Course Syllabus and Schedule

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Recommended Books: *Data Science for Business*
Foster Provost and Tom Fawcett, O'Reilly Media, August 2013
An online version of this book can be accessed through O'Reilly's
Safari service.
R for Data Science
Hadley Wickham and Garrett Grolemund, O'Reilly Media,
January 2017
An online version of this book can be accessed through O'Reilly's
Safari service.

Required Bulkpack: Contains assigned cases and readings.

Prerequisites MKTG 101, and STAT 101 or Equivalent; Knowledge of an
advanced statistical package like R, Python, Stata or SAS.

Software: I will use and demonstrate R but you may prefer to use another
advanced package such as the ones mentioned above.

Course Website: Canvas

Group Assignments: *(i)* There will be 3 group assignments due during the semester.
(ii) Group formation is discussed below.

Guest Speakers: There will be 1-2 Guest Speakers during the course.

Course Objectives

Companies are currently spending millions of dollars on data-gathering initiatives, but few are successfully capitalizing on all this data to generate revenue and increase profit. Converting data into increased business performance requires the ability to extract insights from data through analytics.

This course covers the three pillars of analytics – descriptive, predictive and prescriptive – within the marketing context.

Descriptive Analytics examines different types of data and how they can be visualized, ultimately helping you communicate your findings and strengthen your team's or organization's decision making.

Predictive Analytics explores the use of data for forecasting. You will learn to utilize various tools, including regression analysis, to estimate relationships among variables and predict future behavior.

Prescriptive Analytics takes you through the final step — formulating concrete recommendations. These recommendations can be directed toward a variety of marketing actions, including pricing and social-platform outreach.

Students will be exposed to several methods such as linear regression, logistic regression, multinomial regression, machine learning methods (e.g., neural networks and Support Vector Machines). We will learn how to employ these methods for such managerial decisions as demand forecasting, pricing, and valuing customers.

Overall, you will develop a data analytics mindset, learn new tools, and understand how to convert numbers into actionable insights

Course Materials and Approach

My overall philosophy is there is no better way of developing an understanding of marketing analytics than "learning by doing". In the course we will use a variety of readings, cases and exercises. The readings and cases are contained in the course bulk pack. Lecture notes and any additional handouts will be made available through Canvas. Please read any assigned reading and cases <u>before</u> coming to class.

Comparison with Data and Analysis for Marketing Decisions (MKTG 212)

MKTG 352 will differ from MKTG 212 in the breadth and depth of coverage in three main areas (1) data collection, (2) predictive data analysis, and (3) stated choice experimentation / conjoint analysis.

(1) Data collection: MKTG 212 devotes a significant amount of time to primary data collection (surveys, focus groups) including sessions on basic hypothesis testing (given the broader audience of MKTG 212). In contrast, MKTG 352 focuses on

quantitative analysis after data is collected, especially detailed customer-level transaction data and marketing mix data that the firm already has access to. Thus, MKTG 212 provides students with a broad perspective on the many venues for data collection using traditional marketing research methods; whereas MKTG 352 focuses on data analysis, especially of transaction data.

(2) Data Analysis: MKTG 212 covers descriptive multivariate methods like clustering and factor analysis. It focuses little on predicting outcomes. In contrast, MKTG 352 goes much deeper into predictive analytics, specifically using machine learning models (e.g., random forests, neural networks, Support Vector Machines).

(3) Stated choice experimentation / Conjoint analysis: MKTG 212 covers conjoint analysis from the perspective of a manager using the results. MKTG 352, in contrast, covers these methods in a lot more depth, from the perspective of a data analyst.

Assessment

Your final grade will be based on class participation (case preparation and general contribution), written assignments, and a final examination. The evaluation is as follows:

A. Class Participation	20%
B. Group Assignments	40%
C. Final Examination (individual)	40%

Please note that **no late assignments will be accepted**. All written work is due on the specified date. The due dates for the assignments are listed on the course schedule. A more detailed outline of the evaluation procedure and requirements for A through C is included at the end of this document. Please also read Section D on the electronic device policy.

Group Formation

Students must organize themselves into **groups of 3 to 5** people in order to do the group assignments.

