BUSINESS ANALYTICS (XBA1-GB)

XBA1-GB 8106 Found of Stat Using R (2 Credits)
Typically offered occasionally
The purpose of this course is to ensure that students are prepared to use R as a statistical tool and understand the fundamental statistical concepts. This course is divided into two parts: 1) Getting Started with R and 2) Statistics and R. The R portion of the course will prepare students with the skills needed to work with data using the R statistical computing application. This begins with developing a basic understanding of the R working environment. Second, students will be introduced to the necessary arithmetic and logical operators, salient functions for manipulating data, and getting help using R. Next, students will be introduced to the common data structures, variables, and data types used in R. Students will learn how to develop their own R scripts and utilize the various packages available in R for visualization, reporting, manipulation, and statistical analysis. Students will learn how to import data sets and transform and manipulate those datasets for various analytical purposes such as dealing with missing data. Finally, students will learn how to create control structures, such as loops and conditional statements to traverse, sort, merge, and evaluate data. In the second part of the class, basic concepts of probability and statistics will be introduced. We shall study the concepts of population and sample, discuss the difference between population parameters and sample statistics, and how to draw inference from known sample statistics to usually unknown population parameters. We shall study discrete distributions, their means, and standard deviations, paying particular attention to the binomial distribution. We shall also study continuous distributions and their probability density functions, paying special attention to the most central of the continuous distributions, the normal distribution. The Central Limit Theorem will be introduced, and confidence intervals and statistical tests will be discussed. We shall then study the simple and multiple linear regression, and their applications to prediction and forecast through several examples. The material also includes the study residual analysis, heteroscedasticity, step-wise variable selection, and the Lasso algorithm.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8107 Data Privacy & Ethics (1 Credit)
Typically offered occasionally
Rarely a day goes by without a social or ethical issue concerning analytics in the news. In this class, we're going to tackle these topics head-on. We'll be exploring two important societal aspects of analytics systems: privacy and fairness. We'll look at the foundational theoretical underpinnings of each in practical context, and look at approaches to tackling the challenges they present grounded in technology, regulatory and organizational methods. This is an intensive module, and preparation, debate and engagement will be vital.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8111 Databases for Business Analytics (1 Credit)
Typically offered occasionally
Databases for Business Analytics
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8120 Modern Artificial Intelligence (2 Credits)
Typically offered occasionally
The field of AI will fundamentally transform many industries within the next few years. According to the latest World Economic Forum (WEF) report, AI will create 133 million new and displace 75 million old jobs worldwide (with the net creation of 58 million new jobs) within the next few years, contributing up to $15 trillion to the global GDP by 2030, according to PwC. Furthermore, there is an acute AI skills shortage around the world: the demand for AI jobs is measured in millions, while there are currently about 300,000 AI professionals worldwide, according to another report. Not surprisingly, AI-related jobs are among the fastest-growing and the most in-demand today. Furthermore, AI has experienced rapid growth over the last ten years with major advances in its subfields of Deep Learning, enforcement Learning, Natural Language Processing, Computer Vision, Robotics, and other subfields. The purpose of this course is to provide the students with a systematic introduction to the recent developments in AI through the coverage of fundamental AI concepts, practical business applications, and hands-on experiences with modern AI frameworks. Upon completion of this course, the students will be able to: 1. Understand AI's fundamental concepts and methods, e.g., what AI can do and cannot do 2. Understanding the foundations of machine learning 3. Deep understanding of modern AI --- deep learning, and different deep neural network architectures and their state-of-the-art applications. 4. Learn how to apply AI-based methods to solve business problems and how to integrate AI into your business.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8150 Digital Mktg Analytics (2 Credits)
Typically offered occasionally
