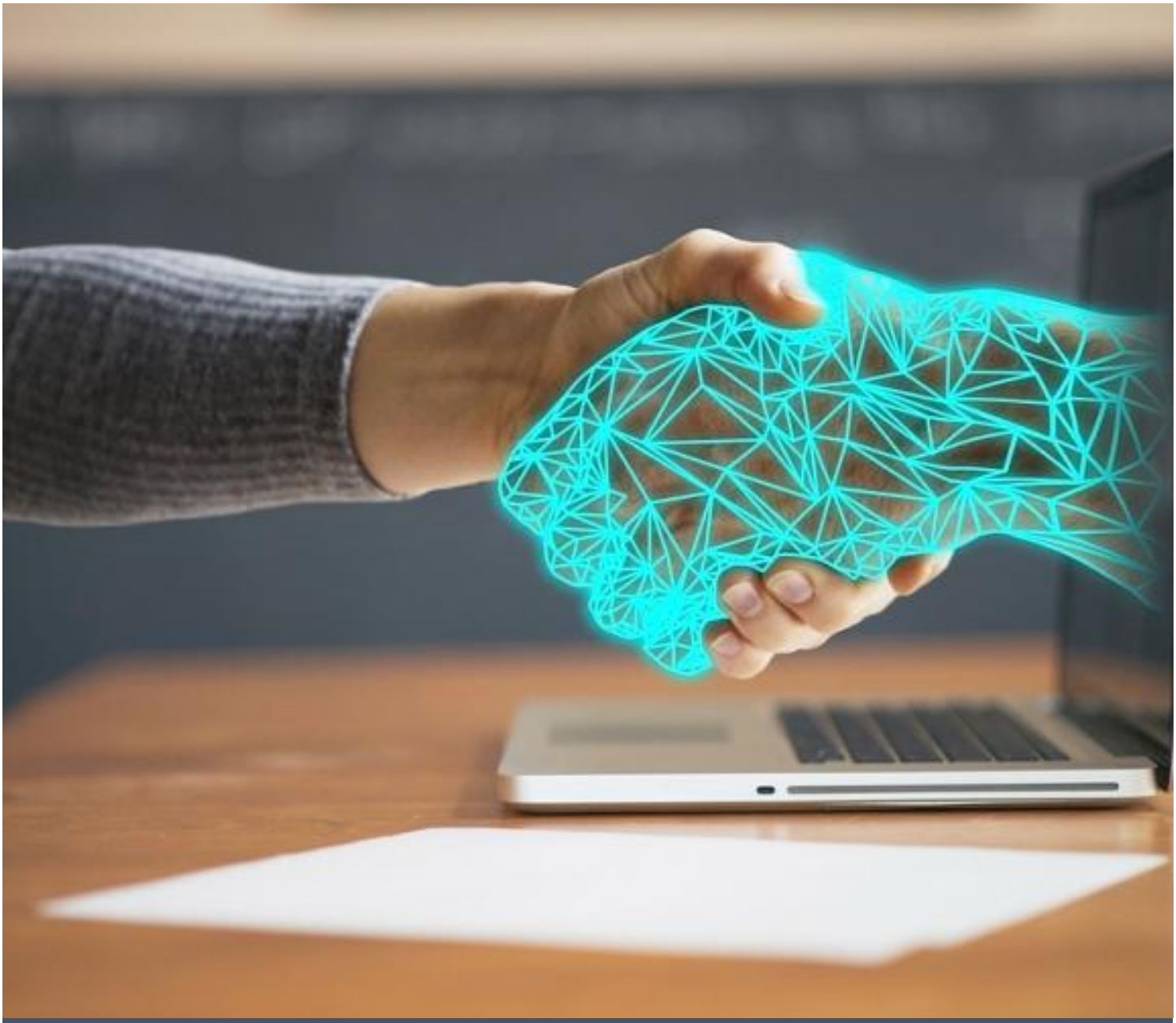


DOMINOS - PREDICTIVE PURCHASE ORDER SYSTEM

- AASHIFA

1. Introduction

The **Domino's Predictive Purchase Order System** aims to forecast **pizza sales** for the upcoming week using historical sales data. Based on the **forecasted sales for each pizza type**, the system calculates the required **ingredient quantities** using a separate **pizza ingredients file**. This ensures efficient **inventory management** and helps optimize **weekly purchase orders**, reducing both stockouts and excess inventory.

