# InvOptima AI

## Overview

The complexities in the modern supply chains have intensified over recent years due to globalization, increasing customer demands, and the arrival of e-commerce. The traditional supply chain management systems are often overwhelmed by the vast amount of data generated daily. This data needs to be cleaned and processed in terms such that not only data analysts but such that the business team can also make conclusions that will help make decisions.

In this proposal I have created and described the base of a complete pipeline to help clients to fullfill their needs and give a direction to their particular needs and increase the daily revenue.

## Working of the Product

A client has the sales data for each and every store that is operating at the moment. They usually have an excel of the:

1. Daily sales data
2. Price of the product
3. Number of units sold
4. Date of the sale
5. Turnover

All these data is collected for the user as an excel or as an csv format. This is now put through the **Demand Forecasting section**. This will then predict the quantity of units we need to order for the next refilling cycle. This will help reduce wastage of goods and reduce stockouts. The code will give a graph which, with a very high accuracy traces and learns the pattern of sales and predicts highly accurate amount of units that need to be bought. The model has a R-squared value of: **0.935**. This a great value which makes us believe that the results obtained can be used to make strategic decisions.

The above said data can be collected for each product and every SKU(stock keeping unit) and then put into the **Segmentation section.** This will help us determine the top performing SKUs and the best performing products, the net profit earned but the product etc. There is a possibility that a lot of units are sold but the selling price is less and there is less space for costlier items. All such decisions can be made and decisions can be made.

[ABC classification is a ranking system for identifying and grouping items in terms of how useful they are for achieving business goals. The system requires grouping things into three categories: A -- extremely important. B -- moderately important. C -- relatively unimportant]

From this analysis the client can infer the following:

1. % Annual Turnover vs. % SKU: this divides the SKUs in 3 categories based on turnover
2. Contribution of Top SKUs to Total Turnover
3. Count of SKUs in ABC Categories
4. Distribution of Turnover (TO%) by ABC Category

This section also helps determine the **Demand variability.** Demand variability analysis focuses on understanding how sales or demand for products fluctuate over time. It helps in predicting future demand, optimizing inventory levels, and ensuring supply meets customer needs efficiently.

From this analysis the client can infer the following:
1. Distribution of Coefficient of Variation (CV)
2. Distribution of Mean Sales
3. Seasonal Sales Pattern - Monthly Aggregation
4. Q-Q Plot (Turnover Data)

Son now before going to the next section, using the above two parts we have defined which particular store and which particular product is giving the maximum profit. We can now shift our focus on the inventory. We know how much and what to order for each particular store.

The next part is the **Inventory Management section.**

We first need to set some parameters which are essential for making decisions.
➔ ordering_cost_per_order(ordering cost per order)
➔ holding_cost_per_unit_per_year(holding cost per unit per year)
➔ lead_time_days(lead time in days)
➔ service_level_target(service level target)

These values can be set by the client and also they can change them and see how the results change and then make an appropriate decision accordingly.

From this analysis the client can infer the following:
1. Total Safety Stock by ABC Categories
2. Optimized Inventory: Safety Stock and Reorder Point
3. Pareto Analysis: Sales Contribution
4. A interactive dashboard which divides the SKUs into 3 categories. Also they tell the Mean demand and the total turnover of each SKU. This helps the client to directly compare each one of them and make important decisions.
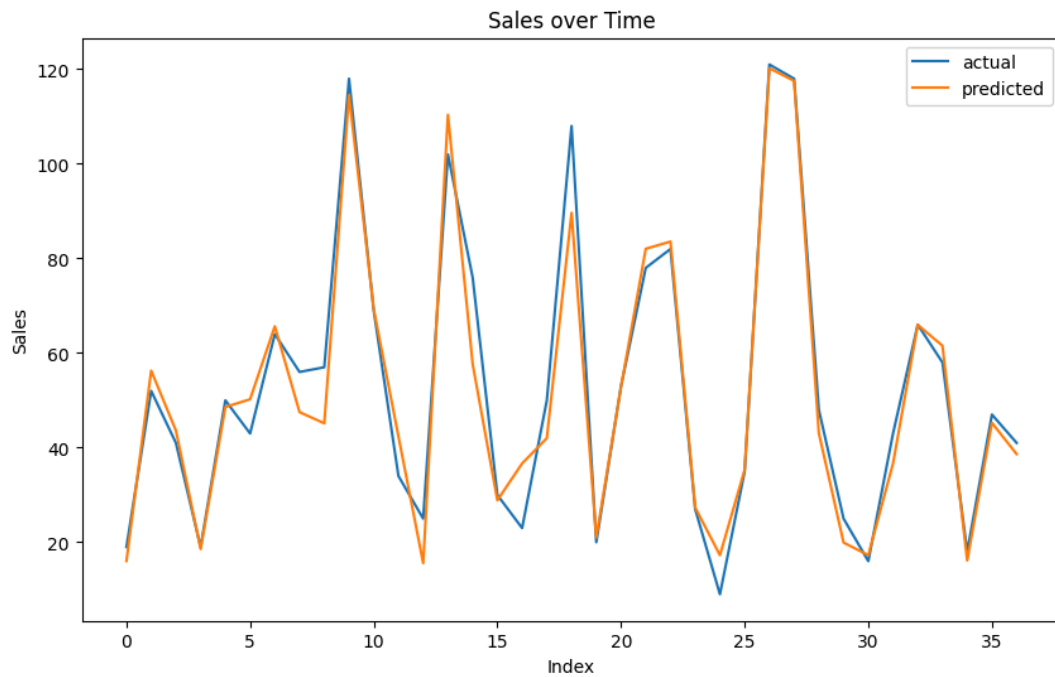
Now we have calculated the reorder points, the safety stock and completed the ABC analysis. With only a little more basic analysis regarding their finances and requirements. The client can place the orde and we move on to the last step.