Our goal in this class is to discuss the new business models that have been enabled by Internet-based new media and digital technologies, and to analyze the impact these technologies have had on industries, firms and people. We will inform our discussions with insights from data and conceptual frameworks that can guide us. To recognize how businesses can successfully leverage these technologies, we will therefore go beyond the technology itself and investigate some key questions. A few examples (these are just illustrative and not comprehensive) are as follows: 1. What are some of the key technology induced disruptive phenomena in the adtech and martech economies? 2. What role does programmatic advertising play in the digital marketing world? What are the metrics for measuring ROI in sponsored search and display advertising? 3. What are the different experimental methods used for measurement and causal analyses in the digital marketing world? 4. What frameworks are deployed today for marketing mix modeling and digital attribution modeling? 5. What is the economic value of textual information in online markets? What are the techniques used these days in this space for mining unstructured data? 6. How are companies leveraging online social networks and online communities for traditional businesses? 7. How are mobile technologies enabling newer kinds of predictive analytics for better targeting of consumers? What are the key effectiveness metrics used by firms these days to measure the performance of mobile marketing? 8. What are the key forces shaping the mobile economy? These are just some examples of questions we will address through lectures. Lectures will be complemented by formal discussion of case studies from Harvard Business School, Kellogg, and other similar sources. The questions for each case study will be given to the students ahead of time. Students will also be doing in-class exercises.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8215 Network Analytics (2 Credits)
Typically offered occasionally
This course is about how the social, technological, and natural worlds are connected, how technology illuminates and shapes these connections, creating fascinating new networked data sets and associated analytics, how the study of networks sheds light on and enables modeling these connections, and how networks enabled by digital technologies are leading to the emergence of new institutions and market forms. While one's "social network" is now associated by many with the popularity of digitally mediated social media, we have always been creatures of our networks—whether those networks involve family, villages, tribes, or Facebook—and our socioeconomic evolution has been molded by the possibilities for exchange that they create. Over our lessons, we will explore the fascinating world of networks, what digital systems reveal about the connections between people, information and technology, the analytics of networks, and how we can model and analyze the rich population-scale networked data sets that digital technologies are making available to us. Topics may include network models of the contagion of pathogens like COVID-19; social network structure and its effects on business and culture; how the structural properties of networks help us understand social capital, power and modern institutions; the influence of networks on access to and propagation of information and fads; power laws; leveraging information networks for web search; the melding of networks, machine learning, and technology into the platform economy. The course is organized as six lessons - Lesson 1: Network Basics - Lesson 2: Measuring Tie Strength and Trust in Social Networks - Lesson 3: Modeling and Interpreting Network Position, Structure and Statistics - Lesson 4: Identifying and Measuring Contagion in Networks - Lesson 5: Epidemiological Models of Contagion - Lesson 6: Network Effects, Platform Economics and Matching Analytics
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8216 Decision Under Risk (2.5 Credits)
Typically offered occasionally
Analytics is "the scientific process of transforming data into insight for making better decisions". For example, sales data can help us understand consumer purchase behaviors as well as demand patterns. These insights can be used to make sales forecasts, which in turn can inform assortment and production planning decisions. Optimization models have played a very important role in turning "insights" into "decisions" for companies in various industries: online advertising, airlines, energy, investment and finance, marketing, manufacturing, retailing, hospitality, etc. This course is aimed at enriching the exposure to business analytics techniques. Students will learn how to build simulation and optimization models that incorporate random parameters (e.g., demand, stock prices, market responses, etc.). It covers four chapters. The first one is on decision trees, a simple but powerful tool that explicitly allows to make optimal decisions in uncertain environments. We will use TreePlan, an Excel add-in to model and solve this type of problems. The second chapter is on advanced linear programming (LP), a follow-up from the contents you learned in Decision Models (DM). This part spans two topics: i) sensitivity analysis, which relates to understanding the impact of changing the parameters of a model on the optimal solution, and is executed using Excel Solver, and ii) solving LP models in python, where we will learn how to use the Pyomo modeling language. The "pythonic" component of this part builds upon the python intro you learned in the Dealing with Data course. The third chapter builds on the simulation topic covered in the DM course. We will discuss how to interpret the output of simulation models in terms of risk evaluation. We will be using Crystal Ball, as it was done in DM, and we will learn how to implement this type of models in Python. We will discuss how to use OptQuest, a Crystal Ball app that allows to make optimal decisions capturing the random nature of the solution. Finally, in chapter four, we will explore how to combine in Python the optimization power of Pyomo with the advantages of Monte Carlo simulation. As in the case of DM, the emphasis throughout the course will be on model formulation, solution methods, and managerial interpretation of the results, rather than on the mathematical algorithms used to solve models.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8217 Dealing With Data Using Python (1 Credit)