Schedule of Class Meetings

<table>
<tr><td>Lecture
#</td><td>Topic, Readings, Cases</td></tr>
<tr><td></td><td>Descriptive Analytics</td></tr>
<tr><td>1</td><td>New Marketing Data and Better Science</td></tr>
<tr><td></td><td>Reading: "Data Science…"
Reading: "The Rapid Adoption…"
Reading: "The Age of Analytics…"</td></tr>
<tr><td>2</td><td>Business Experiments – Correlation vs Causation</td></tr>
<tr><td></td><td>Reading: "A Step by Step Guide…"
Reading: "The Perils of Proactive…"
Reading: "Seven Rules…"</td></tr>
<tr><td></td><td>Predictive Analytics</td></tr>
<tr><td>3</td><td>Advanced Regression Models</td></tr>
<tr><td></td><td>Reading: Advanced Regression Models</td></tr>
<tr><td>4</td><td>Story Telling with Data and Analysis</td></tr>
<tr><td></td><td>Application: Demand Forecasting at L'Occitane</td></tr>
<tr><td></td><td>Prescriptive Analytics / Applications</td></tr>
<tr><td>5</td><td>Logistic Regression
Reading: Advanced Regression Models</td></tr>
<tr><td>6</td><td>Logistic Regression –II</td></tr>
<tr><td>7</td><td>Guest Speaker - I</td></tr>
<tr><td>8</td><td>Pricing Analytics-I</td></tr>
<tr><td></td><td>Reading: "A Conjoint Model for Quantity Discounts</td></tr>
<tr><td>9</td><td>Pricing Analytics-II</td></tr>
<tr><td>10</td><td>Social Networks</td></tr>
<tr><td></td><td>Reading: "Opinion Leadership and Social Contagion…"
Reading: "Predicting Individual Behavior…"
Reading: "Deriving Value from Social…"</td></tr>
<tr><td>11</td><td>Guest Speaker II</td></tr>
<tr><td>12</td><td>Machine Learning Models - I</td></tr>
<tr><td>13</td><td>Machine Learning Models -II</td></tr>
<tr><td></td><td>Reading: "What can Machine Learning…"
Reading: "How Analytics and Machine Learning…"</td></tr>
<tr><td>14</td><td>In Class Exam</td></tr>
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Assessment Details

A. Contribution to Class Discussion (20%)

I expect you to be on time to class. I will "cold call" throughout the ensuing discussion. Please be prepared. I will take attendance every session. If you miss more than three sessions, you will be given an F in the class.

I will evaluate you on how well you respond to questions and on how effectively you take into account the comments and analyses of your classmates. Please do not simply take up air time. In order to obtain a grade for class participation you must attend the class sessions and contribute meaningfully.

B. Group Assignments (40%)

The assignments will be put in Canvas. There will be three assignments. Deadlines will be strictly enforced. You will receive a 0 on an assignment if you submit after the deadline.

  (1) Insights from Regression Analysis – This assignment will require students to describe the results from a regression analysis in terms of its managerial actionability. It will also allow students to appreciate the differences between correlational results and causation. 10% (Due Date: Oct 29, 11:30pm)

  (2) Models and Predictions – This assignment will require students to build prediction models for customer demand for car rentals using different types of models. They will compare the predictive accuracy of different models and explain why they differ. 15% (Due Date: November 14, 11:30pm)

  (3) Conjoint Analysis and Optimal Pricing – This assignment will require students to analyze a choice-based conjoint dataset, infer customers' willingness to pay and make recommendations on product design and pricing. It will also require students to develop market-level simulations to determine the share of new products. 15% (Due Date: December 3rd, 11:30pm)

C. Individual-level Final Examination (40%) (In class – December 6th)

D. Electronic Device Policy: The Wharton School's policy is not to allow the use of Electronic Devices in MBA classes, unless specifically permitted. Please see the electronics in the classroom policy: https://mba-inside.wharton.upenn.edu/wharton-mba-academic-policies/

This course completely adheres to that policy. Consequently, make sure any electronics (e.g., phone, laptop or tablet) are shut off and put away, unless explicitly instructed otherwise.

