

# Data Visualization Syllabus

## 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.

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.

## Course Goals and Objectives

Upon successful completion of this course, you will be able to:

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

## Textbook and Readings

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 \(3rd Edition\)](#) by Colin Ware

## Course Outline

The course consists of 4 weekly modules that focus on the following.

## Week 1: The Computer and the Human

### Key Concepts:

- 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

### Key Concepts:

- 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

### Key Concepts:

- 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

### Key Concepts:

- Visualizing large datasets
- Visualization of databases and data mining results
- Visual analytics for decision support
- Task analysis
- Visualization dashboards

## Elements of This Course

The course is comprised of the following elements:

- **Lecture videos.** In each module the concepts you need to know will be presented through a collection of short video lectures. You may stream these videos for playback within the browser by clicking on their titles or download the videos. You may also download the slides that go along with the videos.

- **Quizzes.** Week 1 and Week 4 will include a for-credit quiz. You will be allowed 3 attempts at the quiz per every 8 hours. 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.
- **Programming assignments.** There are two required programming assignments for the class. The first programming assignment is to create a visualization of numerical data, and the second programming assignment is to create a visualization of non-numerical data (e.g., a network or a hierarchy). For each assignment, 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 programming assignments 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. 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. Within the player that appears, you can activate subtitles. English subtitles are available for all videos.
- All video lectures 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.

## How to Pass the Course

To qualify for a Course Certificate, simply start verifying your coursework at the beginning of the course, get an **80% or higher** on all quizzes and assignments combined, and pay the fee. Coursera [Financial Aid](#) is available to offset the registration cost for learners with demonstrated economic needs. If you have questions about Course Certificates, [please see the help topics here](#).

Also note that this course is in the [Data Mining Specialization](#) offered by the University of Illinois at Urbana-Champaign. By earning a Course Certificate in this course, you are on your way toward earning a [Specialization Certificate in Data Mining](#). You may also choose to pre-pay for the entire Specialization, at a discount. See more information about [Specialization payments](#) here.

**If you choose not to pay the fee**, you can still audit the course. You will still be able to view all videos, submit practice quizzes, and view required assessments. Auditing does not include the option to submit required assessments. As such, you will not be able to earn a grade or a Course Certificate.

## 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. 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 Mentors will monitor this forum and respond to issues.

Note: Due to the large number of learners enrolled in this course, I am not able to answer emails sent directly to my account. Rather, all questions should be reported as described above.