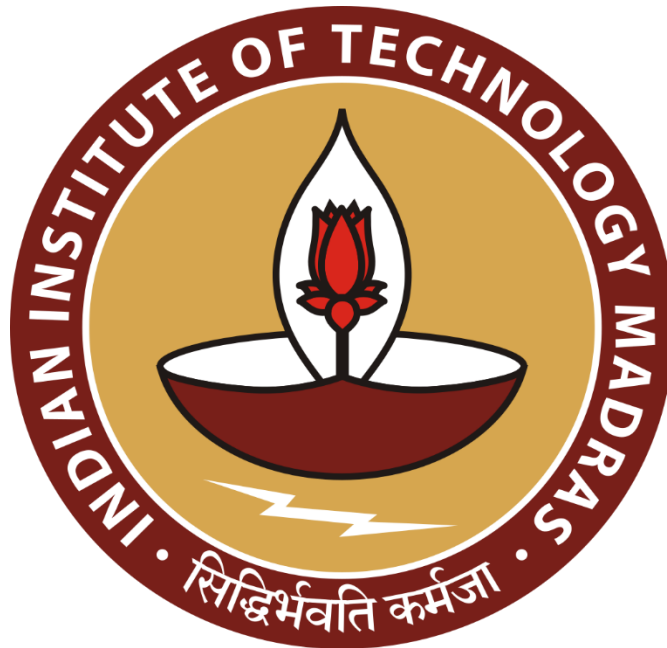# Inventory and Product Optimization through Sales Analytics of a Fashion Outlet

**Mid Term Submission for the BDM Capstone Project**

Submitted by

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IIT MADRAS BS DEGREE PROGRAM

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# **Contents**

# 1. <u>EXECUTIVE SUMMARY</u>

This BDM capstone project, on the subject of Inventory and Product Optimization through Sales Analytics of a Fashion Outlet, The Elegant, a B2C clothing and footwear store located at Ambedkar Chauraha, Rath, Hamirpur (Uttar Pradesh), has its core intention of identification of inefficiencies in stock management, addressing challenges related to overstock and understock, and making data-driven recommendations to increase profitability and improve operational efficiency.

A detailed monthly sales data analysis revealed recurring overstock issues in specific categories, such as *T-Shirt SN43 in May, Benttek Fashion in June and July, Zara G & T-Shirt A80 in August, and multiple items in September and October*. These trends indicate stock accumulation due to excess purchases or slow-moving inventory. Understocking was primarily observed in *Kurta Pajama (KPC & KPB) during October*, attributed to high demand during festive seasons like *Dussehra and Diwali*. This highlights the need for improved demand forecasting to ensure sufficient stock levels during peak periods.

Additionally, *The Elegant* faces challenges such as thin margins on fast-moving items, outdated inventory affecting turnover, and seasonal supply-demand imbalances. To address these, the project employs data analytics techniques, including real-time inventory tracking, sales trend identification, and forecasting models. Data cleaning, visualization, and correlation analysis were conducted to understand stock movement patterns and their impact on revenue.

The insights derived from this study will help *The Elegant* optimize procurement strategies, streamline stock clearance processes, and align inventory levels with consumer demand. By reducing overstock, preventing seasonal shortages, and improving stock turnover, the business can enhance customer satisfaction, minimize financial losses, and drive sustainable growth.

