UCI Division of Continuing Education

Introduction to Analyzing Data for Business Goals

I&C SCI X425.90
2.0 Units

Instructor Information

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Dr. Dursun Delen is the holder of Spears Endowed Chair in Business Administration, Patterson Family Endowed Chair in Business Analytics, Director of Research for the Center for Health Systems Innovation, and Regents Professor of Management Science and Information Systems in the Spears School of Business at Oklahoma State University (OSU). Dr. Delen has over 30 years of experience in analytics both as a business consultant and university professor. Prior to his academic tenure, he worked for a privately-owned research and consultancy company as a research scientist for five years, during which he led a number of decision support, information systems and advanced analytics related research projects funded by federal agencies including DoD, NASA, NIST and DoE. Dr. Delen has published more than 150 peer-reviewed articles and 11 books/textbooks. He is often invited to national and international conferences for keynote addresses, and companies for consultancy engagements on topics related to business analytics, data science, data/text mining, and knowledge management. He regularly serves as chair for tracks and minitracks at various business analytics and information systems conferences. Currently, he is serving on more than a dozen journal editorial boards as editor-in-chief, senior editor, associate editor, and editorial board member. He is the recipient of several research and teaching awards including the prestigious Fulbright scholar, regents distinguished teacher and researcher, and Big Data mentor awards.

Course Description

Advancements in hardware and software have made data easily available for use. This introductory analytics course starts with an overview of data analytics to introduce the different types of data and fundamental concepts behind collecting, storing, and analyzing data. A survey of the different types of analytics (descriptive, diagnostic, predictive, and prescriptive) will provide insight into how each type can be applied to derive the most benefit from available data. Use cases will be discussed to evaluate best practices and lessons learned.

Prerequisites

None.

Student Learning Outcomes

At the end of this course, students will be able to:

- Develop actionable plans from existing corporate data and initiatives to evaluate the effectiveness of current strategies
- Collect, select, describe, profile, and prepare data from various sources for analysis
- Validate and interpret the results of data analytics projects
- Develop questions to use as frameworks for analysis projects by applying the four major types of analytics (descriptive, diagnostic, predictive, and prescriptive)
- Effectively design, develop, and implement data analysis based on defined goals

Course Material

This course requires Microsoft Excel. Students who do not have access to Microsoft Excel may activate a free 30 day trial and purchase the Microsoft Office Suite from any retailer of their choice, we recommend the UCI Textbook store: https://uci.bncollege.com/shop/uci/home.

There are no required textbooks for this course. Below are **optional** but recommended textbooks.

- Delen, D. (2021). *Predictive Analytics: Data Mining, Machine Learning and Data Science for Practitioners 2nd Edition.* Upper Saddle River, New Jersey: Pearson (FT Press Analytics)
- Delen, D. (2019). Prescriptive Analytics: *The Final Frontier for Evidence-Based Management and Optimal Decision Making*. FT Press.

Course Outline

<table>
<tr><td rowspan="2">Module 1</td><td>Key Topics</td><td>

What is Data Analytics (DA)?

How DA Applies Across Industries
The Four Types of DA
Common Terminology in DA
Basic DA Workflow

Data Preparation
Analysis and Data Exploration
Presenting and Communicating Data Analytics Results

The Value of Data Analytics to Business
Standard Processes for Data Analytics

Developing a Data Strategy
Defining Data Need

CRISP-DM Methodology
SEMMA Methodology

Text Mining

Ethics and Data Privacy

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<tr><td>Student Learning Outcomes</td><td>By the end of this module, you will be able to:

Explain how data analytics helps businesses drive actionable results.
Select a data analytics project topic and evaluate data associated with said topic.