2. Dataset Overview

2.1 Datasets Used

Dataset	Description
pizza_sales.csv	Historical sales data for different pizza types.
pizza_ingredients.csv	Ingredient breakdown for each pizza type (dough, cheese, toppings, etc.).

3. Approach

- **Data Collection:** Sales data and pizza ingredient composition were combined.
- **Exploratory Data Analysis (EDA):** Time series trends, seasonality, and pizza-wise demand patterns were identified.
- **Model Selection & Comparison:** Multiple models (ARIMA, SARIMA, Prophet, LSTM, Random Forest) were evaluated for accuracy.
- **Forecasting:** Prophet was selected as the final forecasting model based on its balanced performance for trend and seasonality.
- **Purchase Order Generation:** Forecasted pizza sales were converted into ingredient-level demand for the next 7 days.

4. Model Evaluation

4.1 Model Evaluation (Based on MAPE)

Model	MAPE Value	Comments
ARIMA	0.4902	Smooth predictions; may miss day-to-day fluctuations.
SARIMA	0.4440	Better at capturing seasonal patterns.
Prophet	0.4372	Best balance between trend capture and seasonality.
LSTM	0.4540	Higher error than Prophet, struggles with short-term fluctuations
Random Forest	0.5726	Over-smooths and struggles with rapid fluctuations.

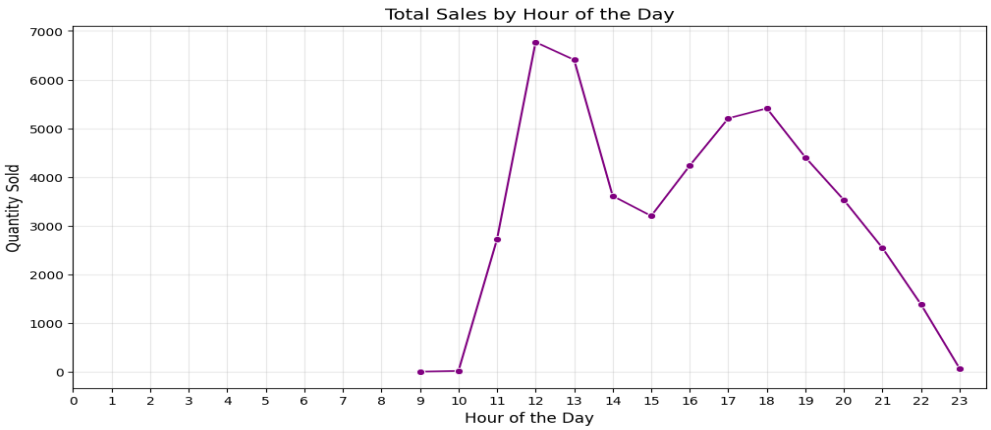
4.2 Why the Prophet Model Was Chosen

- Balanced **trend capture and seasonality handling**.
- **Works well with irregular holidays and promotions**, which were common in the sales data.
- In-built **trend, seasonality, and holiday components** reduce manual effort.
- Consistently delivered the **lowest MAPE among all models** tested.

