Data Visualization with Python

by IBM

About this Course
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.

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Taught by: **Saishruthi Swaminathan**, Data Scientist and Developer Advocate
IBM CODAIT

Taught by: **Dr. Pooja**, Instructor and Subject Matter Expert
Skill-Up Technologies

Basic Info	Course 8 of 12 in the IBM Data Science Specialization
Level	Intermediate
Commitment	3 weeks of study, 4-5 hours/week
Language	English, **Subtitles:** Arabic, French, Bengali, Ukrainian, Chinese (Simplified), Greek, Italian, Portuguese (Brazil), Dutch, Korean, German, Pashto, Urdu, Russian, Thai, Indonesian, Swedish, Turkish, Azerbaijani, Spanish, Dari, Hindi, Japanese, Kazakh, Hungarian, Polish
How To Pass	Pass all graded assignments to complete the course.
User Ratings	Average User Rating 4.5

Syllabus

Module 1

Introduction to Data Visualization Tools

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.

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9 videos, 3 readings

1. **Video:** Welcome to the Course
2. **Reading:** How to Make the Most of this Course
3. **Reading:** Syllabus
4. **Video:** Overview of Data Visualization
5. **Video:** Types of Plots
6. **Video:** Plot Libraries
7. **Video:** Introduction to Matplotlib
8. **Video:** Basic Plotting with Matplotlib
9. **Video:** Dataset on Immigration to Canada
10. **Video:** Line Plots
11. **App Item:** Hands-on Lab: Exploring and Pre-processing a Dataset using Pandas
12. **App Item:** Hands-on Lab: Introduction to Matplotlib and Line Plots
13. **Graded Assignment:** Practice Quiz: Introduction to Data Visualization Tools
14. **Reading:** Summary: Introduction to Data Visualization Tools
15. **Ungraded Plugin:** Cheat Sheet: Data Preprocessing Tasks in Pandas & Plot Libraries

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Graded: Graded Quiz: Introduction to Data Visualization Tools

Module 2

Basic and Specialized Visualization Tools

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.

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7 videos, 1 reading

1. **Video:** Area Plots
2. **Video:** Histograms
3. **Video:** Bar Charts
4. **App Item:** Hands-on Lab: Area Plots, Histograms, and Bar Charts
5. **Graded Assignment:** Practice Quiz: Basic Visualization Tools
6. **Video:** Pie Charts
7. **Video:** Box Plots
8. **Video:** Scatter Plots
9. **Ungraded Plugin:** Reading: Understanding Treemaps and Pivot Charts
10. **App Item:** Hands-on Lab: Pie Charts, Box Plots, Scatter Plots, and Bubble Plots
11. **Video:** Plotting Directly with Matplotlib
12. **App Item:** Hands-on Lab: Plotting Directly with Matplotlib
13. **Graded Assignment:** Practice Quiz: Specialized Visualization Tools
14. **Reading:** Summary: Basic and Specialized Visualization Tools
15. **Ungraded Plugin:** Cheat Sheet: Plotting with Matplotlib using Pandas

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Graded: Graded Quiz: Basic and Specialized Visualization Tools

Module 3

Advanced Visualizations and Geospatial Data

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.

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5 videos, 1 reading

1. **Video:** Waffle Charts & Word Cloud
2. **Video:** Seaborn and Regression Plots
3. **App Item:** Hands-on Lab: Waffle Charts, Word Clouds, and Regression Plots
4. **Graded Assignment:** Practice Quiz: Advanced Visualization Tools
5. **Video:** Introduction to Folium
6. **Video:** Maps with Markers
7. **Video:** Choropleth Maps
8. **App Item:** Hands-on Lab: Creating Maps and Visualizing Geospatial Data
9. **Graded Assignment:** Practice Quiz: Visualizing Geospatial Data
10. **Reading:** Summary: Advanced Visualizations and Geospatial Data
11. **Ungraded Plugin:** Cheat Sheet: Maps, Waffles, WordCloud and Seaborn

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Graded: Graded Quiz: Advanced Visualizations and Geospatial Data

Module 4

Creating Dashboards with Plotly and Dash

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 and discover how to use 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.

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5 videos, 5 readings

1. **Video:** Dashboarding Overview
2. **Reading:** Additional Resources for Dashboards
3. **Video:** Introduction to Plotly
4. **Reading:** Additional Resources for Plotly
5. **App Item:** Plotly Basics: Scatter, Line, Bar, Bubble, Histogram, Pie, Sunburst
6. **Graded Assignment:** Practice Quiz: Creating Dashboards with Plotly
7. **Video:** Introduction to Dash
8. **Ungraded Plugin:** Overview of Cloud IDE Lab Environment
9. **App Item:** Dash Basics: HTML and Core Components
10. **Reading:** Additional Resources for Dash
11. **Video:** Make Dashboards Interactive
12. **Reading:** Additional Resources for Interactive Dashboards
13. **App Item:** Add Interactivity: User Input and Callbacks
14. **Video:** Understanding the Lab Environment
15. **App Item:** Flight Delay Time Statistics Dashboard
16. **Graded Assignment:** Practice Quiz: Working with Dash
17. **Reading:** Summary: Creating Dashboards with Plotly and Dash
18. **Ungraded Plugin:** Cheat Sheet: Plotly and Dash

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Graded: Graded Quiz: Creating Dashboards with Plotly and Dash

Module 5

Final Project and Exam

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.

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3 readings

1. **Ungraded Plugin:** Practice Project Overview
2. **App Item:** Practice Assignment: Part 1 - Analyzing wildfire activities in Australia
3. **App Item:** Practice Assignment: Part 2 - Creating Dashboards
4. **Ungraded Plugin:** Final Project Overview
5. **Reading:** (Optional)Reading: Common Issues in Dash Application
6. **App Item:** Final Assignment: Part 1 - Create Visualizations using Matplotlib, Seaborn & Folium
7. **App Item:** Final Assignment: Part 2 - Create Dashboard with Plotly and Dash
8. **Reading:** Course Summary
9. **Reading:** Congratulations and Next Steps
10. **Reading:** Thanks from the Course Team
11. **Reading:** IBM Digital Badge

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Graded: Final Assignment: Part 3 - Submission and Grading

Graded: Final Exam: Data Visualization with Python - Timed Quiz

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General

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