1. Introduction

In this course we will equip you with the conceptual framework, tools and methods necessary to develop machine-learning intensive research focused on marketing questions. This includes on how to use machine learning tools to:

- Obtain insights on consumer preferences and behavior from user-generated data
- Design and run experiments to learn the most effective ways of interacting with a specific set of consumers
- Understand major challenges and steps in optimizing online experiments with methods such as website morphing
- Understand the potential of user-generated content (UGC) as a way to listen to the voice-of-the-consumer expressed in unstructured data such as texts in blogs and product reviews

You will have the opportunity to develop the skills needed use natural language processing and online experiments to develop prescriptive research involving market phenomena. At the end of this course you will be able to:

- Plan and analyze data from simple online experiments, such as A/B tests, with statistically sound tools
- Locate and inspect the quality of UGC data
- Analyze UGC data with robust methods such as the naïve Bayes classifier
- Use UGC and online experiments to learn about consumers

1.1 Course description

The course has three modules. In the first module (“Mine your Own Business in Blogs, Reviews and Tweets”) we will work with various types of UGC, with a strong emphasis on textual data. We will discuss and use tools to help you automate the detection of both sentiment and content from texts produced by consumers. The other two modules are focused on online
experiments: in the second module ("Learning from Experience: Introduction to Online Experiments") we will provide an introduction to the popular method of A/B testing (www.wikipedia.com/A/B_testing). The third and last module ("Learning While Earning: Advanced Methods for Online Experimentation") is focused on adaptive methods, which are the state-of-art of online experiments because they allow firms to run experiments faster and at lower costs. There is one module assignment to be handed in at the end of each module.

This course will be based on lectures and hands-on activities. Students will be encouraged to apply the methods, templates, and scripts seen during the lectures, use text mining to replicate the findings, and bring their own training texts and online reviews to analyze themselves.

2. Modules and Assignments

The objective of the assignments is to apply theory to data from a real-world case, and motivate you to expand your researcher toolbox. There are three regular assignments. RA1 is individual. RA2 and RA3 can be done in groups of 3 to 4 students.

1. RA1 – Text Analysis
   You should download UGC about a topic of your preference, and then analyze the sentiment and content expressed in the text using the naïve Bayes classifier. The report should include an introduction that provides context on the product or service the product reviews are about (or the topic/owner of the blog or twitter), conceptual support for your dimensions, information on the training texts, and the detailed results and interpretation of your text analysis.

2. RA2 – A/B Experiment
   You will be given various A/B data from randomized controlled trials and will inspect the evolution of their A/B test, analyze the data, interpret the results, and report on findings and present recommendations.

3. RA3 – Morphing
   You will be given morphing data and will analyze and interpret the data, discuss the results, report on findings, and present recommendations.
### 4. Class Schedule - 2019

**Module 1 - Mine your Own Business in Blogs, Reviews and Tweets**

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<th>#</th>
<th>Topics</th>
<th>Objective / Activities</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction - machine learning in marketing</td>
<td>Why and when to use UGC: goals, structure, inputs, outputs, and process</td>
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<td>Introduction to Natural Language Processing</td>
<td>Identification of your own real-world UGC project</td>
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<td>2</td>
<td>Extracting information from UGC</td>
<td>Sentiment Analysis and Topic Analysis</td>
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<td>Bag-of-words model, Naïve Bayes</td>
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<td>3</td>
<td>Practice and planning</td>
<td>Hands-on practice with Excel templates</td>
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<td>Practice with own training texts and reviews.</td>
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<td>4</td>
<td>Predictive analytics using UGC</td>
<td>Working with online reviews: breadth, depth, valence, and helpfulness</td>
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<td>Coaching and teamwork</td>
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<td>5</td>
<td>Advanced Topics in Text Analysis and</td>
<td>Delivery and Presentation of Final Report / Module 1</td>
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<td>Presentations</td>
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# Module 2 - Learning from Experience: Introduction to Online Experiments

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<th>Topics</th>
<th>Objective / Activities</th>
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| 6 | Introduction to A/B tests/ Randomized Controlled Trials | - Planning and design of online experiments  
- Basic statistical concepts and methods to derive sound conclusions from your experiment |
| 7 | Analysis | - Internal validity and external validity of experiments  
- Working with clickstreams. |
| 8 | The Company Perspective in A/B | - User experience, funnel processes (attract, keep, convert), outcome metrics  
- A/B with aggregate data |
| 9 | Ethics in Online Experiments | - Monitoring online experiments. Convergence, consistency and interpretation.  
- Reporting, interpretation and roll-out. Teamwork + coaching |
| 10 | The Consumer Perspective in A/B | - Consumers and pools of subjects. Privacy, ethics and targeting.  
- Teamwork and coaching. |
| 11 | Advanced Topics in A/B and Presentations | - A gentle introduction to morphing  
- Delivery and Presentation of Module 2 Report |

# Module 3 - Learning While Earning: Advanced Methods for Online Experimentation

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<th>Objective / Activities</th>
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<tr>
<td>12</td>
<td>Cognitive Styles</td>
<td>- Personalization and A/B testing</td>
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| 13 | Multi-Armed Bandits (MABs) and Website Morphing | - Learning while earning versus learning then earning  
- Reporting, computational, organizational and practical aspects of morphing. |
| 14 | Personalization: Creating and Capturing Value | - Morphing Dynamic Consumers: Bandits Meet HMM  
- Pricing personalized content  
- Teamwork + coaching |
| 15 | Advanced Topics in MABs and Presentations | Presentation of Module 3 Report |
4. Instructor Bio

Gui Liberali is the professor of digital marketing at the Rotterdam School of Management at Erasmus University. Gui has successfully developed and applied methods for designing and customizing digital products and interactions, and adaptive online experimentation methods to online display advertising and website design, in research collaborations with firms in the U.S., U.K, and Europe. He has presented his research in top universities in the U.S., Europe, Australia and Latin America, and was an invited speaker in U.S. and Europe for Internet companies and forums of market researchers and data scientists. His published papers have been cited in various technology blogs, magazines, and textbooks in marketing and operations research. His work has been published in the most prestigious journals in marketing and management and influential outlets including Marketing Science, Management Science, IJRM, EJOR, and Sloan Management Review. He is the Vice-President for Membership at INFORMS Society of Marketing Science (ISMS). He is currently co-editing a special issue of Management Science on Data-Driven Prescriptive Analytics. Gui is an ERIM Fellow(erim.nl), a finalist of John Little award, and twice a finalist of the ISMS Long-Term award. He is the founder of the Erasmus Centre for Optimization of Digital Experiments at Erasmus University (www.erim.nl/encode), and was a visiting scholar at the MIT Sloan School of Management for several years. He holds a Doctorate in Marketing, and a B.Sc. in Computer Science, both from UFRGS. For more details please visit [www.guiliberali.org](http://www.guiliberali.org) and his LinkedIn page: [https://www.linkedin.com/in/gui-liberali](https://www.linkedin.com/in/gui-liberali)
5. Required Readings – academic articles

- Herring, Louise; Mayhew, Helen; Midha, Akanksha and Ankur Puri. "How to Train Someone to Translate Business Problems into Analytics Questions", Harvard Business Review, February 11, 2019
- Knight, Will. “Reinforcement Learning. By experimenting, computers are figuring out how to do things that no programmer could teach them”. MIT Technology Review, March/April 2017

6. Required Readings – academic articles

We will be used five recent Harvard cases. The cases will be sent to students upon registration along with a detailed syllabus indicating which readings are due which day.

If you have registered but have not received the cases and the detailed syllabus please contact ei@fgv.br