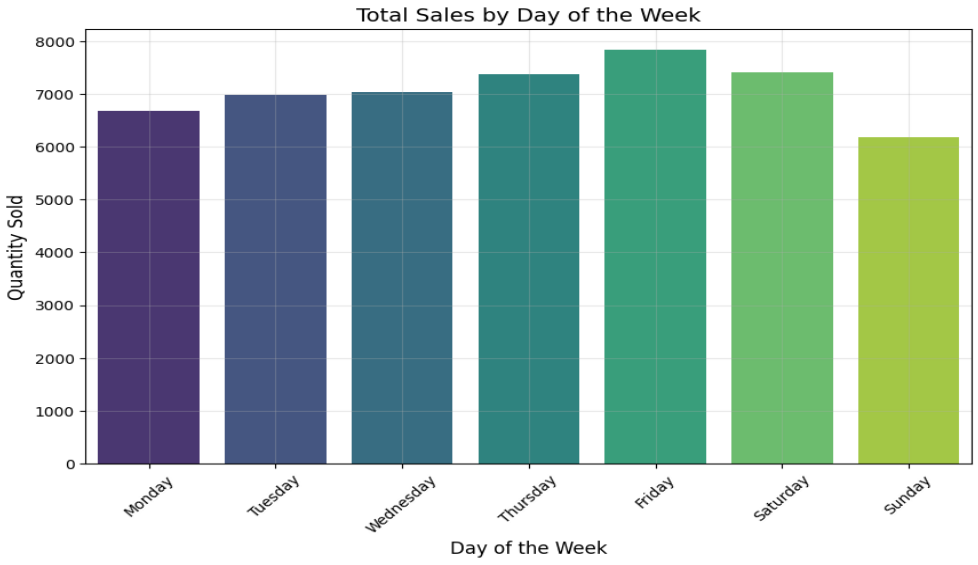
5. Exploratory Data Analysis (EDA)

5.1 Sales Trends

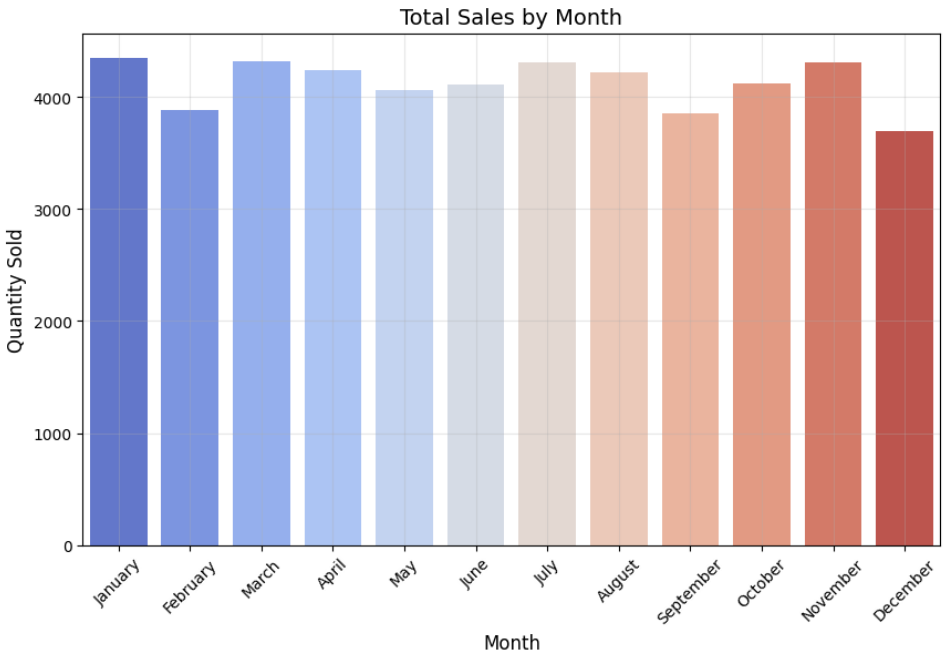
- **Hours** : The highest sales occur around midday (**around 12-2pm**) with a secondary peak around **(6-7pm)**.



- **Days**: **Friday** records the highest sales, followed by **Saturday**, while Sunday is slightly lower.

