Lab 3: Advanced Data Visualization with 3D Techniques

Objective:
In this lab, you will further enhance your data visualization skills by creating three meaningful 3D visualizations using Python. Building on your previous work, this assignment requires you to leverage Python's 3D visualization libraries (such as Matplotlib's mplot3d or Plotly) to explore and present data in three dimensions. Your visualizations should reveal new insights by adding a spatial dimension to your analysis.

Instructions:

Data Set Selection and Overview:
Choose one dataset from the UCI Machine Learning Repository (https://archive.ics.uci.edu/datasets), ensuring you do not select the Iris dataset. Begin your lab by providing a brief explanation of the selected dataset. This overview should include details about its origin, intended purpose, and key features. Use Python (for example, the `head()` function) to display a sample of the raw data, giving an insight into the structure of the dataset. This explanation and data preview should be presented in Markdown cells if you are using a Jupyter Notebook, or as comments if you are working in a Python script.

3D Visualizations:
Generate **five** meaningful 3D visualizations using Python's 3D plotting tools. Each visualization should focus on different aspects or dimensions of the dataset. For each visualization, include clear annotations in Markdown cells (or in-line comments) that cover the following:

- **Purpose and Rationale:**
  Explain what aspect of the dataset you are visualizing in three dimensions. Describe the specific research question or data relationship that your visualization is intended to address.
- **Big Takeaway:** What is the most important observation you want your readers to take away?

You may use various 3D visualization techniques such as scatter plots, surface plots, or wireframe plots. Be creative in your choice of visualizations, and ensure that each one offers a distinct perspective on your dataset.

Saving Visualizations:
Save each of your 3D visualizations as an image file. Name each image using the following format: `<YourName+Title>.png` (for example, if your name is JaneDoe and your first visualization is titled "3DScatterAnalysis," then name the file `JaneDoe_3DScatterAnalysis.png`). This naming convention will help keep your files organized and easily identifiable.

Code Documentation:
Ensure that your code is well-documented throughout. Include clear comments explaining your logic, the steps taken, and any assumptions made during the visualization process. Your

documentation should allow someone who is unfamiliar with your work to easily follow your process and understand your 3D visualizations.

Submission:
Upload all your deliverables—including your Python script or Jupyter Notebook containing the 3D visualizations and the saved image files—to a well-organized **GitHub** repository.

Finally, submit the GitHub repository link through **Canvas** as instructed.