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		● Define the four types of data analytics. ● Identify standard processes for data analytics.
	Module Elements	● Reading Assignments ● Asynchronous Discussions ● Live Virtual Classroom Sessions ● Course Media
	Assignments	● Assignment 1 ● Discussion 1 ● Quiz 1

Module 2	**Key Topics**	● Organizing and Analyzing Data
		● Considerations when Analyzing
		  ○ Interpretation & Subjectivity
		● Statistical Analysis vs Data Analysis
		● Exploratory Data Analysis (EDA)
		  ○ EDA Techniques
		  ○ Characterizing Data
		  ■ Outliers, Nulls, and N/As
		  ○ Understanding Data
		  ■ Graphs and Descriptive Tables
		  ○ Variables
		  ■ Quantitative and Qualitative (Categorical)
		  ■ Discrete and Continuous
		  ○ Data Types and Plotting
		● Data Cleaning and Maintenance
		  ○ The Benefits of Clean Data
		  ○ Data Maintenance
		  ○ Common Tools and Best Practices

	Student Learning Outcomes	By the end of this module, you will be able to: ● Explore and evaluate data analysis tools. ● Choose the analysis strategy and the techniques to explore the collected data for your project. ● Categorize a dataset and explain what the data means. ● Differentiate statistical analysis and exploratory data analysis. ● Define methods of collecting and interpreting data.
	Module Elements	● Reading Assignments ● Asynchronous Discussions ● Live Virtual Classroom Sessions ● Course Media
	Assignments	● Assignment 2 ● Discussion 2 ● Quiz 2
Module 3	**Key Topics**	● Presenting and Communicating Data

		● Data Manipulation ○ Input/Output: File Read and Write ○ Data Inspection ■ Missing Values Data Operations ○ Tools and Techniques ■ Pivoting ■ Shaping ■ Grouping ● Data Visualization ○ Advantages and Limitations ○ Reporting, Monitoring, and Deciding ○ Tools and Techniques ■ Charts ■ Histogram ■ Maps ● Data Storytelling and Communicating Insights ○ Persuasion and Perspectives ○ Individual Visualizations and Dashboards ○ Ethical Data Analytics
	Student Learning Outcomes	By the end of this module, you will be able to: ● Assess different data visualization techniques and discuss their advantages and limitations. ● Decide on a method to validate, prepare, and communicate insights to key stakeholders. ● Organize data using a pivot table in Excel. ● Describe the process of data manipulation and techniques using Excel.
	Module Elements	● Reading Assignments ● Asynchronous Discussions ● Live Virtual Classroom Sessions ● Course Media
	Assignments	● Assignment 3 ● Discussion 3 ● Quiz 3
Module 4	**Key Topics**	● What is Descriptive Analytics? ○ Techniques of Descriptive Analytics ■ Descriptive Statistics ■ Summary of Data ■ Online Analytics Processing with Dashboards and Scorecards ● Considerations for Creating Descriptive Analytics ○ Asking the Right Questions ○ Selecting Valuable Data Sources ● Business Challenges ○ Missing Time Series Data

		○ Transforming Variables ○ Interpretation of Meaning
	Student Learning Outcomes	By the end of this module, you will be able to: ● Discuss the best way to use descriptive analytics for your data strategy. ● Investigate considerations for how descriptive analytics will help you solve the business problem for your final project. ● Define descriptive analytics and the techniques of descriptive analytics.
	Module Elements	● Reading Assignments ● Asynchronous Discussions ● Live Virtual Classroom Sessions ● Course Media
	Assignments	● Assignment 4 ● Discussion 4 ● Quiz 4
Module 5	**Key Topics**	● What is Diagnostic Analytics? ● Techniques of Diagnostic Analytics ○ Box Plots, Outliers, and Correlations ○ Sensitivity Analysis ● While Descriptive Analytics Answer the “What” Question, Diagnostic Analytics Answer the “Why” Question ● Achieving Business Goals with Diagnostic Analytics ○ Diagnostic Analytics Example
	Student Learning Outcomes	By the end of this module, you will be able to: ● Evaluate a scenario and discuss how diagnostic analytics can be used to achieve business goals. ● Investigate considerations for how diagnostics analytics will help you solve the business problem for your final project. ● Define diagnostic analytics and the techniques of diagnostic analytics.
	Module Elements	● Reading Assignments ● Asynchronous Discussions ● Live Virtual Classroom Sessions ● Course Media
	Assignments	● Assignment 5 ● Discussion 5 ● Quiz 5
Module 6	**Key Topics**	● What is Predictive Analytics? ● Techniques and Methodologies ○ Statistical methods ■ Linear and Logistic Regression ○ Machine Learning methods ■ Decision Trees, Neural Networks, and Support Vector

