227	789	876	1185
Python (Computer program language)	416	640	938	528

Recommendation: UCF book holdings are comparable to those of aspirational peer institutions. If the proposed program were to shift focus to a new area that UCF does not have adequate coverage, additional new funds will be needed to acquire books.

Response: The book holdings are sufficient to support the MSBA program, again, since the MSBA program follows several new related programs and the acquisitions for those programs are sufficient. No new book holdings are required. There are no plans to change the focus of the MSBA program, especially not outside the areas in which UCF has adequate coverage.

B. Discuss any additional library resources that are needed to implement and/or sustain the program through Year 5. Describe how those costs are reflected in Appendix A – Table 3A or 3B.

Not applicable to this program because no additional library resources are needed to implement or sustain the proposed program.

C. Describe any specialized equipment and space currently available to implement and/or sustain the proposed program through Year 5.

Most courses in the program are designed to use free and open-source software for instruction and research, as that is the state of the art at present. For example, faculty will adopt open-source software such as Python and R for data manipulation, machine learning and statistical modeling. No specialized equipment will be required to teach related courses.

Furthermore, the investments in infrastructure have already been made when standing up the precursor to this program, the temporary M.Sc. Economics program. In the planning stages, an investment was made to acquire two computer clusters, each comprising 48 CPUs: one dedicated to faculty and another dedicated to students. These computing resources are sufficient to serve the students and faculty in the PMSM-BA program, the BA track of the BSBA degree and the new MSBA program.

In addition, the Department of Statistics and Data Science has created the Big Data Lab, which is led by newly hired Professor Mitch Hill. All computers in the lab are installed with statistical analysis software such as SAS, R, and Python, which covers the students' needs for computing resources. All students who are currently taking classes from the statistics department are welcome to use lab resources. With the investments made to support a range of programs to date, no further investments need to be made

for the new program.

D. Describe any additional specialized equipment or space that will be needed to implement and/or sustain the proposed program through Year 5. Include any projected Instruction and Research (I&R) costs of additional space in Appendix A – Table 3A or 3B. Costs for new construction should be provided in response to Section X.E. below.

Not applicable to this program because no new I&R costs are needed to implement or sustain the program through Year 5

E. If a new capital expenditure for instructional or research space is required, indicate where this item appears on the university's fixed capital outlay priority list. Appendix A – Table 3A or 3B includes only I&R costs. If non-I&R costs, such as indirect costs affecting libraries and student services, are expected to increase as a result of the program, describe and estimate those expenses in narrative form below. It is expected that high enrollment programs, in particular, would necessitate increased costs in non-I&R activities.

Not applicable to this program because no new capital expenditures are needed to implement or sustain the program through Year 5.

F. Describe any additional special categories of resources needed to operate the proposed program through Year 5, such as access to proprietary research facilities, specialized services, or extended travel, and explain how those projected costs of special resources are reflected in Appendix A – Table 3A or 3B.

Not applicable to this program because no additional special categories of resources are needed to implement or sustain the program through Year 5.

G. Describe fellowships, scholarships, and graduate assistantships to be allocated to the proposed program through Year 5, and explain how those are reflected in Appendix A – Table 3A or 3B.

Not applicable to this program because no fellowships, scholarships and/or graduate assistantships will be allocated to the proposed program through Year 5.

The Business Analytics program will award four graduate teaching assistantships, depending on the need, to support courses in the Department of Economics. The assistantship consists of a tuition reduction and a stipend. In the fall and spring semesters, the tuition reduction is \$2,593.44 and the stipend is \$5,000. In the summer semester, the tuition reduction is \$1,729 and the stipend is \$3,750. Including the cost of benefits, the annual expenditure for a graduate teaching assistantship for the full academic year is \$20,940. These assistantships will be allocated to new students based on the evaluation of all accepted students by the admissions committee in consultation with the director of the program and the Chair of the Economics Department.

IX. Required Appendices

The appendices listed in tables 1 & 2 below are required for all proposed degree programs except where specifically noted. Institutions should check the appropriate box to indicate if a particular appendix is included to ensure all program-specific requirements are met. Institutions may provide additional appendices to supplement the information provided in the proposal and list them in Table 4 below.

Table 1. Required Appendices by Degree Level

Appendix	Appendix Title	Supplemental Instructions	Included? Yes/No	Required for Degree Program Level		
				Bachelors	Masters/ Specialist	Doctoral/ Professional
A	Tables 1-4			X	X	X
B	Consultant's Report and Institutional Response					NA
C	Academic Learning Compacts	Include a copy of the approved or proposed Academic Learning Compacts for the program		NA		
D	Letters of Support or MOU from Other Academic Units	Required only for programs offered in collaboration with multiple academic units within the institution			X	
E	Faculty Curriculum Vitae				X	
F	Common Prerequisite Request Form	This form should also be emailed directly to the BOG Director of Articulation prior to submitting the program proposal to the Board office for review.		NA		
G	Request for Exemption to the 120 Credit Hour Requirement	Required only for baccalaureate degree programs seeking approval to exceed the 120 credit hour requirement		NA		
H	Request for Limited Access Status	Required only for baccalaureate degree programs seeking approval for limited access status		NA		

Table 2. Additional Appendices

Appendix	Appendix Title	Description
I	Library Resources for an Additional Program	Library Evaluation of the Proposal to add a new MS in Business Analytics degree program in the College of Business Administration
II	Examples of Job Postings	Examples of job postings from firms such as Universal, BNY Mellon and local health care providers specifying a master's degree in a quantitative discipline with a focus on business or statistics.
III	Letters of Support from Industry	Letters from industry professionals in the Orlando area outlining their needs for employees with the skills acquired in the MSBA program.

Appendix A: Budget Worksheets

- - -

APPENDIX A
TABLE 1-B
PROJECTED HEADCOUNT FROM POTENTIAL SOURCES
(Graduate Degree Program)

Source of Students (Non-duplicated headcount in any given year)*	Year 1 HC	Year 1 FTE	Year 2 HC	Year 2 FTE	Year 3 HC	Year 3 FTE	Year 4 HC	Year 4 FTE	Year 5 HC	Year 5 FTE
Individuals drawn from agencies/industries in your service area (e.g., older returning students)	4	5	4	5	6	7.5	6	7.5	8	10
Students who transfer from other graduate programs within the university**	0	0	0	0	0	0	0	0	0	0
Individuals who have recently graduated from preceding degree programs at this university	10	12.5	12	15	14	17.5	15	18.75	15	18.75
Individuals who graduated from preceding degree programs at other Florida public universities	2	2.5	3	3.75	3	3.75	5	6.25	6	7.5
Individuals who graduated from preceding degree programs at non-public Florida institutions	2	2.5	3	3.75	3	3.75	5	6.25	6	7.5
Additional in-state residents***	0	0	0	0	0	0	0	0	0	0
Additional out-of-state residents***	1	1.25	2	2.5	2	2.5	2	2.5	3	3.75
Additional foreign residents***	1	1.25	1	1.25	2	2.5	2	2.5	2	2.5
Other (Explain)***	0	0	0	0	0	0	0	0	0	0
Totals	20	25	25	31.25	30	37.5	35	43.75	40	50

* List projected annual headcount of students enrolled in the degree program. List projected yearly cumulative ENROLLMENTS instead of admissions.

** If numbers appear in this category, they should go DOWN in later years.

*** Do not include individuals counted in any PRIOR category in a given COLUMN.

APPENDIX A

**Table 2
Anticipated Faculty Participation**

Faculty Code	Faculty Name or "New Hire" Highest Degree Held Academic Discipline or Specialty	Rank	Contract Status	Initial Date for Participation in Program	Mos. Contract Year 1	FTE Year 1	% Effort for Prg. Year 1	PY Year 1	Mos. Contract Year 5	FTE Year 5	% Effort for Prg. Year 5	PY Year 5
A	John L. Solow, Ph.D. Economics	Professor	Tenure	Fall 2023	9	0.75	0.25	0.19	9	0.75	0.25	0.19
A	Harry J. Paarsch, Ph.D. Economics	Professor	Tenure	Fall 2023	9	0.75	0.50	0.38	9	0.75	0.50	0.38
A	Dean Jens, Ph.D. Economics	Asst. Prof.	Tenure-earning	Fall 2023	9	0.75	0.25	0.19	9	0.75	0.25	0.19
A	Lealand Morin, Ph.D. Economics	Asst. Prof.	Tenure-earning	Fall 2023	9	0.75	0.25	0.19	9	0.75	0.25	0.19
A	Michael Tseng, Ph.D. Economics	Asst. Prof.	Tenure-earning	Fall 2023	9	0.75	0.25	0.19	9	0.75	0.25	0.19
A	Alex Mantzaris, Ph.D. Statistics and Data Science	Asst. Prof.	Tenure-earning	Fall 2023	9	0.75	0.50	0.38	9	0.75	0.50	0.38
A	Nizam Uddin, Ph.D. Statistics and Data Science	Professor	Tenure	Fall 2023	9	0.75	0.25	0.19	9	0.75	0.25	0.19
Total Person-Years (PY)								1.69				1.69

Faculty Code	Code Description	Source of Funding	PY Workload by Budget Classification	
			Year 1	Year 5
A	Existing faculty on a regular line	Current Education & General Revenue	1.69	1.69
B	New faculty to be hired on a vacant line	Current Education & General Revenue	0.00	0.00
C	New faculty to be hired on a new line	New Education & General Revenue	0.00	0.00
D	Existing faculty hired on contracts/grants	Contracts/Grants	0.00	0.00
E	New faculty to be hired on contracts/grants	Contracts/Grants	0.00	0.00
F	Existing faculty on endowed lines	Philanthropy & Endowments	0.00	0.00
G	New faculty on endowed lines	Philanthropy & Endowments	0.00	0.00
H	Existing or New Faculty teaching outside of regular/tenure-track line course load	Enterprise Auxiliary Funds	0.00	0.00
Overall Totals for			1.69	1.69

APPENDIX A
TABLE 3
PROJECTED COSTS AND FUNDING SOURCES

Budget Line Item	Reallocated Base* (E&G) Year 1	Enrollment Growth (E&G) Year 1	New Recurring (E&G) Year 1	New Non-Recurring (E&G) Year 1	Contracts & Grants (C&G) Year 1	Philanthropy / Endowments Year 1	Enterprise Auxiliary Funds Year 1	Subtotal Year 1	Continuing Base** (E&G) Year 5	New Enrollment Growth (E&G) Year 5	Other*** (E&G) Year 5	Contracts & Grants (C&G) Year 5	Philanthropy/ Endowments Year 5	Enterprise Auxiliary Funds Year 5	Subtotal Year 5
Faculty Salaries and Benefits	328,942	0	0	0	0	0	0	\$328,942	349,340	0	0	0	0	0	\$349,340
A & P Salaries and Benefits	14,896	0	0	0	0	0	0	\$14,896	15,804	0	0	0	0	0	\$15,804
USPS Salaries and Benefits	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
Other Personal Services	6,000	0	0	0	0	0	0	\$6,000	6,000	0	0	0	0	0	\$6,000
Assistantships & Fellowships	83,764	0	0	0	0	0	0	\$83,764	88,865	0	0	0	0	0	\$88,865
Library	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
Expenses	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
Operating Capital Outlay	0	0	0	0	0	0	0	\$0	11,000	0	0	0	0	0	\$11,000
Special Categories	0	0	0	0	0	0	0	\$0	0	0	0	0	0	0	\$0
Total Costs	\$433,602	\$0	\$0	\$0	\$0	\$0	\$0	\$433,602	\$471,008	\$0	\$0	\$0	\$0	\$0	\$471,008

*Identify reallocation sources in Table 3.

**Includes recurring E&G funded costs ("reallocated base," "enrollment growth," and "new recurring") from Years 1-4 that continue into Year 5.

***Identify if non-recurring.

Faculty and Staff Summary

Total Positions	Year 1	Year 5
Faculty (person-years)	1.69	1.69
A & P (FTE)	0	0
USPS (FTE)	0	0

Calculated Cost per Student FTE

	Year 1	Year 5
Total E&G Funding	\$433,602	\$471,008
Annual Student FTE	25	50
E&G Cost per FTE	\$17,344	\$9,420

APPENDIX A
TABLE 3
PROJECTED COSTS AND FUNDING SOURCES

Table 2 Column Explanations

Reallocated Base* (E&G)	1	E&G funds that are already available in the university's budget and will be reallocated to support the new program. Please include these funds in the Table 3 – Anticipated reallocation of E&G funds and indicate their source.
Enrollment Growth (E&G)	2	Additional E&G funds allocated from the tuition and fees trust fund contingent on enrollment increases.
New Recurring (E&G)	3	Recurring funds appropriated by the Legislature to support implementation of the program.
New Non-Recurring (E&G)	4	Non-recurring funds appropriated by the Legislature to support implementation of the program. Please provide an explanation of the source of these funds in the budget section (section III. A.) of the proposal. These funds can include initial investments, such as infrastructure.
Contracts & Grants (C&G)	5	Contracts and grants funding available for the program.
Philanthropy Endowments	6	Funds provided through the foundation or other Direct Support Organizations (DSO) to support the program.
Enterprise Auxiliary Funds	7	Use this column for continuing education or market rate programs and provide a rationale in section III.B. in support of the selected tuition model.
Continuing Base** (E&G)	9	Includes the sum of columns 1, 2, and 3 over time.
New Enrollment Growth (E&G)	10	See explanation provided for column 2.
Other*** (E&G)	11	These are specific funds provided by the Legislature to support implementation of the program.
Contracts & Grants (C&G)	12	See explanation provided for column 5.
Philanthropy Endowments	13	See explanation provided for column 6.
Enterprise Auxiliary Funds	14	Use this column for continuing education or market rate programs and provide a rationale in section III.B. in support of the selected tuition model.

