The Analytics Advantage: Case Studies in Big-Data and Analytics in Industry

This class will meet on **Mondays from 2:15pm-5:30pm (Section 1) and 5:45pm-9pm (Section 2)**.

For both sections, the first session will take place on **Thursday March 26th 2020, 6pm-8pm**, at the offices of the Boston Consulting group in Hudson Yards. Our regularly scheduled sessions will begin on Monday March 30th 2020.

Attendance at this first section at BCG is compulsory *unless* you are registered for another class that conflicts with that first timeslot. To request an exemption, email the TA with a screenshot of your conflicting registration.

This is the final class in the CBS Business Analytics sequence, and focuses on how analytics have transformed industries from healthcare to finance. This class will build upon concepts you encountered in the core and in follow-on analytics classes. The only pre-requisites for this class are core Statistics and Business Analytics.

Course Description

Business analytics refers to the ways in which enterprises such as businesses, non-profits, and governments use data to gain insights and make better decisions. Business analytics is applied in operations, marketing, finance, and strategic planning among other functions. The ability to use data effectively to drive rapid, precise and profitable decisions has been a critical strategic advantage for companies as diverse as WalMart, Google, Capital One, and Disney. In addition, many current and recent startups are based on the application of analytics to large databases. With the increasing availability of broad and deep sources of information — so-called "Big Data" — business analytics are becoming an even more critical capability for enterprises of all types and all sizes.

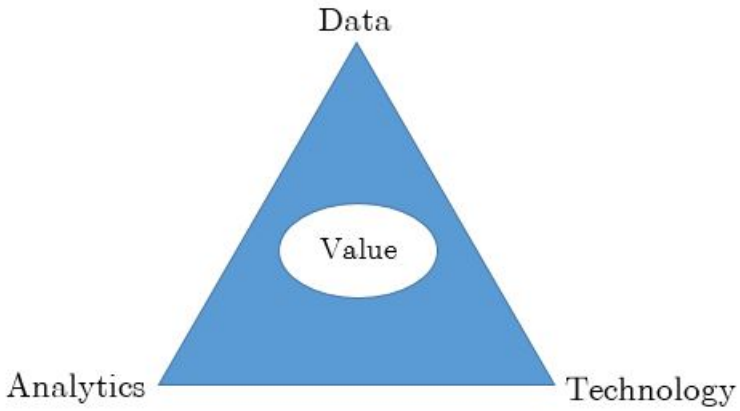
This class will focus on how analytics have generated value in a broad range of industries. Each class will be taught by a different faculty member with specific subject matter expertise and will focus on one specific industry and on how it has been transformed through the use of analytics.

To reflect the importance of this connection to industry, our first session will meet at the offices of the Boston Consulting Group in Hudson Yards. There, we will be hearing from senior executives as BCG and BCG's analytics group (Gamma) about their data-driven work with their clients

Following this first class, each of the remaining five sessions will focus on a specific industry include one or more of the following:

- Background on the history and importance of the problem in that industry, and the impact analytics have had in that respect
- A primer on relevant technologies and methods
- A discussion of the inherent complexities involved in implementing an analytical solution in a messy, fast-moving environment
- Current, state-of-the-art approaches to the problem

In each session, the focus will be on how analytics can be used to drive value; each of the points above, whether about data, technology, or analytics, will converge on that topic



As in the core, this class will involve 'hands on' work using the Business Analytics add-in and other tools as appropriate.

Connection to the Core & Analytics Curriculum

You were introduced to the fundamentals of business analytics in your core 'Business Analytics' class, and given an opportunity to deepen and broaden your exposure to these topics in various elective classes (including Business Analytics 2, Applied Regression Analysis, Data Analytics in Python, and Modern Econometrics for Business, among others).

These classes were anchored in cases, but their focus was on understanding the analytics techniques and the way value could be extracted using these techniques. As a result we generally picked one very narrow problem to work on without a broad focus on the industry itself. 'The Analytics Advantage' takes the opposite perspective and focuses on the industry first, looking at a range of ways analytics can be used in that industry.

Many students will choose to take this class after having taken one of our more advanced analytics electives, but those interested in broad applications without a deep dive into any specific technique may find this class attractive as a follow-on to the core.

