



**MIT** MANAGEMENT  
EXECUTIVE EDUCATION

## **APPLIED BUSINESS ANALYTICS**

SKILLS TO HELP MAKE THE RIGHT  
MANAGERIAL DECISIONS.

Delivered in collaboration with  EMERITUS

# OVERVIEW

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The abundance of data creates opportunities for business leaders to make better decisions. The challenge is that interpreting data from multiple sources isn't common knowledge for most business professionals. How do we know which algorithm to use? How do we know when to apply your human judgement into the decision mix? What are some of the most practical applications of artificial intelligence?

Business analytics skills are a requirement across a variety of job functions and are in high demand from employers. In fact, job postings for this skill set have increased by 130 percent from September 2016 to the present. The Bureau of Labor Statistics (BLS) expects growth for business analytics skills to jump 10.9 percent, outpacing the national growth average of 5.2 percent for all jobs, from 2018 to 2028.

In the non-technical **Applied Business Analytics** program, you will learn a practical framework that includes data models, decisions, and value, building confidence in using data to improve decision-making. The only prerequisite is high-school level math and basic statistics.

Upon completion of **Applied Business Analytics**, you will know which analytics approach is the most appropriate for your situation, and more importantly, how to tackle big data and leverage it for better business outcomes.

## In this program, you will learn to:

- Recognize the breadth of analytic applications
- Describe common algorithms, their appropriate applications across domains, and their limitations
- Discuss how to use analytics problem solving to lead teams and design deliverables
- Apply best practices for data analytics process management, including establishing workflows, identifying inter-dependencies, and recognizing when to utilize human judgement

No coding knowledge required

## START DATE

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May 19, 2020

## PRICE

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\$2,800

## DURATION

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6 weeks,  
4-6 hours/week



## PAUL MCDONAGH-SMITH

Digital Capability Leader at  
MIT Sloan

“In MIT Sloan online programs, we aim to build both capability and confidence. Insights are supported by real-world examples and opportunities to apply what you are learning.”

# LEARN FROM AN INDUSTRY PIONEER

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Dimitris Bertsimas, the Boeing Leaders for Global Operations Professor of Management, is author of several popular textbooks, including *Analytics Edge* and *Data Models & Decisions: The Fundamentals of Management Science*. Together with expert collaborators, he condensed 30 years of MIT teaching experience and his own firsthand knowledge of business analytics to create a highly practical curriculum to create a highly practical curriculum that is the basis of this program. Designed for pragmatic leaders who refuse to be left behind, the program helps leaders make analytically-supported decisions to arrive at better business outcomes.

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**Because you can't look an algorithm in the eye, leaders must know how to inspect and audit algorithms.**

- Professor Dimitris Bertsimas, MIT Sloan School of Management

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## WHO SHOULD ATTEND

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Anyone who wants to understand the business applications for analytics can benefit from this program, whether for a functional area of practice or for general management. This program is designed for non-technical professionals, however those with technical backgrounds will find bonus code snippets to illustrate how to implement the concepts.

### Representative roles include:

- General managers and senior executives
- Consultants
- Data and technology specialists
- Functional leaders and individual contributors of their team
- Entrepreneurs/business owners

# WHAT YOU'LL LEARN: ANALYTICS DEMYSTIFIED

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The goal of business analytics is to determine which datasets are useful and how they can be leveraged to solve problems and increase efficiency, productivity, and revenue. Extract greater value from your data by learning about these time-tested categories of algorithms:



## Linear Regression

The "best fit" line through all data points. Predictions are numerical.  
Example: Learn how a linear regression algorithm can change outcomes for a professional sports team



## Logistic Regression

The adaptation of Linear regression to problems of classification (e.g., Yes/No questions, groups, etc.)  
Example: Use logistic regression to predict coronary heart disease



## Decision Tree

A graph that uses a branching method to match all possible outcomes of a decision.  
Example: Using a cutting-edge algorithm called an optimal classification tree, we will establish optimal inventory positions for smart phones.



## Random Forest

Takes the average of many decision trees, each of which is made with a sample of the data. Each tree is weaker than a full decision tree, but by combining them we get better overall performance.  
Example: Predict Supreme Court decisions using random forest



## Clustering

Sees what groups the data points fall into when we apply a clustering algorithm, such as K-Means  
Example: Use hierarchical clustering to group movie genres for Netflix



## AI/Deep learning

Allows machines to solve complex problems by learning from large amounts of data, algorithms inspired by the human brain.  
Example: Train a computer to read numbers.

