OVERVIEW OF THE PROJECT

Project Name – End-to-End Retail Performance and Behavioral Analytics

OBJECTIVE :

The objective of this project is to design and implement an end-to-end Business Intelligence solution that transforms raw retail data (sales, customers, products, stores, returns) into a unified, interactive Power BI dashboard.

TOOLS USED :

1. **Data Cleaning & Preparation**
    - **Excel** → Handled missing values, duplicates, and formatting.
    - **Python (Pandas, NumPy)** → Performed exploratory data analysis (EDA) and advanced cleaning where required.
2. **Database & Querying**
    - **MySQL** → Designed ER diagram, built relationships, stored, and cleaned tables.
    - **SQL** → Used for joins, aggregations, and KPI calculations (e.g., revenue, profit, return rates).
3. **Visualization & Reporting**
    - **Power BI** → Created interactive dashboards with slicers/filters (by date, region, category).
    - Used **charts** to represent insights (sales trends, customer segments, product/category performance, returns).
4. **Presentation & Documentation**
    - **PowerPoint** → Prepared business insight presentations with findings, interpretations, and recommendations.
    - **Word/PDF** → Documentation of methodology, insights, and executive summary.

STEPS:

- **Python via PyCharm & Jupyter Notebook**
  - Performed **data cleaning and preprocessing**, including handling duplicates, missing values, and formatting issues.
  - Developed **calculated fields** such as profit and return rate for deeper analysis.
  - Ensured **data consistency and integrity** across all datasets before loading into MySQL.
  - Libraries used: **Pandas, NumPy, Matplotlib, Seaborn**.

- **SQL**
  - All cleaned datasets (**Sales, Customers, Products, Stores, Returns**) were imported and stored in a **MySQL relational database** for centralized access and management.
  - **Database schema design/ modelling** was carried out by creating tables and establishing **relationships** through **primary and foreign keys**, resulting in a well-defined **ER Diagram**.
  - As part of this, a new row was inserted into the **Stores table** to represent the *online store*, ensuring that the foreign key relationships between Sales and Stores worked correctly.

    ```
    INSERT INTO stores VALUES ('online_store', 'online', 'online', 'online', 'online', 0);
    ```

  - A set of **10 SQL-based business queries** was developed to answer key questions such as Top 5 products by sales, monthly revenue trend, store profitability, and return rates.
  - SQL was extensively used for **data transformation and analysis**, including:
    - **Filtering** data using WHERE clauses.
    - **Grouping and aggregation** using GROUP BY and aggregate functions (SUM, COUNT, AVG).
    - **Ranking and partitioning** using PARTITION BY for advanced analytics, such as identifying top customers per region.

- PowerBI
    - Designed and developed a **comprehensive interactive dashboard** that consolidated insights from multiple domains, including **Sales performance, Customer segmentation, Product & Category analysis, and Return behavior patterns**.
    - The dashboard included a wide range of **Key Performance Indicators (KPIs)** such as Total Revenue, Profit, Quantity Sold, Average Order Value, Customer Count, and Return Rate, allowing management to track performance at a glance.
    - Built relationships between fact tables (Sales, Returns) and dimension tables (Customers, Products, Stores).
    - Implemented **interactive features** such as:
        - **Filters and slicers** for dynamic exploration by region, category, time period, and sales channel.
        - **Drilldowns** from yearly to monthly and daily levels, enabling users to move seamlessly between high-level overviews and detailed transaction-level insights.
- **Business Insights & Recommendations**
    - Interpreted dashboard findings to highlight key insights (e.g., top-performing regions, profitable customer segments, high-return categories).
    - Provided **actionable recommendations** for improving sales, customer retention, and reducing returns.
- **Documentation & Presentation**
    - Compiled project steps, findings, and recommendations into a structured **Word/PDF report**.
    - Designed a **PowerPoint presentation** to communicate results to stakeholders.