**README for CYBR 486 - Lab #2: Plotting Iris Data**

**Overview**

This lab explores data visualization techniques using Python libraries such as matplotlib, seaborn, numpy, and pandas. The objective is to analyze and visualize the Iris dataset to gain insights into its structure and relationships. The lab includes a variety of plot types such as line plots, bar plots, scatter plots, pie charts, and heatmaps.

**Objectives**

1. Learn the basics of data visualization using Python.
2. Use matplotlib and seaborn to create different types of plots.
3. Explore the Iris dataset to understand data distribution and relationships.
4. Practice creating meaningful and visually appealing plots.

**Files**

* **Lab Notebook**: Contains the Python code for creating all visualizations.
* **iris.csv**: The dataset used for the lab, which includes measurements of sepal and petal dimensions for three Iris species: Setosa, Versicolor, and Virginica.
* **Images**: Screenshots or generated images of the plots created during the lab.

**Steps Performed**

1. **Basic Plots**:
   * Demonstrated line plots, bar charts, and scatter plots using synthetic data.
2. **Custom Graphs**:
   * Created customized line and bar plots to visualize quadratic growth.
3. **Iris Dataset Analysis**:
   * Visualized relationships between different measurements (e.g., petal length vs. ID).
   * Created bar plots for sepal width distribution.
4. **Frequency Analysis**:
   * Generated bar and pie charts to display the frequency of Iris varieties.
5. **Data Relationships**:
   * Plotted scatter plots to explore relationships between sepal and petal dimensions.
6. **Seaborn Visualizations**:
   * Used Seaborn to create scatter plots with color-coded Iris varieties.
7. **Correlation Heatmaps**:
   * Built heatmaps to show correlations among numerical attributes, both variety-agnostic and grouped by Iris variety.

**Requirements**

To run the code in this lab, the following Python libraries must be installed:

* numpy
* pandas
* matplotlib
* seaborn

Install these libraries using:

bash

Copy code

pip install numpy pandas matplotlib seaborn

**Usage Instructions**

1. Load the iris.csv file into the same directory as the Python notebook or script.
2. Open the notebook or script in an IDE such as Jupyter Notebook, Google Colab, or any Python editor.
3. Execute the cells sequentially to generate the plots.

**Outputs**

This lab generates the following visualizations:

* Line, bar, and scatter plots for synthetic and Iris data.
* A pie chart showing the distribution of Iris varieties.
* Scatter plots and Seaborn scatterplots for exploring relationships between features.
* Heatmaps illustrating correlation matrices.

**Key Learnings**

* Data visualization techniques can reveal patterns and insights in datasets.
* Matplotlib provides basic plotting capabilities, while Seaborn enhances visualizations with ease.
* Proper customization (e.g., labels, titles, and colors) improves plot readability and interpretability.

**Improvements**

For future labs, consider adding:

* Interactivity using tools like plotly or dash.
* Statistical summaries alongside the visualizations.
* Advanced visualizations, such as box plots or violin plots.

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