BUS 111a: Business Analytics
Course Syllabus (Draft- subject to change)
Fall 2017

Course Instructor
Bhoomija Ranjan
Assistant Professor of Marketing
Email: branjan@brandeis.edu

Course TA
TBD
Email:

Course Logistics
Timing: Tuesday and Friday, 12:30 PM – 2 PM
Location: Block J
Office Location: Sachar 214A
Office Hours: Thursday 10 AM – 1PM, by appointment

TA Office Hours:

Course Information

We are now in an era of voluminous real-time data, fast affordable computing, and a data-driven decision making, and firms across the spectrum are using and developing new methods to gain competitive advantage. This course is about analyzing, and interpreting data about markets and customers. It has been designed for managers who will be using data analytics, and so is intended for students wanting to go into marketing, finance, consulting, entrepreneurship, business strategy and operations management. Students who take this class will learn about the sorts of business decision problems in which research information is most useful, including problems related to pricing, target market selection, and new product introduction.

More specifically, the course provides experience with applications of data analytics specifically to business decisions. The learning objectives for the course are to learn how to:

- Define the decision problem and determine what information is needed
- Acquire trustworthy and relevant data and judge its quality. This includes:
  - An introduction to the data analysis process
  - The role of the data analyst, the value of big data, and the fundamental relationships between data and models
  - The R programming language so that students will have the tools needed to work complex data sets
- Analyze data to make strategic and tactical business decisions using statistical models
  - The data generating process, what regression does and its limitations, and the impact that data has on the findings of a regression
  - The goals, challenges, and metrics to use in explanatory and predictive analyses
Course Format

The course meets twice weekly and will rely on a blend of required readings, lectures, business cases, homework assignments and a course project to master the material. There is an assumption that students are aware of standard statistical techniques as covered in an introductory statistics course, and more technical material will be reviewed as needed.

Course Pre-Requisites

BUS 10a (Functions of the Capitalist Enterprise) and BUS 51b (Quantitative Methods in Business). A background in statistics/econometrics, such as ECON 83 or ECON 184, is preferred.

Learning Goals

- Defining the Problem- On the first of these points, the organizing theme of the course is “backward market research.” This is a process of starting at the end of the process, envisioning decisions that will be taken based on research. Beginning at the end of the process highlights the importance of identifying the information that is instrumental to making the decision.
- Getting Data & Judging its Quality- On the second point, after we know what information is needed, two questions arise: how to get the necessary data and how to judge its quality. We will cover data gathering methods in sufficient detail that you can have confidence in using qualitative methods for idea-generation and in making decisions based on the data that come from quantitative studies.
- Data Analysis- On the third point, once trustworthy data have been acquired, we must analyze it to make the business decision. There are certain state-of-the art tools for crunching the numbers and drawing the right conclusion about what price to set, which product concept to develop or launch, how to segment the market, etc. In this class, you will learn enough about these tools to understand when and where specific tools are appropriate. You will also consider and discuss ethical dimensions of a particular study, project, or application.
- Communication- Framing and analysis is great, but without effective communication market research gets rejected, ignored, or simply never done. Communicating market research, like most business contexts, involves both clearly articulating the points and selling those ideas. In this course I orient the communication through the practice of disciplined data-driven story-telling in course projects and group presentations.

Course Materials

Required

2. Harvard Business Publishing course: articles and cases (CoursePack will be made available for purchase)

**Recommended but Optional**

1. UCLA Institute for Digital Research and Education Webpage: [https://stats.idre.ucla.edu/r/](https://stats.idre.ucla.edu/r/)
4. Experimental Ideal & Causality Reference: Mostly Harmless Econometrics: Chapters 1, 2, and 3

**Course technology**

All of the software we will use in this course can be accessed on the public computer clusters at IBS and/or on your personal laptops. We’ll continue to use some of the tools used in other IBS analytical courses (Stata, SPSS, R etc.).

Of particular importance are R, Github and DataCamp:

- **R**: R is a free software environment for statistical computing and graphics, and is widely used by both academia and industry. The advantage of the R software is that it can work on both Windows and Mac-OS. It is ranked no. 1 in the KDnuggets 2015 poll on top languages for analytics, data mining, and data science. **RStudio** is a user friendly environment for R that has become popular. **Each student should download these two programs**: Please note: even if you already have them, please check for updates.

  R Software:  [http://www.r-project.org/index.html](http://www.r-project.org/index.html)

- **Github** is also a free environment that facilitates (a) collaborative work and (b) version control for software projects that are under development. It is very widely used by data scientists to manage and share their work.

