Product Demand Prediction with Machine Learnings

PHASE - 1

Problem Definition:

The problem is to create a machine learning model that forecasts product demand based on historical sales data and external factors. The goal is to help businesses optimize inventory management and production planning to efficiently meet customer needs. This project involves data collection, data preprocessing, feature engineering, model selection, training, and evaluation.

Project Objectives:

❖ Develop a predictive model that accurately forecasts product demand.

❖ Utilize historical sales data and external factors to improve demand predictions.

❖ Enable businesses to optimize inventory levels and production scheduling.

❖ Enhance customer satisfaction by ensuring product availability while minimizing excess inventory.

Abstract:

The "Demand Prediction Using Machine Learning" project is a pivotal endeavour aimed at transforming business operations through data-driven insights. Focusing on forecasting product demand, it leverages historical sales data and external variables like marketing campaigns and holidays. This multifaceted project encompasses data collection, preprocessing, and feature engineering to curate a high-quality dataset. Model selection and training employ machine learning techniques like Random Forest and XGBoost to develop accurate demand prediction models. Model evaluation ensures reliability, potentially optimizing inventory management, production planning, and

customer satisfaction, while concurrently reducing operational costs, making it an indispensable initiative for forward-thinking businesses.

Libraries Used:

- Numpy
- Pandas
- Plotly
- Sklearn

Process Involved:

1. **Data Collection:** In the product demand project, data collection involves gathering past sales records, product details, and external factors like holidays and marketing campaigns. This data, collected from various sources, forms the basis for building a computer model that predicts how much of a product customers will want. It's like gathering puzzle pieces to see the bigger picture, helping businesses stock just the right number of products, reducing waste, and keeping customers happy

2. **Data preprocessing**: Data preprocessing in the product demand project is like preparing ingredients before cooking a meal. After collecting sales and external data, we clean it by removing errors or missing values, ensuring all information is accurate. We then transform things like dates into a consistent format so the model understands them. Just like chopping veggies for a stew, we simplify complex data. Next, we create new features like looking at past sales or holidays, like adding spices to enhance flavour. This step ensures our data is ready for the "cooking" phase, where we build the demand prediction model, making it easier to forecast product demand and serve up satisfying results for businesses.

3. **Feature Engineering:** In the product demand project, feature engineering is like adding secret ingredients to a recipe to make it taste better. After collecting and preparing data, we enhance it by creating new features that help the prediction model understand the patterns. It's similar to adding spices and herbs to make a dish more flavorful. For instance, we might look at past sales data, holidays, or special events and turn them into features that improve our model's accuracy. Feature engineering is about making our data more informative, like giving a recipe that extra zing, so our model can better forecast product demand and help businesses serve their customers deliciously.

4. **Model Selection:** Model selection in the product demand project is like picking the right tool for a job. After gathering and preparing data, we need to choose the best mathematical method (or model) that will help us predict product demand accurately. It's similar to selecting the right kitchen gadget for a specific recipe. For instance, if our data has complex patterns, we might choose a powerful tool like XGBoost, while for simpler patterns, we might use Linear Regression, like using a whisk for mixing or a blender for pureeing. The goal is to find the model that fits our data just right, making our demand forecasts taste like a well-prepared dish.

5. **Model Training:** Model training in the product demand project is like teaching a computer to make predictions. We use the prepared data to help the model learn patterns and relationships. It's similar to showing someone examples to help them understand. The better we teach the model, the more accurate its predictions become, benefiting businesses.

6. **Evaluation:** Evaluation in the product demand project is like checking how well our prediction model works. We compare its forecasts to real sales data to see if it's accurate. It's like grading a test to know if our model

is doing a good job at helping businesses predict and manage product demand effectively.

Conclusion:

In conclusion, Phase 1 of the "Product Demand Using Machine Learning" project lays the groundwork for an ambitious journey to enhance inventory management and production planning. Our mission is to create a machine learning model that predicts product demand by utilizing historical sales data and external factors. This phase prioritizes the essential steps of data collection, preprocessing, and feature engineering, ensuring a solid foundation for subsequent phases. The focus on model selection, training, and evaluation reflects our commitment to delivering accurate forecasts. As we move forward, we remain dedicated to optimizing business operations, minimizing costs, and meeting customer needs efficiently through the power of data-driven insights.