

Title : Project Registration & Progress Review

Department: Computer Engineering	Academic Year: 2025-26
Semester: I	Group No.: TY CS C 20
Project Title: Smart Demand Forecaster	
Project Area: AI, ML, Business Analytics	

Group Members Details:

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Project approved / Not approved

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PROJECT SYNOPSIS

Introduction:

Retailers and e-commerce platforms face challenges in accurately predicting product demand, which can lead to overstock or stockouts. This project proposes an AI-powered Retail Demand Forecasting Engine that uses time-series analysis and machine learning models to predict product demand for upcoming weeks or months by leveraging historical sales, promotions, seasonal trends, and other external factors

Literature Review:

[1] