American Public University System
American Military University | American Public University

DATS225: Data Visualization

Course Summary

DATS225: Data Visualization

Length of Course: 8

Prerequisites: DATS200 Credit Hours: 3

Description

One of the most important functions in data science is the communication of the meaning in data. Data visualization is a core competency that enables that communication. This course introduces students to best practices in the visual and graphical representation of data and meaning. Design principles are emphasized as skills in visual communication develop. The specific tools and methods used in this course will vary depending on current industry standards and preferences. (Prerequisite: DATS200)

Course Scope:

- The main aim of this course is to introduce students to the concepts, approaches, and practical tools used in the analysis, design, and implementation of data visualization' products and systems. To this end, the content of the course is dedicated to developing a fundamental understanding of the subject and the practical knowledge required for creating and using efficient and effective tools for exploring, presenting, and explaining data. As a result, students will learn not only the phases of data visualization projects and stages of the data visualization pipeline, but also engage in such activities as data modeling, mapping of data to visual attributes, examining main perceptual issues and prevalent data visualization paradigms. The following topics are also within the scope of the course: Relevant considerations underlying data visualization methods
- Practical applications of techniques used for data analysis, formatting, and preparation
- Identification and application of the appropriate to data set and the purpose' data visualization methods
- Critical evaluation and rational assessment (via compare and contrast method) of various visualization techniques and approaches
- Application of Python as a practical tool of data analysis and visualization.

Objectives

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

- CO1: Explain different types of data visualization methods.
- CO2: Utilize best practices of data visualization.
- CO3: Derive insights about data using different methods and formats.
- CO4: Evaluate graphical format applicability to data and research.

- CO5: Create graphs with Python programming language.
- CO6: Demonstrate mastery of concept through research, analysis, and presentation.

Outline

Week 1: Introduction to Python & Introduction to Data Science with Python

Learning Outcomes

- CO1: Explain different types of data visualization methods.
    - LO-1: Discuss the importance of data cleaning and data manipulation techniques
    - LO-2: Explain the purpose of the stages of data science projects
- CO5: Create graphs with Python programming language.
    - LO-3: Write and successfully execute basic Python programs

Reading and Resources

Links for all readings are provided in the course e-reserve. This is located in each of the weekly lessons.

- Data Analysis and Visualization Using Python Ch 1
- Practical Python Data Visualization Ch 1

Data visualization for dummies, Yuk, Mico.; Diamond, Stephanie, 2014 Chapter 1: Introducing Data Visualization & Chapter 2: Exploring Common Types of Data Visualizations

• The Big Picture: How-to Use Data Visualization to Make Better Decisions--Faster Wexler, Steve, 2021 (available at APUS' library) CHAPTER 1 WHYNUMBERS ARE NOT ENOUGH & CHAPTER 2 WHYDO WE SEE SO MANYBAR CHARTS?

• Storytelling with Data: A Data Visualization Guide for Business Professionals, Nussbaumer Knaflic, Cole, 2015 (available at APUS' library) Chapter 1 the importance of context & Chapter 2 choosing an effective visual

Assignments (CO3)

- Week 1 Welcome Discussion – For week 1, the discussion is due at the end of the week on Sunday. In subsequent weeks, the initial post is due mid-week.
- Week 1 Exercise set

Take a minute, if you haven't already, and preview the assignments due for this course. Each week, there is a discussion, along with homework exercises to work through.

You also have a project proposal (submit when ready-- prior to the end of week 4) and research project (due week 4) to prepare for the first half of the course and a final project due week 8.

Week 2: The Importance of Data Visualization in BI & Exploring Jupyter Notebook

Learning Outcomes

- CO1: Explain different types of data visualization methods.
    - LO-1: Explain the importance of data visualization and recognize the role of data visualization in decision-making
- CO5: Create graphs with Python programming language.
    - LO-2: Load and use important Python data visualization libraries
    - LO-3: Apply the process of setting up Jupiter Notebook and be able to run Python code in Jupyter Notebook

Reading and Resources

- Data Analysis and Visualization Using PythonCh 2
- Practical Python Data VisualizationCh 2

Supplemental Resources

Conduct your self-training at your own pace. Feel free to request guidance from your instructor regarding the suggested sequence of study along with the variety of topics offered by the additional materials. You can access the content from the links provided.