# PROGRAM HIGHLIGHTS

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Interactive discussion posts



Non-technical curriculum for business professionals



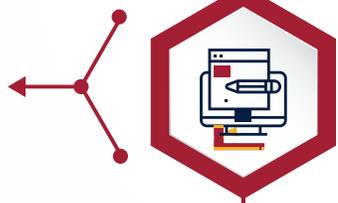
Highly visual learning techniques



Case studies across multiple industries



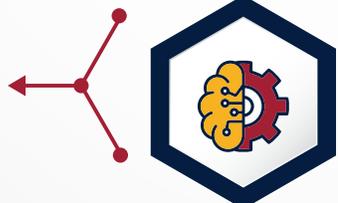
Hands-on application exercises



Optional code snippets for R and Python



AI made more accessible



# PROGRAM TOPICS

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Through a series of case studies that lay out an analytics framework, this program helps prepare leaders to leverage data for better business outcomes and lead teams of data scientists.

## WEEK 1

### **Netflix: How Clustering Built a Movies-You'll-Love Feature**

How can Netflix and other video-on-demand providers predict customer preferences? Explore a basic movie recommendation engine and observe the details of clustering, the critical enabler that makes it all possible.

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## WEEK 2

### **Moneyball: How Linear Regression Built a Winning Team**

Learn how a linear regression algorithm can outperform talent scouts for player selection in a manner that outperforms the traditional scouting system as the Oakland A's did in the early 2000s.

### **Framingham Heart Study: Using Logistic Regression to Save Lives**

How do we leverage Framingham Heart Study data to improve public health? You will consider the ability of logistic regression to save lives by predicting the chance that an individual will develop coronary heart disease.

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## WEEK 3

### **Boston Real Estate: Algorithms to Predict Real Estate Values**

Leverage a historic Boston real estate data set and a set of simplified approaches and consider the development and launch of an app based on your end user's stated accuracy and interpretability requirements.

### **Supreme Court: Classification and Regression Trees (CART) to Predict Court Cases**

Study how analytics are used to predict Supreme Court decisions. Analyze classification and regression tree (CART) algorithm and how they can outperform the elite community of experts.

## WEEK 4

### **D2Hawkeye: Healthcare Case Management**

What if the healthcare system could identify patients before a major health complication and intervene? Learn how predictive modeling can dramatically improve the identification of high-risk patients and save lives.

### **Twitter: Mining Tweets to Understand Customer Sentiment at Apple**

How can companies use analytics to understand their customers? The challenge: can we correctly classify tweets as being negative, positive, or neither as it relates to Apple? Learn how corporate entities use natural language processing to track user sentiment of the “Twitterverse.”

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## WEEK 5

### **Deep Learning: Training Computers to Get Smarter**

Learn how deep learning algorithms enable your machine to read numbers with the open-source frameworks TensorFlow and Keras.

### **Corporate Strategy: Integer Optimization to Drive Portfolio Decisions for Maximum Value**

How do we support a CFO of a fictitious company to chart a course that will simultaneously shift the company to a more high tech focus and maximize net present value (NPV). Construct a mixed integer optimization model and set one of the largest U.S.-based private companies on a path to sustainable growth.

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## WEEK 6

### **Inventory Management: Machine Learning Helps with Optimization**

Study a new approach to inventory management and consider a machine learning algorithm and optimal decision trees to improve operational performance.

### **Commercial Airline Insurance Simulation: Finding the Best Policy**

Observe an airline as it uses Monte Carlo Simulations to set its fleet insurance policy. Consider insurance policy recommendations for an airline given fleet composition with three objectives:

- Properly insure the airline’s assets over a 5-year window
- Minimize cost
- Ensure cash obligations are met in the first year

# The Learning Journey

## The Anatomy of a Use Case: How You Learn



### **Intro Activity:**

Statement of the problem facing the industry in the form of a poll, activity, or discussion question



### **Intro Video from the Professor:**

Sets up the case and learning outcomes



### **Interactive Flipbook of Case:**

A storyboard for illustrating the key points of the case



### **Debrief with Faculty:**

Assessment of what has been learned from the case



### **Applied Learning Opportunity:**

Brief assignment after some cases to apply the learning

# PROGRAM FACULTY

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## Dimitris Bertsimas



**Boeing Leaders for Global  
Operations Professor of  
Management**

**Associate Dean for  
Business Analytics**

**Professor, Operations  
Research**

Dimitris Bertsimas is the *Boeing Leaders for Global Operations Professor of Management*, a Professor of Operations Research, and the Associate Dean for the Master of Business Analytics at MIT.

A faculty member since 1988, his research interests include optimization, stochastic systems, machine learning, and their application. In recent years, he has worked in robust optimization, statistics, healthcare, transportation, and finance. Bertsimas was a cofounder of Dynamic Ideas, LLC, which developed portfolio management tools for asset management. In 2002, the assets of Dynamic Ideas were sold to American Express. He is also the founder of Dynamic Ideas Press, a publisher of scientific books, the cofounder of Benefits Science, a company that designs health care plans for companies, of Dynamic Ideas Financial, a company that provides financial advice to customers, of Alpha Dynamics, an asset management company, P2 Analytics, an analytics consulting company and of MyA Health, a personalized health care advice company.