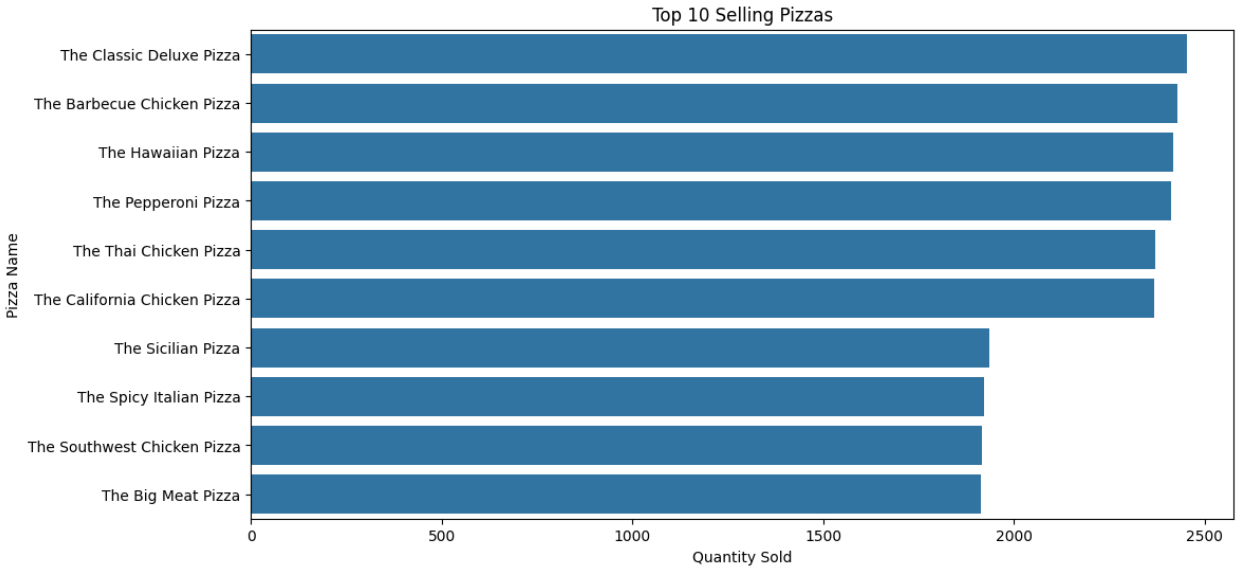


- **Months : January, March, November** have the highest sales, while **December** has relatively lower sales.



5.2 Top-Selling Pizzas

- **The Classic Deluxe Pizza** leads in sales, followed by **Barbecue Chicken Pizza** and **Hawaiian Pizza**.



- Chicken and classic flavors dominate customer preferences.

5.3 Revenue and Size Preferences

- Large pizzas contribute the highest revenue, showing a clear customer preference for larger sizes, likely for group orders.
- A few top-selling pizzas contribute disproportionately to overall revenue, making them key products to focus on.

5.4 Order Volume by Category

- **Classic** and **Chicken** categories drive the highest order volumes, indicating strong demand for familiar and versatile flavors.

6. Final Outputs

6.1 Forecast Files Saved

File Name	Description
final_forecast.csv	Forecasted daily sales for all pizzas over the next period.
next_week_purchase_order.csv	Forecasted ingredient purchase quantities for the next 7 days.

7. Forecast Plots and Observations

Observations from Plots

- **Holiday Spikes:** Sudden spikes (likely due to **promotions or holidays**) were captured by Prophet.
- **Clear Trend and Seasonality Patterns:** Prophet's decomposition plots highlight both **overall trends** and **weekly cycles**, which match the nature of pizza sales.

Visualization Benefits

- Provides visual validation that certain pizza types (like BBQ Chicken) follow **unique sales trends**.
- Helps store managers and procurement teams quickly understand **sales patterns before approving purchase orders**.

8. Purchase Order Generation Logic

Process Overview

- **Pizza Forecast:** Prophet generates **7-day sales forecasts** for each pizza.
- **Ingredient Breakdown:** Each forecasted pizza sale is converted into **ingredient quantities** using pizza_ingredients.
- **Total Ingredient Demand:** For each ingredient (cheese, sauce, etc.), the **total required quantity** across all pizzas is calculated.
- **Final CSV Output:** Results in next_week_purchase_order.csv, which can be directly used by the **procurement team** for ordering ingredients.

9. Conclusion

The Domino's Predictive Purchase Order System integrates:

- **Sales forecasting for pizzas.**
- **Conversion into ingredient-level demand.**
- **Weekly purchase order generation.**

With Prophet's **high accuracy and clear seasonality detection**, this system offers:

- **Just-in-time inventory planning.**
- **Reduced stockouts.**
- **Minimized wastage.**

Key Benefits

- **Forecast accuracy validated using MAPE comparison.**
- **Handles holidays and irregular sales.**
- **Direct CSV output ready for purchase systems.**