

Welcome to the Course

- Video: Welcome to the Course
- Reading: How to Make the Most of this Course
5 min
- Reading: Syllabus
10 min

Introduction to Data Visualization

Syllabus

Abstract

One of the most important skills of successful data scientists and data analysts is the ability to tell a compelling story by visualizing data and findings in an approachable and stimulating way. In this course you will learn many ways to effectively visualize both small and large-scale data. You will be able to take data that at first glance has little meaning and present that data in a form that conveys insights.

This course will teach you to work with many Data Visualization tools and techniques. You will learn to create various types of basic and advanced graphs and charts like: Waffle Charts, Area Plots, Histograms, Bar Charts, Pie Charts, Scatter Plots, Word Clouds, Choropleth Maps, and many more! You will also create interactive dashboards that allow even those without any Data Science experience to better understand data and make more effective and informed decisions.

You will learn hands-on by completing numerous labs and a final project to practice and apply the many aspects and techniques of Data Visualization using Jupyter Notebooks and a Cloud-based IDE. You will use several data visualization libraries in Python, including Matplotlib, Seaborn, Folium, Plotly & Dash.

Course Learning Objectives

After completing this course, a learner will be able to:

- Implement data visualization techniques and plots using Python libraries, such as Matplotlib, Seaborn, and Folium to tell a stimulating story.
- Create different types of charts and plots such as line, area, histograms, bar, pie, box, scatter, and bubble.
- Create advanced visualizations such as waffle charts, word clouds, regression plots, maps with markers, & choropleth maps.
- Generate interactive dashboards containing scatter, line, bar, bubble, pie, and sunburst charts using the Dash framework and Plotly library.

Module 1

Title: Introduction to Data Visualization Tools**Description**

Data visualization is a way of presenting complex data in a form that is graphical and easy to understand. When analyzing large volumes of data and making data-driven decisions, data visualization is crucial. In this module, you will learn about data visualization and some key best practices to follow when creating plots and visuals. You will discover the history and the architecture of Matplotlib. Furthermore, you will learn about basic plotting with Matplotlib and explore the dataset on Canadian immigration, which you will use during the course. Lastly, you will analyze data in a data frame and generate line plots using Matplotlib.

Objectives

By the end of this week, you will be able to:

- Discuss data visualization and its importance
- Discover the history of Matplotlib and its architecture
- Use Matplotlib to create plots employing Jupyter notebook
- Explore the dataset on immigration to Canada
- Identify the steps to analyze data in Pandas data frame
- Use Matplotlib to create line plots

Activities**Lesson 0: Welcome to the Course**

- Welcome to the Course
- How to Make the Most of this Course
- Syllabus

Lesson 1: Introduction to Data Visualization

- Overview of Data Visualization
- Types of Plots
- Plot Libraries
- Introduction to Matplotlib
- Basic Plotting with Matplotlib
- Dataset on Immigration to Canada
- Line Plots
- Hands-on Lab: Exploring and Pre-processing a Dataset using Pandas
- Hands-on Lab: Introduction to Matplotlib and Line Plots
- Practice Quiz: Introduction to Data Visualization
- Module 1 Summary: Introduction to Data Visualization Tools
- Module 1 Cheat Sheet
- Module 1 Graded Quiz: Introduction to Data Visualization Tools

Module 2

Title: Basic and Specialized Visualization Tools**Description**

Visualization tools play a crucial role in data analysis and communication. These are essential for extracting insights and presenting information in a concise manner to both technical and non-technical audiences. In this module, you will create a diverse range of plots using Matplotlib, the data visualization library. Throughout this module, you will learn about area plots, histograms, bar charts, pie charts, box plots, and scatter plots. You will also explore the process of creating these visualization tools using Matplotlib.

Objectives

By the end of this week, you will be able to:

- Explore an area plot with an illustration and create it using Matplotlib
- Define a histogram with an illustration and create it using Matplotlib
- Describe a bar chart with an illustration and create it using Matplotlib
- Discover a pie chart with an illustration and create it using Matplotlib
- Describe a box plot with an illustration and create it using Matplotlib
- Discover a scatter plot with an illustration and create it using Matplotlib

Activities**Lesson 1: Basic Visualization Tools**

- Area Plots
- Histograms
- Bar Charts
- Hands-on Lab: Area Plots, Histograms, and Bar Charts
- Practice Quiz: Basic Visualization Tools

Lesson 2: Specialized Visualization Tools

- Pie Charts
- Box Plots
- Scatter Plots
- Hands-on Lab: Pie Charts, Box Plots, Scatter Plots, and Bubble Plots
- Plotting Directly with Matplotlib
- Hands-on Lab: Plotting Directly with Matplotlib
- Practice Quiz: Specialized Visualization Tools
- Module 2 Summary: Basic and Specialized Visualization Tools
- Module 2 Cheat Sheet
- Module 2 Graded Quiz: Basic and Specialized Visualization Tools

Module 3

Title: Advanced Visualizations and Geospatial Data

Description

Advanced visualization tools are sophisticated platforms that provide a wide range of advanced features and capabilities. These tools provide an extensive set of options that help create visually appealing and interactive visualizations. In this module, you will learn about waffle charts and word cloud including their application. You will explore Seaborn, a new visualization library in Python, and learn how to create regression plots using it. In addition, you will learn about Folium, a data visualization library that visualizes geospatial data. Furthermore, you will explore the process of creating maps using Folium and superimposing them with markers to make them interesting. Finally, you will learn how to create a Choropleth map using Folium.

