

Descriptive Analytics: Data Visualization & Storytelling with Data

I&C SCI X425.91

2 Units

# Instructor Information

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Yu Zhang has over 5 years of experience in python programming and uses the big query SQL, python colab, and Tableau in previous and current work. She has over 5 years of experience in academia in statistical analysis and 3 years of experience in industry and government working on complex data and machine learning projects. She is technically sound with full experience in data validation and machine learning modeling. In addition, she has over 6 year’s teaching experience as a lecturer, teaching assistant, and mentor working in UC Santa Barbara, UC Davis, UC Irvine. She is passionate about using data analytics for real-world problem solving and working with diverse students.

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# Course Description

This course covers the foundations of descriptive analytics in the context of business and financial data analysis. Through the application of interactive visual analytics, students will learn how to extract structure from historical data and present key points through graphical storytelling. Additional topics include data manipulation, visualization foundations, audience identification, ethical considerations, dashboard creation, and report generation. A survey of available visualization tools will be included with a hands-on project.

# Prerequisites

I&C SCI X425.90 Introduction to Analyzing Data for Business Goals.

# Sequencing

I&C SCI X425.91 Descriptive Analytics: Data Visualization & Storytelling with Data is a required course in the Data Analytics for Business Certificate Program.

# Student Learning Outcomes

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

* Explain fundamental concepts behind descriptive analytics.
* Create an analytics report plan.
* Setup and perform data analysis using industry-standard models.
* Create data maps to identify patterns from reported data.
* Create visualizations to explain analytics results.
* Interpret analytics reports.
* Implement the following major tasks of analytics deployment: (1) define business goals, (2) prepare data, (3) select, model, and present results.

# Course Material

Microsoft Excel and Tableau are required for this course.