This analysis forms the foundation for informed decision-making, equipping *The Elegant* with actionable insights to improve inventory management, increase profitability, and maintain a competitive edge in the retail market.
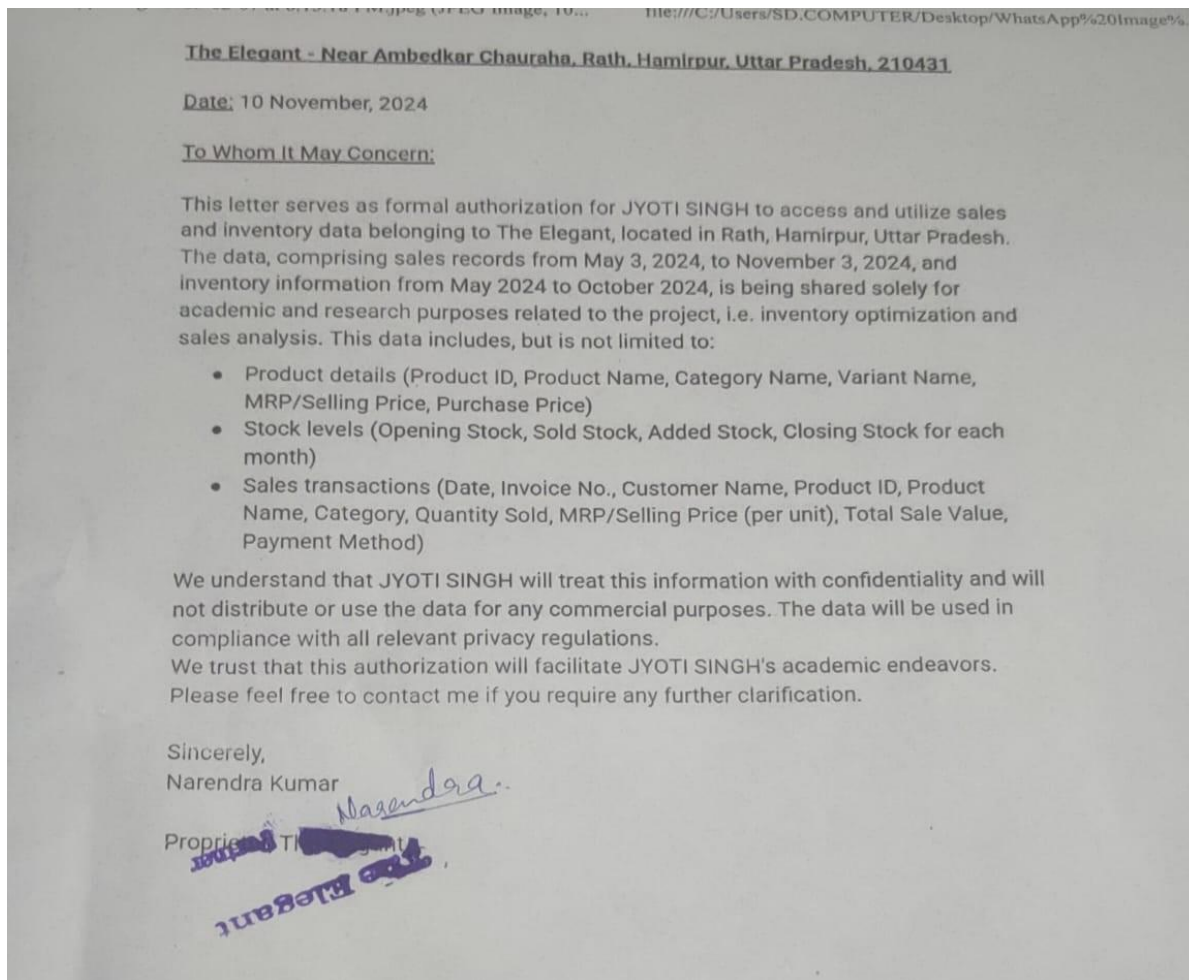
# 2. <u>PROOF OF ORIGINALITY</u>

The data applied in this project is primary data, which is collected directly by interacting with the business owner through one-on-one interactions. The business uses a digital inventory management system, in which all the product details including sales and stock levels are recorded using barcode scanning. The data is maintained in digital formats, and it was exported to Excel for analysis. This ensures that the data is accurate, systematically recorded, and directly obtained from the business operations, confirming its originality and authenticity for the study.

