Brief overview of the course:

This course provides an introductory overview to data analytics techniques and their application in business through a combination of lectures, business case studies, and hands-on learning. The case studies illustrate how companies are leveraging different sources of data, with different analytical techniques, to improve their performance. Hands-on learning will be on a free web-based graphical development environment, and will allow students to practice using some of these tools themselves. Students will gain an understanding of the many possibilities for applying data science in business, and will be able to consider additional learning opportunities to gain further depth. This course is an excellent resource for managers who see the opportunity to use data analytics in business but do not have the skills and background to engage with data analytics themselves.

Course structure:

The course has been set up as a set of six modules, with the intention that a learner does one module per week, spending 3-6 hours per week. However, as an on-demand course, you can do it at whatever pace suits you.

The six modules are described in more detail in the next section. Before that, here is what each module contains:

1. Seven to ten video segments, covering the content for that week. Each week revolves around a specific aspect of data analytics. The video segments for each week, generally, follow the following pattern:
    a. An introductory video, containing an overview of the topic that week.
    b. A real-life example, usually drawn from business, of that week's topic applied in practice.
    c. Instruction on the technical content of that week.
    d. Demonstration of how to use our software for doing hands-on work on that topic.
    e. Additional sub-topics within that week's topic.

2. Homework. Most weeks contain all 3 of the following sections; some only contain 2.
    a. Hands-on exercises using our course software for the topic of that week, multiple-choice auto-graded.
    b. Conceptual and application-level questions for that topic, multiple-choice auto-graded.
    c. Brief essay question focused more on application in business, peer-graded.

3. Data sets drawn from the real world. These data sets are used in both the video demos and homework assignments. Data sets are sometimes slightly edited to make them suitable for our class, and are provided to you through a Google Drive link.

4. References, primarily to the sources of the data sets. That way, if you have further interests, you can dig deeper on that topic by working with the original data set, any accompanying data sets, and reading associated papers and articles.

Course outline and Learning objectives

This section contains the outline of each of the six modules in this course. Each module is structured as described above. You can see the specific content of each module on the course website; the section below lists the learning objectives of each module.

1. Overview of Data Analytics in Business.
    a. Understand the many different sources of data for businesses today, and get a sense of the differences in the types and quality of data from different sources.
    b. Get introduced to the Analytics Value Escalator, a framework describing different data analytics tools along dimensions of difficulty and business value. Our course will follow this framework.
    c. Get introduced to our course software, Microsoft's AzureML. You will set up your account and upload your first data set, so you are prepared for the exercises in the following modules.

2. Extract, Transform and Load:
    a. Understand how generating business value requires acquiring, cleaning, curating, organizing, and managing data from many different sources.
    b. Get introduced to SQL (Structured Query Language), the main tool for organizing, structuring, and querying data.
    c. Practice simple SQL commands on AzureML to build proficiency, so you have the ability to start deploying it in the real world.

3. Descriptive Analytics:
    a. Get introduced to the various tools used for describing data, visual and quantitative.
    b. Learn how one quantity is described using summary measures and histograms, and practice on AzureML.
    c. Learn how two quantities are described using correlation and scatter plots, and practice on AzureML.
    d. Get a brief introduction to probability concepts.

4. Diagnostic Analytics:
    a. Understand how statistical hypothesis tests are conducted, what a p-value means and indicates, and the types of errors possible in hypothesis testing.
    b. Conduct hypothesis tests (single quantity as well as A/B tests) on AzureML to build proficiency.
    c. Get introduced to additional advanced topics in diagnostic analytics, namely linear regression and design of experiments.

5. Predictive Analytics:
    a. Learn how predictions are made using regression-based techniques as well as machine learning techniques.
    b. Get a basic introduction to machine learning for predicting binary variables, including an understanding of accuracy, the classification matrix, and interpretation of output.
    c. Build proficiency by developing your own machine learning models on AzureML.

6. Prescriptive Analytics, Artificial Intelligence, and Course Wrap-up:

a. Get a brief overview of optimization and simulation, the two main methods of prescriptive analytics which help us make decisions using data.
b. Get an introduction to the emerging uses of artificial intelligence in business.
c. Understand the risks and dangers of relying too much on data without understanding, intuition and insight.
d. Contemplate the impact of advanced analytics on society.

Expectations for Learners

Students will get the most out of this course if they fully participate in all the components. Specifically, the AzureML software has been chosen because it is browser-accessible, free and cloud-based: this provides a robust yet highly accessible tool to learn analytics and build your own models. Therefore, completing these hands-on exercises, both during instructional videos and during homework assignments, is essential. In addition, students are expected to complete all assessments, including the multiple-choice questions and peer-graded essays; this will require you to actively engage with all the video instructional material.

Course Materials and Instructor

All course material was developed by the instructor, with the help of his two teaching assistants: Maggie Li and Murray Lei. Citations for all external material has been provided, either within the videos or externally. The instructor for this course is Amitabh Sinha, Associate Professor of Technology and Operations, Ross School of Business, University of Michigan.