**Retail Business Performance & Profitability Analysis**

**1. Introduction**

In today's competitive retail landscape, understanding business performance through data is critical to ensure profitability, manage inventory efficiently, and align supply with seasonal demand. This project focuses on analyzing a transactional retail dataset to uncover profit-draining product segments, optimize inventory turnover, and identify seasonal product behavior patterns. The ultimate goal is to derive actionable insights that help improve operational efficiency and profitability.

**2. Abstract**

We analyzed a comprehensive retail dataset containing transaction-level information such as product categories, customer demographics, sales, costs, inventory levels, and regions. The project was executed in three key stages:

* Data Cleaning , Transformation and Analysis (Python)
* Visualization & Insight Derivation (Power BI)

The final outputs include a Power BI dashboard, cleaned and exported data files, and strategic recommendations for improving business outcomes.

**3. Tools Used**

* **Python (Pandas):** For data aggregation, profit margin calculations and For data preprocessing, profit computation, inventory turnover analysis, and seasonality segmentation
* **Power BI:** For building an interactive dashboard with KPIs, charts, and filters

**4. Steps Involved in Building the Project**

**Step 1: Data Cleaning (Python – Pandas)**

* Handled missing values in gender, region, cost price, and age using mean/mode imputation
* Removed duplicates and converted relevant fields to categorical types

**Step 2: Profit Margin Analysis ( Python)**

* Calculated profit and profit margin per transaction
* Aggregated profit by Category and Sub-Category

**Step 3: Inventory Turnover & Correlation**

* Computed Average Inventory and Inventory Days
* Found negative correlation between Inventory Days and Profit

**Step 4: Seasonality Analysis**

* Derived seasons using transaction date
* Analyzed seasonal profit patterns by product category

**Step 5: Strategic Flagging**

* Identified **Slow-Moving** items based on high inventory days and low profit
* Flagged **Overstocked** products using inventory imbalance logic

**Step 6: Data Export**

* Exported cleaned datasets for use in Power BI

**Step 7: Power BI Dashboard**

* Created 3 pages:
  + **Overview:** KPIs, profit by category, region-based sales
  + **Inventory:** Inventory Days vs Profit, stock performance
  + **Seasonality:** Profit trends by season, top/worst seasonal performers

**5. Conclusion**

This analysis helped reveal several critical insights:

* Some sub-categories had high sales but low margins — needing pricing or cost optimization.
* Overstocked items with low profitability present cost-saving opportunities through better inventory planning.
* Seasonality plays a significant role — some products perform far better in specific seasons, suggesting marketing and stocking adjustments.

**Future Scope:**  
The project can be extended by integrating real-time inventory feeds, forecasting models, and customer-level segmentation for targeted promotions.