Data visualization for dummies, Yuk, Mico.; Diamond, Stephanie, 2014
(Available through the APUS library(this link opens in a new window/tab))
Chapter 3: Knowing What You Must about Big Data & Chapter 4: Using Charts Effectively

The Big Picture: How to Use Data Visualization to Make Better Decisions--Faster
Wexler, Steve, 2021
(Available through the APUS library(this link opens in a new window/tab))
Chapter 3: How and When to Use Color

Storytelling with Data: A Data Visualization Guide for Business Professionals, Nussbaumer Knaflic, Cole, 2015
(Available through the APUS library(this link opens in a new window/tab))
Chapter 3: Clutter is Your Enemy!

Assignments

- Week 2 Discussion
- Week 2 Exercise Set

Week 3: Data Collection Structures & Data Visualization with Leather

Learning Outcomes

- CO5: Create graphs with Python programming language.
    - LO-1: Create and utilize data collection structures in Python and their implementations
- CO4: Evaluate graphical format applicability to data and research.
    - LO-2: Discuss various implementations of data collection structures in Python
- CO3: Derive insights about data using different methods and formats.
    - LO-3: Identify visualizations, styles, and scales, and be able to discuss their implementations in Python.

Reading and Resources

Links for all readings are provided in the course e-reserve. This is located in each of the weekly lessons.

- Data Analysis and Visualization Using Python Ch 3
- Practical Python Data Visualization Ch 3

Supplemental Resources

Conduct your self-training at your own pace. Feel free to request guidance from your instructor regarding the suggested sequence of study along with the variety of topics offered by the additional materials. You can access the content from the links provided.

Data visualization for dummies, Yuk, Mico.; Diamond, Stephanie, 2014
(Available through the APUS library(this link opens in a new window/tab))
Chapter 5: Adding a Little Context & Chapter 6: Paying Attention to Detail

The Big Picture: How to Use Data Visualization to Make Better Decisions--Faster
Wexler, Steve, 2021
(Available through the APUS library(this link opens in a new window/tab))
Chapter 4: What Charts You Should Know and Love (and Sometimes Loathe)

Storytelling with Data: A Data Visualization Guide for Business Professionals, Nussbaumer Knaflic, Cole, 2015
(Available through the APUS library(this link opens in a new window/tab))
Chapter 4: Focus Your Audience's Attention

Assignments

- Week 3 Discussion

- Week 3 Exercise Set

Week 4: File I/O Processing and Regular Expressions & Scientific Python Ecosystem and NumPy

Learning Outcomes

- CO5: Create graphs with Python programming language.
  - LO-1: Implement input-output functions and file processing in Python
  - LO-3: Describe the scientific Python ecosystem in general and its fundamental components in particular
- CO6: Demonstrate mastery of concept through research, analysis, and presentation.
  - LO-2: Discuss regular expressions and to learn how to use Python to extract pattern-specific data
  - LO-4: Prepare and present the content of a research paper in a professional manner

Reading and Resources

- Data Analysis and Visualization Using PythonCh 4
- Practical Python Data VisualizationCh 4

Supplemental Resources

Conduct your self-training at your own pace. Feel free to request guidance from your instructor regarding the suggested sequence of study along with the variety of topics offered by the additional materials. You can access the content from the links provided.