<u>Link to the photos, video, data, and other related files:</u>

https://drive.google.com/drive/folders/1Gff4MHouEXZ3cON3KrLF9_XnAHSWokY-?usp=sharing

<u>Letter from the organization:</u>



**The Elegant - Near Ambedkar Chauraha, Rath, Hamirpur, Uttar Pradesh, 210431**

Date: 10 November, 2024

To Whom It May Concern:

This letter serves as formal authorization for JYOTI SINGH to access and utilize sales and inventory data belonging to The Elegant, located in Rath, Hamirpur, Uttar Pradesh. The data, comprising sales records from May 3, 2024, to November 3, 2024, and inventory information from May 2024 to October 2024, is being shared solely for academic and research purposes related to the project, i.e. inventory optimization and sales analysis. This data includes, but is not limited to:

- Product details (Product ID, Product Name, Category Name, Variant Name, MRP/Selling Price, Purchase Price)
- Stock levels (Opening Stock, Sold Stock, Added Stock, Closing Stock for each month)
- Sales transactions (Date, Invoice No., Customer Name, Product ID, Product Name, Category, Quantity Sold, MRP/Selling Price (per unit), Total Sale Value, Payment Method)

We understand that JYOTI SINGH will treat this information with confidentiality and will not distribute or use the data for any commercial purposes. The data will be used in compliance with all relevant privacy regulations.
We trust that this authorization will facilitate JYOTI SINGH's academic endeavors. Please feel free to contact me if you require any further clarification.

Sincerely,
Narendra Kumar

Proprietor, The Elegant

# 3. <u>METADATA</u>

<u>Description</u>: The data for this project was provided in two Excel workbooks: one containing stock information and another with sales records for "The Elegant," a retail store in Rath, Hamirpur, Uttar Pradesh. The dataset spans from May 2024 to October 2024, providing a comprehensive six-month view of the store's operations.

Key Data Points:

- 199 unique Products.

- **Price Range**: ₹149 to ₹2449

- **Categories**: Shoes, Jeans, T-Shirts, Kurtis, Joggers, Shirts, Cargo Pants, etc.

<u>Sales Data</u>: The sales data contains 8 columns, including transaction details (date), product information (ID, name, category), and sales specifics (quantity sold, price, total value, payment method) for daily sales records from May 1, 2024, to October 31, 2024.

- **Product ID**: Unique product identifier; links sales and inventory data.

- **Category Name**: Product category; helps in performance analysis by category.

- **MRP/Selling Price**: Price at which product is sold; important for pricing and profit margin analysis.

- **"Payment Method**: Payment method used; helps understand customer preferences."

- **Date**: Sale date; allows for time-based analysis and seasonality trends.

- **Quantity Sold**: Units sold per transaction; key to understanding demand patterns.

- **Total Sale Value**: Total sale amount; vital for revenue analysis.

| Attribute Name | Data Type |
|---|---|
| Date | datetime64[ns] |
| Product ID | string |
| Product Name | string |
| Category | string |
| Quantity Sold | int64 |
| MRP/Selling Price (per unit) | float64 |
| Total Sale Value | float64 |
| Payment Method | string |

<u>Stocks Data</u>: The stock data contains 31 columns, including product details (ID, name, category, variant, MRP/selling price, purchase price) and monthly inventory movements (opening stock,

sold stock, added stock, closing stock) for 199 unique products over a 6-month period from May 2024 to October 2024.

- **Inventory Movements**: *Opening Stock, Sold Stock, Added Stock, Closing Stock*: Track monthly stock movements; crucial for inventory turnover and optimization.

- **Purchase Price**: Cost of acquiring product; essential for calculating profit margins.

- **MRP/Selling Price**: Price at which product is sold; critical for pricing and profit margin analysis.