Course Materials

There is no required textbook for the class. There will be slides for each class that will be posted on canvas.

Requirements and Grading

This class will be assessed by means of data-based exercises that will be set either before or after each class. These exercises will give you an opportunity to either prepare for the upcoming class or extend the examples you have studied in the previous class. See Canvas for assignment details and due dates.

Grades will be determined as follows:

- 70% : assignments
- 30% : attendance and participation

You are expected to come to class prepared, on time, and ready to discuss any pre-class readings and articles assigned for that class.

Detailed Class Plan

Each class will be taught by a faculty member in the Decision, Risk, and Operations division, based on their research and expertise in a specific industry. To ensure continuity and to link the topics in each class to each other, Prof Daniel Guetta will act as the course leader, introducing each class and handling any logistics that arise.

- **Class 1:** Analytics at BCG Gamma

  BCG Gamma is the Boston Consulting Group's Analytics and AI powerhouse. The group boasts over 700 analytics practitioners who work together with other case groups at BCG to deliver value through analytics, in areas as diverse as customer personalization, marketing, infrastructure, operations, and risk management. The group grew organically within BCG over the past decade, and is now experiencing 50–100% year-on-year growth.

  In our first class, we will be visiting the BCG offices in Hudson Yards, and hear from senior BCG executives about the work they have done in this area. We will discuss the role of analytics in adding value, and how the use of these techniques has increased in recent years.

  This session will take place on Thursday March 26th 2020, from 6-8pm.

- **Class 2 – March 30th:** Text Analytics in Finance: Signal from Chaos

  Prof Paul Glasserman

  Text analysis is increasingly used to extract predictive information from news, social media, corporate and legal documents. In this session, we will introduce two of the most widely used tools from natural language processing, sentiment analysis and topic modeling. We will discuss the main techniques used and highlight companies developing or applying these methods, with particular emphasis on using text analysis to forecast financial market returns.

- **Class 3 – April 6th:** The Rise of Recommendation Engines: the Promise and Challenges

  Prof Assaf Zeevi

  Recommendation engines (or recommender systems as they are often referred to) are one of the most successful and widely used applications of machine learning technologies in business. They are central to many areas, in particular in the burgeoning tech sector, including social networks, search engines, online retail, music and video streaming platforms, and content dissemination, to name but a few. In this session we will introduce the basic premise for recommendation engines, key working principles and relevant concepts, as well as some of the methods that pertain to their operation. We will illustrate these on several use cases, and discuss key challenges that present in these contexts.

- **Class 4 – April 13th:** Analytics in Healthcare: When Regression Isn't Enough

  Prof Carri Chan

  There is great promise surrounding the use of Machine Learning in healthcare. We will introduce tools to evaluate the potential benefits of utilizing predictive analytics with a particular emphasis on healthcare delivery at hospitals. We will also discuss how to address challenges introduced by the need to provide guidance on how to go from predictive analytics to prescriptive analytics when randomized control trials are not always possible.

- **Class 5 – April 20th:** Blockchain and Cryptocurrencies: Fundamentals, Approaches, and Future Outlook

  Prof Ciamac Moallemi

  The development of cryptocurrencies has garnered much attention as one of the most surprising fintech innovations in recent years. In this session, we will employ analytics to study these systems. We will begin by describing the enabling underlying technologies: decentralized blockchains and distributed ledgers. Building on this, we will analyze the basic economics of these systems and leverage simulation analytics to understand security and operational characteristics. We will conclude by considering the implications of our analysis for the long term success of decentralized blockchains.

- **Class 6 – April 27th:** Digital Marketplaces and Ride Hailing: An Industry Based on Data

  Prof Garrett van Ryzin

  Ride hailing is an industry based on information technology and data. Mobile computing devices in the hands of every rider and driver – with broadband connectivity, graphical interfaces, GPS tracking and high-resolution mapping – have created an unprecedented capability to instrument and automate transportation. This has led to the creation of novel marketplaces for transportation that have fundamentally changed urban transportation throughout the world. In this session, we look at the role of analytics in enabling this innovation. Specifically, we will examine a fundamental spatial-temporal model of ride hailing service and how it is used to support product, strategic and operational decision making in the industry.