Objectives

By the end of this week, you will be able to:

- Explore waffle charts and word cloud along with their application
- Describe Seaborn and explore the process of generating attractive regression plots
- Describe Folium and explore the process of creating maps
- Explore the process of superimposing markers on maps using Folium
- Describe Choropleth maps with the help of an illustration
- Explore the process of creating a Choropleth map using Folium

Activities

Lesson 1: Advanced Visualizations and Geospatial Data

- Waffle Charts & Word Cloud
- Seaborn and Regression Plots
- Hands-on Lab: Waffle Charts, Word Clouds, and Regression Plots
- Practice Quiz: Advanced Visualization Tools

Lesson 2: Visualizing Geospatial Data

- Introduction to Folium
- Maps with Markers
- Choropleth Maps
- Hands-on Lab: Creating Maps and Visualizing Geospatial Data
- Practice Quiz: Visualizing Geospatial Data
- Module 3 Summary: Advanced Visualizations and Geospatial Data
- Module 3 Cheat Sheet
- Module 3 Graded Quiz: Advanced Visualizations and Geospatial Data

Module 4

Title: Creating Dashboards with Plotly and Dash

Description

Dashboards and interactive data applications are crucial tools for data visualization and analysis because they provide a consolidated view of key data and metrics in a visually appealing and understandable format. In this module, you will explore the benefits of dashboards and identify the different web-based dashboarding tools in Python. You will learn about Plotly graph objects and Plotly express to create charts. You will gain insight into Dash, an open-source user interface Python library, and its two components. Finally, you will gain a clear understanding of the callback function and determine how to connect core and HTML components using callback.

Objectives

By the end of this week, you will be able to:

- Identify different web-based dashboarding tools available in Python
- Explore Plotly and its two sub-modules
- Use Plotly graph objects and Plotly express to create charts
- Discover Dash and its two components
- Describe the callback function
- Determine the process of connecting core and HTML components using callback

Activities

Lesson 1: Creating Dashboards with Plotly and Dash

- Dashboarding Overview
- Additional Resources for Dashboards
- Introduction to Plotly
- Additional Resources for Plotly
- Plotly Basics: Scatter, Line, Bar, Bubble, Histogram, Pie, Sunburst
- Practice Quiz: Creating Dashboards with Plotly

Lesson 2: Working with Dash

- Introduction to Dash
- Overview of Cloud IDE lab-environment
- Dash Basics: HTML and Core Components
- Additional Resources for Dash
- Make Dashboards Interactive
- Additional Resources for Interactive Dashboards
- Add Interactivity: User Inputs and Callbacks
- Understanding the Lab Environment
- Flight Delay Time Statistics Dashboard
- Practice Quiz: Working with Dash
- Module 4 Summary: Creating Dashboards with Plotly and Dash
- Module 4 Cheat Sheet
- Module 4 Graded Quiz: Creating Dashboards with Plotly and Dash

Module 5

Title: Final Project and Exam

Description

The primary focus of this module is to practice the skills gained earlier in the course and then demonstrate those skills in your final assignment. For the final assignment you will analyze historical automobile sales data covering periods of recession and non-recession. You will bring your analysis to life using visualization techniques and then display the plots and graphs on dashboards. Finally, you will submit your assignment for peer review and you will review an assignment from one of your peers. To wrap up the course you will take a final exam in the form of a timed quiz.

Objectives

By the end of this week, you will be able to:

- Practice visualization skills
- Practice creating a dashboard
- Create various visualizations using a number of plot libraries
- Create a dashboard and add interactivity
- Review and grade an assignment submitted by peers

Activities

Lesson 1: Practice Project

- Practice Project Overview
- Practice Assignment: Part 1 - Analyzing wildfire data in Australia
- Practice Assignment: Part 2 - Creating Dashboards

Lesson 2: Final Project

- Final Project Overview
- Final Assignment: Part 1 - Create visualizations using Matplotlib, Seaborn & Folium
- Final Assignment: Part 2 - Create Dashboard with Plotly and Dash

- Final Assignment: Part 3 - Submission and Grading

- Final Exam: Data Visualization with Python -Timed Quiz

Lesson 3: Course Wrap Up

- Course Summary
- Congratulations and Next Steps
- Thanks from the Course Team

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