- **Product ID**: Unique product identifier; links sales and inventory data.

| Attribute Name | Data Type |
|---|---|
| Branch Name | string |
| Product ID | string |
| Product Name | string |
| Category Name | string |
| Variant Name | float64 |
| MRP/Selling Price | float64 |
| Purchase Price | float64 |
| Opening Stock | int64 |
| Sold Stock | int64 |
| Added Stock | int64 |
| Closing Stock | int64 |

# 4. DESCRIPTIVE STATISTICS

This section summarizes the key insights from the descriptive statistics presented in the table, highlighting trends in revenue, sales, and overall performance.

| Year-Month | Total Revenue | Mean Revenue | Median Revenue | Total Items Sold |
|---|---|---|---|---|
| 2024-05 | 190,081 | 974.77 | 738.0 | 304 |
| 2024-06 | 216,636 | 1072.46 | 898.0 | 398 |
| 2024-07 | 206,240 | 1091.22 | 897.0 | 351 |
| 2024-08 | 190,144 | 704.24 | 549.0 | 335 |
| 2024-09 | 177,553 | 980.96 | 699.0 | 309 |
| 2024-10 | 241,799 | 948.23 | 599.0 | 386 |

From May to October 2024, the revenue and sales trends exhibited significant seasonal variations. **October 2024 emerged as the best-performing month**, generating the highest revenue of

₹241,799 and recording the highest number of items sold (386 units). This spike in sales can be attributed to festive shopping trends, indicating that demand for products surged during this period. In contrast, **September 2024 recorded the lowest revenue** (₹177,553), while **August 2024 had the lowest number of items sold** (335 units), highlighting a temporary slowdown in consumer demand.

| Category | Total Sales | Total Quantity Sold | Avg Order Value |
|---|---|---|---|
| Cargo Pants | 101524 | 76 | 2476.200000 |
| Jeans | 193200 | 271 | 1044.300000 |
| Jegging | 33175 | 75 | 737.200000 |
| Jogger | 34633 | 127 | 474.400000 |
| Kurta Pajama | 127730 | 120 | 1851.200000 |
| Kurti | 152636 | 264 | 897.900000 |
| Legging | 11309 | 41 | 471.200000 |
| Lower | 35462 | 98 | 601.100000 |
| Midi | 41761 | 69 | 971.200000 |
| Plazzo | 6725 | 25 | 517.300000 |
| Shirt | 83875 | 147 | 1215.600000 |
| Shoes | 194441 | 162 | 1207.700000 |
| Shorts | 5066 | 34 | 266.600000 |
| T-Shirt | 154498 | 462 | 646.400000 |
| Top | 45220 | 110 | 565.300000 |
| Track Suit | 1198 | 2 | 599.000000 |

Total Sales: Shoes show the highest overall sales of ₹194,441, which primarily happens due to their higher sale price rather than demand as 162 units only were sold in this category. T-Shirts and Jeans recorded the highest unit sales at 462 and 271
units respectively. Cargo Pants and Kurta Pajama have the maximum average order values at ₹2,476.2 and ₹1,851.2. This means both these categories sell at premium pricing. Track Suits are recorded to have minimum sales and have sold the minimum number of
units, hence show the slow-moving category.

**T-Shirts** were the highest-selling item (462 units), while **Track Suits** had the lowest sales (2 units). **Shoes**, despite high revenue (₹194,441), had lower demand, driven by a higher selling price. To optimize stock, high-demand items like **T-Shirts and Jeans** should be prioritized, while slow-moving products like **Track Suits and Plazzo** may need promotions. Strategic planning for **high-value categories like Cargo Pants and Kurta Pajama** during festive seasons can further boost profitability.

# 5. DETAILED EXPLANATION OF ANALYSIS PROCESS/METHOD

**5.1 Data Loading and Initial Exploration**: The dataset was loaded into a Pandas DataFrame for analysis in Excel format. The key columns in the SALES_DATA included Date, Product Name, Quantity Sold, Total Sale Value, while the STOCKS_DATA consisted of Product Name, Opening Stock, Closing Stock, Added Stock. An initial exploration of the dataset was conducted to check for missing values, data types, and overall distribution. Such summary statistics as total revenue, product-wise sales count, and the available stock levels were calculated to gain an initial understanding of the sales performance and inventory flow.