APPENDIX A

TABLE 4

ANTICIPATED REALLOCATION OF EDUCATION GENERAL FUNDS*

Program and/or E&G account from which current funds will be reallocated during Year 1	Base before reallocation	Amount to be reallocated	Base after reallocation
Statistics - Annual Budget (FY23)	2,819,374	79,643	\$2,739,731
Economics - Annual Budget (FY23)	4,251,510	339,062	\$3,912,448
College of Business - Annual Budget (FY23)	33,170,211	14,896	\$33,155,315
	0	0	\$0
	0	0	\$0
	0	0	\$0
	0	0	\$0
	0	0	\$0
Totals	\$40,241,095	\$433,602	\$39,807,493

* If not reallocating E&G funds, please submit a zeroed Table 4

APPENDIX D: Memorandum of Understanding between the College of Business and the College of Sciences

MEMORANDUM OF UNDERSTANDING
BETWEEN
COLLEGE OF SCIENCES
AND
COLLEGE OF BUSINESS
IN REGARDS TO
MASTER OF SCIENCE IN BUSINESS ANALYTICS PROGRAM

The College of Business (hereafter COB) and the College of Sciences (hereafter COS) are entering into this agreement to establish a Master of Science in Business Analytics (hereafter MSBA) program as a self-supporting degree program to launch in the Fall of 2023. This document sets out the basic parameters of the program, a governance structure, and a method for sharing revenues and expenses generated by the program.

PROGRAM STRUCTURE

The MSBA will be a 9-course, 30-credit-hour program. The COB is responsible for teaching 6 courses, representing 18 credit hours in the program. The COS is responsible for teaching 3 courses, representing 12 credit hours in the program. The COB will be responsible for staffing courses in Software Tools for Business Analytics, Mathematical Tools for Business Analytics, Microeconomic Analysis for Business Analytics, Data Visualization, as well as a two-part, 6 credit-hour sequence for the Capstone in Business Analytics I and II. The COS will be responsible for staffing courses in Probability and Statistics for Business Analytics, Advanced Computer Processing of Statistical Data, as well as a 6-credit-hour course in Fundamental Data Analytical Methodology with Business Applications.

GOVERNING BODY

The MSBA program will be governed by a six-member board made up of the Deans of the COB and COS, the Chair of the Economics Department, the Chair of the Department of Statistics and Data Science, as well as the program director and co-director. All strategic, curriculum and financial decisions concerning the MSBA program (including a decision not to go forward with a cohort or to end the program) must be approved by this body by a simple majority vote. Meetings of the group are at the discretion of the governing body. The program will be reviewed in 3 years of its initiation to evaluate its progress and administration structure, as needed, to make sure that it is functioning properly and it serves the students, as it was intended to.

PROGRAM SUPPORT

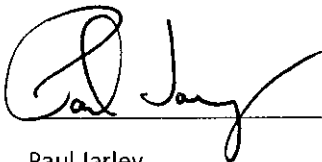
Support for program marketing, finance, admissions and student services will be provided by the COB. The COB will charge an overhead rate of 15% of revenues net of university taxes to cover these activities. All admission decisions will be made jointly by the director and co-director of the program, after a vote on each admission application by an admissions committee consisting of the program director and co-director, along with faculty who are instructors of courses in the MSBA program.

TUITION, REVENUES and EXPENSES

Tuition will be set at the regular tuition rate of \$369.65 per credit hour, for a total of \$11,089.50 per student. The university will receive 22% of gross revenue, equal to \$2,440 per student. The COB program support charge will be 15% of the remaining \$8,650 per student (\$1,297). The remaining \$7,353 will be split between the two colleges and can be used to compensate the director/co-director, cover the costs of instruction, or defray other program or college expenses. The net revenue will be allocated according to the proportion of credit hours provided by each department, comprising \$4,412 for the COB (60% of \$7,353) and \$2,941 for the Department of Statistics and Data Science in the COS (40% of the \$7,353).


Table 1 below shows how tuition revenues would be allocated based on enrollment of 20, 30 and 40 students, respectively.

Table 1: Revenue Allocations with 20, 30 and 40 Students Enrolled			
Number of Students Enrolled	20	30	40
Gross Revenue	221,790	332,685	443,580
University Revenue	48,794	73,191	97,588
Net Revenue	172,996	259,494	345,992
COB Overhead	25,949	38,924	51,899
Net Revenue to Distribute Between Colleges	147,047	220,570	294,093
Proportion Allocated to COB	88,228	132,342	176,456
Proportion Allocated to COS (Statistics)	58,819	88,228	117,637



Paul Jarley
Dean
College of Business

8/2/22
Date



Maggy Tomova
Dean
College of Sciences

8/2/2022
Date

Appendix E: Curricula Vitae of Faculty Teaching in Program

CURRICULUM VITAE

Name: Harry John Paarsch

Position: Professor of Business Analytics
Department of Economics
University of Central Florida

E-Mail Address: Harry.Paarsch@UCF.edu

Education: B.A. (Honours), First Class — Economics; Queen's University, 1980
M.S. — Statistics; Stanford University, 1983
A.M. — Economics; Stanford University, 1984
Ph.D. — Economics (with minor in Statistics); Stanford University, 1987

Awards, Fellowships, and Scholarships: British Columbia Provincial Government Academic Scholarship, 1976
George and Mary Louise Patton Award in Economics, Queen's University, 1978
Social Sciences and Humanities Council of Canada Doctoral Fellowship, 1981–4
Arch W. Shaw National Fellowship, Hoover Institution on War, Revolution and Peace, 1995–6
P.E.T.E. Teaching Award in Recognition of Professional Excellence in the Training of Economists, Department of Economics, University of Iowa, 2000–1 and 2006–7
Robert Jensen Research Fellowship, Henry B. Tippie College of Business, University of Iowa, 2002–8
Fellow of the *Journal of Econometrics*, 2006
Fellow of the *International Association for Applied Econometrics*, 2020

Past Positions: Assistant Professor — Department of Economics, University of British Columbia, 1987–92
Assistant Professor — Department of Economics, University of Western Ontario, 1992–5
Associate Professor — Department of Economics, University of Western Ontario, 1995–6
Associate Professor — Department of Economics, University of Iowa, 1996–2001
Professor — Department of Economics, University of Iowa, 2001–8
Chair — Department of Economics, University of Melbourne, 2008–11
Principal Economist — Amazon.com, 2011–4

Refereed Publications

1. Paarsch, Harry J., "A Monte Carlo Comparison of Estimators for Censored Regression Models," *Journal of Econometrics*, 24 (1984), 197–213.
2. Paarsch, Harry J., "Micro-Economic Models of Beef Supply," *Canadian Journal of Economics*, 18 (1985), 636–651.
3. Paarsch, Harry J., "Work Stoppages and the Theory of the Offset Factor: Evidence from the British Columbian Lumber Industry," *Journal of Labor Economics*, 8 (1990), 387–417.
4. MaCurdy, Thomas E., David A. Green, and Harry J. Paarsch, "Assessing Empirical Approaches for Analyzing Taxes and Labor Supply," *Journal of Human Resources*, 25 (1990), 415–490.
5. Paarsch, Harry J., "Deciding between the Common and Private Value Paradigms in Empirical Models of Auctions," *Journal of Econometrics*, 51 (1992), 191–215.
6. Donald, Stephen G. and Harry J. Paarsch, "Piecewise Pseudo-Maximum Likelihood Estimation in Empirical Models of Auctions," *International Economic Review*, 34 (1993), 121–148.
7. Paarsch, Harry J., "The Effect of Stumpage Rates on Timber Recovery," *Canadian Journal of Economics*, 26 (1993), 107–120.
8. Paarsch, Harry J., "A Comparison of Estimators for Empirical Models of Auctions," *Annales d'Economie et de Statistique*, 34 (1994), 143–157.
9. Hendricks, Kenneth and Harry J. Paarsch, "A Survey of Recent Empirical Work concerning Auctions," *Canadian Journal of Economics*, 28 (1995), 403–426.
10. Donald, Stephen G. and Harry J. Paarsch, "Identification, Estimation, and Testing in Parametric Empirical Models of Auctions within the Independent Private Values Paradigm," *Econometric Theory*, 12 (1996), 517–567.
11. Paarsch, Harry J., "Deriving an Estimate of the Optimal Reserve Price: An Application to British Columbian Timber Sales," *Journal of Econometrics*, 78 (1997), 333–357.
12. Paarsch, Harry J. and Bruce Shearer, "The Response of Worker Effort to Piece Rates: Evidence from the British Columbia Tree-Planting Industry," *Journal of Human Resources*, 34 (1999), 643–667.
13. Paarsch, Harry J. and Bruce Shearer, "Piece Rates, Fixed Wages, and Incentive Effects: Statistical Evidence from Payroll Records," *International Economic Review*, 41 (2000), 59–92.
14. Donald, Stephen G., David A. Green, and Harry J. Paarsch, "Differences in Wage Distributions between Canada and the United States: An Application of a Flexible Estimator of Distribution Functions in the Presence of Covariates," *Review of Economic Studies*, 67 (2000), 609–633.
15. Donald Stephen G. and Harry J. Paarsch, "Superconsistent Estimation and Inference in Structural Econometric Models Using Extreme Order Statistics," *Journal of Econometrics*, 109 (2002), 305–340.
16. Haley, M. Ryan and Harry J. Paarsch, "The Stochastic Implications of Rent Maximization: An Application to Stumpage Rates for Timber in British Columbia," *Journal of Applied Econometrics*, 19 (2004), 25–48.
17. Brendstrup, Bjarne, Harry J. Paarsch, and John L. Solow, "Estimating Market Power in the Presence of Capacity Constraints: An Application to High-Fructose Corn Sweetener," *International Journal of Industrial Organization*, 24 (2006), 251–267.
18. Brendstrup, Bjarne and Harry J. Paarsch, "Identification and Estimation in Sequential, Asymmetric, English Auctions," *Journal of Econometrics*, 134 (2006) 69–94.

19. Donald, Stephen G., Harry J. Paarsch, and Jacques Robert, “An Empirical Model of the Multi-Unit, Sequential, Clock Auction,” *Journal of Applied Econometrics*, 21 (2006), 1221–1247.
20. Brendstrup, Bjarne and Harry J. Paarsch, “Semiparametric Identification and Estimation of Multi-Object, English Auctions,” *Journal of Econometrics*, 141 (2007), 84–108.
21. Paarsch, Harry J. and Bruce Shearer, “Do Women React Differently to Incentives? Evidence from Experimental Data and Payroll Records,” *European Economic Review*, 51 (2007), 1682–1707.
22. Brendstrup, Bjarne, Johan Moritz Kuhn, and Harry J. Paarsch, “Bilateral Bargaining: The Case of Firms and Workers in Denmark,” *Applied Economics Research Bulletin*, Special Issue I (Auctions), March (2008), 221–242.
23. Hubbard, Timothy P. and Harry J. Paarsch, “Investigating Bid Preferences at Low-Price, Sealed-Bid Auctions with Endogenous Participation,” *International Journal of Industrial Organization*, 27 (2009), 1–14.
24. Paarsch, Harry J. and John Rust, “Valuing Programs with Deterministic and Stochastic Cycles,” *Journal of Economic Dynamics and Control*, 33 (2009), 614–623.
25. Paarsch, Harry J. and Bruce S. Shearer, “The Response to Incentives and Contractual Efficiency: Evidence from a Field Experiment,” *European Economic Review*, 53 (2009), 481–494.
26. de Castro, Luciano I. and Harry J. Paarsch, “Testing Affiliation in Private-Values Models of First-Price Auctions Using Grid Distributions,” *Annals of Applied Statistics*, 4 (2010), 2073–2098.
27. Hubbard, Timothy P., Tong Li, and Harry J. Paarsch, “Semiparametric Estimation in Models of First-Price, Sealed-Bid Auctions with Affiliation,” *Journal of Econometrics*, 168 (2012), 4–16.
28. Halldorson, Jeffrey B., Harry J. Paarsch, Jennifer Dodge, Alberto M. Segre, Jennifer Lai, and John P. Roberts, “Center Competition and Outcomes Following Liver Transplantation,” *Liver Transplantation*, 19 (2013), 96–104.
29. Haley, M. Ryan, Harry J. Paarsch, and Charles H. Whiteman, “Smoothed Safety First and the Holding of Assets,” *Quantitative Finance*, 13 (2013), 167–176.
30. Hubbard, Timothy P., René Kirkegaard, and Harry J. Paarsch, “Using Economic Theory to Guide Numerical Analysis: Solving for Equilibria in Models of Asymmetric First-Price Auctions,” *Computational Economics*, 42 (2013), 241–266.
31. Hong, Han, Harry J. Paarsch, and Pai Xu, “On the Asymptotic Distribution of the Transaction Price in a Clock Model of a Multi-Unit, Oral, Ascending-Price Auction within the Common-Value Paradigm,” *RAND Journal of Economics*, 44 (2013), 664–685.
32. Cho, Sung-Jin, Harry J. Paarsch, and John Rust, “Is the ‘Linkage Principle’ Valid?: Evidence from the Field,” *Journal of Industrial Economics*, 62 (2014), 346–375.
33. Hickman, Brent R., Timothy P. Hubbard, and Harry J. Paarsch, “Identification and Estimation of a Bidding Model for Electronic Auctions,” *Quantitative Economics*, 8 (2017), 505–551.
34. Gentry, Matthew L., Timothy P. Hubbard, Denis Nekipelov, and Harry J. Paarsch, “Structural Econometrics of Auctions: A Review,” *Foundations and Trends[®] in Econometrics*, 9 (2018), 79–302.
35. Paarsch, Harry J. and John Rust, “Implementing Faustmann–Marshall–Pressler at Scale: Stochastic Dynamic Programming in Space,” *Advances in Econometrics*, 42 (2020), 145–174.
36. Ho, Anson T. Y., Lealand Morin, Harry J. Paarsch, and Kim P. Huyhn, “Household Credit Usage in Canada during the Coronavirus Pandemic.” *Canadian Journal of Economics*, (forthcoming).

