PRODUCT DEMAND PREDICTION WITH MACHINE LEARNING PHASE-2

Step 1: Data Collection and Preprocessing

As mentioned earlier, gather historical sales data and external factors data. Ensure that the data is cleaned and formatted appropriately.

Step 2: Data Splitting

Split the data into training, validation, and test sets as previously described.

Step 3: Model Selection

Select ARIMA and/or Prophet as your time series forecasting models:

ARIMA:

- ARIMA is suitable for capturing stationary time series data. It consists of three main components: AutoRegressive (AR), Integrated (I), and Moving Average (MA).
- Determine the order of differencing (I) and the orders of AR and MA components through time series analysis and autocorrelation plots.

Prophet:

- Prophet is designed for forecasting time series data with seasonality, holidays, and abrupt changes in trend.
- It can automatically handle missing data points and outliers.

Step 4: Model Training

Train the ARIMA and Prophet models on the training data. For ARIMA, use the determined orders for differencing, AR, and MA. For Prophet, specify relevant seasonality components and holidays.

Step 5: Model Evaluation

Evaluate the performance of both ARIMA and Prophet using appropriate time series forecasting metrics like Mean Absolute Error (MAE), Mean Squared Error (MSE), or Root Mean Squared Error (RMSE) on the validation set.

Step 6: Model Selection and Ensemble (Optional)

You can choose to select the better-performing model between ARIMA and Prophet based on validation results or combine their forecasts for improved accuracy. Ensemble techniques like weighted averaging or stacking can be used for this purpose.

Step 7: Model Deployment

Deploy the selected model (ARIMA, Prophet, or an ensemble) in a production environment for making real-time or batch predictions.

Step 8: Continuous Monitoring and Maintenance

Monitor the model's performance over time and retrain it periodically to adapt to changing demand patterns and external factors.

Step 9: Integration with Inventory Management

Integrate the demand forecasting model, including ARIMA or Prophet, with your inventory management and production planning systems to automate decision-making based on demand predictions.

Step 10: Optimization and Decision Support

Utilize the insights provided by the time series forecasting models to optimize inventory levels, production schedules, and supply chain operations. They can also support decision-making for promotions, pricing, and other strategies.