		Machines. ● Considerations for Creating Predictive Analytics ○ Supervised vs Unsupervised Learning ○ Training Data Versus Test Data ○ Model Selection ● Business Challenges ○ Error-Prone Data ○ Bias-Variance Tradeoff ○ Interpretation & Subjectivity ● Achieving Business Goals with Predictive Analytics
	Student Learning Outcomes	By the end of this module, you will be able to: ● Evaluate a scenario and discuss the optimal predictive modeling technique(s) to achieve business goals. ● Investigate considerations for how predictive analytics will help you solve the business problem for your final project. ● Define predictive analytics and the techniques of predictive analytics.
	Module Elements	● Reading Assignments ● Asynchronous Discussions ● Live Virtual Classroom Sessions ● Course Media
	Assignments	● Assignment 6 ● Discussion 6 ● Quiz 6
Module 7	**Key Topics**	● What is Prescriptive Analytics? ● Techniques of Prescriptive Analytics ○ Optimization ■ Identifying the Goal/Objective ○ Simulation ○ Experimental Design ● Considerations for Creating Prescriptive Analytics ○ Identifying the Goal ○ Identifying Achievability (Rules) ○ Describing the Action (Testing) ● Business Challenges ○ Interpretation & Subjectivity ○ Implementation
	Student Learning Outcomes	By the end of this module, you will be able to: ● Evaluate a scenario and discuss how prescriptive analytics can be applied to achieve business goals. ● Practice optimization by formulating a linear programming model in Excel. ● Investigate considerations for how prescriptive analytics will help you solve the business problem for your final project.

		• Define prescriptive analytics and the techniques of prescriptive analytics.
	Module Elements	• Reading Assignments • Asynchronous Discussions • Live Virtual Classroom Sessions • Course Media
	Assignments	• Assignment 7 • Discussion 7 • Quiz 7
Module 8	**Key Topics**	• A Longitudinal View to Business Analytics and Data Science • Deep Learning • Explainable AI • AutoML • Model Ensembles • Sensor Technologies and IoT • Geospatial Analytics ○ Real-Time Location Intelligence • Cloud Computing and Data Science
	Student Learning Outcomes	By the end of this module, you will be able to: • Discuss the potential for new data analysis methods to impact the future of business. • Develop a data strategy leveraging each of the four types of data analytics discussed in the course: descriptive analytics, diagnostic analytics, predictive analytics, and prescriptive analytics. • Identify leading-edge methods, methodologies, and technologies used in data analytics and examine trends in their usage in business.
	Module Elements	• Reading Assignments • Asynchronous Discussions • Live Virtual Classroom Sessions • Course Media
	Assignments	• Assignment 8 • Discussion 8 • Quiz 8

Evaluation and Grading

This course will be graded using the following weighted percentages for each of the assignments in the course. Feedback and grades are typically posted within one week of assignments due dates.

Assignments	**% of Grade**
Discussions	20%

Assignments	40%
Final Assessment	30%
Quizzes	10%
Total	**100%**

Grading Scale

This course uses the following grading scale.

Letter Grade	Percentage
A+	97% - 100%
A	93% - 96%
A-	90% - 92%
B+	87% - 89%
B	83% - 86%
B-	80% - 82%
C+	77% - 79%
C	73% - 76%
C-	70% - 72%
D+	67% - 69%
D	63% - 66%
D-	60% - 62%
F	59% or less

Technical Requirements

Below are the basic technical requirements for all UC Irvine, Division of Continuing Education courses.