Chapters in Handbooks

1. Davies, James B., David A. Green, and Harry J. Paarsch, “Economic Statistics and Social Welfare Comparisons: A Review.” Chapter 1 in the *Handbook of Applied Economic Statistics*, edited by David Giles and Aman Ullah. New York: Marcel Dekker, 1998, pages 1–38.
2. Hubbard, Timothy P. and Harry J. Paarsch, “On the Numerical Solution of Equilibria in Auction Models with Asymmetries within the Private-Values Paradigm.” Chapter 2 in the *Handbook of Computational Economics*, Volume 3, edited by Kenneth L. Judd and Karl Schmedders. New York: Elsevier, 2014, pages 35–111.

Invited and Review Publications

1. Paarsch, Harry J., “LIMDEP, Version 6.0: A Review,” *Journal of Applied Econometrics*, 9 (1994), 91–98.
2. Chapman, James T.E., David McAdams, and Harry J. Paarsch, “Bounding Revenue Comparisons across Multi-Unit Auction Formats under ε -Best Response,” *American Economic Review Papers and Proceedings*, 97 (2007), 455–458.
3. Paarsch, Harry J. and Karl Schmedders, “Introduction,” *Jahrbücher für Nationalökonomie und Statistik / Journal of Economics and Statistics*, Special Issue concerning “Big Data”, 238 (2018), 183–186.

Books

1. Paarsch, Harry J. and Han Hong. *An Introduction to the Structural Econometrics of Auction Data*. Cambridge, MA: MIT Press, 2006.
2. Hubbard, Timothy P. and Harry J. Paarsch. *Auctions*. Cambridge, MA: MIT Press, 2015. (Translated into Japanese by Yosuke Yasuda and Hiroo Yamagata. Tokyo: NTT Publishing, 2017.)
3. Paarsch, Harry J. and Konstantin Golyaev. *A Gentle Introduction to Effective Computing in Quantitative Research: What Every Research Assistant Should Know*. Cambridge, MA: MIT Press, 2016.

Patent

1. United States Patent Number US 8,732,538 B1; 20 May 2014. “Measuring Test Effects Using Adjusted Outlier Data.” Inventors: Zhuo Zhang, Harry J. Paarsch, Patrick Ludvig Bajari, Sameer R. Rajyaguru, Ivan Eduardo Gonzalez, and Devesh R. Raval.

Software

1. Morin, Lealand and Harry J. Paarsch, “R Package ‘interCross’.” Typescript. Orlando: Department of Economics, University of Central Florida, 2021.

JOHN L. SOLOW

Address:

Office:

Department of Economics
College of Business
University of Central Florida
P.O. Box 161400
Orlando, FL 32816-1400
(407)-823-3833

e-mail: John.Solow@ucf.edu

Fax: (407)-823-3269

Date of Birth: February 27, 1954

Educational Background:

BA, Economics, Yale University, 1976
MA, Economics, Stanford University, 1981
Ph.D., Economics, Stanford University, 1983

Areas of Interest:

Industrial Organization, Economics of Sports, Law and
Economics, Public Finance

Academic Experience:

White-Xander Professor of Economics, University of Central
Florida, August 2019 - present

Professor Emeritus, Department of Economics, University of
Iowa, May, 2019 - present

Professor, Department of Economics, University of Iowa, August,
2012 - May, 2019

Associate Professor, Department of Economics, University of
Iowa, August, 1988 - July, 2012

Visiting Lecturer, Department of Economics, University of
Auckland, June, 1992 - August, 1992

Visiting Associate Professor, Department of Economics,
Stanford University, January, 1990 - June, 1990

Assistant Professor, Department of Economics, University of
Iowa, August, 1981 - July, 1988

Instructor, Department of Economics, Stanford University,
June, 1980 - August, 1980

Other Experience:

Visiting Scholar, Stanford University Law School, January, 1990
- June, 1990

Visiting Fellow, Centre of Policy Studies, Monash University,
May, 1984 - July, 1984

Research Assistant, Electric Power Research Institute,
January, 1978 - June, 1979

Economist, Federal Energy Administration, August, 1976 - July,
1977

Awards:

Distinguished Member, National Society of Collegiate Scholars

Tippie College of Business Dean's Teaching Award, 2004

Delta Sigma Pi (Professional Business Fraternity) Professor of
the Year, 1997-1998

University of Iowa Collegiate Teaching Award, 1997

Justice International Business Fellowship, Tippie College of
Business, University of Iowa, 2008-present

Lloyd J. and Thelma W. Palmer Fellowship, Tippie College of
Business, University of Iowa, 2007-2008

Pioneer Hi-Bred Research Fellow, Tippie College of Business,
University of Iowa, 2002 - 2003

Stanley C. Hollander Best Paper Award, 10th Conference on
Historical Analysis & Research in Marketing, 2001

Grants:

American Cancer Society Grant to study "Economic Impact of Iowa City Smokefree Restaurant Ordinance"

U.S. Department of Energy Grant to study "Estimating the Economic Impact of Substituting Switchgrass for Coal for Electric Generation in Iowa" (with Richard A. Ney, Michael S. Balch, Jerald L. Schnoor and Ori J. Sivan), DE-FC36-96GO10148.

Resources for the Future Small Grants Program grant to study "Exhaustible Resources, Recycling, and Market Structure," April, 1983

University of Iowa Center for Advanced Study Interdisciplinary Grant to study "Market Power and Antitrust Policy," June, 1991

Referee for:

American Economic Review, Canadian Journal of Economics, Economica, Economic Development Quarterly, Economic Inquiry, Economic Journal, International Economic Review, International Journal of Industrial Organization, Journal of Econometrics, Journal of Economic Education, Journal of Environmental Economics and Management, Journal of Policy Modeling, Journal of Public Economics, Journal of Sports Economics, Journal of Sports Finance, Quarterly Journal of Economics, RAND Journal of Economics, Resources and Energy, Science, Southern Economic Journal

Courses Taught:

Principles of Microeconomics
First-Year Seminar in Economics
First-Year Honors Seminar: Doing Well and Doing Good
Economics of American Industries
Industrial Organization
Antitrust: Legal and Economic Analysis
Economics of the Government Sector
Public Sector Economics
Environmental and Natural Resource Economics
Economics of Sports
Law and Economics
Seminar: Game Theory and the Law
Managerial Economics (MBA, Executive MBA)

Microeconomics for Business Analytics (MS)
Industrial Organization (PhD)

Professional Memberships:

American Economic Association
Econometric Society
Southern Economic Association
Western Economic Association International
North American Association of Sports Economists

Published Articles:

"Do You Get What You Pay For? Salary and Ex Ante Player Value in Major League Baseball" (with Anthony C. Krautmann), forthcoming, *Journal of Sports Economics*

"(Mal)ingering on the Disabled List" (with Anthony C. Krautmann), *Contemporary Economic Policy*, 33:4 (2015), 689 - 697.

"A Nash Bargaining Model of the Salaries of Elite Free Agents" (with Anthony C. Krautmann), *Journal of Sports Economics*, 12 (2011) 309 - 316.

"Moving on Up: The Rooney Rule and Minority Hiring in the NFL" (with Benjamin L. Solow and Todd Walker), *Labour Economics*, 18 (2011), 332 - 337.

"The Dynamics of Performance over the Duration of Major League Baseball Long-Term Contracts" (with Anthony Krautmann), *Journal of Sports Economics*, 10 (2009), 6 - 22.

"Leveling the Playing Field or Just Lowering Salaries? The Effects of Redistribution in Baseball" (with Anthony Krautmann), *Southern Economic Journal*, 73 (2007), 947 - 958; reprinted in V. Andreff (ed.) Recent Developments in the Economics of Sports, Edward Elgar Publishing Ltd., London (2011).

"Estimating Market Power in the Presence of Capacity Constraints: An Application to High-Fructose Corn Sweetener" (with Bjarne Brendstrup and Harry Paarsch), *International Journal of Industrial Organization*, 24 (2006), 251 - 267.

"Doing Good Economics in the Courtroom: Thoughts on *Daubert* and Expert Testimony in Antitrust" (with Daniel Fletcher), *Journal of Corporation Law*, 31 (2006), 489 - 502.

"Community and Gender in Social Dilemma Experiments" (with Nicole Kirkwood), *Journal of Economic Behavior and Organization* 48 (2002), 403 - 412.

"Exorcising the Ghost of Cigarette Advertising Past: Collusion, Regulation and Fear Advertising", *Journal of Macromarketing* 21 (2001), 135 - 145.

"An Economic Analysis of the Droit de Suite", *Journal of Cultural Economics* 22 (1998), 209 - 226; reprinted in R. Towse and R. Holzauer (eds.) The Economics of Intellectual Property, Edward Elgar Publishing Ltd., London (2002).

"Forecasting Nuclear Power Supply using Bayesian Vector Autoregression" (with Roderick Beck) *Energy Economics* 16 (1994), 185 - 192.

"Paternalistic Preferences, Interpersonal Transfers and Reciprocity" *Southern Economic Journal* 61 (1994), 379 - 386.

"Is it Really the Thought that Counts? Toward a Rational Theory of Christmas" *Rationality and Society* 5 (1993), 506 - 517.

"Nuclear Power Plant Performance: the post Three Mile Island Era" (with Anthony C. Krautmann), *Energy Economics* 14 (1992), 209 - 216.

"Monopoly Production of Durable Exhaustible Resources" (with David A. Malueg), *Economica* 57 (1990), 29 - 47.

"A Note on Welfare in the Durable Goods Monopoly" (with David A. Malueg), *Economica* 56 (1989), 523 - 527.

"Economies of Scale in Nuclear Power Generation" (with Anthony C. Krautmann), *Southern Economic Journal* 55 (1988), 70 - 85.

"Exhaustibility and the Durable Goods Monopolist," (with David A. Malueg), *Mathematical and Computer Modelling* 10 (1988), 419 - 427.

"Errata to 'The Durable Goods Monopolist and Consistency with Increasing Costs' by C. Kahn" (with David A. Malueg and Charles Kahn), *Econometrica* 56 (1988), 754.

"On Requiring the Durable Goods Monopolist to Sell" (with David A. Malueg), *Economics Letters* 25/3 (1987), 283 - 288.

"The Capital-Energy Complementarity Debate Revisited," *American Economic Review* 77 (1987), 605 - 614.

"Interindustry Flows and the Incidence of the Corporate Income Tax," *Journal of Public Economics* 30 (1986), 359 - 368.

"General Equilibrium Incidence of Energy Taxation," *Southern Economic Journal* 51 (1985), 1018 - 1030.

"Factor Intensity Rankings in U.S. Production," (with Deborah Johnson), *Economics Letters* 16 (1984), 369 - 374.

"Domestic Energy: A Forgotten Factor in Simple Energy-Economy Models," (with Stephen C. Peck), *The Energy Journal* 3 (1982), 39 - 52.

"A General Equilibrium Approach to Aggregate Capital-Energy Complementarity," *Economics Letters* 2 (1979), 91 - 94.

Books:

Economics: Principles and Policy 14th ed. (with William Baumol† and Alan Blinder), Boston: Cengage Learning (2019)

Antitrust Law Vol. IV (with Phillip E. Areeda and Herbert Hovenkamp), Boston: Little, Brown and Company, (1998).

Antitrust Law Vol. IVA (with Phillip E. Areeda and Herbert Hovenkamp), Boston: Little, Brown and Company, (1998).