The last section is the **Route Optimization.** In a medium size business there might be multiple outlets. Also it is possible that product is available at one or more distribution centres of the seller. It is necessary to optimize the routes before hand to save time and fuel. Also this might save confectionary items from getting spoilt before reaching the outlet.
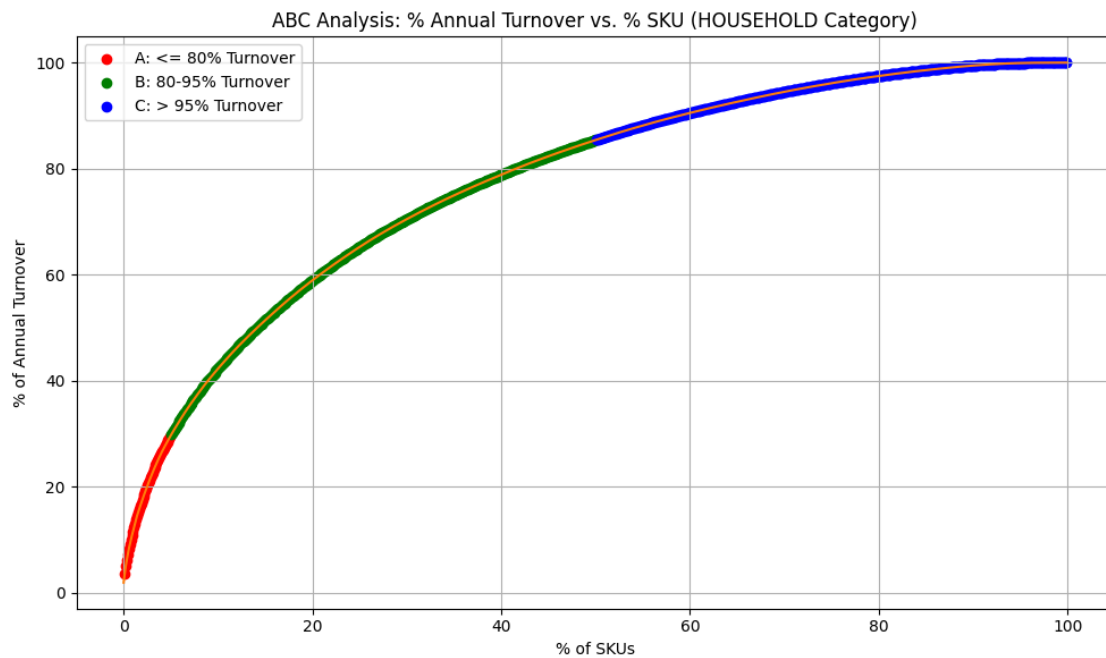
A map with optimized routes, distance(km) saved and the planned path is obtained in a graph which can be then