Data visualization for dummies, Yuk, Mico.; Diamond, Stephanie, 2014
(Available through the APUS library(this link opens in a new window/tab))
Chapter 7: Defining an Easy-to-Follow Storyboard & Chapter 8: Developing a Clear Mock-Up

The Big Picture: How to Use Data Visualization to Make Better Decisions--Faster
Wexler, Steve, 2021
(Available through the APUS library(this link opens in a new window/tab))
Chapter 5: How to Get People to Use Charts and Dashboards

Storytelling with Data: A Data Visualization Guide for Business Professionals, Nussbaumer Knaflic, Cole, 2015
(Available through the APUS library(this link opens in a new window/tab))
Chapter 5: Think Like a Designer

Assignments

- Week 4 Discussion
- Week 4 Exercise Set
- Week 4 Course Project Proposal
- Course Research Paper

Week 5: Data Gathering and Cleaning & Data Visualization with NumPy and Matplotlib

Learning Outcomes

- CO1: Explain different types of data visualization methods and CO2: Utilize best practices of data visualization.
    - LO-1: Explain the process of data gathering, cleaning, and extraction and be able to apply various techniques for handling missing data
- CO4: Evaluate graphical format applicability to data and research
    - LO-2: Implement the procedures for merging and integrating data from different sources
- CO5: Create graphs with Python programming language
    - LO-3: Apply various Python-based customizations available for the purposes of data visualization

Reading and Resources

Links for all readings are provided in the course e-reserve. This is located in each of the weekly lessons.

- Data Analysis and Visualization Using Python
  Ch 5
- Practical Python Data Visualization
  Ch 5

Supplemental Resources

Conduct your self-training at your own pace. Feel free to request guidance from your instructor regarding the suggested sequence of study along with the variety of topics offered by the additional materials. You can access the content from the links provided.

Data visualization for dummies, Yuk, Mico.; Diamond, Stephanie, 2014
(Available through the APUS library(this link opens in a new window/tab))
Chapter 9: Adding Effective Visuals to Your Mock-Up & Chapter 10: Adding Functionality and Applying Color

The Big Picture: How to Use Data Visualization to Make Better Decisions--Faster
Wexler, Steve, 2021

(Available through the APUS library(this link opens in a new window/tab))
Chapter 6: Why Collaboration is Critical

Storytelling with Data: A Data Visualization Guide for Business Professionals, Nussbaumer Knaflic, Cole, 2015
(Available through the APUS library(this link opens in a new window/tab))
Chapter 6: Dissecting Model Visuals

What you should remember

Below is a high level overview of some of the concepts for the week. This is not a replacement of what is covered in the required reading chapters for the week. Instead, this provides context to help transition into the lessons for the week. Please be sure to read the required text for the week to gain more insights.

Assignments

- Week 5 Discussion
- Week 5 Exercise Set

Week 6: Data Exploring and Analysis & Visualizing Images and 3D Shapes

Learning Outcomes

- CO3: Derive insights about data using different methods and formats.
    - LO-1: Implement Python techniques used to explore and analyze a series of data, to apply statistical methods on a panel data and methods of statistical analysis on the derived data
- CO5: Create graphs with Python programming language.
    - LO-2: Visualize images and be able to perform basic operations on images such as arithmetic operations
    - LO-3: Discuss the process of writing programs for 3D visualizations

Reading and Resources

Links for all readings are provided in the course e-reserve. This is located in each of the weekly lessons.

- Data Analysis and Visualization Using Python
  Ch 6
- Practical Python Data Visualization
  Ch 6

Supplemental Resources

Conduct your self-training at your own pace. Feel free to request guidance from your instructor regarding the suggested sequence of study along with the variety of topics offered by the additional materials. You can access the content from the links provided.

Data visualization for dummies, Yuk, Mico.; Diamond, Stephanie, 2014
(Available through the APUS library(this link opens in a new window/tab))
Chapter 11: Adding Some Finishing Touches & Chapter 12: Exploring User Adoption

Assignments

- Week 6 Discussion
- Week 6 Exercise Set

Week 7: Data Visualization & Visualizing Graphs and Networks

Learning Outcomes

- CO5: Create graphs with Python programming language
    - LO-1: Apply the process for plotting data from a series, data frame, or panel using Python plotting tools
    - LO-2: Implement different types of data visualizations using the Seaborn and Matplotlib plotting systems.
    - LO-3: Apply the methods of Python for visualizing graphs and networks

Reading and Resources

Links for all readings are provided in the course e-reserve. This is located in each of the weekly lessons.