Antitrust Law Vol. IIA (with Phillip E. Areeda and Herbert Hovenkamp), Boston: Little, Brown and Company, (1994).

Lealand Morin

CONTACT	Department of Economics College of Business University of Central Florida	https://business.ucf.edu/person/lealand-morin/ Lealand.Morin@business.ucf.edu
INTERESTS	Data Science, Predictive Modeling Time Series Econometrics, Consumer Finance	
EDUCATION	Queen's University , Kingston, ON Canada	
	Ph.D., Economics	January 2017
	M.A., Economics	September 2006
	Laurentian University , Sudbury, ON Canada	
	B.A., Mathematics, and B.A., Economics	May 2005
	H.B.Comm., (Finance)	May 2000
PROFESSIONAL	Capital One Bank , Toronto, ON Canada	
	<i>Senior Data Scientist</i>	September 2014 to August 2018
	Led statistical training for Data Scientists and Business Analysts. Advised analysts for appropriate sample design and modeling methods. Built statistical models to predict default risk and marketing response.	
TEACHING	University of Central Florida , Orlando, FL Department of Economics, College of Business Administration	
	<i>Assistant Professor</i>	Fall 2018 to present
	ECO 5445 Introduction to Business Analytics (Graduate)	Fall 2018, 2019
	ECO 6416 Applied Business Research Tools (Graduate)	Fall 2018-20
	ECP 3004 Topics in Financial Economics	Spring 2019
	GEB 6895 Business Intelligence (Graduate)	Fall 2019
	ECO 6935-6 Capstone Courses in Business Analytics I & II (Graduate)	Spring 2020
	QMB 6358 Software Tools for Business Analytics (Graduate)	Fall 2020
	ECP 3004 Python for Business Analytics	Spring 2021
	Queen's University , Kingston, ON Canada Department of Economics	
	<i>Term Adjunct Assistant Professor</i>	Winter 2017, 2018
	ECON 853 Time Series Econometrics (Graduate)	Winter 2018
	ECON 423 Topics in Financial Economics	Winter 2017
	<i>Teaching Fellow</i>	Winter 2012, 2016
	ECON 853 Time Series Econometrics (Graduate)	Winter 2012
	ECON 423 Topics in Financial Economics	Winter 2012, 2016
	<i>Teaching Assistant</i>	September 2005 to May 2011
	ECON 853 Time Series Econometrics (Graduate)	Winter 2010, Winter 2011
	ECON 852 Quantitative Methods (Graduate)	Fall 2007, Fall 2008, Winter 2008, Fall 2009, Fall 2010

RESEARCH

- Federal Reserve Policy after the Zero Lower Bound: An Indirect Inference Approach (with Ying Shang), *forthcoming in Empirical Economics*
- A Simple Unit Root Test For Near Double-Integrated Time Series (with Michael Tseng)
- The Consumer's Reaction to Cyber Security Incidents at Financial Institutions (with Anson Ho)
- Penalties for Speeding and their Effect on Moving Violations: Evidence from Quebec Drivers (with V. Chandler and J. Penney), *resubmitted, minor revisions requested*
- Prediction Intervals for the Area Under the ROC Curve
- Consumer Credit at the Intensive and Extensive Margin (with Victoria Yiwen Wang)
- A Flexible Framework for Intervention Analysis Applied to Credit-Card Usage during the Coronavirus Pandemic (with Anson T. Y. Ho, Harry J. Paarsch, and Kim P. Huynh), *resubmitted*
- Consumer Credit Usage in Canada during the Coronavirus Pandemic (with Anson T. Y. Ho, Harry J. Paarsch, and Kim P. Huynh), *resubmitted*
- Diffusion Models of Interest Rates from the Great Depression to the Great Recession and Beyond, *submitted*
- The Fractionally Cointegrated VAR Model in R (with M. Popiel and M. Nielsen), a manual to accompany the R packages `fracdist` and `FCAVR`

SOFTWARE

- `interCross`: An R package for intervention analysis using the cross-section of a wide panel (with Harry J. Paarsch)
- `fracdist`: Numerical Distribution Functions of Fractional Unit Root and Cointegration Tests
- `FCAVR`: The Fractionally Cointegrated VAR Model (with M. Popiel and M. Nielsen)
- `FCAVRmodel.m`: A Matlab software package for estimation and testing in the fractionally cointegrated VAR model (with M. Nielsen), QED working paper 1273

CONFERENCES

Presentations

- A Flexible Framework for Intervention Analysis Applied to Credit-Card Usage during the Coronavirus Pandemic
Credit Scoring & Credit Rating Conference,
Southwestern University of Finance and Economics October 2020
2020 Banca d'Italia and Federal Reserve Board Joint Conference
on Nontraditional Data & Statistical Learning
with Applications to Macroeconomics November 2020
- Prediction Intervals for the Area Under the ROC Curve
University of Central Florida January 2018
- Keeping Diffusion Processes within Bounds: Using Information between Observations
CEA Annual Meetings, Montreal June 2013
RES Ph.D. Meetings, London, UK January 2014
Concordia University, University of Manchester, State Street (Boston, MA) 2014

Statistical Society of Canada (Halifax, NS)	June 2015
Canadian Econometric Study Group (Guelph, ON)	October 2015
Traffic Court: Where the Fast & Furious become the Slow & Litigious (with V. Chandler)	
CEA Annual Meetings, Ottawa	June 2016
A Slap on the (Driver's) Wrist?	
Legal Expertise Gained from Traffic Tickets (with V. Chandler and Y. Shang)	
CEA Annual Meetings, Toronto	June 2015
Price Elasticities to Trading Activity Identified with Return and Volume Comovement	
CEA Annual Meetings, Ottawa	June 2011
Volatility is Double Trouble in the Financial Sector: Time-Varying Betas by Industry	
CEA Annual Meetings, Quebec City	May 2010

Discussions

Synthetic Control with Imperfect Pre-treatment Fit	
by Bruno Ferman and Cristine Pinto	
Canadian Econometrics Study Group, Ottawa	October 2018
Regulated Variance Ratio Unit Root Tests	
by Mirza Trokic (McGill University)	
Canadian Econometrics Study Group, Kingston	October 2012
Reducing uncertainty in technical trading with fuzzy logic	
by Nikola Gradojevic (Lakehead University)	
CEA Annual Meetings, Ottawa	June 2011
Optimal Fleet Replacement and Forecasting Under Uncertainty	
by David W. Maybury (Defence R&D Canada)	
CEA Annual Meetings, Toronto	June 2009

SERVICE

Panel Moderator, Alumni Panel, Big Data Analytics Symposium	
University of Central Florida	February 26, 2020
Graduate Program Committee, Admissions Committee, Search Committee	
Department of Economics, University of Central Florida	2018 to present
Essay Review Committee	
Florida Canada Linkage Institute, University of Central Florida	2018 to present
Career Skills Workshop	
Statistical Society of Canada, Student Conference, Dalhousie University	2015
Referee for Empirical Economics	2011
Ph.D. advisor for GARP chapter, Queen's University	2009
Judge for MENSA Canada Scholarship Programme	2006 to 2017

AWARDS

Ontario Graduate Scholarship	2010 to 2011
CGS Doctoral Fellowship	2007 to 2010
SSHRC Tri Council Award	2007
R. S. McLaughlin Fellowship	2005 to 2006
Entrepreneurship Research Alliance Research Assistantship	2006
Dean Earle D. MacPhee Memorial Fellowship	
in Commerce and Administration	2006 to 2007

Dr. Alexander V. Mantzaris

University of Central Florida
Department of Statistics
University of Central Florida (UCF)
4000 Central Florida Blvd
P.O. Box 162370
Orlando, FL 32816-2370
USA

Phone: +1 407 823 3631
Fax: +1 407 823 3930
Email: alexander.mantzaris@ucf.edu

Academic Employment

Assistant Professor of Statistics, University of Central Florida (UCF); August 2016
Postdoctoral Research Assistant (PDRA) University of Strathclyde, Department of Chemistry (2015 September till present)
Secondment with Stipso and University of Strathclyde (2014 till 2015)
Feasibility study with Stipso and University of Strathclyde (2014 March till June 2014; 3 months)
KTP with University of Strathclyde and Bloom Agency (2013 till 2014)
University of Strathclyde Postdoctoral Research Associate (PDRA)- Department of Mathematics and Statistics (2011 till 2013; 2 years)
University of Edinburgh Research Associate (RA)- School of Informatics (2010 till 2011; 6 months)

Education - PhD/MSc/BEng

PhD in the Institute for Adaptive and Neural Computation in the School of Informatics of the University of Edinburgh and BIOS (Biomathematics and Statistics Scotland) which was supervised by Professor Dirk Husmeier. Title: "Improved Bayesian methods for detecting recombination and rate heterogeneity in DNA sequence alignments" (2007-2011).
MSc in Bioinformatics and Machine Learning from the University of Edinburgh, School of Informatics (2005-2006).
BEng in Software Engineering from the University of Edinburgh, School of Informatics (2001-2005)

Commercial/Industrial Employment

Stipso *Edinburgh, UK* (2014-2015)
Bloom Agency *Leeds, UK* (January 2013-2014)
Gulfstream Software Ltd *Edinburgh* (June-August 2009 and September-October 2008)
Profile systems *Athens* (June-August 2004)
Kintec *Athens* (June-August 2003)

Impact/Recognition

Featured in, *The Economist*: An article (print and online) was dedicated to the results of my work on the analysis of the Eurovision song contest:
<https://www.economist.com/blogs/graphicdetail/2018/05/daily-chart-7>
<https://www.economist.com/news/europe/21742117-continent-annual-singing-tournament-becoming-increasingly-partisan-neighbourly-voting>

Awards

Best student contribution at the international conference PRIB 2009 for "Distinguishing Region from Within-Codon Rate Heterogeneity in DNA Sequence Alignments"
Given the title of Impact Champion researcher for Strathclyde University on two separate accounts, 2013 and 2014, for the collaborative research done with industrial partners.

Supervised the winning team of the *Siemens 2017 Wind Analytics Competition Award* at the 'UCF Big Data Analytics Symposium' (March 22, 2017)

Transportation Research Board (TRB) best student paper award 2018 for the paper on freeway operations: 'Investigating and Modeling the Illegal U-turn Violations at Medians of Limited Access Facilities' by Omar Al-Sahili, Haitham Al-Deek, Adrian Sandt, Alexander Mantzaris, John Roger, and Md Omar Faruk

Grants and Funding

Co-PI for DARPA grant - Deep Agent: A Framework for Information Spread and Evolution in Social Networks \$6.2M (PI for the project is Ivan Garibay Eng at UCF)

15K from Bloom Agency for a one year secondment to pay my salary with matching funding from the Impact Acceleration Account (IAA) of Strathclyde University as part of the Knowledge Transfer Project (KTP). (2013)

16K from Stipso for a one year secondment to pay my salary with matching funding from the Impact Acceleration Account (IAA) of Strathclyde University as part of the Knowledge Transfer Project (KTP). (2014)

Publications (selected)

"Exploring How Homophily and Accessibility Can Facilitate Polarization in Social Networks", Taylor, Cameron E. and Mantzaris, Alexander V. and Garibay, Ivan, *Information* 9(12), 2018

"Exploring social media network landscape of post-Soviet space", Alexander Semenov, Alexander V. Mantzaris, Alexander Nikolaev, Alexander Veremyev, Jari Veijalainen, Eduardo L. Pasilliao, Vladimir Boginsky, *IEEE Access*, 2018

"Examining the Schelling Model Simulation through an Estimation of Its Entropy", Alexander V. Mantzaris, Samuel R. Rein, and Alexander D. Hopkins, *Entropy*, (20)-9, 2018

"Preference and neglect amongst countries in the Eurovision Song Contest", Alexander V. Mantzaris, Samuel R. Rein, and Alexander D. Hopkins, *Journal of Computational Social Science*, (1), 1-14, DOI: 10.1007/s42001-018-0020-2, 2018

"Examining Collusion and Voting Biases Between Countries During the Eurovision Song Contest Since 1957", Alexander V. Mantzaris, Samuel R. Rein, and Alexander D. Hopkins, *Journal of Artificial Societies and Social Simulation (JASSS)*, vol21, issue1, 2018

"Asymmetry through Time Dependency" Alexander V. Mantzaris and Desmond J. Higham, *The European Physical Journal B*, vol 89, 2016

"Uncovering nodes that spread information between communities in social networks" Alexander V. Mantzaris *EPJ Data Science* Vol3, 1-17, 2014

"Discovering and validating influence in a dynamic online social network", Laflin Peter, Mantzaris Alexander V., Ainley Fiona, Otley Amanda, Higham Desmond J., *Social Network Analysis and Mining* 2013, vol 3

"Dynamic network centrality summarizes learning in human brain", Mantzaris Alexander V., Bassett Danielle S., Wymbs Nicholas F., Estrada Ernesto, Porter Mason A., Mucha Peter J., Grafton Scott T., Higham Desmond, *Journal of Complex Networks* (2013) <http://dx.doi.org/10.1093/comnet/cnt001>