Bertsimas has coauthored more than 200 scientific papers and books, including *The Analytics Edge* (with A. O'Hair and W. Pulleyblank, Dynamic Ideas, 2016). He is former department editor of *Optimization for Management Science* and of *Operations Research in Financial Engineering*. A member of the National Academy of Engineering and an INFORMS fellow, he has received numerous research awards, including the Harold Larnder Prize (2016). He has also received recognition for his educational contributions: The Jamieson prize (2013) and the Samuel M. Seegal prize (1999).

Bertsimas holds a BS in electrical engineering and computer science from the National Technical University of Athens, Greece, as well as an MS in operations research and a PhD in applied mathematics and operations research from MIT.

# CERTIFICATE

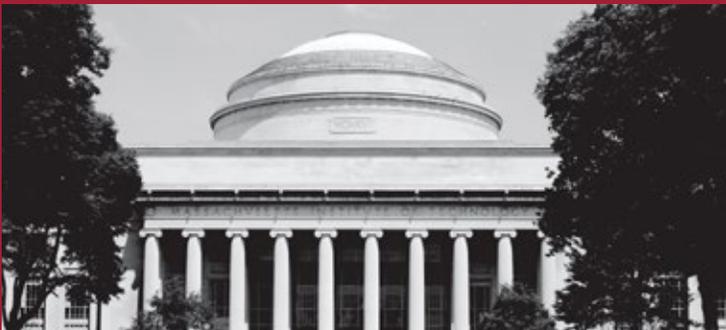
Get a verified digital certificate of completion from MIT Sloan School of Management. This program also counts towards an MIT Sloan Executive Certificate.

*Note: After successful completion of the program, your verified digital certificate will be emailed to you in the name you used when registering for the program. All certificate images are for illustrative purposes only and may be subject to change at the discretion of MIT Sloan.*



## ABOUT MIT SLOAN SCHOOL OF MANAGEMENT

The MIT Sloan School of Management, located in Cambridge, Massachusetts, is one of the world's leading business schools and has a network of over 20,000 alumni across 90 countries. It is a part of the Massachusetts Institute of Technology, which has to its credit 89 Nobel Laureates, 47 Rhodes Scholars, and 48 MacArthur Fellows (as of 2017). MIT's motto is 'Mens et Manus', which literally means 'Mind and Hand', reflecting the educational belief of MIT's founders: education for practical application.



## ABOUT EMERITUS

MIT Sloan Executive Education is collaborating with online education provider EMERITUS to deliver its executive programs through a dynamic, interactive, digital learning platform. By working with EMERITUS, MIT Sloan Executive Education brings its growing portfolio of courses online to address the evolving demands of executives. EMERITUS' approach to learning is based on a cohort - based design to maximize peer-to-peer sharing and includes live teaching with world-class faculty and hands-on project based learning. In the last year, more than 30,000 students from over 150 countries have benefited professionally from EMERITUS' courses.

# THE LEARNING EXPERIENCE

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Our programs are designed to meet the needs of individual learning styles, while also leveraging the power of peer learning. This is achieved through a user-friendly learning platform that enables participants to easily navigate the program content to achieve learning objectives.

## KEEPING IT REAL

**Our pedagogical approach, designed to bring concepts to life, includes:**

- Byte-sized learning elements
- Real-world application
- Peer learning discussions
- Active support from program Learning Facilitators



## KEEPING IT CONVENIENT

Access to program content is flexible, available through multiple devices allowing working professionals to easily manage schedules and learn remotely — anytime, anywhere. Participants obtain access to learning materials via a modular approach, with new content released weekly.

## KEEPING IT ENGAGING

Our online classroom enables participants to seamlessly interact with their peers and stay on track towards program completion — with culturally-enriching encounters along the way. Program modules consist of a variety of teaching instruments, including:

- Video lectures
- Moderated discussions
- Class materials: articles, cases
- Quizzes
- Surveys
- Learning journey support offered by a dedicated Learning Facilitator team
- Office hours with program support team

### Access Requirements

- Valid email address
- Microsoft Office suite
- PDF viewer to view all documents and presentations
- Computing device connected to the internet
- Latest browser version to access our learning platform

### Other Requirements

Certain programs may require the usage of additional software, tools, or applications. Participants will be informed about these additional requirements at the registration stage or during program commencement. Our program advisors are also available to respond to any questions about these requirements.



Easily schedule a call with a program advisor to learn more

[SCHEDULE A CALL](#)

You can apply for the program here

[APPLY](#)

## **CONNECT WITH A PROGRAM ADVISOR**

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Email: [mit@emeritus.org](mailto:mit@emeritus.org)

Phone: +1-617-855-1045