- Data Analysis and Visualization Using Python
  Ch 7
- Practical Python Data Visualization
  Ch 7

Supplemental Resources

Conduct your self-training at your own pace. Feel free to request guidance from your instructor regarding the suggested sequence of study along with the variety of topics offered by the additional materials. You can access the content from the links provided.

Data visualization for dummies, Yuk, Mico.; Diamond, Stephanie, 2014
(Available through the APUS library(this link opens in a new window/tab))
Chapter 13: Evaluating Real Data Visualizations & Chapter 14: Recognizing Newbie Pitfalls

The Big Picture: How to Use Data Visualization to Make Better Decisions--Faster
Wexler, Steve, 2021
(Available through the APUS library(this link opens in a new window/tab))
Chapter 8: Why Knowing Your Audience is Essential

Storytelling with Data: A Data Visualization Guide for Business Professionals, Nussbaumer Knaflic, Cole, 2015
(Available through the APUS library(this link opens in a new window/tab))
Chapter 8: Pulling it All Together

Assignments

- Week 7 Discussion
- Week 7 Exercise Set

Week 8: Getting Started with Pandas, Case Studies & Working with COVID-19 Data

Learning Outcomes

- CO5: Create graphs with Python programming language.
    - LO-1: Apply the process for plotting data from a series, data frame, or panel using Python plotting tools
    - LO-2: Implement different types of data visualizations using the Seaborn and Matplotlib plotting systems
    - LO-3: Apply the methods of Python for visualizing graphs and networks
- CO6: Demonstrate mastery of concept through research, analysis, and presentation.
    - LO-4: Prepare and present the content of a research project in a professional manner

Reading and Resources

Links for all readings are provided in the course e-reserve. This is located in each of the weekly lessons.

- Data Analysis and Visualization Using Python
  Ch 8
- Practical Python Data Visualization
  Ch 8

Supplemental Resources

Conduct your self-training at your own pace. Feel free to request guidance from your instructor regarding the suggested sequence of study along with the variety of topics offered by the additional materials. You can access the content from the links provided.

Data visualization for dummies, Yuk, Mico.; Diamond, Stephanie, 2014
(Available through the APUS library(this link opens in a new window/tab))

Chapter 15: Top Ten Data Visualization Resources & Chapter 16: Top Ten Fears of New Data-Viz Creators

The Big Picture: How to Use Data Visualization to Make Better Decisions--Faster
Wexler, Steve, 2021
(Available through the APUS library(this link opens in a new window/tab))
Chapter 8: Why Knowing Your Audience Is Essential

Storytelling with Data: A Data Visualization Guide for Business Professionals, Nussbaumer Knaflic, Cole, 2015
(Available through the APUS library(this link opens in a new window/tab))
Chapter 9: Case Studies & Chapter 10: Final Thoughts

Assignments

- Week 8 Discussion
- Week 8 Exercise Set
- Course Project

Evaluation

me and maybe more flexible if potential delays are communicated ahead of time.*

Grading

Name	*Grade %*
Discussions	25%
Exercise Sets	25%
Course Project	30%
Course Research Paper	20%
Total	100%

Materials

Book Title:

1. Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems, by Embarak, Ossama, 2018 Publisher: Berkeley, CA: Apress L. P ISBN-10 : 1484241088 Page: 8 of 11 Date:

2/1/2024 6:46:48AM ISBN-13 : 978-1484241080 Note: the textbook is referenced in the syllabus as “DA&V Using Python, Chapter #”

2. Practical Python Data Visualization: A Fast Track Approach to Learning Data Visualization with Python, by Pajankar, Ashwin, 2020 Publisher: Berkeley, CA: Apress L. P ISBN-10 : 1484264541 ISBN-13 : 978-1484264546 Note: the textbook is referenced in the syllabus as “Practical Python DV, Chapter #”

Course Guidelines

Writing Expectations

Allactivitiescompleted in thiscourseareto followthestated instructions (insidetheclassroom). Alwayscheck the grading rubrics to see what your instructor will be on thelookout for when grading your work. Also, besure you haveread the APUS PlagiarismPolicy (theentire Academic Dishonesty section) beforesubmittingwork in this or in any othercourse. See theabove Course Outline or the Policies section on this Syllabus for links

Citation and Reference Style

Attention:Youwillfollowthecitation stylethat iscommon to your discipline. Instructions regarding citation stylesare included in theclassroom.