visualized on an interactive dashboard.
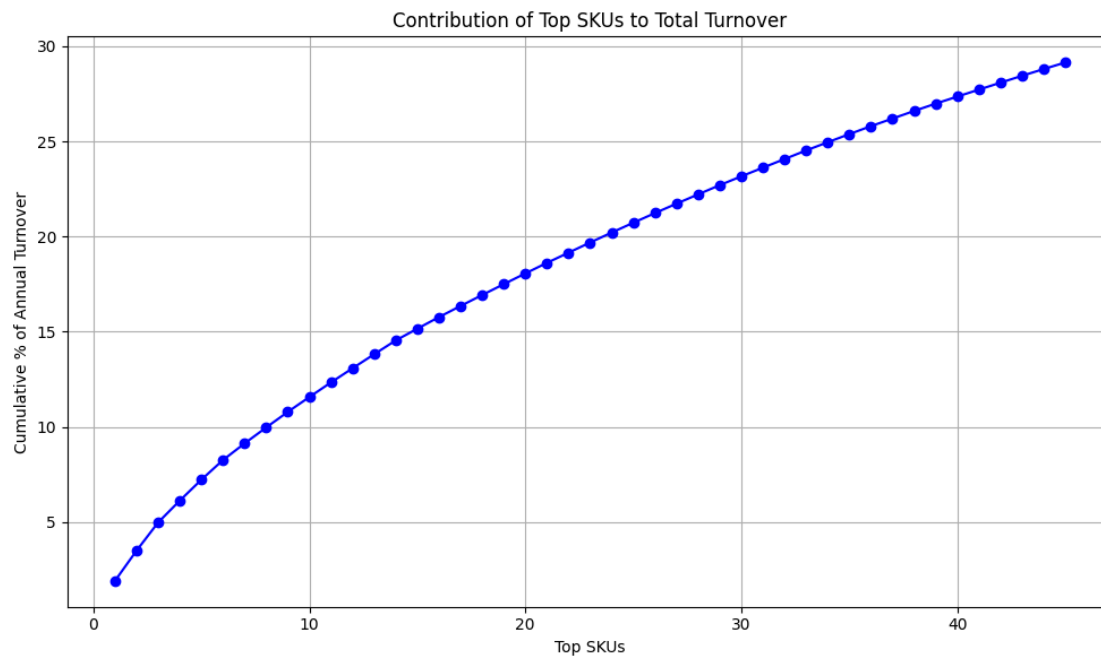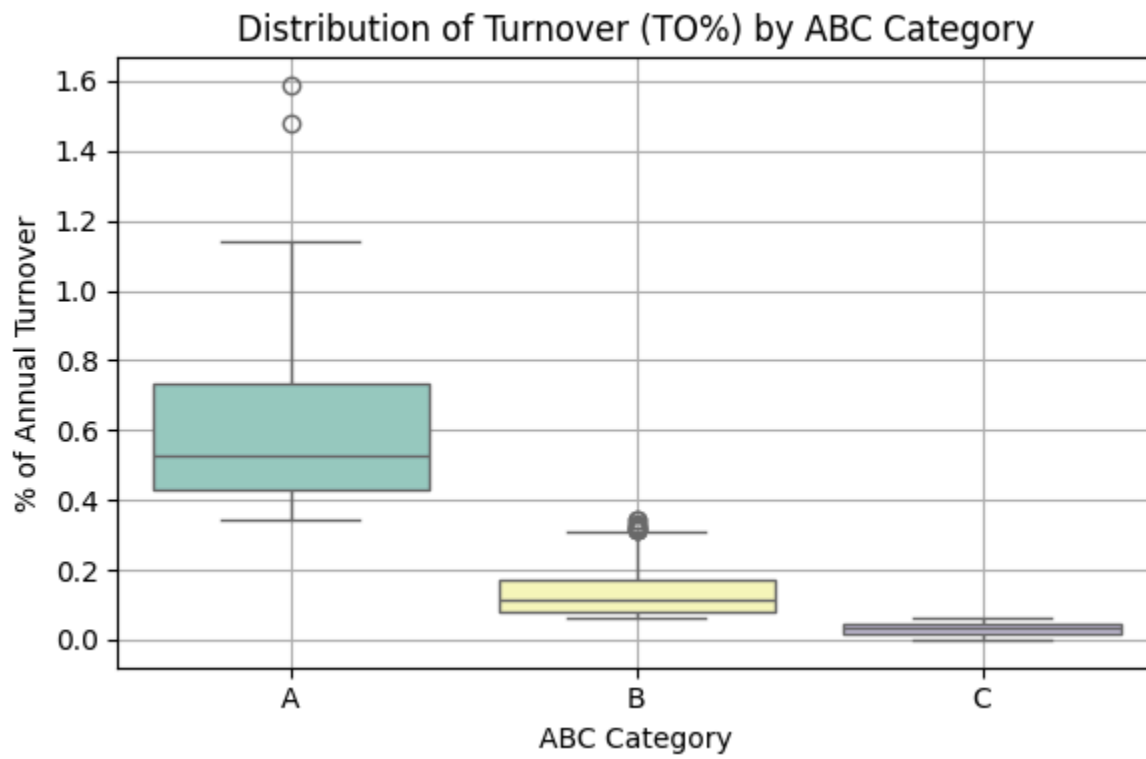
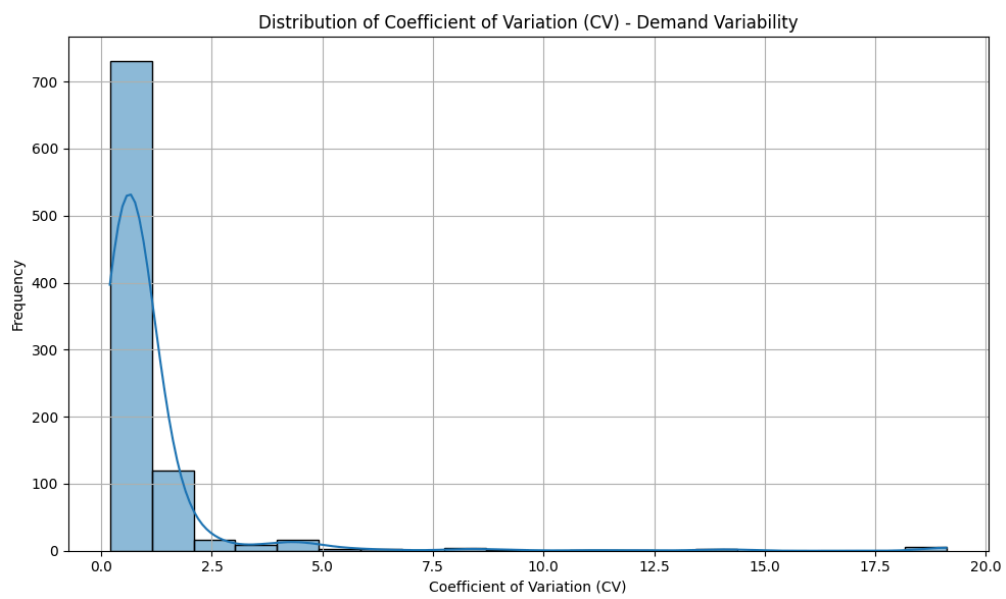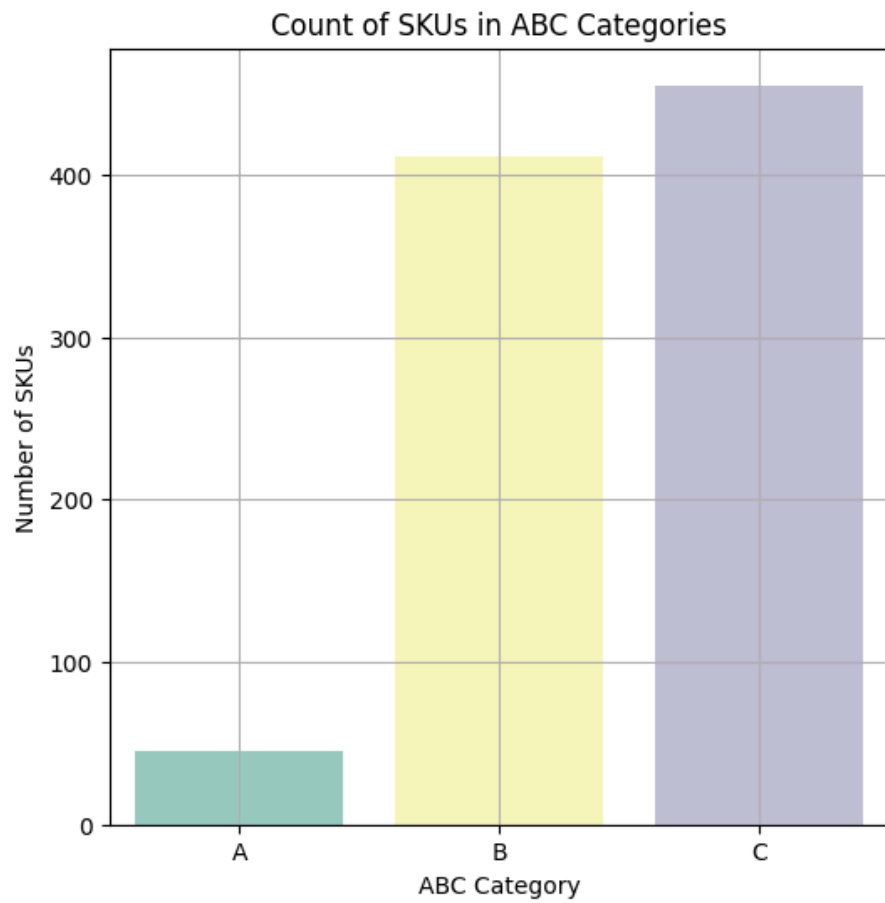The graphs and images that can be seen using the code:

**Demand Forecasting:**


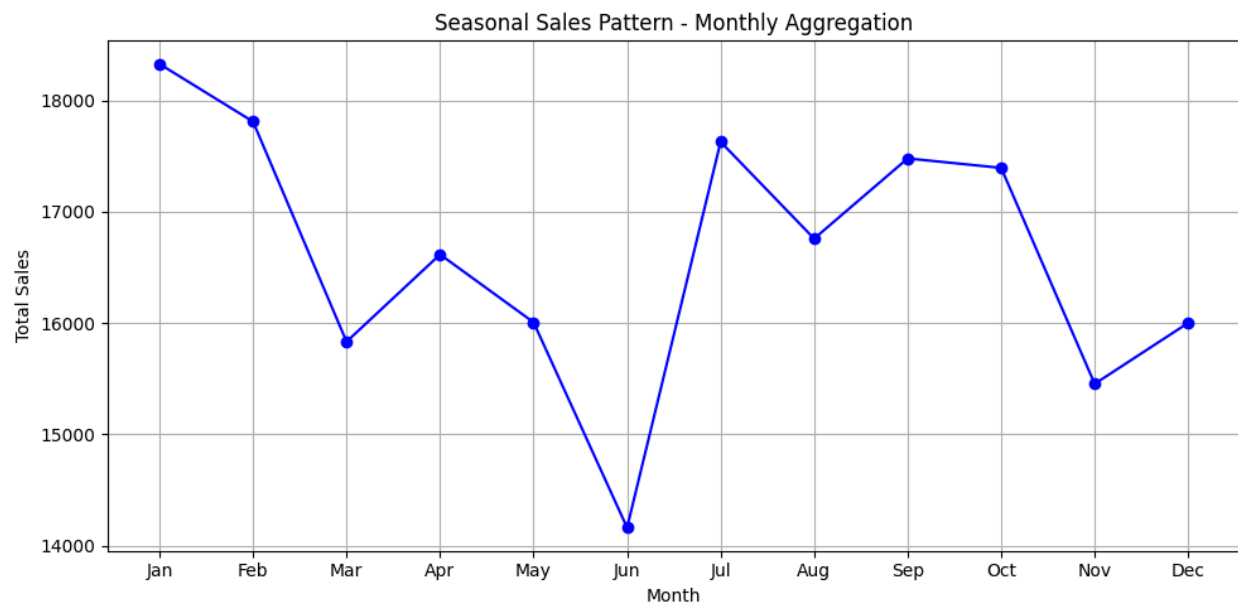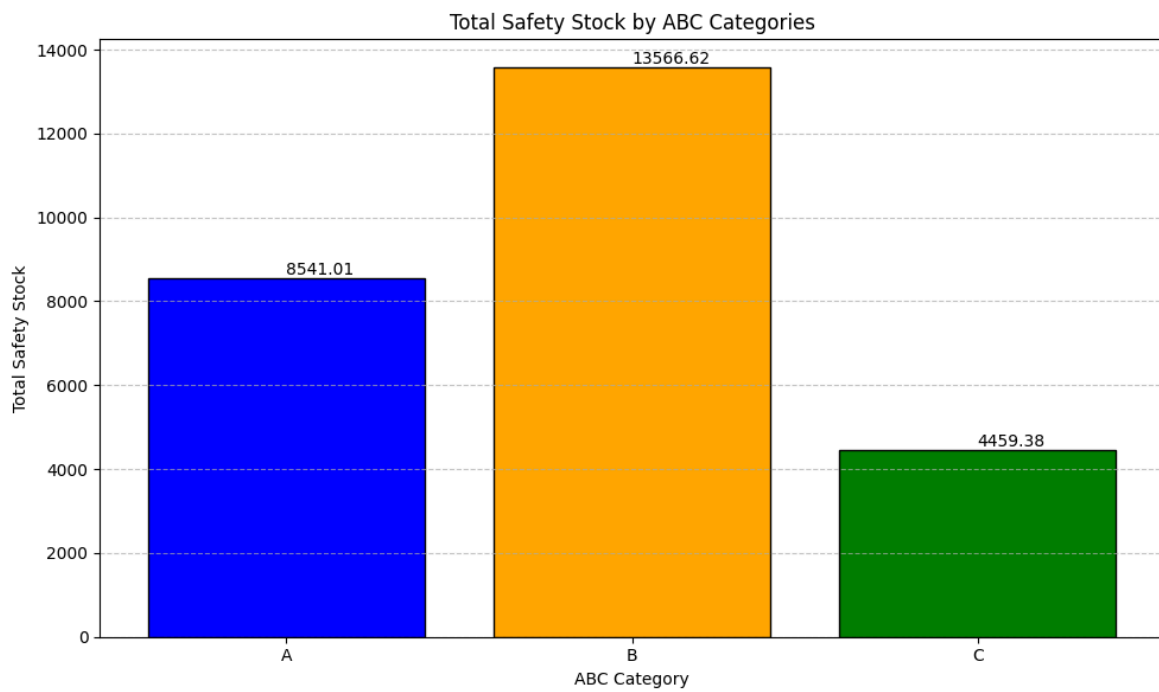
**Segmentation:**