Typically offered occasionally
This class is designed to teach students to handle data programmatically, without being software engineers. This course guides students through the whole data management process, from initial data acquisition to final data analysis. From a tools perspective, we cover Python and SQL. SQL is the lingua franca for all data analysts, and virtually all companies store their data in SQL-accessible repositories. Python serves as a great general-purpose programming language for a wide variety of data management tasks, and is commonly used as the "glue" that brings together all the different aspects of the analytics process. The list of topics that we plan to cover: # Data modeling and ER model # Relational databases and SQL # Accessing data sources: Web APIs # Data manipulation using Python Pandas # Regular expressions and Web Crawling # Text Analytics
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8237 Machine Learning (3 Credits)
Typically offered occasionally
This course is about gaining exposure to core machine learning techniques and their applications to business domains and functions. MIT research shows 9% higher top line and 26% higher net margins for companies with 'Leading Digital' capabilities. While most firm have capabilities in summarizing the data they have, very few have the analytical abilities to gain true insights from such data to get business results. The course will expose you to the art-of-the-possible with respect to state-of-the-art methods and applications of supervised and unsupervised machine learning. Majority (5/6th) of the course will focus on supervised machine learning for prediction. The course will be based on $1 million plus worth use-cases of analytics completed at the Carlson Analytics Lab. It will be driven practical uses cases and use a mixture of lecture, discussion of key issues, and an in-class group prediction contest over the three days! At the end of the course all students will become excellent at understanding the power of data mining to create business value. You will learn how to identify opportunities of using supervised and unsupervised machine learning methods, setup the problems correctly, develop intuition of how the major classes of machine learning algorithms work, and how to use the appropriate metrics and approaches to judge performance. We will also cover the important topic of algorithmic bias and examine ways to correct for it. Finally we will look at explainable AI and the interface between machine learning and causal inference to estimate heterogeneous treatment effects.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8271 Strat, Change & Analytics (2 Credits)
Typically offered occasionally
The goal of this course is to understand why organizations often fail to realize a return on their analytics investments. My argument is that, while there are clearly technical and skill-based reasons why some firms struggle, most of the impediments arise from organizational issues. Specifically, the contextual business knowledge and the analytics knowledge in most organizations are separated from one another, which creates real problems both for asking good questions and for understanding what to do with the output from analytics efforts. o address these issues, we will seek to understand the link between strategy (the most integrative business function in most firms) and analytics. Analytics is about improving decision making, and strategy is all about making value creating decisions, so the two are a natural fit together. We will explore how to use data – both small data and big data– to improve decision making and value creation in organizations. While we won't focus on learning lots of new ""tools"", my goal is to give you a chance to practice deploying the tools that you have been learning throughout the program. As a result, some of the assignments (both in the pre-module and the in-module portions) will be analytically challenging and are intentionally individual and ambiguous to help you move away from closely directed assignments. As opposed to thinking specifically about the analytical tools or looking to gain new analytical tools, this class focuses on figuring out how trying to deploy those analytical tools that you have already been introduced to within the context of an organization creates challenges. While the specific topics that we will cover will be broad, the topics fall under three primary impediments to achieving ROI (return on investment) from analytics, and we will use these three impediments (and solutions) to structure the course: • Asking Questions. Because business executives don't understand what analytics can (and cannot) do, they tend to ask bad questions. And