# Task-Six:

# GlobalMart Sales Forecasting using SARIMA

## Project Overview

This project applies **Time Series Forecasting** to predict sales for GlobalMart using historical order data.  
We use **SARIMA (Seasonal ARIMA)** modeling to analyze daily sales, identify seasonality, and forecast future demand.

## Dataset

* File: train.csv
* Key Columns:

Order Date – Date of transaction

Sales – Sales value

Data is resampled into **daily totals** for analysis.

## Methodology

### 1. Data Preprocessing

Converted Order Date to datetime.

Set date as index.

Resampled sales data into **daily frequency**.

Missing values filled with 0.

### 2. Stationarity Check (ADF Test)

Applied **Augmented Dickey-Fuller (ADF) test**.

**ADF Statistic:** -4.9266

**p-value:** 0.00003 (< 0.05)

Series is **stationary** → No differencing required.

### 3. Model Building (SARIMA)

Model: SARIMA(1,0,1)(1,1,1,7)

Captures weekly seasonality (s = 7).

Trained on historical data, tested on last 30 days.

model = SARIMAX(train['Sales'],

order=(1,0,1),

seasonal\_order=(1,1,1,7),

enforce\_stationarity=False,

enforce\_invertibility=False)

### 4. Model Evaluation

Compared **actual vs predicted sales** for test set.

Model captured sales trends and weekly seasonality well.

### 5. Forecasting

Forecasted **next 30 days of sales**.

Added **confidence intervals** to show possible range of outcomes.

## Results & Visualization

**Historical Data** – Sales trends plotted over time.

**Train/Test Split** – Predicted vs actual sales compared.

**Future Forecast** – 30-day forecast with confidence intervals.

Graphs show:

* Black line → Actual sales (test set)
* Orange line → Predicted sales
* Red line → Future forecast
* Pink shaded region → Confidence intervals

## Key Findings

* The sales series is **stationary**.
* Weekly **seasonality** detected (patterns every 7 days).
* SARIMA performed well for short-term forecasting.
* Forecast predicts **next 30 days of sales**.

## Business Insights for GlobalMart

* **Inventory Planning**

Forecasts help avoid overstocking or stockouts.

* **Seasonality Awareness**

Weekly demand cycles allow better **supply chain management**.

* **Risk Management**

Confidence intervals highlight demand uncertainty.

Plan for both demand surges (upper bound) and slowdowns (lower bound).

* **Actionable Strategy**

Ensure stock for peak-demand days.

Boost promotions during predicted low-sales days.

Align procurement, logistics, and staffing with forecast.

## Conclusion

The SARIMA model provides GlobalMart with a **reliable short-term sales forecast**.  
By leveraging this model, the company can:

Improve **inventory decisions**

Reduce **operational costs**

Increase **customer satisfaction**