# Course Outline

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| **Module 1** | **Key Topics** | * Descriptive Analytics   + Objectives   + Process and Action Cycle   + Audience   + Visualization as Human-in-the-Loop Analytic Tool * Visualization Fundamentals   + Objectives   + Grammar of Graphics     - Data, Types and Classes, and Encodings       * Scales       * Coordinates     - Putting it Together: Facets, Layers, and Composition * Key Points |
| **Student Learning Outcomes** | By the end of this module, you will be able to:   * Successfully set up and install Tableau environment * Recognize basic concepts behind descriptive analytics and visualization * Apply the basics of visualization to sample data * Perform data manipulations to sample data |
| **Module Elements** | * Readings * Assignment * Discussion * Quiz * Media * Zoom session |
| **Assignments** | * Assignment 1 * Discussion 1 * Quiz 1 |
| **Module 2** | **Key Topics** | * Interactive Univariate Descriptive Analytics   + Data Types   + From Data to Representation   + Standard Visualizations     - Values       * Tables       * Bar Charts     - Distributions       * Histogram       * Density Plots     - Proportions     - Interaction and Action Intents * Key Points |
| **Student Learning Outcomes** | By the end of this module, you will be able to:   * Conduct a univariate descriptive analysis to sample data * Compare and contrast types of visualizations * Interpret analysis results and create a variety of visualizations |
| **Module Elements** | * Readings * Assignment * Discussion * Quiz * Media * Zoom session |
| **Assignments** | * Assignment 2 * Discussion 2 * Quiz 2 |
| **Module 3** | **Key Topics** | * Interactive Visual Data Analytics   + Scaling and Data Transformations   + Comparisons     - Facets     - Layered Univariate Visualizations     - Scatterplots     - Scatterplot Matrix   + Statistical Relationships     - Heatmaps       * Covariance Heatmaps       * Correlation Heatmaps     - Distributions       * Contour Plot * Interaction and Action Intents   + Interaction Intents   + Action Patterns   + Brushing and Linked Plots * Key Points |
| **Student Learning Outcomes** | By the end of this module, you will be able to:   * Recognize the different types of visualizations that can be created with the results of a multivariate descriptive analysis * Perform a multivariate descriptive analysis to sample data * Discuss the importance of interactivity for understanding complex data sets |
| **Module Elements** | * Readings * Assignment * Discussion * Quiz * Media * Zoom session |
| **Assignments** | * Assignment 3 * Discussion 3 * Quiz 3 |
| **Module 4** | **Key Topics** | * Geospatial Analysis   + Data Preparation   + Layers   + Visual Exploration * Network Analysis   + Data Preparation   + Layers   + Visual Exploration |
| **Student Learning Outcomes** | By the end of this module, you will be able to:   * Perform geospatial and network analysis to sample data * Create visualizations from geospatial and network analysis * Identify ways in which geospatial analysis and network analysis are used in visualizations * Discuss different types of visualizations and how they affect decision-making |
| **Module Elements** | * Readings * Assignment * Discussion * Quiz * Media * Zoom session |
| **Assignments** | * Assignment 4 * Discussion 4 * Quiz 4 |
| **Module 5** | **Key Topics** | * Time Series   + Line Graphs   + Slope Graphs   + Cycle Plots   + Highlight Tables   + Decomposition   + Multiple Line Plots * Key Points |
| **Student Learning Outcomes** | By the end of this module, you will be able to:   * Name and practice temporal visual analysis techniques to design visuals * Consider the use of 2D and 3D plots in time series data |
| **Module Elements** | * Readings * Assignment * Discussion * Quiz * Media * Zoom session |
| **Assignments** | * Assignment 5 * Discussion 5 * Quiz 5 |
| **Module 6** | **Key Topics** | * Analytical Dashboarding   + Focusing on Relevant Data     - Data Reduction     - Feature Reduction   + Reducing Complexity     - Abstracting Data     - Grouping   + Putting it Together     - Process     - Considerations |
| **Student Learning Outcomes** | By the end of this module, you will be able to:   * Analyze and identify different types of visualizations * Compare data density and visual density * Create a descriptive analytics dashboard |
| **Module Elements** | * Readings * Assignment * Discussion * Quiz * Media * Zoom session |
| **Assignments** | * Assignment 6 * Discussion 6 * Quiz 6 |
| **Module 7** | **Key Topics** | * Effective Visuals   + Design and Perception   + Data Density and Visual Density   + Color   + Associations * Storytelling   + Reasoning   + Structure * Key Points |
| **Student Learning Outcomes** | By the end of this module, you will be able to:   * Implement storytelling principles * Develop an information layout * Recognize the significance of visuals and storytelling when delivering data to an audience * Demonstrate what they have learned by developing a capstone project |
| **Module Elements** | * Readings * Assignment * Discussion * Quiz * Media * Zoom session |
| **Assignments** | * Capstone Project * Discussion 7 * Quiz 7 |
| **Module 8** | **Key Topics** | * Ethics, Deception, and Fallacies * Deploying and Publishing * Custom Visualization   + JavaScript and D3.js   + Using Designer Tools     - Adobe Illustrator     - Adobe After Effects * Game Engines: Unreal Engine and Unity3D * Future of Visualization |
| **Student Learning Outcomes** | By the end of this module, you will be able to:   * Produce a professional presentation on capstone project * Interpret story and results from data and visualizations * Investigate the future of data visualization and how new technologies may transform the way data is viewed. |
| **Module Elements** | * Readings * Assignment * Discussion * Quiz |
| **Assignments** | * Capstone Project Presentation * 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.

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| --- | --- |
| **Assignments** | **% of Grade** |
| Discussions | 20% |
| Quizzes | 10% |
| Assignments | 40% |
| Final Assessment | 30% |
| **Total** | **100%** |

## Grading Scale

This course uses the following grading scale.

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| --- | --- |
| **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:

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| **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](mailto:dce-services@uci.edu)) or by calling (949) 824-5414 (option 1), Monday-Friday, 8:30am-4:30pm.