If you are observed using any electronics in class without permission once, your course grade will be decreased by one full letter (e.g., A to B, B- to C-). If you are observed doing so twice, your course grade will be F.

Readings:

1) Provost, Foster and Tom Fawcett (2013), "Data Science and its Relationship to Big Data and Data-driven Decision Making," *Big Data*, 1, 1, 51-59.

2) Brynjolfsson, Erik, and Kristina McElheran (2016), "The Rapid Adoption of Data-Driven Decision-Making," *American Economic Review*, 106(5): 133-39.

3) Henke, Nicholas, Jacques Bughin, Michael Chui, James Manyika, Tamim Saleh, Bill Wiseman and Guru Sethupathy (2016), "The Age of Analytics: Competing in A Data Driven World," McKinsey Global Institute.

4) Dai, Weijia, Hyunjin Kim, and Michael Luca (2016), "Advertising Experiments at Restaurant Grades," Harvard Business School Exercise 916-038.

5) Eric T. Anderson and Duncan Simester (2011), "A Step by Step Guide to Smart Business Experiments," *Harvard Business Review*, 89, 3, 1-9.

6) Ascarza, Eva, Raghuram Iyengar and Martin Schleicher (2016), "The Perils of Proactive Churn Prevention Using Plan Recommendations: Evidence from a Field Experiment," *Journal of Marketing Research*, 53, 1, 46-60.

7) Kohavi, Ron, Alex Deng, Roger Longbotham and Ya Xu (2014), "Seven Rules of Thumb for Web Site Experimenters," In *Proceedings of the 20th ACM SIGKDD International Conference on Knowledge Discovery and Data mining* (KDD '14), pp. 1857-1866.

8) Iyengar, Raghuram and Sunil Gupta (2006), "Advanced Regression Models," in *The Handbook of Marketing Research*, Edited by Rajiv Grover and Marco Vriens, Sage Publications, Inc., 267- 287.

9) Brand Loyalty at URBN. In the process of being written.

10) Iyengar, Raghuram (2017), "Demand Forecasting at L'Occitane," The Wharton School.

11) Brynjolfsson, Erik and Tom Mitchell (2017), "What can Machine Learning Do? Workforce Implications," *Science*, 1530-1534.

12) MIT Technological Review (2016). "How Analytics and Machine Learning Help Organizations Reap Competitive Advantage,"

13) Fader. Peter S. and Bruce G. S. Hardie (2009), "Probability Models for Customer Base Analysis," *Journal of Interactive Marketing*, 23, 61-69.

14) Iyengar, Raghuram and Kamel Jedidi (2012), "A Conjoint Model of Quantity Discounts," *Marketing Science*, 31 (2), 334-350.

15) Iyengar, Raghuram, Christophe Van den Bulte and Thomas W. Valente (2011), "Opinion Leadership and Social Contagion in New Product Diffusion," *Marketing Science*, 30 (2), 195- 212.

16) Goel, Sharad and Daniel G. Goldstein (2014), "Predicting Individual Behavior with Social Networks," *Marketing Science*, 33, 1, 82-93.

17) Stephen, Andrew and Olivier Toubia (2010), "Deriving Value from Social Commerce Networks," *Journal of Marketing Research*, 47, 215-228.

18) Netzer, Oded, Ronen Feldman, Jacob Goldenberg and Moshe Fresko (2012), "Mine Your Own Business: Market-Structure Surveillance Through Text Mining," *Marketing Science*, 31(3), 521-543.

19) Lee, Dokyun, Kartik Hosanagar and Harikesh Nair (2017), "Advertising Content and Consumer Engagement from Social Media: Evidence from Facebook," *Management Science*, Forthcoming.

20) Goel, Sharad, Duncan J. Watts and Daniel G. Goldstein (2012), "The Structure of Online Diffusion Networks," Proceedings of the 13th ACM Conference on Electronic Commerce, 623-698.

21) Hill, Shawndra, Aman Nalavade and Adrain Benton (2012), "Social TV: Real Time Social Media Response to TV Advertising," ADKDD 2012: The Sixth International Workshop on Data Mining for Online Advertising and Internet Economy.