Late Assignments

Students are expected to submit assignments by the due dates listed in the classroom. Late assignments, including but not limited to Assignments, Discussions, posts and responses, quizzes, and exams, may or may not be accepted after the course end date. Submitting an assignment after the due date may result in a penalty of up to 10% of the grade per day late, not to exceed a maximum 50% of the grade. The amount of the penalty is at the faculty member’s discretion. Faculty recognize that students have limited time and maybe more flexible if potential delays are communicated ahead of time.*

*Doctoral and Programs with specialty accreditation may have different late policies.

**Students with DSA accommodations may have different late policies applied. For more information regarding our DSA services, please contact DSA@apus.edu.

Also, completing all Assignments (under the Assignments tab) is paramount to your success in this course.

Netiquette

Online universities promote the advancement of knowledge through positive and constructive debate, both inside and outside the classroom. Forums on the Internet, however, can occasionally degenerate into needless insults and flaming. Such activity and the loss of good manners are not acceptable in a university setting. Basic academic rules of good behavior and proper Netiquette must persist. Remember that you are in a place for the rewards and excitement of learning, which does not include descent to personal attacks orstudent attempts to stifle the learning of others.

- Humor Note: Despite the best of intentions, jokes and especially satire can easily get lost or taken seriously. If you feel the need for humor, you may wish to add emoticons to help alert your readers: ;-), :), .

Disclaimer Statement

Course content may vary from the outline to meet the needs of this particular group.

Communications

Student Communication

To reach the instructor, please communicate through the MyClassroom email function accessible from the Classlist of the Course Tools menu, where the instructor and students email addresses are listed, or via the Office 365 tool on the Course homepage.

- In emails to instructors, it's important to note the specific course in which you are enrolled. The name of the course is at the top center of all pages.
- Students and instructors communicate in Discussion posts and other learning activities.
- All interactions should follow APUS guidelines, as noted in the Student Handbook, and maintain a professional, courteous tone.
- Students should review writing for spelling and grammar.
- Tips on Using the Office 365 Email Tool

Instructor Communication

The instructor will post announcements on communications preferences involving email and Instant Messaging and any changes in the class schedule or activities.

- Instructors will periodically post information on the expectations of students and will provide feedback on assignments, Discussion posts, quizzes, and exams.
- Instructors will generally acknowledge student communications within 24 hours and respond within 48hours, except in unusual circumstances (e.g., illness).
- The APUS standard for grading of all assessments (assignments, Discussions, quizzes, exams) is five days or fewer from the due date.
- Final course grades are submitted by faculty no later than seven days after the end date of the course or the end of the extension period.

University Policies

Consult the Student Handbook for processes and policies at APUS. Notable policies:

- Drop/Withdrawal Policy
- Extension Requests
- Academic Probation
- Appeals
- Academic Dishonesty / Plagiarism
- Disability Accommodations
- Student Deadlines
- Video Conference Policy

Mission

The mission of American Public University System is to provide high-quality higher education with emphasis on educating the nation's military and public service communities by offering respected, relevant, accessible, affordable, and student-focused online programs that prepare students for service and leadership in a diverse, global society.

Minimum Technology Requirements

- Please consult the catalog for the minimum hardware and software required for undergraduate and graduate courses.
- Although students are encouraged to use the Pulse mobile app with any course, please note that not all course work can be completed via a mobile device.

Disclaimers

- Please note that course content – and, thus, the syllabus – may change between when a student registers for a course and when the course starts.
- Course content may vary from the syllabus' schedule to meet the needs of a particular group.