Conference Talks (selected)

"Examining the effect of polarization on Dynamic Communicators when allowed to compete for social influence" Cameron E. Taylor, Ivan Garibay, Alexander V. Mantzaris, CAPS (Complexity and Policy Studies) (2018)

"Investigating and Modeling a Different Type of Wrong-Way Driving: Illegal U-turn Violations at Medians of Freeways and Toll Roads" Omar Al-Sahili, Haitham Al-Deek, Alexander Mantzaris, TRB Annual Meeting, 2018

"Hierarchical Dynamic Walks" Alexander V. Mantzaris, Peter Grindrod, Desmond J. Higham, Heilbronn Annual Conference, Bristol (2015)

"Anticipating Activity in Social Media Spikes" Higham Desmond J., Mantzaris Alexander V., Peter Grindrod, Otley Amanda, Laflin Peter, ICWSM15- workshop on 'Modeling and Mining Temporal Interactions', 2015

MICHAEL C. TSENG

CONTACT INFORMATION

E-mail michael.tseng@ucf.edu

RESEARCH INTERESTS

Financial Economics · Time Series Econometrics

EMPLOYMENT

Aug 2018 - Present Assistant Professor
Department of Economics
University of Central Florida
USA

Aug 2016 - July 2018 Postdoctoral Researcher
Swiss Finance Institute
École Polytechnique Fédérale de Lausanne
Switzerland

EDUCATION

2016 PhD, Economics
Simon Fraser University, Canada
Thesis: *Essays on Financial Economics*

2012 PhD, Mathematics
Pennsylvania State University, USA
Thesis: *Rokhlin Actions on AF C^* -Algebras and Classifiability*

2008 BS, Mathematical Sciences
University of Texas at Dallas, USA

PUBLICATIONS AND WORKING PAPERS

Ramazan Gençay, Jakub Rojček, Soheil Mahmoodzadeh, Michael C. Tseng, *Price Impact and Bursts in Liquidity Provision*, **Quantitative Finance**, 2018. Working paper version available on [SSRN](#)

Xiaowen Lei, Michael C. Tseng, "Wait and See" Monetary Policy, **Macroeconomic Dynamics**, 2019. Working paper version available on [SSRN](#).

Nathan Abu, Gary Richardson, Michael C. Tseng, *Periodogram ordinate: Spatial model with near unit roots and dependent errors*, **Statistics and Probability Letters**, 2020.

Ramazan Gençay, Hao Pang, Michael C. Tseng, Yi Xue, *Contagion in a Network of Heterogeneous Banks*, **Journal of Banking and Finance**, 2020. Working paper version available on [SSRN](#).

Gary Richardson, Michael C. Tseng, *Frequency Domain Unit Root Test for Spatial*

Models, Under Review.

Stefan Avdjiev, Uluc Aysun, Michael C. Tseng, *Regulatory Arbitrage and Global Push Factors, Under Review.*

Michael C. Tseng, *Estimation of a Time-Varying Parameter from Long-Range Dependent Data*, available on [SSRN](#).

Soheil Mahmoodzadeh, Michael C. Tseng, *Spot Arbitrage in FX Market and Algorithmic Trading: Speed Is Not of the Essence, Under Review*, available on [SSRN](#).

Working Paper

Michael C. Tseng, *A 2-Dimensional Functional Central Limit Theorem for Non-stationary Dependent Random Fields*, available on [SSRN](#).

Working Paper

Lealand Morin, Michael C. Tseng, *A Simple Unit Root Test For Near Double-Integrated Time Series*, available on [SSRN](#).

Working Paper

Semyon Malamud, Michael C. Tseng, Yuan Zhang, *Price Discovery for Options*, available on [SSRN](#).

Working Paper

Semyon Malamud, Michael C. Tseng, Yuan Zhang, *The Demand for Commodity Options*.

M.C. Tseng, H. Zhou, and V. Ramakrishna, *Parametrizations of Positive Matrices With Applications, Mathematics of Quantum Computation and Quantum Technology*, pp. 387-405, Chapman and Hall/CRC, 2008

M.C. Tseng and V. Ramakrishna, *Dilation theoretic parametrizations of positive matrices with applications to quantum information, Operator Theory, Structured Matrices, and Dilations: Tiberiu Constantinescu Memorial Volume*, Theta Foundation, 2007.

PRESENTATIONS

2014 Seattle-Vancouver Econometrics Conference

31st Annual Meeting of the Canadian Econometric Study Group (Poster presentation and Discussant)

NBER-NSF Time Series Conference 2015 Vienna (Poster presentation)

Koç University Finance Seminar

Microstructure of Foreign Exchange Markets, Trinity College, University of Cambridge

SoFiE Financial Econometrics Summer School, National Bank of Belgium

University of Vienna ISOR Seminar

U.S. Securities and Exchanges Commission

University of Central Florida Department of Statistics Colloquium

Mathematics in the City Beautiful: PDEs, SDEs, Control Theory, and
Applications to Finance and Life Sciences

2019 Annual Meeting of the Canadian Economics Association

TEACHING

UCF **Mathematics**

Financial Economics for Mathematicians (Financial Math MS/PhD)

UCF **Economics**

Mathematical Economics I & II (MS)

Econometrics I · Time Series Econometrics (Undergraduate)

Quantitative Methods for Business Analytics (Professional MS)

EPFL **Swiss Finance Institute**

Econometrics (Master of Financial Engineering)

SFU **Economics**

Intermediate Microeconomics · Intermediate Macroeconomics · Econometrics
Mathematical Economics (Undergraduate)

Penn State **Mathematics**

Matrices · Calculus I · Ordinary Differential Equations · Calculus and Vector
Analysis (Undergraduate)

SERVICE

UCF **Department of Economics**

Library Acquisition Committee · Graduate Program Committee (Economics
MS) · Graduate Program Committee (PMSM-BA)

PROGRAMMING LANGUAGES

R, Python, Matlab, C++

January 28, 2021

Dean Jens

University of Central Florida
Department of Economics
4336 Scorpius St.
Orlando, FL 32816-1400

Phone: (407) 823-4467
Email: dean.jens@ucf.edu

Academic Employment

Assistant Professor of Economics
University of Central Florida College of Business Administration

2018–present

Education

Ph.D., Economics, Rutgers University, 2018

Dissertation Title: “Coordination and Uncertainty”

M.A., Economics, Fordham University, 2010

M.S., Physics, Princeton University, 1999

B.S., Mathematics, University of Chicago, 1996

Research Interests

Market Design

Game Theory

Group decision making under uncertainty

Risk-Dominance and its kin

Asset Pricing

Liquidity Premia

Bubbles

Money

JEL codes
C6 C7 C9
D4 D7 D8 D9
G1
L1

Papers

2020, “Concave Expectations”

2019, “Bayesian and Non-Bayesian Learning”

2018, “Risk Dominance, Beliefs, and Equilibrium”

2017, “Shortages and Runs”

Presentations

“Risk Dominance, Beliefs, and Equilibrium”

WATE, Orlando, FL, October 26, 2018

International Conference on Game Theory, Stony Brook, NY, July 16, 2019

“Bayesian and Non-Bayesian Learning”

WATE, Gainesville, FL, October 25, 2019

SEA, Zoom / New Orleans, LA, November 23, 2020

Teaching Experience

Data Visualization		Spring 2021
Applied Business Tools	Foundational tools of probability and statistics for business analytics	Spring 2020
Data Wrangling	A class on data acquisition, cleaning, management, and exploration for graduate students in a business analytics track	Spring 2019, Spring 2020
Introductory Macroeconomics		Five times, Fall 2018– Spring 2021
Math Camp	Intensive one-week math review for incoming graduate students in economics	2013–2017
Game Theory	An upper-level elective for undergraduates	Spring 2017
Introductory Econometrics	an upper-level elective	Fall 2018
Introductory Econometrics	A course required for all undergraduate economics majors	Fall 2012; Fall 2013
Financial Economics	An upper-level elective for undergraduates; an overview of risk, discounted cash flows, and some ontology of financial instruments	Summer 2012
Teaching Assistant for Public Economics, Game Theory, Introductory Microeconomics		
Grader for miscellaneous other classes		

Peer Review

I have reviewed papers for

Theory and Decision

Computational Economics

International Journal of Industrial Organization

Games and Economic Behavior

Nonacademic Employment

Strategist (Quant), Goldman Sachs, 2005–2008

I developed models to price and hedge counterparty credit risk on derivatives and optimized the efficiency of computer programs

Computer programmer, 1999–2005

Network programming (presentation layer and session layer) in C++, with some SQL

Curriculum Vitae
Nizam Uddin
Department of Statistics
University of Central Florida
Orlando, FL 32816
407-823-2692; nizam.uddin@ucf.edu

EDUCATION

- Ph. D. - Old Dominion University, Virginia, USA, 1989.
Research Area: Optimal Experimental Design.
Advisor: John P. Morgan, Professor, Department of Statistics, Virginia Tech.
- M. Sc. - University of Saskatchewan, Canada, 1985.
- M. Sc. - University of Dhaka, Bangladesh, 1979.
- B. Sc. - University of Dhaka, Bangladesh, 1977.

TEACHING EXPERIENCE

- Professor, Department of Statistics; University of Central Florida, Orlando, Florida, USA. August, 2009 - present.
- Associate Professor, Department of Statistics and Actuarial Science; University of Central Florida, Orlando, Florida, USA. August, 2002 - July, 2009.
- Associate Director and Principal Consultant, Institute of Statistics and Data Mining, University of Central Florida, Orlando, Florida. August 2002 - July 2007.
- Visiting Assistant Professor, Department of Statistics and Actuarial Science; Associate Director and Principal Consultant, Institute of Statistics and Data Mining, University of Central Florida, Orlando, Florida. August 2001 - July 2002.
- Associate Professor, Department of Mathematics, Tennessee Technological University, Cookeville, Tennessee, USA. August 1998 - July 2001.
- Assistant Professor, Department of Mathematics, Tennessee Technological University, Cookeville, Tennessee, USA. August 1994 - July 1998.
- Assistant Professor, Department of Mathematics and Statistics, University of Southern Maine, Portland, Maine, USA. September 1989 - July 1994.
- Teaching Assistant, Department of Mathematics and Statistics, Old Dominion University, Norfolk, Virginia, USA. September 1985 - August 1989.
- Teaching Assistant, Department of Mathematics, University of Saskatchewan, Saskatoon, Canada. September 1983 - August, 1985.
- Lecturer, Department of Statistics, University of Chittagong, Chittagong, Bangladesh. June 1979 - August 1983.

AWARDS

- TIP (Teaching Incentive Program Award)- 2011
- RIA (Research Incentive Award) - 2009
- Promotion to Full Professor - August, 2009.

PUBLICATIONS - Refereed Journal Papers

(Year/Title/Authors/Journal/Volume/Pages)

- 2016 “Testing equality of two normal means using combined samples of paired and unpaired data, Nizam Uddin and Mohammed Hasan, *Communications in Statistics- Simulation and Computation*, to appear.
- 2016 “Finding Supply Chain Talent: An Outreach Strategy”, Steve Leon and Nizam Uddin, *Supply Chain Management- International Refereed Journal*, 21, 1, 20-44
- 2015 “Predictors of Intention to Refer to Pediatric Palliative or Hospice Care, Norma Conner and Nizam Uddin, *American Journal of Hospice and Palliative Care*, 1-8.
- 2015 “Stress, Social Support and Depression in Arab Muslim Immigrant Women in the Detroit Area of the United States, Karen Aroian, Nizam Uddin and Darshana Ullah. In: Nazilla Khanlou and F. Berry Pilkington (Ed), *Women’s Mental Health: Resistance and Resilience in Community and Society*, Springer International Publishing Switzerland 2015, 69-81.
- 2015 “Wrong Way Driving Multifactor Risk-Based Model for Florida Interstates and Toll Facilities, John Rogers, Adrian Sandt, Haitham Al-Deek, Ahmad Alomari, Nizam Uddin, Eric Gordin, Cristina Santos, Jessica Renfrow, Grady Carrick, *Transportation Research Record: Journal of the Transportation Research Board*.
- 2014 “Nursing student end-of- life attitudes after an online death and dying course, Norma Conner, Vicky Loerzel, and Nizam Uddin, *Journal of Hospice and Palliative Nursing*, 2014, 16, 374-382.
- 2014 “Tigecycline for severe clostridium diffivile infection, Ashley Thomas, Farhan Khan, Nizam Uddin and Mark R. Wallace. *International Journal of Infectious Diseases*, 2014, 26, 171-172.
- 2012 “Use of Locking Plate and Screws in the Triple Pelvic Osteotomy Procedure, Scott Rose, Ken Bruecker, Steve Petersen and Nizam Uddin, *Veterinary Surgery*, 41, 2012, 114-120. International Refereed Journal.
- 2012 “Effect of Locking Triple Pelvic Osteotomy Plate on Screw Loosening in 26 Dogs, Scott Rose, Jeffrey Peck, Cheryl Tano, Nizam Uddin, and Jacek Haan, *Veterinary Surgery*, 41, 2012, 156-162. International Refereed Journal.
- 2012 “Alteration of brain water content in H-Tx hdrocephalic rat, Rammling, Uddin, Paul, Madan, and Pattisapu. *Journal of Neurosurgery: Pediatrics*. In review.