**5.2 Data Preprocessing**: To ensure data consistency, necessary preprocessing steps were undertaken: Missing values in essential columns like Total Sale Value and Quantity Sold were identified and handled appropriately. Dates in the SALES_DATA were converted to a standard format to facilitate accurate time-series analysis. Product names were standardized across both datasets to ensure correct merging and analysis. Stock data was cleaned by ensuring that negative stock values were either corrected or flagged for further review.

**5.3 Descriptive Statistics**: A comprehensive statistical summary was prepared, including: Mean and Median Revenue: To assess the central tendency of earnings. Monthly Revenue and Sales Count: To understand seasonal variations. Product-Wise Performance: Identifying top-performing and slow-moving products based on total units sold and revenue generated. Stock Turnover Analysis: Evaluating how frequently each product was sold and replenished.

**5.4 Monthly Trend Analysis**: The data was grouped by month to track sales and revenue fluctuations over time. A line chart was created to visualize revenue trends, highlighting peak and slow periods. This analysis provided insights into seasonal demand variations, such as increased sales in October, likely due to festive shopping, and a decline in subsequent months.

**5.5 Product Performance Analysis**: Each product's performance was assessed based on: Best-Selling Products: Identified by total units sold. Lowest-Selling Products: Items with the least number of sales across months. High-Revenue Generating Products: Items contributing significantly to overall revenue. Slow-Moving Inventory: Products with low sales but high stock levels, indicating potential overstocking issues.

**5.6 Seasonal Trends and Strategic Recommendations**: By evaluating monthly sales and revenue data, seasonal trends were identified. October had the highest sales and revenue, suggesting an opportunity to stock up on high-demand products before peak months. August and September saw relatively lower sales, indicating a potential need for promotional strategies to boost revenue during slow periods.

**5.7 Stock Management Analysis**: The STOCKS_DATA was analyzed to assess inventory levels and replenishment patterns. The key insights included: Stock Turnover Rate: The frequency at which products were sold and restocked. Stock-Out Risk Assessment: Identifying products frequently running low on stock. Overstocked Items: Products that were consistently restocked but had low sales, leading to excess inventory.

**5.8** <u>**Summary of Findings**</u>: The best-performing month was October 2024, with the highest revenue and sales volume. The worst-performing month was September 2024, with the lowest revenue generation. T-Shirts emerged as the best-selling product, consistently contributing to revenue. Formal Shoes had the lowest sales volume, indicating a need for targeted promotions or inventory adjustments. Stock levels needed optimization to prevent overstocking of slow-moving items while ensuring sufficient availability of high-demand products.

# 6. <u>RESULTS AND FINDINGS</u>

**6.1** <u>**Overview:**</u> The monthly revenue trend was a fluctuating curve over six months, with ₹190,000 in May 2024 to a peak of ₹220,000 in June. A steady decline was observed, bottoming out at ₹180,000 in September and then rebounding sharply to ₹240,000 in October.

The products, T-shirt has been in the top sale, selling 400+ pieces; Jeans and Kurtis each had sales more than 200+. Sales in Shoes, Shirts, and Joggers was average with units of 100–150 pieces, and very poor sales at less than 50 pieces with Shorts, Plazzo, and Track Suits.
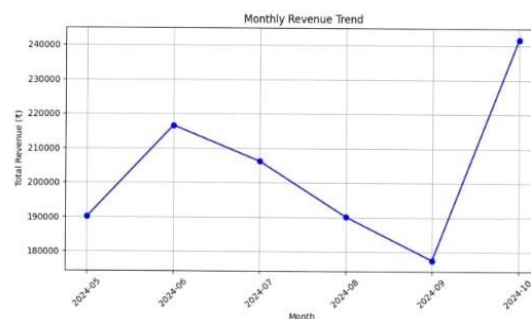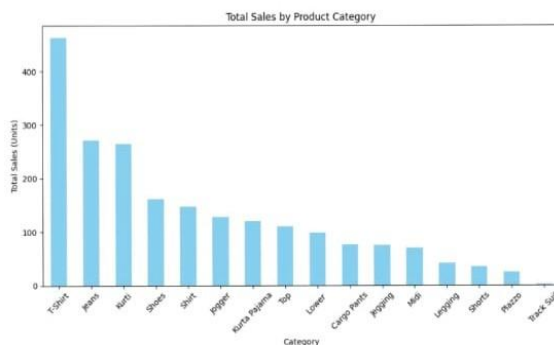