## Distribution of Turnover (TO%) by ABC Category



## Contribution of Top SKUs to Total Turnover

## Count of SKUs in ABC Categories



## Distribution of Coefficient of Variation (CV) - Demand Variability

**Seasonal Sales Pattern - Monthly Aggregation**



## Inventory Management:

**Total Safety Stock by ABC Categories**

Optimized Inventory: Safety Stock and Reorder Point
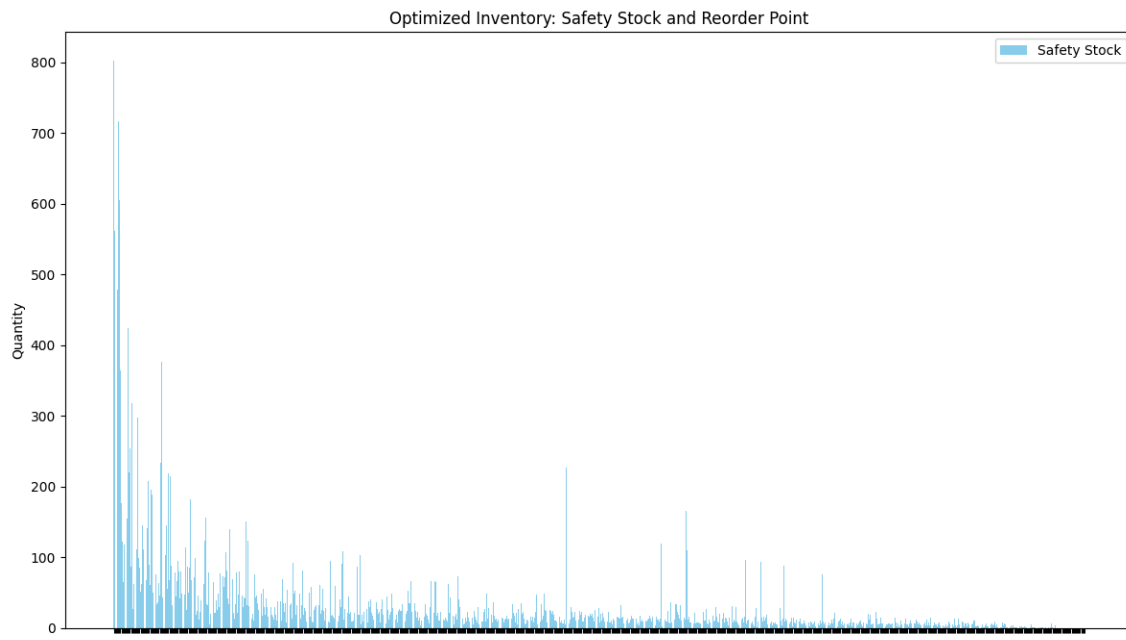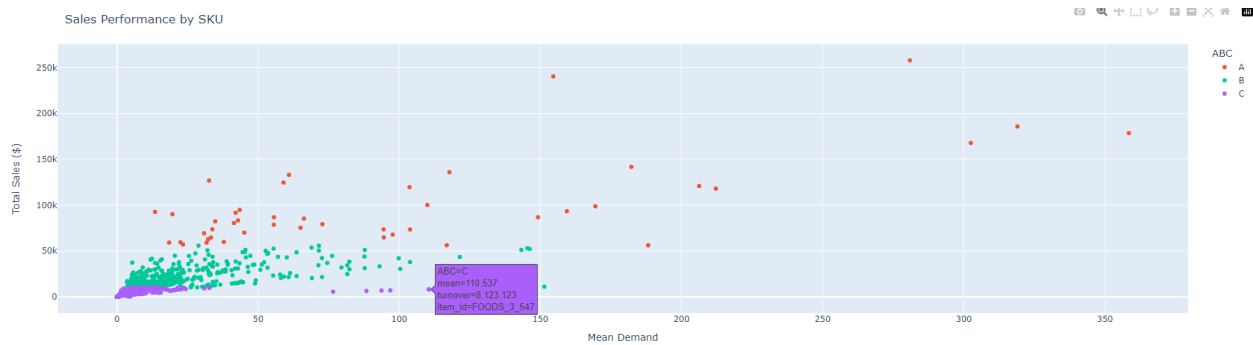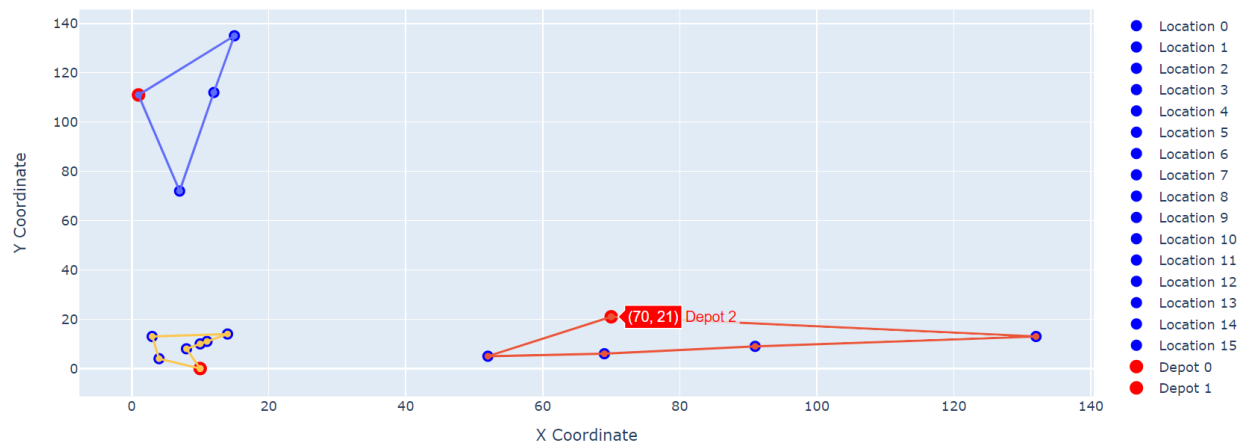