because analytics leaders don't often understand how the organization creates value, they cannot typically ask value creating questions in a vacuum. We will explore how to ask better questions by looking at how the question asked relates to the analytical approach used to answer the question. • Taking Action. Organizations don't engage in data science for the curiosity of the outcome of the analysis alone (that's more like academics). Instead, they want to DO something with the output of the analysis. But understanding what you can – and cannot – do with the output of analytics efforts, and how those outputs can be adjusted based on organizational goals, is a challenge. • Designing Organizations. Too often, organizations simply append their analytics investments to their existing organizational structure, and focus on working with the data they already have as opposed to thinking through what they could do with new data to create value. The structure and mindset of how analytics is used in the organization is key to unlocking real value.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8314 Operations Analytics (1 Credit)
Typically offered occasionally
This short course, during Module 2, is positioned to remind you why you are learning how to do all the data analytics. The focus is on business problems that we are trying to solve. And, to learn how to make better data-driven decisions. We will emphasize improving our domain knowledge about the industry and companies that we are working with; this includes your Capstone Projects. We will practice deciphering and solving business problems using data analytics and effective modeling from various industries.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8330 Revenue Mgmt & Pricing (2 Credits)
Typically offered occasionally
The field of AI will fundamentally transform many industries within the next few years. According to the latest World Economic Forum (WEF) report, AI will create 133 million new and displace 75 million old jobs worldwide (with the net creation of 58 million new jobs) within the next few years, contributing up to $15 trillion to the global GDP by 2030, according to PwC. Furthermore, there is an acute AI skills shortage around the world: the demand for AI jobs is measured in millions, while there are currently about 300,000 AI professionals worldwide, according to another report. Not surprisingly, AI-rel ated jobs are among the fastest-growing and the most in-demand today. Furthermore, AI has experienced rapid growth over the last ten years with major advances in its subfields of Deep Learning, Reinforcement Learning, Natural Language Processing, Computer Vision, Robotics, and other subfields. The purpose of this course is to provide the students with a systematic introduction to the recent developments in AI through the coverage of fundamental AI concepts, practical business applications, and hands-on experiences with modern AI frameworks. Upon completion of this course, the students will be able to: 1. Understand AI's fundamental concepts and methods, e.g., what AI can do and cannot do 2. Understanding the foundations of machine learning 3. Deep understanding of modern AI --- deep learning, and different deep neural network architectures and their state-of-the-art applications. 4. Learn how to apply AI-based methods to solve business problems and how to integrate AI into your business
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8336 Intro to Analytics and AI (2 Credits)
Typically offered occasionally
This course will change the way you think about data and its role in business. Businesses, governments, and individuals create massive collections of data as a byproduct of their activity. Increasingly, decision-makers and systems rely on intelligent technology to analyze data systematically to improve decision-making. In many cases automating analytical and decision-making processes is necessary because of the volume of data and the speed with which new data are generated. This course provides a deep introduction to business analytics, with a focus on the science of extracting information and knowledge from data (data science). We will examine the underpinnings of data analytics, always keeping in mind the goal of improving decision-making. We will study the fundamental principles of data science and data mining, including frameworks for data-analytic thinking and how data science methods embody the fundamental principles. We will examine real-world examples and cases to place the material in context, to help develop data- analytic thinking, and to illustrate that proper application is as much an art as it is a science.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8346 Big Data (1 Credit)
Typically offered occasionally
This course offers an in-depth hands-on exploration of cutting-edge cloud technologies used for big data analytics. The pre-module will cover background readings on the theoretical foundations of Hadoop and MapReduce, as well as business articles on how Hadoop and related technologies are used by companies. The pre-module will also cover some basics of navigating Google Cloud Platform (GCP) for uploading and analyzing data using Google Cloud Storage, BigQuery, and PySpark on Dataproc (Hadoop cluster). Next, in the in-class module, we will focus on the Hadoop Big Data environment – specifically, Linux, Hadoop distributed file system (HDFS), Apache Sqoop, Apache Pig and Apache Hive – for data management and extract-transform-load (ETL) operations. Then, we will use Google Cloud Platform (GCP) to do hands-on exercises to upload and process large files (in the 1 GB+ range) for your Capstone project and other purposes. On GCP we will focus on cloud file storage, querying cloud data, visualizing cloud data, and using PySpark to run analytics on cloud data. In the post-module, we will have assignments on the hands-on material covered in the in-class module.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8348 Data Visualization (1.5 Credits)