- **DataCamp** is an online resource that offers interactive R and Python courses on topics in data science, statistics and machine learning ([www.datacamp.com](http://www.datacamp.com)). During this course, you would be automatically enrolled in DataCamp (for the duration of the course) and would learn in the comfort of your browser with video lessons and fun coding challenges.
**Course Evaluation**

Your final course grade will be computed on the following criteria:

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<th>Factor</th>
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<tbody>
<tr>
<td>Class contributions</td>
<td>10</td>
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<tr>
<td>Mid-term Exam</td>
<td>20</td>
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<tr>
<td>Final Exam</td>
<td>20</td>
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<tr>
<td>Computational Assignments &amp; Case Analyses</td>
<td>20</td>
</tr>
<tr>
<td>Team Project Assignment</td>
<td>30</td>
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<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
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**Class contributions.** Class participation is important in this course both as a means of developing understanding and as an indicator of student progress. Participation can take many forms, and each student is expected to contribute actively, freely, and effectively to the classroom experience by raising questions, demonstrating preparedness and proficiency in the analysis of problems and cases, and explaining the implications of particular analyses in context. Homework-based discussion and presentations are an important part of participation. To this end, regular class attendance is required.

With assistance from the TA, I will evaluate the quality of your classroom contributions each class, as well as the quality of your contributions via email, LATTE discussion, etc. These will all be factored together in determining your ultimate contributions grade. I will allow up to two class absences without a penalty to the contribution grade.

**Absences.** The text and course video captures cannot replace what you miss if you are absent, particularly when a session is devoted to case analysis. In addition we will cover important material not covered in the text. It is your responsibility to catch up on any material you miss by reading the textbook and borrowing class-notes from others in the class. Please let me know in advance by email if you need to miss a class.

**Exams:** There are two scheduled exams, one in-class and final. The first one will cover the concepts and techniques for the first six weeks; the second will focus on materials introduced since the first exam.

I will be available to assist with exam preparation in office hours, by appointment, on email, or via phone. No make-up exams will be provided.

**Computational assignments and Case Analyses (4):** There are four assignments and illustrative cases intended to test computational and/or statistical skills. Of these, two are DataCamp Course Assignments intended to familiarize you with R and data handling techniques. In the other two assignments, equal weight will be given to the correctness of the analysis/code and to your interpretation and explanation of results. The DataCamp assignments have to be performed individually, while the rest may be performed in groups of 2.
Team project: The team project consists of a large dataset, which will be analyzed by multiple teams of three-to-four students. The team project will combine both statistical and computational techniques learnt, as well as managerially relevant analysis. To ensure that teams consistently work on the project through the semester, the team project consists of 3 reports and a final team presentation—

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<tr>
<td>Interim Report I</td>
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<td>Interim Report II</td>
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<td>Final Team Project Report</td>
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<tr>
<td>Presentation</td>
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<td><strong>TOTAL</strong></td>
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The Interim Reports are designed to monitor on-going progress in the project data analysis, as well as an application of the concepts learnt in class till that point. For the Final Project report, teams will prepare a brief technical report explaining their methods and findings, as well as a PowerPoint presentation of their work. At the end of the course, we will devote two-three days to team presentations of results and recommendations. A detailed project assignment will be distributed early in the semester.

Each student will participate in a team, and all group members will receive the same grade for the project. At a minimum, all group members must participate fully in the project, including attending group meetings, preparing an analysis plan, conducting analyses, and writing up and presenting the project report.

Class Conduct

Use of technology in the classroom. You are allowed to use laptops and tablets during some lectures, which will be specified by the instructor. When allowed, they should only be used for coursework related activities and not for email, social media, or other activities not directly related to the course. Cell phones must be turned off or silenced during class. No photography or recording of any kind is allowed without explicit permission from the instructor.

Respect during class discussions: On some days we will discuss assigned cases. We have a shared responsibility to create a classroom environment where all voices and ideas can be expressed and different viewpoints can be exchanged. This often calls for active listening and for simply waiting to be recognized before you speak. Individuals vary widely in their willingness and desire to speak, as well as in their confidence with the English language. I will insist that everyone participate at some level—which means you should expect to be called upon, and no one will be allowed to dominate or monopolize class discussion.

Late assignments. Late assignments will not be accepted without my prior permission, and will incur a penalty unless the circumstances are exceptional.
**Academic Honesty:** You are expected to be honest in all of your academic work. Please consult Brandeis University *Rights and Responsibilities* for all policies and procedures related to academic integrity. Students may be required to submit work to TurnItIn.com software to verify originality. Allegations of alleged academic dishonesty will be forwarded to the Director of Academic Integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university. Citation and research assistance can be found at LTS - Library guides.

**Disabilities:** If you are a student with a documented disability on record at Brandeis and wish to have a reasonable accommodation made for you in this class, please see me immediately.

**Workload Expectation**

As this is a four-credit course, you are expected to spend a minimum of 9 hours of study time per week in preparation for class (readings, exercises, assignments, preparation for exams, research, etc.).

**Communications and Getting Help**

We’ll make regular use of LATTE. All lecture notes, handouts, assignments, and supporting materials will be available via LATTE, and any late-breaking news will reach you via email. Please check your Brandeis email and the LATTE site regularly to keep apprised of important course-related announcements.

