**High Impact Skills Development Program**

**in Artificial Intelligence, Data Science, and Blockchain**

**Module 3: Data Visualization**

Lab 6: Advanced Interactive Data Visualization Using Python and ChatGPT

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# Objective:

In this lab, you will create advanced data visualizations using Python’s Matplotlib library, focusing on different graphs and adding interactivity to them. This hands-on session will deepen your understanding of advanced Matplotlib functionalities, from creating complex layouts with GridSpec to incorporating interactivity into your visualizations.

# Materials Needed:

* Python and any preferred IDE
* ChatGPT

# Dataset:

* Superstore Dataset

# Lab Work:

## Task 1: Subplots and GridSpec Layout

In this task, you will use Matplotlib's `GridSpec` to create a layout with multiple subplots showing different visualizations from the Superstore dataset.

* Setup the Layout:
* Create Subplots:
  + Use the first subplot for a bar chart of total sales by category.
  + Use the second subplot for a scatter plot of sales vs. profit.
  + Use the third subplot for a pie chart of sales distribution by region.
  + Sample code to add a graph to one subplot is given below. Use the similar pattern to generate add other subplots.
* Adjust Layout:



## Task 2: Combining Different Types of Plots

In this task, you will combine a line plot and a bar chart in the same figure to compare monthly sales trends against the number of orders.

* Using twinx() method to get two axes in the same graph
* Customize and Enhance the Plot:
* Add titles, axis labels, and a legend.
* Adjust the scales of the two axes to make the comparison clearer.

## Task 3: Adding Interactivity - Hover Tooltips

In this task, you will add basic interactivity to your plot by displaying tooltips when hovering over data points.

* Generate basic code to add tooltips using the following ChatGPT prompt

*“Create a Python script using Matplotlib to generate a scatter plot of sales versus profit from a dataset. Add interactivity such that when a user hovers over a data point, a tooltip appears showing the sales and profit values. Include the necessary code to annotate the scatter plot and connect the hover event to display the tooltip.”*

* Customize the Interactivity:
  + Modify the tooltip to show additional information such as the state name or category.

## Task 4: Adding Interactivity - Zoom and Pan

* Get Basic Code from ChatGPT using the following prompt:

*“Generate a Python script using Matplotlib that allows for zoom and pan functionality on a line plot of sales versus profit. Implement zooming by left-clicking on a point, which should adjust the view to center around the clicked point with a small range. Additionally, add the ability to reset the view to the original scale with a right-click. The code should include event handlers for mouse clicks to handle zooming and resetting the view.”*

* Enhance the Functionality:
  + Add the ability to reset the zoom and pan to the original scale.
  + Include instructions for panning with click-and-drag.

# Additional Resources for Self-Learning:

* [Matplotlib Subplot](https://www.w3schools.com/python/matplotlib_subplot.asp)
* [Customizing Location of Subplot Using GridSpec](https://omz-software.com/pythonista/matplotlib/users/gridspec.html)
* [18. Gridspec in Matplotlib](https://python-course.eu/numerical-programming/gridspec-in-matplotlib.php)
* [Tooltips with Python’s Matplotlib](https://towardsdatascience.com/tooltips-with-pythons-matplotlib-dcd8db758846)
* [Interactive navigation](https://matplotlib.org/3.2.2/users/navigation_toolbar.html)