**Week 5 - Lab Assignment: Interactive Dashboard with Filtering & Drill-down**

**Objective**

In this assignment, you will **build an interactive dashboard** that allows users to explore sales data using:

* **Filtering:** Users can select **regions, product categories, and years** to refine the data.
* **Drill-down:** Users can start at the **year level** and drill down into **monthly** and **category-level** sales.
* **Multiple Visualizations:** At least **two types of charts** should be included.

This assignment will test your ability to create **interactive, user-friendly visualizations** that enhance data exploration.

**Dataset**

📌 **Use the Sample Supermarket Dataset from Kaggle:**  
<https://www.kaggle.com/datasets/bravehart101/sample-supermarket-dataset>

Columns available:

* **Date**: The date of transaction
* **Region**: Sales region
* **Category**: Product category
* **Sales**: Revenue generated

If you use a different dataset, **document all modifications**.

**Tasks**

**1. Filtering (Dropdown Menus)**

* Create a dashboard where users can **filter sales by:**
  + **Region**
  + **Product Category**
  + **Year**
* Ensure the **charts update dynamically** when the filters change.

**2. Drill-down (Year → Month → Category)**

* The first chart should **display yearly sales**.
* When a user **clicks on a year**, a second chart should **update to show monthly sales**.
* When a user **clicks on a month**, a third chart should **display sales by product category** for that month.

**3. Multiple Views & Chart Types**

* Include at least **two types of visualizations**, such as:
  + **Bar Chart**: Comparing sales across different categories.
  + **Line Chart**: Showing sales trends over time.
  + **Map**: Displaying sales across regions.

✅ **Bonus:** Add a **heatmap or scatter plot** to show correlations in sales trends.

**4. User Interaction & Usability**

* Ensure **smooth interaction** between filters and charts.
* Display **hover tooltips** for detailed sales information.
* Format numbers properly (e.g., currency for sales).

**Optional tasks**

This is optional and only for students who want an extra challenge, you don’t need to submit it and you can complete it later at your own pace:

**5. Advanced Analytics (Optional)**

🔍 **Task:** **Enhance the dashboard with additional insights, such as:**

* **Sales Forecasting:** Use a simple time-series model (e.g., ARIMA, Prophet) to predict next month's sales.
* **Customer Segmentation:** If customer data is available, apply **K-Means clustering** to analyze purchasing behavior.
* **Market Basket Analysis:** If transaction details are available, implement **association rule mining** (Apriori algorithm) to find frequent item sets.
* **Real-time Updates:** Simulate a **streaming dashboard** that updates sales in real time.

This section is **optional** for undergraduate students but **recommended for PhD students**.

**Submission Requirements**

* **Python script or Jupyter Notebook (.ipynb)** containing all code.