- 2011 “Comparison of Some Series of Binary and Nonbinary Balanced Nested Row-Column Designs for Correlated Errors, Nizam Uddin, *JSM Proceedings of American Statistical Association*, Miami, FL, 4386-4397, 2011.
- 2011 “Comment on An alternative proof of the number of m -flats n -dimensional finite Projective Geometry formed from Galois Field $G. F. (p^n)$, where p is a prime number and n is a positive integer, By Q. M. Hossain, Nizam Uddin, Nova Science, New York, 2011. To appear.
- 2011 “Should a Cardiologist be the Principal Attending Physician or the Consultant to a Hospitalist or General Internist for Cardiovascular Disease Admissions?”, Everett G. D. and Uddin, N., *American Heart Hospital Journal*, 9, 2011, 81-86. International Refereed Journal.
- 2011 “Two constructions for neighbor balanced block designs with nested rows and columns”, **Nizam Uddin**, *Journal of statistical Theory and Applications* 10, 347-356. (International refereed journal)
- 2010 “Colistin Dosing and Nephrotoxicity in a large community teaching hospital, DeRyke, Crawford, Uddin, Wallace. *Antimicrobial Agents and Chemotherapy*, 54, 4503-4505. (Refereed Journal of American Society of Microbiology).
- 2010 “Beta-blocking drug use in cocaine abusers: is it safe and effective therapy in hospitalized patients? , Everett G. D., Uddin, N. and others. *Journal of Investigative Medicine*, 58, 357-357 (Meeting Abstract).
- 2008 “Optimal block designs for three treatments when observations are correlated”, **Nizam Uddin**, *Journal of statistical Planning and Inference*, 138, 1960-1966. (International refereed journal)
- 2008 “MV-Optimal block designs for correlated errors”, **Nizam Uddin**, *Statistics & Probability Letters*, 17, 2926-2931. (International refereed journal)
- 2008 “Optimality and efficiency of small chessboard designs for correlated errors”, **Nizam Uddin**, *Metrika*, 68, 343-350. (International refereed journal)
- 2008 “ E -optimal designs when errors follow a conditional autonormal process”, **Nizam Uddin**, *Linear Algebra and Its Applications*, doi:10.1016/j.laa.2008.09.009. (International refereed journal).
- 2008 “MV-Optimal designs for three treatments when observations are correlated”, **Nizam Uddin**, Accepted for publication in *Sankhya, Series B*, - The Indian Journal of Statistics, 70, 113-120. (International refereed journal).

- 2008 “When should a cardiologist seek hospital co-management support from a hospitalist or general internist? , George Everett and Nizam Uddin, Accepted for publication in *The American Heart Hospital Journal*. (International refereed journal).
- 2007 “Neighbor properties of some classes of *BIBRCs* and their efficiencies for correlated errors”, **Nizam Uddin**, *Journal of Statistical Planning and Inference*, 137, 1669-1680. (International refereed journal)
- 2007 “Pilot-scale verification and analysis of iron release flux model”, Mutoti, Dietz, Imran, **Nizam Uddin**, and Taylor, *ASCE Journal of Environmental Engineering*, 133, 173-179. (International refereed journal)
- 2007 “Comparison of Hospital costs and length of stay for community internists, hospitalists, and academicians”, George Everett, **Nizam Uddin**, and Beth Rudloff, *Journal of General Internal Medicine*, 22, 662-667. (International refereed journal)
- 2007 “Serum and Forskolin Cooperate to Promote G1 Progression in Schwann Cells by Differentially regulating Cyclin D1, Cyclin E1 and p27Kip Expression”, Iacovell, Lopera, Bott, Baldwin, Khaled, **Uddin** and Fernandez-Valle, *GLIA*, 55, 1638-1647. (International refereed journal)
- 2006 “Occurrence of infected amoebae in cooling towers compared with natural aquatic environments: implications for emerging pathogens”, *ACS Journal: Environmental Science and Technology*, Berk, Gunderson, Newsome, Farone, Hayes, **Uddin**, Williams, Johnson, Farsian, Reid, Skimmyhorn, Farone; *Environ. Sci. Technol.*; 2006; 40(23); 7440-7444. (International refereed journal)
- 2005 “Universally optimal structurally balanced row column designs with some empty nodes”, **Nizam Uddin**, *Journal of Statistical Planning and Inference*, 133, 509-522. (International refereed journal)
- 2005 “Constructions of some classes of neighbor balanced designs”, **Nizam Uddin** and M. Hanif Talukder, *Ars Combinatoria: Australian-Canadian Journal of Combinatorics*, 74, 275-289. (International refereed journal)
- 2005 “Split models for predicting multivehicle crashes during high-speed and low-speed operating conditions on freeways”, M. Abdel-Aty, **Nizam Uddin** and Anurag Pande, *Transportation Research Record - Journal of the Transportation Research Board No.-1908*, pp 51-58. International Refereed Journal.
- 2005 “Traffic surveillance from a safety perspective: An ITS data application”, M. Abdel-Aty, Anurag Pande and **Nizam Uddin**, *Proceedings of the 8th International IEEE*

- Conference on Intelligent Transportation Systems (ITSC2005), Vienna, September, 2005 (Refereed, published in CD).
- 2005 “Proactive real-time safety implementation strategy on freeways”, M. Abdel-Aty, Anurag Pande, and **Nizam Uddin**, Proceedings of the 13th International Conference on Road Safety on Four Continents, Warsaw, October, 2005 (Refereed, published in CD).
- 2005 “Improving safety and security by developing a traffic accident prevention system”, M. Abdel-Aty, **Nizam Uddin** and Anurag Pande, Proceedings of the first International Conference on Safety and Security Engineering, Rome, Italy, June, 2005 (Refereed, published in CD).
- 2004 “Comparison of hospital Cost and length of stay associated with general internist and hospitalist physicians at a community hospital”, George Everett, Anton, Jackson, Swigert, and **Nizam Uddin**, *The American Journal of Managed Care*, 10, 626-630. (International refereed journal)
- 2004 “Predicting free-way crashes based on loop detector data using matched case-control logistic regression” Abdel-Aty, **Nizam Uddin**, Fathy Abdalla, and Anurag Pande, *Transportation Research Record - 1897: Journal of Transportation Research Board*, 88- 95. (International refereed journal)
- 2004 “A Behavior Checklist Comparative Investigation of the Speech-Associated Coping Responses of Persons who do and do not Stutter”, Martinee Vanryckeghem, Gene Brutton, **Nizam Uddin**, and John Borsel, *Journal of Fluency Disorders*, 29, 237-250. (International refereed journal)
- 2003 “Ethnic Identity, Self-Esteem, and Ethnocentrism: A Study of Social Identity Versus Multicultural Theory of Development”, Charles Negy, Tara Shreve, Bernard Jensen and **Nizam Uddin**, *Cultural Diversity and Ethnic Minority Psychology*, 9, 333-344. (International refereed journal)
- 2003 “Optimal row-column designs for two treatments”, John P. Morgan and **Nizam Uddin**, *Journal of Statistical Planning and Inference*, 115, 603-622. (International refereed journal)
- 2002 “A method of construction of a class of universally optimal structurally incomplete row-column designs”, **Nizam Uddin**, *Statistics & Probability Letters*, 59, 93-98. (International refereed journal)

- 2000 “Optimal cylindrical-block designs for correlated observations”, **Nizam Uddin**, *Journal of Statistical Planning and Inference*, 84, 2000, 323-336. (International refereed journal)
- 1999 “Efficient block designs for settings with spatially correlated errors- Errata”. **Nizam Uddin** and John P. Morgan. *Biometrika*, 86, 1999, 233. (International refereed journal)
- 1999 “A class of neighbor balanced block designs and their efficiencies for spatially correlated errors”, John P. Morgan and **Nizam Uddin**, *Statistics*, 32, 1999, 317-330. (International refereed journal)
- 1999 “Some E-optimal partially balanced nested row-column designs with unequal block sizes”, **Nizam Uddin**, *Calcutta Statistical Association Bulletin*, 49, 1999, 41-54. (International refereed journal)
- 1998 “On optimal two-period repeated measurements designs”, **Nizam Uddin**, *Communications in Statistics- Theory and Methods*, 27, 1998, 827-837. (International refereed journal)
- 1997 “Universally optimal designs with blocksize $p \times 2$ and correlated observations”. **Nizam Uddin** and John P. Morgan. *Annals of Statistics*, 25, 1997, 1189 - 1207. (International refereed journal)
- 1997 “Efficient block designs for settings with spatially correlated errors”. **Nizam Uddin** and John P. Morgan. *Biometrika*, 84, 1997, 443-454 (International refereed journal)
- 1997 “Optimal partially balanced nested row-column designs”, **Nizam Uddin**. *Journal of Statistical Planning and Inference*, 60, 1997, 351-366. (International refereed journal)
- 1997 “Further constructions for orthogonal sets of balanced incomplete block designs with nested rows and columns”, **Nizam Uddin** and John P. Morgan, *Sankhya*, B, 59, 1997, 156-163. (International refereed journal)
- 1997 “Orthogonal sets of balanced incomplete block designs with nested rows and columns”, John P. Morgan and **Nizam Uddin**. *Journal of Statistical Planning and Inference*, 59, 1997, 360-378. (International refereed journal)
- 1997 “Equireplicate balanced block designs with nested rows and columns with at most two distinct block sizes”. **Nizam Uddin**, Q. Chen and S. A. Patil. *Utilitas Mathematica - A Canadian Journal of Discrete and Applied Mathematics*, 52, 1997, 49-64. (International refereed journal)

- 1996 “E-optimal incomplete block designs with two distinct block sizes”, **Nizam Uddin**. *Journal of Statistical Planning and Inference*, 55, 1996, 235-248. (International refereed journal)
- 1996 “Optimal blocked main effects plans with nested rows and columns and related designs”, John P. Morgan and **Nizam Uddin**. *Annals of Statistics*, 24, 1996, 1185-1208. (International refereed journal)
- 1996 “On *MV*-optimal incomplete block designs with unequal block sizes ”. **Nizam Uddin** and Leiming Li. *Metron*, 30, 1996, 195-205. (International refereed journal)
- 1995 “The robustness of binary and non-binary nested row-column designs under the unavailability of blocks : a comparison”, **Nizam Uddin** and Dexter C. Whittinghill. *The Australian Journal of Statistics*, 37, 1995, 111-124. (International refereed journal)
- 1995 “E-optimal nested row-column designs with unequal replications of treatments”, **Nizam Uddin** and S. A. Hossain. *Sankhya - The Indian Journal of Statistics, Series B*, 57, 1995, 112-121. (International refereed journal)
- 1995 “On recursive construction for balanced incomplete block designs with nested rows and columns ”. **Nizam Uddin**. *Metrika - International Journal of Theoretical and Applied Statistics*, 42, 1995, 341-345. (International refereed journal)
- 1995 “Optimal, Non-Binary, Variance Balanced Designs”. John P. Morgan and **Nizam Uddin**. *Statistica Sinica*, 5, 1995, 535-546. (International refereed journal)
- 1993 “Optimality and construction of nested row and column design”. John P. Morgan and **Nizam Uddin**. *Journal of Statistical Planning and Inference*, 37, 1993, 81-93. (International refereed journal)
- 1993 “On mutually orthogonal and totally balanced sets of balanced incomplete block designs with nested rows and columns”. John P. Morgan and **Nizam Uddin**, *Statistica Sinica*, 3, 1993 435-451. (International refereed journal)
- 1992 “Constructions for some balanced incomplete block designs with nested rows and columns”. **Nizam Uddin**. *Journal of Statistical Planning and Inference*, 31, 1992, 253-261. (International refereed journal)
- 1992 “Optimal block designs with maximum blocksize and minimum replication constraints”, **Nizam Uddin** and John P. Morgan, *Communications in Statistics*, 21(1), 1992, 179 - 195. (International refereed journal)

- 1991 “Two dimensional design for correlated observations”. John P. Morgan and **Nizam Uddin**. *Annals of Statistics*, 19, 1991, 2160-2182. (International refereed journal)
- 1991 “Optimal and near optimal sets of Latin squares for correlated errors”, **Nizam Uddin** and John P. Morgan, *Journal of Statistical Planning and Inference*, 29, 1991, 279-290. (International refereed journal)
- 1991 “Two constructions for balanced incomplete block designs with nested rows and columns”, **Nizam Uddin** and John P. Morgan. *Statistica Sinica*, 1, 1991, 229-232. (International refereed journal)
- 1990 “Some constructions of balanced incomplete block designs with nested rows and columns”, **Nizam Uddin** and John P. Morgan. *Biometrika*, 77, 1990, 193-202. (International refereed journal)
- 1990 “Some series constructions for minimal size equineighboured balanced incomplete block designs with nested rows and columns”, **Nizam Uddin**, *Biometrika*, 77, 1990, 829 - 833. (International refereed journal)
- 1990 “Some constructions for rectangular, Latin square and pseudocyclic nested row-column designs”, J. P. Morgan and **Nizam Uddin**, *Utilitas Mathematica*, 38, 1990, 43-51. (International refereed journal)