**6.2** <u>**Month-wise Product Category Performance and Seasonal Trend Analysis**</u>: T-Shirts continue to be the top-selling item throughout the year, and there is steady demand and preference by customers. Jeans and Kurtis are selling consistently as they are staple wear, but Kurtis might be seasonal in demand as it may peak during festive periods or cultural events, so that category will work best with a targeted promotion.

Shoes and Joggers display a moderate but steady sales volume, indicating a consistent customer base that values comfort and functionality. Track Suits and Plazzo, on the other hand, display occasional peaks, possibly due to seasonal trends, specific events, or changing fashion preferences.

On the other hand, Plazzo, Track Suits, and Shorts are the least selling categories that are not so popular. It may be due to low demand, a specific target audience, or poor marketing strategies. In order to enhance sales, these categories should be promoted through more visibility and targeted advertisements. Further, the optimum stock of T-Shirts and Jeans should be maintained while the seasonal and slow-moving products are managed strategically in order to increase the overall

profitability. **By analyzing monthly product trends, businesses can optimize stock levels and pricing strategies to maximize profit margins.**



Sales Distribution by Category - 2024-05



Sales Distribution by Category - 2024-08



Sales Distribution by Category - 2024-07



Sales Distribution by Category - 2024-06



Sales Distribution by Category - 2024-10



Sales Distribution by Category - 2024-09
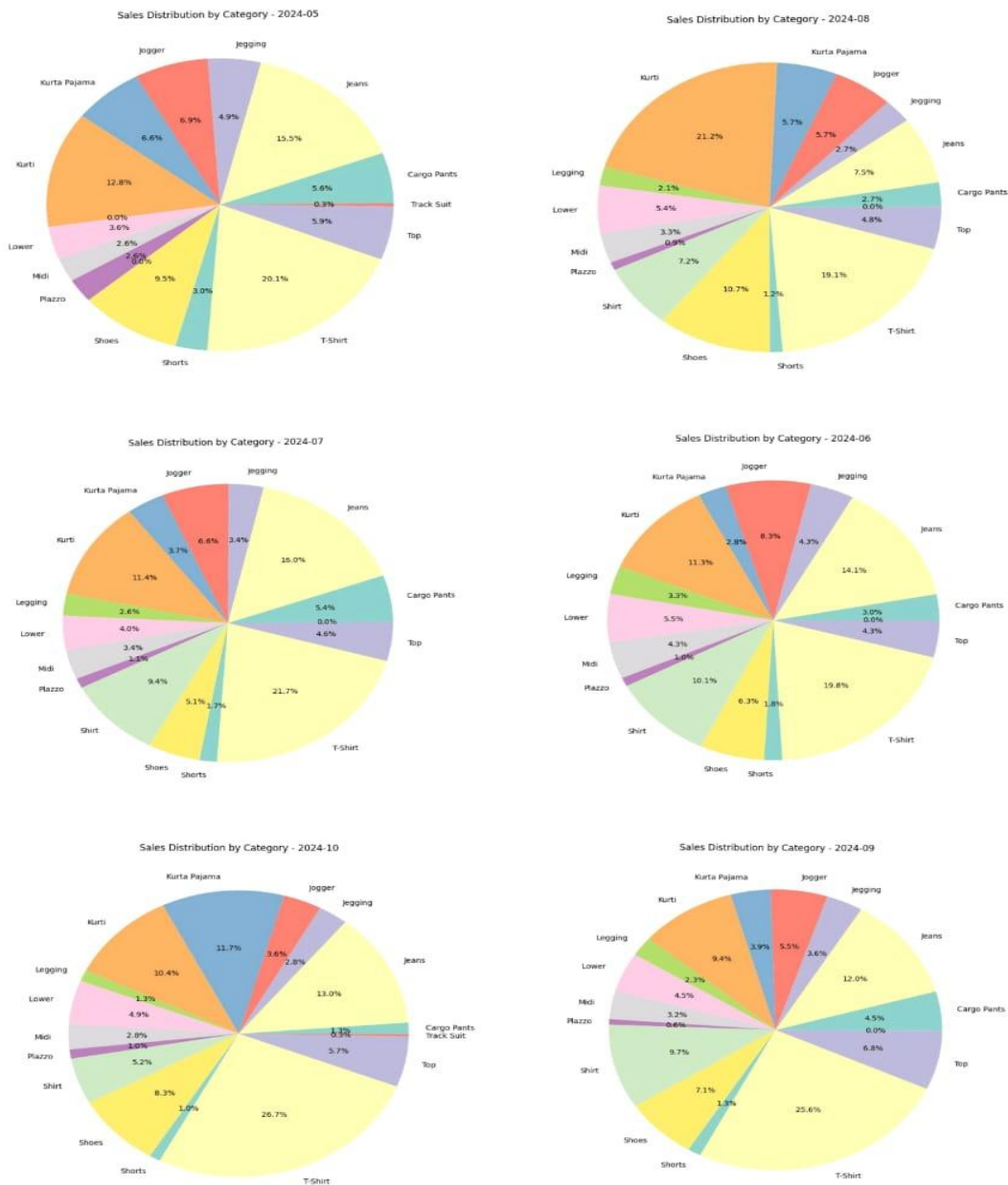
**6.3 Inventory Assessment: Overstock and Understock Trends**: STOCKS_DATA revealed some trends of repeated overstocking like in T-Shirt SN43 in May, Benttek Fashion in June, July, Zara G & T-Shirt A80 in Aug and numerous others in Sep and Oct, suggesting an inventory accumulation trend. The understocking was also reported in the Kurta Pajama product for the month of Oct possibly because of its heavy festive demand in Dussehra and Diwali. This calls for improved forecasting demand and timely restocking of seasonal products, coupled with readjustment of procurement and clearance strategies to optimize the efficiency of the available inventory.

```
🟢 Understocked Products (High Sales vs. Available Stock):
+---------+----------------------------------------------+
