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Data Visualization

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Course Description

Data Visualization is a course that teaches how to create visualizations that effectively communicate the meaning behind data to an observer through visual perception. We will learn how a computer displays information using computer graphics, and how the human perceives that information visually. We will also study the forms of data, including quantitative and non-quantitative data, and how they are properly mapped to the elements of a visualization to be perceived well by the observer. We will briefly overview some design elements for effective visualization, though we will not focus on the visual design needed to make attractive and artistic visualizations. This course does not require computer programming, but computer programming can be used to complete the exercises. The course will conclude with the integration of visualization into database and data-mining systems to provide support for decision making, and the effective construction of a visualization dashboard.

Course Goals and Objectives

- To understand how 2-D and 3-D computer graphics are used to visualize data.
- To understand how an observer perceives and processes information from a visual display.
- To learn a wide vocabulary of visualization methods and how best to apply them to different kinds of data.
- To learn which design styles and colors work best for different visualization situations.
- To learn how to visualize data when it is not numerical.
- To learn techniques for visualizing databases and data mining to help visually sort through massive datasets.
- To learn how to analyze tasks and build visualization dashboards to provide data to support making a decision.

Textbook

There is no required textbook for this class. However the following textbooks may be helpful.

- Visualization Analysis and Design by Tamara Munzner.
- Information Visualization: Perception for Design by Colin Ware.

Course Outline

The course consists of 4 weekly modules, each of which will be released to you shortly before the module begins.

Module	Key Concepts
Week 1: The Computer and the Human	- Introduction to Visualization - Using computer graphics to display data - The model human processor and Fitts's law - Human visual perception and cognition
Week 2: Visualization of Numerical Data	- Different kinds of visualizations and how best to apply them to data - Basic charts such as bar charts and scatter plots - More advanced visualization techniques, such as streamgraphs and parallel coordinates - Some elements of design and color usage
Week 3: Visualization of Non-Numerical Data	- Graphs, networks, and hierarchies - Layout of relational and hierarchical data, such as treemaps - Methods for visualizing high-dimensional data, such as principal component analysis and multidimensional scaling
Week 4: The Visualization Dashboard	- Visualizing large datasets - Visualization of databases and data mining results - Visual analytics for decision support - Task analysis - Visualization dashboards

Multiple Ways to Complete This Course (And Multiple Potential Benefits)

I am continually looking to improve this course and may encounter some issues requiring us to make changes sooner rather than later. As such, this syllabus is subject to change. I appreciate your input and ask that you have patience as we make adjustments to this course.

This course offers a free, no-risk Signature Track Trial. To qualify for a Course Certificate, simply start verifying your coursework at the beginning of the course (with no upfront charges), and pay the $49 Signature Track registration fee anytime before the last week of the course. You can delay payment until you're confident you'll pass. Coursera Financial Aid is available to offset the registration cost for students with demonstrated economic needs. If you have questions about this trial, please see the help topics here.

Also note that this course is the fifth in the Data Mining Specialization offered by the University of Illinois at Urbana-Champaign. By earning a Verified Certificate in this course, you are on your way toward earning a Specialization Certificate in Data Mining.

If you choose not to verify your work, you can still participate in the complete course. While your final

grade will be recorded on your Course Records page, **this course will not offer a Statement of Accomplishment.** You will, however, still receive any badges you earn, as described below.

	What It's Called	How It's Earned	What You Get
	Course Achievement Badge	70% or higher for all quizzes and assignments combined	Qualify for a Course Certificate
	Course Mastery Badge	95% or higher for all quizzes and assignments combined	Qualify for a Course Certificate

Elements of This Course

The course is comprised of the following elements:

- **Lecture videos.** Each week your instructor, will teach you the concepts you need to know through a collection of short video lectures. You may either stream these videos for playback within the browser by clicking on their titles, or you can download each video for later offline playback by clicking the download icon.
- **In-lecture questions.** Each lecture has questions associated with it to help verify your understanding of the topics. These questions will automatically appear while watching the video if you stream the video through your browser. The questions are available as a separate downloadable text file for those who prefer to download the videos. These questions do not contribute toward your final score in the class.
- **Quizzes.** Week 1 and Week 4 will include a for-credit quiz. You will be allowed two (2) attempts at the quiz. Each attempt may present a different selection of questions to you. Your best score will be used when calculating your final score in the class. There is no time limit on how long you take to complete each attempt at the quiz. There is a deadline for each quiz; however, if you submit a quiz within the first five (5) days after the deadline, you can still earn all of the possible points for the quiz.
- **Projects.** There are two required projects for the class. The first project will be to create a visualization of numerical data, and the second project will be to create a visualization of non-numerical data (e.g., a network or a hierarchy). For each project, sample data will be provided but you are encouraged to find your own data. Your goal will be to present that data in a visualization that helps the observer to better understand what the data represents. The projects will be peer graded based on rubrics that measure how well the course's methods have been applied to the visualization of the data.

Information About Lectures

The lectures in this course contain the most important information you need to know. You can access these lectures via the **All Videos** link in the main menu or via the weekly overview pages (preferred). The following resources accompany each video:

- ▶The play button will open the video up in your browser window and stream the lecture to you. The duration of the video (in hours-minutes-seconds format) is also listed. Some lectures may include in-video questions described above. Within the player that appears, you can click the CC button to activate closed captions. English captions are available for all videos. In some cases, the captions have been translated by your peers into other languages and made available to you. Learn more about translating captions into other languages.

- ⊡ The Lecture Notes or Lecture Slides provide you with a reference of the key points raised in the lecture. In some cases, when the Lecture Notes are presented in a wiki format, you will have the ability to edit the Lecture Notes to provide more details and help out your fellow participants.
- ☰ The Transcript provides you with the text of the speaker's words. It is provided in English only.
- ⤓ The Download link allows you to download a copy of the file in MP4 format (which most video player software can handle). This option may be useful if you are on a slower Internet connection or prefer to view the videos when not connected to the Internet. Each file is automatically numbered in the order it appears in the course and includes the duration (in hours-minutes-seconds format) in the file name as well.
- ☰ If you choose to download the video, you may optionally wish to download the closed-caption SRT file to accompany it. Consult your video player's documentation on how to load the SRT file with your video. SRT files are only available in English.
- ✎ Downloaded video files do not include in-lecture questions embedded within them like streamed videos do. However, you can download the in-lecture questions as a separate file.
- 💬 Most videos have a discussion forum dedicated to them. This is a great place to discuss any questions you have about the content of the video or to share your ideas and responses to the video.

Discussion Forums

The discussion forums are a key element of this course. Be sure to read more about the discussion forums and how you can make the most of them in this class.

Getting and Giving Help

You can get/give help via the following means:

- Use the Learner Help Center to find information regarding specific technical problems. For example, technical problems would include error messages, difficulty submitting assignments, or problems with video playback. You can access the Help Center by clicking on the **Help Center** link at the top right of any course page. If you cannot find an answer in the documentation, you can also report your problem to the Coursera staff by clicking on the **Contact Us!** link available on each topic's page within the Learner Help Center.
- Use the Content Issues forum to report errors in lecture video content, assignment questions and answers, assignment grading, text and links on course pages, or the content of other course materials. University of Illinois staff and Community TAs will monitor this forum and respond to issues.

Note: Due to the large number of students enrolled in this course, the instructor is not able to answer emails sent directly to his account. Rather, all questions should reported as described above.

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