Pareto Analysis: Sales Contribution

Sales Performance by SKU

**Route Optimization:**



These are the graphs/dashboards obtained from the code.

# Prototype development

- 🔗 Demand Forecasting
- 🔗 Segmentation
- 🔗 Inventory Optimization
- 🔗 Route optimization

### Feasibility

This project has the potential to be developed and rolled out as a SaaS (Software as a Service) platform within a relatively short time frame, allowing widespread access and adoption by various users. The technological requirements are well within reach, and the necessary infrastructure can be established efficiently to support the deployment and scaling of the service.

### Viability

As the retail industry continues to expand both in India and internationally, the demand for advanced tools and techniques to optimize sales and manage data effectively will only increase. Small and medium-sized businesses, in particular, will benefit from this service, ensuring its relevance and sustainability over the long term. However, continuous innovation and adaptation to emerging technologies will be essential to maintaining its competitive edge and ensuring its ongoing success.

### Monetization

This service offers a clear and direct path to monetization, as it can be launched as a fully operational product upon completion, ready to be utilized by businesses seeking to enhance their operations. The market demand for such a service provides ample opportunities for revenue generation, making it a financially viable venture from the outset.

# Business Modeling

## Freemium Business Model

"Freemium" means "Free" and "Premium" service. It offers two types of services to the customers, 'free service' and 'paid service'. The free service users have limited access to the basic features whereas the premium services are unlocked when the person buys the paid service.

The Freemium model should be adopted by companies when they are looking to grow their business and brand quickly. This model is preferred because everybody likes free stuff, and nobody wants to pay money for something they're not sure will work for them.

So, the freemium model addresses that by providing such an enticing offer: giving users the ability to experience a new product without any risk.Its free plan allows the users to have 2,000 computations and 12,000 per month, whereas the priced plans give more advanced features. The regular user mostly turns into a paid user as it would be hectic to change the platform once you have 2,000 listed subscribers.

### Financial Equation

It can be directly launched into the retail market

$Y = X * (1 + r)^t$

$Y = (X) * (1.04)^t$

Y = Profit over time, X = Price of our Product, r = growth rate, t = time interval

1+r = 1 + 4% = 1.04