| Month   | Understocked Products                        |
+=========+==============================================+
| May     | None                                         |
+---------+----------------------------------------------+
| June    | None                                         |
+---------+----------------------------------------------+
| July    | None                                         |
+---------+----------------------------------------------+
| Aug     | None                                         |
+---------+----------------------------------------------+
| Sep     | None                                         |
+---------+----------------------------------------------+
| Oct     | Kurta Pajama KPC, Kurta Pajama KPB           |
+---------+----------------------------------------------+
```

```
🔴 Overstocked Products (Excessive Stock vs. Sales):
+---------+-----------------------------------------------------------+
| Month   | Overstocked Products                                      |
+=========+===========================================================+
| May     | TShirt SN43                                               |
+---------+-----------------------------------------------------------+
| June    | Benttek Fashion                                           |
+---------+-----------------------------------------------------------+
| July    | Benttek Fashion                                           |
+---------+-----------------------------------------------------------+
| Aug     | Zara G, TShirt A80                                        |
+---------+-----------------------------------------------------------+
| Sep     | Miss Wow F, Jogger A, Kurti SN18, Kurta Pajama KPD        |
+---------+-----------------------------------------------------------+
| Oct     | Jogger A, TShirt SN48, Pant BJ C                          |
+---------+-----------------------------------------------------------+
```

# 7. CONCLUSION:

This analysis examined monthly stock trends and analyzed revenue trends, highlighting recurring overstocking in T-Shirt SN43 (May), Benttek Fashion (June, July), Zara G & T-Shirt A80 (August), and multiple products in September and October. Understocking was there for Kurta Pajama (KPC & KPB) in October, likely due to festive demand. Improving demand forecasting, procurement strategies, and inventory control will help optimize stock levels and prevent imbalances.