If you are hesitant to participate for any reason or if you have questions about anything, please come and see me. I am happy to help. Please contact me for assistance for any reason, or if you have questions, comments, or concerns about the course. All of my contact information is on the cover page of this syllabus.

**Course Plan**

<table>
<thead>
<tr>
<th>WK</th>
<th>Cls</th>
<th>Date</th>
<th>Topic and Readings</th>
<th>Assignments (Due before class)</th>
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<tbody>
<tr>
<td>1</td>
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<td>8/31</td>
<td>Introduction</td>
<td>Install R and RStudio before Class</td>
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<td><em>READING: Keep Up with your Quants</em> by Thomas H. Davenport</td>
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<td><a href="https://hbr.org/2013/07/keep-up-with-your-quants">https://hbr.org/2013/07/keep-up-with-your-quants</a></td>
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<td><em>REQUIRED: Install R and RStudio before Class</em></td>
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<td>*VIEW: <a href="https://www.youtube.com/watch?v=cX532N_XLi8">https://www.youtube.com/watch?v=cX532N_XLi8</a> OR <a href="https://www.youtube.com/watch?v=5ZbjUEg4a1g">https://www.youtube.com/watch?v=5ZbjUEg4a1g</a></td>
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<td>Day</td>
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<td>9/4</td>
<td>Introduction to RStudio and Data Analysis – PART I</td>
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</table>
**READING:**  
1. *CF* – Chapter 2  
2. “3 Myths of Learning Programming Languages”  
   [http://www.sitepoint.com/the-3-myths-of-learning-programming-languages/](http://www.sitepoint.com/the-3-myths-of-learning-programming-languages/)  
3. “Why I want to write nice R code”  
| 3   | Fr   | 9/7  | Introduction to RStudio and Data Analysis – PART II | DataCamp Assignment 1 |
| 3   | 4    | 9/11 | No Classes – Rosh Hashanah |
| 4   | 5    | 9/14 | Statistics Review – Measurement | Install RMarkdown & Latex before class  
**READING:**  
1. What’s behind the Numbers (LATTE) |
| 6   | 5    | 9/18 | Interpreting Data Patterns using R – Descriptive Statistics |  
**READING:**  
1. *CF* – Chapters 3,4  
2. You have the Numbers, But What Does It Mean? By Andrew O’Connell and Walter Frick  
| 6   | Fr   | 9/21 | Data Visualization Techniques | DataCamp Assignment 2  
**READING:**  
1. *CF* – Chapter 5 |
| 5   | 7    | 9/25 | No Classes – Brandeis Monday |
| 5   | 7    | 9/28 | Hypothesis Testing – Sampling & Confidence Intervals | Interim Term Project Report – I  
**READING:**  
1. *CF* Chapter 6  
   [https://hbr.org/2016/02/a-refresher-on-statistical-significance](https://hbr.org/2016/02/a-refresher-on-statistical-significance) |
| 6   | 8    | 10/2 | Hypothesis Testing – t-tests, chi-squared tests |  
**READING:** *CF* Chapter 6 |
| 9   | Fr   | 10/5 | Hypothesis Testing in R |  
**READING:** *CF* Chapter 6 |
<table>
<thead>
<tr>
<th>Week</th>
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<th>Event</th>
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<tr>
<td>7</td>
<td>Tu</td>
<td>10/9</td>
<td>Guest Speaker</td>
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<tr>
<td>11</td>
<td>Fr</td>
<td>10/12</td>
<td>Mid-Term Review</td>
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<tr>
<td>8</td>
<td>Tu</td>
<td>10/16</td>
<td>Mid-Term Quiz</td>
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| 13   | Fr  | 10/19  | Regression Analysis – Principles<br>$\text{READING: CF Chapter 7}$
| 9    | Tu  | 10/23  | Regression Analysis in R<br>$\text{READING: CF Chapter 7}$
| 15   | Fr  | 10/26  | Dummy variable regressions<br>Ebay Data Assignment
| 10   | Tu  | 10/30  | Segmentation Techniques                    |
| 17   | Fr  | 11/2   | Functional Form Regressions                 |
| 11   | Tu  | 11/6   | Predictive Models – PART I<br>$\text{READING: To Explain or to Predict? by Galit Shmueli}\text{https://www.stat.berkeley.edu/~aldous/157/Papers/shmueli.pdf}$
| 19   | Fr  | 11/9   | Predictive Models – PART II                |
| 12   | Tu  | 11/13  | Model Selection (Testing & Training Data)  |
| 21   | Fr  | 11/16  | Potential Biases – Omitted Variables        |
| 13   | Tu  | 11/20  | Thinking about Causality & The Experimental Ideal
|      |     |        | 11/23 No Classes – Thanksgiving            |
| 14   | Tu  | 11/27  | Final Quiz Review                          |
| 15   | Tu  | 12/4   | Student Presentations                      |
| 16   | Tu  | 12/11  | Student Presentations                      |