Hardware

To participate in this course, you need a computer or device with reliable internet access. The device should be able to play videos on the screen and audio through headphones or speakers.

Software

For this course, you must have Microsoft Office, Google Docs, OpenOffice, or another compatible word processing software. If additional software is required, your instructor will provide detailed access information.

Skill Requirements

You may be required to use a web camera, copy and paste functions, attach documents, or use upload features in the LMS. In addition, you may need to upload and view documents in PDF format. You can download Adobe Acrobat Reader to open PDF files by going to this site: https://get.adobe.com/reader/. (Please note that Apple OS X includes the Preview application, which allows you to open PDF files.)

Communication Expectations

The majority of course communication takes place in general course forums. The written language has many advantages: more opportunity for reasoned thought, the ability to go in-depth, and more time to think through an issue before posting a comment. However, written communication also has certain disadvantages, such as a lack of the face-to-face signaling that occurs through body language, intonation, pausing, facial expressions, and gestures. As a result, please be aware of the possibility of miscommunication and compose your comments in a positive, respectful, and constructive manner.

UC Irvine Policies

Code of Conduct

All participants in the course are bound by the University of California Code of Conduct, found at https://ce.uci.edu/resources/conduct/.

Academic Honesty Policy

The University is an institution of learning, research, and scholarship predicated on the existence of an environment of honesty and integrity. As members of the academic community, faculty, students, and administrative officials share responsibility for maintaining this environment. It is essential that all members of the academic community subscribe to the ideal of academic honesty and integrity and accept individual responsibility for their work. Academic dishonesty is unacceptable and will not be tolerated at the University of California, Irvine. Cheating, forgery, dishonest conduct, plagiarism, and collusion in dishonest activities erode the University's educational, research, and social roles.

Students who knowingly or intentionally conduct or help another student engage in dishonest conduct, acts of cheating, or plagiarism will be subject to disciplinary action at the discretion of UCI Division of Continuing Education.

Disability Services

If you need support or assistance because of a disability, you may be eligible for accommodations or services through the Disability Service Center at UC Irvine. Please contact the DSC directly at (949) 824-7494 or TDD (949) 824-6272. You can also visit the DSC's website: http://www.disability.uci.edu/. The DSC will work with your instructor to make any necessary accommodations. Please note that it is your responsibility to initiate this process with the DSC.

Privacy

UC Irvine is fully committed to maintaining the integrity of your personal student information, including academic records, in accordance with the Federal Family Education Rights and Privacy Act of 1974 (FERPA). For complete information on privacy and FERPA, please visit the UCI Privacy and Student Records website: http://www.reg.uci.edu/privacy/.

Accessibility

The University of California and UC Irvine are committed to improving accessibility for all students. For complete information about UC Irvine's policy affecting all information technology systems and software, please visit: https://www.oit.uci.edu/accessibility/accessibility-policies/.

For accessibility information pertaining to the software used in UCI courses, please see below:

Software	Link
Canvas (LMS)	https://www.canvaslms.com/accessibility
Zoom	https://zoom.us/docs/doc/vpat/Zoom%20Product%20Web%20Pages%20VPAT.pdf
VidGrid	https://www.vidgrid.com/accessibility/

UCI-DCE Student Services

The UCI Division of Continuing Education Student Services office is responsible for maintaining enrollment, academic, and financial records while providing academic support services to DCE students, instructors, and staff. Services include:

- Student records and DCE My Account portal access
- Adding, dropping, and waiting lists for all DCE courses and programs
- Cashiering, refunds, and accounts receivable
- Grades, transcripts, candidacy, and certificates
- International F-1 student advising, student academic success, and wellness support
- Important notifications regarding DCE course-related changes such as schedule, location, instructor, and course materials

Descriptions of many of these services can be found at https://ce.uci.edu/resources/. Additionally, UCI-DCE Student Services is available by email (dce-services@uci.edu) or by calling (949) 824-5414 (option 1), Monday-Friday, 8:30am-4:30pm.