NYU | TANDON SCHOOL OF ENGINEERING

MG-GY-9753 Business Analytics
Special Topics in Technology Management
Fall 2016

Course Description

Business analytics is a set of data analysis and modeling techniques for understanding business situations and improving business decisions. This course provides an introduction to business analytics concepts, methods and tools with concrete examples from industry applications. In the first part of the course, we will focus on data analysis concepts and understanding data with a refresher on basic probability and statistics. In the second part, we will cover the principles and techniques for data visualization to improve comprehension, communication, and decision-making. The final part of the course will introduce the basic principles and techniques of applied mathematical modeling for managerial decision making with an emphasis on optimization models that are widely used in diverse industries and functional areas, including finance, marketing, and operations. Finally, throughout the course, we explore the challenges that can arise in implementing analytical approaches within an organization.

The course emphasizes that business analytics is not a theoretical discipline: these techniques are only interesting and important to the extent that they can be used to provide real insights and improve the speed, reliability, and quality of decisions.

Pre-Requisites

Probability, Statistics, Linear Algebra, Excel

Instructors

JeanCarlo (J.C.) Bonilla, Adjunct Professor, jb3379@nyu.edu
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Office hours by appointment

Required Textbook

None.

Suggested Textbook by Topic

Essentials of Business Analytics. Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, and David R. Anderson. Cengage Learning, 2014.

>   *AKA " Essentials"*

Excell: Management Science: The Art of Modeling with Spreadsheets, Powell and Baker. Wiley

R: Data Mining and Business Analytics with R, Johannes Ledolter, 1st Edition

Business Analytics: Keeping Up with the Quants: Your Guide to Understanding and Using Analytics, Thomas H. Davenport & Jinho Kim, 2013

Decision Models: Spreadsheet Modeling & Decision Analysis: A Practical Introduction to Management Science, Cliff Ragsdale, 6th edition.

Data Visualization: The visual display of quantitative information, Eduard R. Tufte, 2001

Scoping: Thinking with Data How to Turn Information into Insights, Max Shron, 2014

Required Analytics Cases

Additional reading materials will be available in NYUClasses. These cases showcase the application of business analytics in operations, marketing, finance, strategy, product development, human resources, and sales.

>   *AKA " Cases"*

Software

This course will require the use of Windows Excel, RStudio, and Tableu

Grading Policy

- **Weekly Assignments, Quizzes, and In-class Data Dives - 40%**
    - Mostly data analysis and programming assignments. Some assignments will include theoretical aspects to make sure students understand the important mathematical concepts in data analytics.
    - There will be a 10min online quiz during each class testing the understanding of theory reviewed in class as well as reading materials.
    - In-class data dives are hands on sessions around the entire data life cycle. These include project scoping, data manipulation and integration, analysis, visualization, and reporting.

- **Exams – 30%**
    - Two exams on covering theory and applications

- **Team Project –30%**
    - This is the capstone experience of the course where students will form groups consisting of between 3 and 4 people depending upon the size of class. Teams will build a project using a publicly accessible datasets. They will motivate the business problem, do enough explanatory analysis and generate data driven strategic insight. Each team will give a brief class midterm presentation on the project, followed by a final presentation at the end of the course.

For the purposes of computing GPAs, the following schedule is used.

Letter Grade	100% Scale	Grade Point Value
A	100-95	4.0
A-	94-90	3.7
B+	89-85	3.3
B	84-80	3.0
B-	79-75	2.7
C+	74-70	2.3
C	69-65	2.0
F	64-0	0

Course Web Page

You must have access to the NYU Classes site (http://classes.nyu.edu/). All announcements and class-related documents (supplemental and suggested readings, discussion questions, etc.) will be posted there.

Some class announcements will be distributed via NYU e-mail. Thus, it is important that you actively use your NYU e-mail account, or have appropriate forwarding set up on NYU Home (https://home.nyu.edu/).