FUNDED RESEARCH AND CONSULTING PROJECTS

PI/Co-PI /Funding Agency/Amount/Year

- **Nizam Uddin** (PI), Orlando Regional Healthcare System, \$36,245.00, 2001-2006.
- **Nizam Uddin** (PI), Incharge Institute, \$18,100.00, 2003- 2005.
- **Nizam Uddin**, Principal Consultant, Institute of Statistics and Data Mining, \$19,750.00 (fee received by the Department of Statistics and Actuarial Science for miscellaneous projects through the Institute), 2001 - 2008.
- David Nickerson (PI) and **Nizam Uddin** (Co-PI) Golfweek's Super News, \$8,500.00, Co-PI's share 50%, 2006.
- Abdel-Aty (PI) and **Nizam Uddin** (Co-PI), Florida Department of Transportation, \$507,966.00, Co-PI's share \$45,716.00, 2004 - 2006.
- Abdel-Aty (PI) and **Nizam Uddin** (Co-PI), Florida Department of Transportation, \$122,650.00, CO-PI's share was equivalent to two months summer salary, 2002 - 2004.
- Cristina Fernandez-Valle (PI) and **Nizam Uddin** (Statistical Consultant), Department of Defence, \$926,698, Consultant's share: one month summer salary, 2003- 2007.
- Sharon Berk (PI) and **Nizam Uddin** (Statistical Consultant), Environmental Protection Agency, \$396,060.00, Consultant's share: one month summer salary, 1998-2001.
- **Nizam Uddin** (PI), National Science Foundation, \$30,000.00, 1992-94.
- **Nizam Uddin** (PI), Maine EPSCoR, \$ 10,000.00, 1991 -1992.
- **Nizam Uddin** (PI) University of Southern Maine, \$3,000.00, 1991.
- **Nizam Uddin** (PI), Tennessee Technological University, \$ 8,800.00, 1997-2001.

ADDITIONAL APPENDIX I: Library Resources for an Additional Program

Memo

To: Dr. Michael Caputo, Professor and Chair, Department of Economics
Dr. Nora Underwood-Caputo, Associate Lecturer, Undergraduate Program Director
Dr. Harry Paarsch, Professor and Graduate Program Director
Dr. Sevil Sonmez, Senior Associate Dean at College of Business Administration
Ms. Ying Zhang, Interim Associate Director, Collection Services & Resource Management
Mr. Frank Allen, Interim Director of Libraries
Ms. Sara Duff, Acquisitions & Collection Assessment Librarian

From: Peter Spyers-Duran, Associate Librarian, Cataloging Services

Subject: Library Evaluation of the Proposal to add a new MS in Business Analytics degree program in the College of Business Administration

Date: February 16, 2021

When reviewing library support for a new MS in Business Analytics degree program in the College of Business Administration, the following institutions were identified as aspirational peers for the library holdings comparison:

- University of Florida (UF)
- Georgia Tech (GT)
- University of Georgia (UGA)

These universities were selected as peers because each has a degree program that is similar to the proposed MS in Business Analytics at UCF.

Summary and Projected Costs for New Library Resources:

The comparison of UCF's library collections to those of UF, GT, and UGA finds that UCF's existing book, journal, and database holdings will meet the current needs of the proposed degree program, and therefore no immediate funds are requested. However, in the event that any new key journal or database becomes critical for the degree in the future, additional recurring funding will need to be provided to the Libraries to add these resources. The Libraries' budget is facing severe cuts. Presently, existing subscriptions and resources are under review and consideration for cancellation. Very little funding is available to add new books or videos for this growing new subject.

Comparative Analysis on key library resources supporting the proposed MS in Business Analytics

Databases:

Databases	UCF	UF	GT	UGA
ABI/INFORM Complete	1	1	1	1
ACM Digital Library	1	1	1	1
*Bloomberg Terminal	1	0	1	0
Bloomberg.com	0	0	0	0
Business Source Premier	1	1	1	1
Compendex	1	1	1	1
Datastream	0	1	0	0
Data Citation Index	1	0	1	1
Data-Planet	0	0	1	0
EconLit	1	1	1	1
Factiva	0	1	1	1
Gartner	1	0	0	0
IEEE Xplore	1	Electronic Library	1	1
MathSciNet	1	1	1	1
NBER Working Papers	1	1	1	1
Nexis Uni	1	1	1	0
Science Direct	1	1	1	1
SimplyAnalytics	1	1	1	0
Statista	0	1	1	0
Statistical Insight	0	1	0	0
Web of Science	1	1	1	1
* Available for UCF College of Business faculty/students only and NOT subscribed and maintained by the UCF Libraries.				

Recommendation: The UCF Libraries databases compare favorably with those of the aspirational peer institutions. UCF has the databases needed to support the proposed MS in Business Analytics degree program; however, if a new database were to become critical to the program in the future, additional recurring funding will need to be provided to the Libraries to add this resource.

Key Journals

Journals	ISSN	UCF	UF	GT	UGA
Advances in Data Analysis and Classification	862-5347, 1862-5355.	1	1	1	1

Applied Stochastic Models and Data Analysis	8755-0024, 1099-0747.	1	1	1996 - 1999	1985-1991
Big Data	2167-6461; 2167-647X	03/01/14 - 12/31/17	0	1	0
Big Data and Society	2053-9517	1	1	1	1
Big Data Mining and Analytics	IEEE	1	0	0	0
Big Data Research	2214-5796; 2214-580X	1	1	0	1
Computational statistics & data analysis	0167-9473, 1872-7352.	1	1	1	1
Data	2306-5729	1	1	1	1
Data Science Journal	1683-1470	1	1	1	1
EPJ Data Science Journal	2193-1127	1	1	1	1
IEEE Transactions on Knowledge and Data Engineering	1041-4347	1	1	1	1
Intelligent Data Analysis	1088-467X; 1571-4128	1-year embargo	1	1	1
International Journal of Business Analytics (IJBAN)	2334-4547, 2334-4555	1	0	0	0
International Journal of Business Analytics and Intelligence (IJBAI)	2321-1857	1-year embargo	1	1-year embargo	1-year embargo
Journal of Big Data	2196-1115	1	1	1	1
Journal of Business Analytics	2573-234X, 2573-2358	1	0	1	1
Journal of Data Science	1680-743X, 1683-8602	1	1	1	
Statistical Analysis and Data Mining: The ASA Data Science Journal	1932-1864; 1932-1872	1	1	1	1
The Journal of Finance and Data Science	2405-9188	1	1	1	1

Recommendation: The UCF Libraries provides full-text access to the current issue of sixteen of the nineteen journals provided by aspirational peer institutions. Two of the twenty journals have a one-year embargo (there is no full-text access to the most current 12-months content). UCF lost access to *Big Data* in 2017 due to cuts.

Overall, the UCF Libraries journals compare favorably with those of aspirational peer institutions. UCF has the journals needed to support the MS in Business Analytics degree program as proposed; however, in the event of program expansion or a new key journal becomes critical for the program in the future, additional recurring funding will need to be provided to the Libraries to add these resources.

Books (by the Subject headings, keywords)

Library of Congress Subject Headings	UCF	UF	GT	UGA
Big data	780	440	893	832
"Business Analytics" keyword search	168	104	232	186
Data mining	4012	1423	3337	2462
Decision making, Mathematical models	319	330	311	512
Econometric models	184	146	1397	2281
Econometrics	899	787	662	1169
Economics, Mathematical	851	625	1127	1532
Game theory	1227	789	876	1185
Python (Computer program language)	416	640	938	528

Recommendation: UCF book holdings are comparable to those of aspirational peer institutions. If the proposed program were to shift focus to a new area that UCF does not have adequate coverage, additional new funds will be needed to acquire books.

ADDITIONAL APPENDIX II: Examples of Job Postings

Examples of job postings from firms such as Universal, BNY Mellon and local health care providers specifying a master's degree in a quantitative discipline with a focus on business or statistics.

Sr. Analyst, Business Analytics Revenue Mgmt

Universal Orlando
Orlando, FL

Employment type:

Full-time

Job description

JOB SUMMARY: Implement and execute revenue management and pricing solutions to drive superior financial performance through advanced analytic methods. Run and monitor market response models to understand price sensitivity and determine optimal pricing for Universal Express, Food, Merchandise and other businesses within Universal Parks. Develop, test and implement new products, test price and demand sensitivity, make recommendations to maximize profitability. Deliver key performance tracking metrics and monitor ongoing performance.

MAJOR RESPONSIBILITIES:

- Implement and Execute Revenue management models that reflect price elasticity for all guest facing products sold at domestic theme parks and support automation of Revenue Management decision making and identify opportunities to drive incremental profitability. Drive efforts will include data preparation, normalization, and segmentation to accurately predict the market response to changing prices.
- Review model accuracy, adjust price, calculate demand sensitivity and make recommendations that maximize profitability. Measure market response at the product and category levels across multiple locations and parks. Maintain and review baseline historical pricing, seasonality, transaction volume, revenue, penetration, per capita, pricing, etc.
- Deliver weekly and annual pricing recommendations; collaborate with product owners and their senior leaders to take action to drive incremental revenue. Develop and maintain dashboards/reporting and drive performance measurement.
- Trouble shoot forecast and optimization anomalies with revenue management team using statistical and mathematical optimization models.
- Understands and actively participates in Environmental, Health & Safety responsibilities by following established UO policy, procedures, training and team member involvement activities.
- Performs other duties as assigned.

EDUCATION: High school degree or GED is required. Bachelor's degree is required.

Master's degree is preferred. Master of Science Degree/Phd in Industrial Engineering, Operations Research, Management Science, Mathematics, Statistics or equivalent.

EXPERIENCE: 5+ years of experience in the field or in a related area; or equivalent combination of education and experience.

Your talent, skills and experience will be rewarded with a competitive compensation package.

Universal is not accepting unsolicited assistance from search firms for this employment opportunity. All resumes submitted by search firms to any employee at Universal Orlando via email, the Internet or in any form and/or method without a valid written Statement of Work in place for this position from Universal Orlando HR/Recruitment will be deemed the sole property of Universal Orlando. No fee will be paid in the event the candidate is hired by Universal Orlando as a result of the referral or through other means.

Universal Orlando Resort. **Here you can.**

Universal Orlando is an equal opportunity employer. Universal elements and all related indicia TM & © 2022 Universal Studios. All rights reserved. EOE

Business Analyst Specialist

Dice

Orlando, FL

Employment type:

Full-time

Job description

Dice is the leading career destination for tech experts at every stage of their careers. Our client, DVI Technologies, Inc., affiliated with BNY Mellon is seeking the following. Apply via Dice today!

Title: Business Analyst Specialist

Location: Orlando, FL

Duration: Full Time

Job Description: Data Experience and Domain knowledge

- Experience with logical data model
- Experience creating Data Operating Models and implementation
- Experience in business analysis and data analysis (e.g., consolidation of similar data from multiple sources and identifying differences, making recommendation on which to select)
- Accountable for ensuring that the data and data processes adhere to all policies
- Ability to investigate, interview and gather information effectively
- Provides knowledge and expertise regarding enterprise reference data organization and usage
- Provides knowledge and expertise regarding enterprise CRM, Client Onboarding, KYC and related utilities

Business Process Management

- Performs reactive and proactive processes and activities required to design, implement, maintain, and improve the compliance and performance of operations processes on highly complex projects.
- Performs highly complex data mining, trend analysis, metric and report production, process maturity and compliance assessment, process flow charting, and iterative process activities (e.g. validity checks, change reviews, data quality checks tool enhancement design and review).
- Identifies and defines the sequence or procedural workflow of process activities and tasks.
- Creates process requirements, reviews functional requirements, validates solutions, coordinates and participates in testing, coordinates and participates in process rollouts for highly complex or multiple enhancements.

- Directs activities that affect stakeholders across multiple functionalities for process development, implementation, and support. Investigates and methodically analyzes, diagnoses and resolves any suspected or reported performance issues, questions, incidents, or problems identified through monitoring activities.
- Identifies, measures and records the Organization's, Process', and Performers' current-state performance results to establish the baseline measurement for performance improvement initiatives.
- Contributes to the achievement of area objectives. Excellent documentation skills (meeting minutes, status updates, current and target state documentation)

Technical Requirements

- Ability to write simple SQL statements and Excel for data analysis
- Constructs and runs complex SQL queries
- Data analysis and compiling reports
- Ability to understand physical data model (tables, columns, metadata, etc.)
- Knowledge of 3rd party vendor market data feeds

General Skillset

- Strong analytical/logical thinker
- Strong communication and presentation skills to multiple stakeholders
- Proactive engagement (i.e., not afraid to raise issues, questions and speak up)
- Able to clearly articulate and communicate to BNYM business and others (e.g., questions that business can understand, output that should be reviewed by business)
- Ability to 'connect the dots' – Ability to assess and catch (before acting) the impact of one change that can have an impact on something else
- The candidate must be a self-starter, adapt to dynamics of the work environment, ability to multitask, meet tight timelines, hardworking, efficient with good analytical skills.

