

# PROJECT REPORT

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## 1. Technical Description

This project is about forecasting of data on the basis of historic data using Time series analysis and inventory optimization according to certain parameters.

**Data Loading and Preparation:** Dataset is downloaded from kaggle.

**Importing Libraries:** Numpy, Pandas for datasets. Plotly , Matplotlib for data visualization. Statsmodels for using SARIMA model.

**Demand Forecasting:** SARIMA model is applied on the data(seasonal data) for predicting future values that was followed by plotting ACF and PACF for estimating values of parameters . This gives predicted values for next 10 days that serves as input for inventory management.

**Inventory Optimization:** Optimal inventory levels are determined by calculating parameters like Order Quantity, Reorder point, Safety stock, Total Cost. Formulas used are as follows:

- Order quantity:  $Q^* = \mu + z \cdot \sigma$   
where  $z$  is the z-score,  $\mu$  is the mean, and  $\sigma$  is the standard deviation of the forecasted demand.
- Reorder Point =  $\mu \cdot \text{Lead Time} + z$
- Safety Stock = Reorder Point -  $(\mu \cdot \text{Lead Time})$
- Total Cost = Holding Cost + Stockout Cost
- Holding Cost = holding cost (per unit)  $\times$  (initial inventory +  $0.5 \times Q^*$ )
- Stockout Cost = stockout cost  $\times$   $\max(0, \mu \cdot \text{Lead Time} - \text{initial inventory})$

## 2. Use of AI Tools

We have used Chatgpt for building OOPS class of Inventory Management.

## 3. Future Explorations

- Demand forecasting can be used to predict future crop yields that too are based on seasonal fluctuations ( according to climatic conditions) that can help farmers to plan resources like seeds, fertilizers and pesticides accordingly.
- We can also use inventory optimization for maintaining balance between supply and demand by minimizing the costs.