Statement of Academic Integrity

Students are expected to follow standards of excellence set forth by New York University. Such standards include respect, honesty, and responsibility. This class does not tolerate violations to academic integrity including:

- Plagiarism
- Cheating on an exam
- Submitting your own work toward requirements in more than one course without prior approval from the instructor
- Collaborating with other students for work expected to be completed individually
- Giving your work to another student to submit as his/her own
- Purchasing or using papers or work online or from a commercial firm and presenting it as your own work

Fall 2016 Course Schedule*

Week	Topics
Week 1	**Overview & Context** Competing on Analytics in today's Business Landscape. The data lifecycle. Analytics vs. Intelligence vs. Data Science. **Introduction to R & Descriptive Statistics** Using R scripts, we will review concepts in descriptive statistics such as measures of central tendency, measures of dispersion, and measures of association between two variables. *Reading:* ● *Essentials Ch. 1-2*

	● *NYUClasses: Descriptive and Summary Stats* ● *NYUClasses: R Basics*
Week 2	**Adv. Descriptive Statistics & Visualization** In this module we will cover the principles of hypothesis testing, correlations analysis, and statistical significance. In addition, this will be the first session on effective data visualization **Regression I** This module covers the basics of regression analysis. Our emphasis will be on applications and interpretation of the results for making real life business/policy decisions and <u>not</u> on the mathematical and statistical properties of the techniques used to produce these results. In order to provide a broad intuition of the concepts and methods, we will use data and examples from marketing decision making such as segmentation, estimating market potential and forecasting demand, etc. *Reading:* ● *Essentials Ch. 2, 3, 4* ● *NYUClasses: Regression* ● *NYUClasses: Visualizations*
Week 3	**Regression II** We will continue covering regression analysis including non-linear transformations and dummy variables. **Prediction & Classification Trees** In addition to advanced regression, we will cover prediction and classification trees. *Reading:* ● *Essentials Ch. 4, 6* ● *NYUClasses: Regression* ● *Case: "Prediction"*
Week 4	**Exam #1**
Week 5	**Linear Models & Optimization** This the first session on prescriptive analytics. Using Excel, we will introduce some important analytic methods (e.g. spreadsheet modeling, optimization), to recognize their assumptions and limitations, and to employ them in decision making. We will practice translating descriptions of decision problems into formal models, and investigate those models in an organized fashion. *Reading:* ● *Essentials Ch. 7, 8* ● *NYUClasses: "Linear Models"*
Week 6	**Decision Models** This is a continuation of prescriptive analytics. These series of lectures will introduce the basic principles and techniques of applied mathematical modeling for managerial decision making.

Week 7	**Introduction to Tableau & Data Visualization** Visualizations are graphical depictions of data that can improve comprehension, communication, and decision-making. In this lecture, you will learn visual representation methods and techniques that increase the understanding of complex data and models. Emphasis will be placed on the identification of patterns, trends and differences from temporal/spatial data and their visual representation. You will have hands on practice with Tableau. *Reading:* ● *Essentials Ch. 7, 8* ● *NYUClasses: "Linear Models"*
Week 8	**Managing Data Projects** Designing analytics solutions not only depends on the data and models, but also on the aspects governing the culture and environment around teams where the analytics will be deployed. In order to design successful data solutions, we will cover in this week the principles of how to turn information into insight, project scoping, thinking data, and mitigating risks for analytics adoption. **Term Project Kick-off** This the first in-class working session where teams will aim to scope the problems they are interested in solving. By the end of the class, each team will present a project brief outlining the context, need, vision, and outcomes of the term project. In addition, teams will submit a project plan with deliverables, milestones, and key dates. *Reading:* ● *NYUClasses: "Thinking with Data"*
Week 9	Exam #2
Week 10	**Data Dive 1** This first data dive will focus on data manipulation, analysis, and actionable insight generation on customer insight, market selection, targeting and positioning strategies, customer choices, and brand equity. *Reading:* ● *Case: "Home Depot and Lowe's"* *Case: "Harrah's Casinos"*
Week 11	**Data Dive 2** The second data dive will cover Digital Marketing Analytics topics using Google Search Analytics as a case study. We will discuss and demonstrate how data can aid the design of a marketing mix model and how data from marketing analytics can be leveraged to make better and more informed decisions. *Reading:* ● *Case: "Marketing Analytics"*
Week 12	**Special Topic: Text as Data** As part of this course, we will be covering a special topic. The special topic is an introduction to an advanced type of analytics. The session will provide an introduction to text mining in R, explain the principles of using text as data, and provide a "lab" for

	students to apply this principle for business problems. *Reading:* ● *NYUClasses: "Text as Data"* **Project Brief** As part of the project experience, teams will make a 3-5 minute presentation on preliminary insights.
Week 13	**Project Consultations** This session is dedicated to teamwork and final preparation for project presentations. Together we will review project plans against actual progress and reposition project deliverables for the final analytical sprint.
Week 14	**Project Presentations: Session 1**
Week 15	**Project Presentations: Session 2**