Typically offered occasionally
This course is an introduction to the principles and techniques for visualizing data. This course shows you how to better understand your data, present clear evidence of your findings to your intended audience, and tell engaging data stories that clearly depict the points you want to make all through data graphics. You will learn visual representation methods and techniques that increase your understanding of complex data and models. Emphasis is placed on the identification of patterns, trends, and differences from data sets across categories, space, and time. The ways that humans process and encode visual and textual information will be discussed in relation to selecting the appropriate method for the display of quantitative and qualitative data. Graphical methods for specialized data types (times series, categorical, etc.) are presented. Topics include charts, tables, graphics, effective presentations, multimedia content, animation, and dashboard design. Throughout the course, several questions will drive the design of data visualizations. These include: Who's the audience? What's the data? What's the task? What's the best visual display? This is a hands-on course. In this course, we will focus on Tableau and Excel to create, edit, alter, and display your data graphics. To learn these tools, we will begin working with some very small data sets to practice and then advance to larger data sets. Since this is not a class on data analysis or models, you'll be expected to apply your prior knowledge of statistics, data mining, and data science to the creation of beautiful data displays (using big or small data).
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8350 Decision Models (2 Credits)
Typically offered occasionally
This course introduces the basic principle s and techniques of applied mathematical modeling for managerial decision making. You will learn to use some important analytic methods (e.g.spreadsheet modeling, optimization, Monte Carlo simulation), to recognize their assumptions and limitations, and to employ them in decision making. The course is entirely hands-on. The emphasis will be on model formulation and interpretation of results, not on mathematical theory. The emphasis is on models that are widely used in diverse industries and functional areas, including finance, marketing, and operations.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8354 Data Driven Dec-Making (2 Credits)
Typically offered occasionally
This class uses a blend of academic papers and real-world cases, together with data work in and out of class, to learn how to think as an applied social scientist. This is a skillset that will be valuable to you throughout your career. Business managers, policymakers and strategists are typically interested in understanding causal mechanisms, but often can only observe correlations. In this class, we will discuss ways to disentangle correlation from causation, including the use of advanced econometric techniques and experimental design.
Grading: Grad Stern Graded
Repeatable for additional credit: No

XBA1-GB 8600 Capstone (6 Credits)
Typically offered occasionally
The MSBA Capstone is a six-credit integrative exercise, which gives you as students the opportunity to demonstrate an understanding of the core competencies taught throughout the program and apply them to real business concerns. In self-formed groups of 4-5 members, your project can be as big as you want as long as it is feasible in size and scope to be completed within twelve months. We encourage you to form strong, balanced teams, where you have a variety of expertise, backgrounds, skill sets, and work styles—just like you would experience in the real world. Your objective is not to “boil the ocean,” but rather use business analytics to address a specific, strategic issue. All projects should include data mining, modelling and/or other business analytics techniques learned in the program. You will carry out this project over four phases during the course of your year of study: # Ideation: form groups around a shared idea # Investigation: collect your data, thoroughly research, and employ modeling methodologies # Synthesis: report and findings start to take shape # Execution: findings become solidified into final report and presentation There will be multiple deliverables during the year to facilitate your completion of the final Capstone, including: # 7 assignments # 5 presentations # 5 surveys Module 5 is when your group will present your findings to the Capstone Directors and a board of panelists.Please note that all deliverables are required and will be considered as a part of your overall Capstone grade. Please refer to the following information as you plan out your project.
Grading: Grad Stern Graded
Repeatable for additional credit: No