Bachelor's degree in business or technical-related discipline, or equivalent work experience required, advanced degree preferred, 6-8 years of experience in providing consulting advice to senior IT and business management required, experience in the securities or financial services industry is a plus.

BNY Mellon is an Equal Employment Opportunity/Affirmative Action Employer. Minorities/Females/Individuals with Disabilities/Protected Veterans. Our ambition is to build the best global team – one that is representative and inclusive of the diverse talent, clients and communities we work with and serve – and to empower our team to do their best work. We support wellbeing and a balanced life, and offer a range of family-friendly, inclusive employment policies and employee forums.

- provided by Dice

Business Analyst

Change Healthcare
Orlando, FL

Employment type:

Full-time

Job description

Business Analyst Overview of Position Job Posting

This Business Analyst role is a high visibility position to the leadership team of Member Engagement. He/she will be leading and supporting the transformation of Member Engagement (ME) operations efficiency and effectiveness thru the identification, assessment, and implementation of process improvement opportunities across the multiples stages, systems, and process of ME operations. He / She will be leveraging subject matter expertise in member engagement operations in conjunction with analytical, financial tools and process improvement techniques to drive best practices and a holistic process design, ensuring and optimal balance across efficiency, effectiveness, and quality. The successful candidate should be knowledgeable of member engagement operations and capable of working with other team members to identify, quantify and drive multiple analysis/projects from conceptualization to implementation. He/she should be highly analytical, innovative, highly driven, self-motivated, results oriented individual who is comfortable working in a fast-paced environment with minimum guidance. The candidate should be a team player with good communication skills and ability to influence team members towards common goals.

What will be my duties and responsibilities in this job?

- Work with multiple stakeholders to:
- Collecting and screening feedback from multiple areas of the operation to identify and quantify opportunities to improve the quality and efficiency of end to end process.
- Propose innovative viable solutions that will address the opportunities identified and are aligned with the multiple stakeholders.
- Coordinate and assist in the development of business cases for each initiative including investment requirements
- Perform detailed due diligence across technology, physical & logical security, regulatory constraints, client contracts to determine the viability of the identified opportunities.
- Support development of Annual Strategy Plans and provide process subject matter expertise, analytics, or project management support during ideation to implementation of initiatives.
- Lead implementation of the process improvements actives/projects across multiple stakeholders to ensure delivery as per timelines, budget, and targeted business benefits
- Ensure projects follow industry best practices and end-to-end process design and methodologies meeting customer and business needs. Having alignment with the product roadmaps and growth plans for the business.
- Track implementation related issues and work with various workstream leads to resolve them. Escalate issues in a timely manner to the leadership for resolution.

- Provide regular program status updates to different stake holders ranging from Business Unit General Managers and Senior Leadership Team.
- Collaborate with Product Owners to define product vision, manage product roadmaps and growth opportunities according to business value / ROI
- Monitor performance of initiatives and benefits to shareholders, customers, and employees.
- Partner with operations to develop KPIs
- Evaluate servicing improvement opportunities, develop business cases, and implement selected opportunities.

What are the requirements needed for this position?

- Bachelors or **masters degree in Industrial engineering or similar field or Business (a plus)**
- Project Management Professional (PMI) or equivalent Project Management certification (e.g., Certified Project Management Practitioner, International Project Management Association, a plus)
- Lean Management or Six Sigma certification (Black Belt, a plus)
- 1-3 years of member engagement operations, metrics, and internal and external customers
- Passion to identify and drive process improvement with proven experience or educational qualifications, identifying improvements opportunities.
- Strong analytical and problem-solving skills
- Strong Interpersonal skills
- Creative thinker with a vision
- Attention to details
- Advanced Microsoft Office expertise (including, Excel, Word, PowerPoint)

What other skills/experience would be helpful to have?

- 1 years experience in process improvement/reengineering using industry standard methodologies or educational qualifications
- Skills in process re-engineering methodologies (e.g. Lean/Six Sigma) and process automation (e.g. Robotics Process Automation)
- 0-3+ years experience in project management Experience working in Agile Software Development methodologies
- Highly motivated self-starter, who can work independently with minimum guidance
- Excellent business acumen, executive presence, and verbal and written communications skills
- Experience developing project portfolios, managing implementation across cross functional teams, achieving project milestones on budget and in time.
- 1+ years experience of Service Industry
- 1+ years experience in Quality Improvement
- 1+ years experience of Healthcare industry
- 1+ years experience of BPO industry
- 1+ years experience in data analytics using tools like SAS, SQL to provide strategic insights

What are the working conditions and physical requirements of this job? General Office Demands

How much should I expect to travel?

Employees in roles that require travel will need to be able to qualify for a company credit card or be able to use their own personal credit card for travel expenses and submit for reimbursement.

li-remote

IWork4CHNG

ChangeHealthcareCareers

HiringNow

RemoteWork

WorkFromHome

Join our team today where we are creating a better coordinated, increasingly collaborative, and more efficient healthcare system!

COVID Vaccination Requirements

We remain committed to doing our part to ensure the health, safety, and well-being of our team members and our communities. As such, we require all employees to disclose COVID-19 vaccination status prior to beginning employment and we may require periodic testing for certain roles. In addition, some roles require full COVID-19 vaccination as an essential job function. Change Healthcare adheres to COVID-19 vaccination regulations as well as all client COVID-19 vaccination requirements and will obtain the necessary information from candidates prior to employment to ensure compliance.

Equal Opportunity/Affirmative Action Statement

Change Healthcare is an equal opportunity employer. All qualified applicants will receive consideration for employment without regard to race, color, religion, age, sex, sexual orientation, gender identity, genetic information, national origin, disability, or veteran status. To read more about employment discrimination protections under federal law, read EEO is the Law at [Link available when viewing the job] and the supplemental information at [Link available when viewing the job] you need a reasonable accommodation to assist with your application for employment, please contact us by sending an email to [Email available when viewing the job] with "Applicant requesting reasonable accommodation" as the subject. Resumes or CVs submitted to this email box will not be accepted.

Click here [Link available when viewing the job] to view our pay transparency nondiscrimination policy.

California (US) Residents: By submitting an application to Change Healthcare for consideration of any employment opportunity, you acknowledge that you have read and understood Change

Healthcares Privacy Notice to California Job Applicants Regarding the Collection of Personal Information ([Link available when viewing the job] .

Change Healthcare maintains a drug free workplace and conducts pre-employment drug-testing, where applicable, in accordance with federal, state and local laws.

Change Healthcare is an equal opportunity employer. All qualified applicant will receive consideration for employment without regard to race, color, religion, age, sex, sexual orientation, gender identity, genetic information, national origin, disability, or veteran status.

Associate Business Intelligence Analyst

Highmark Health
Orlando, FL

Estimated salary:

\$18-35

Employment type:

Full-time

Job description

This job utilizes project management techniques to develop Business Intelligence solutions using Oracle Cloud Analytics technologies. Activities may include but not limited to consulting with cross-functional business groups to identify data and analytical needs, capture and document requirements, determine the appropriate Oracle Cloud tool, coordinate with report developers to design and oversee development, review findings with leadership, and facilitate testing with the end users. This job will also facilitate related process/data improvement efforts, standardization, best practices, advanced analytics, and development of executive level presentations. This job may also prepare similar intelligence for operational purposes.

****ESSENTIAL RESPONSIBILITIES:****

- Utilize Project Management methodologies to design and track creation of Business Intelligence solutions within Oracle Cloud
- On a regular basis and as needed, work with various departments to understand business objectives; design and build analytics using Oracle Cloud; publish metrics dashboards and executive presentations. Identify, analyze, and interpret trends or patterns in complex data sets.
- Ensure consistency and accuracy of information and reporting by monitoring performance and usage of Oracle Cloud. Research fluctuations to core metrics/key performance indicators (KPIs), participate and/or lead process and data improvement efforts.
- Develop processes, tools, and templates to enable efficient, accurate and standardized data analyses and related deliverables; leverage automation to greatest extent possible. Design and implement analytical solutions and other strategies that optimize statistical efficiency and data quality.
- Develop work plans to meet deadlines, accurately estimate completion dates, and communicate status to leadership.
- Contribute to ensuring that all changes to reporting, processes, and procedures are reflected, appropriately documented and that consistency is maintained for team. Ensure the correct first time /quality review processes are utilized and that changes maintain data integrity control processes.
- Work closely with management to prioritize business and information needs.
- Other duties as assigned or requested.

****Education****

****Required****

- Bachelor's Degree in Math, Computer Science, Analytics, Engineering, Information Science or related field

****Preferred****

- Master's in Math, Computer Science, Analytics, Engineering, Information Science or related field

****Experience****

****Minimum****

- 1 year Directly related work experience

****Preferred****

- Project Management- Oracle Cloud Business Intelligence- Oracle Analytics Cloud

****LICENSES or CERTIFICATIONS****

****Required****

- None

****Preferred****

- None

****SKILLS****

- Proficient to master level with Microsoft Office products including Excel, Power Point, Word, and Access

- Basic understanding of SQL / querying capabilities

- Experience with end-user reporting tools

- Familiarity with the Software Development Lifecycle Process and Project Management Lifecycle

- Strong written and verbal communication skills

- Strong analytical skills with the ability to collect, organize, analyze, and disseminate significant amounts of information with attention to detail and accuracy

- Effective participation in team-based work

- Ability to find solutions and deliver results within a rapid, fast changing, entrepreneurial, technology-driven culture

- Capable of adjusting to changing priorities

- Ability to understand business needs to master new skills and technologies in a short period of time.

- Must have strong interpersonal skills and the ability to establish, develop and maintain cross-functional business relationships, as well as have excellent presentation and problem-solving skills

ADDITIONAL APPENDIX III: Letters of Support from Industry Professionals

Dr. Paul Jarley
Dean, College of Business
University of Central Florida
12744 Pegasus Drive
Orlando, FL 32816

Brandon Shelton
Senior Director, Advanced Analytics Lab
L.A. Care Health Plan
813-528-6734
bshelton@lacare.org

2021-10-22

Dear Dr. Jarley,

At L.A. Care, the country's largest publicly-operated Medicaid plan, we are continuing to expand the use of advanced analytics to make better decisions in nearly all aspects of our business, and thus strongly support the proposed Master of Science degree program in Business Analytics.

L.A. Care's Advanced Analytics Lab is heavily dependent upon "Business Insights Analysts". These professionals create actionable and accurate decision-support products through statistical analysis of very large, diverse datasets. In addition to their own projects, we often pair Business Insights Analysts with our Data Scientists on machine learning projects, due to our Analysts' strong understanding of the complex business environment we support and datasets that we work with. To be effective at L.A. Care, our Business Insights Analysts require the ability to work with the specific tools and analytic approaches outlined in the proposed program's curriculum.

Like L.A. Care, many large health plans throughout the country are continuing to expand their use of advanced analytic applications in areas such as population health management, utilization management, provider networking, and claims processing. It is vital that these health plans are able to hire professionals with the appropriate analytic skills to support the above-mentioned functional areas in making the most well-informed operational and strategic decisions on behalf of their members, stakeholders, and taxpayers. L.A. Care has aggressively developed this competency over the last 4 years, and will continue to increase its dependency on these skills over the next 3-5 years.

Please feel free to contact me if you have an questions.

Sincerely,

Brandon Shelton

From: [Rao, Praveen](#)
To: [Lealand Morin](#)
Cc: [Daniel Eilen](#)
Subject: MSBA Support
Date: Friday, October 22, 2021 9:28:10 AM
Attachments: [image001.png](#)

Dr. Morin,

At Spectrum Reach (Charter Communications), we are continuing to leverage advanced analytics in many of our business operations, and thus very strongly support the proposed Master of Science degree program in Business Analytics.

We believe that there is a strong need for employees who are familiar with the computational and statistical techniques necessary to make sense of the massive amounts of data that our business continuously generates. It is well known that data scientists are in great demand. However, the business analysts who are trained to work alongside the data scientists are especially valuable to us, since these employees have the business acumen to leverage analytics to solve our business problems.

Here at Spectrum Reach, we see opportunities in many areas of our company and would recommend this program for many of our current roles, primarily those in marketing, product and financial analysis. We also see opportunities in other areas and would recommend that other degree programs incorporate portions of the curriculum for students in other disciplines, to gain an understanding of the value of information and analytics.

We plan to continue to build competence in business analytics in the future and expect to hire for these skills in an accelerated mode within the next 3-5 years.

Overall, from our perspective, we anticipate a strong and continued demand for such talented employees to stay ahead of our competition and compete in the global marketplace.

If you have any questions, please do not hesitate to contact me.

Thank you
Praveen Rao



Praveen Rao | Director, Data Science |

P 407-745-2534 |

2251 Lucien Way | Maitland, FL 32751 SpectrumReach.com
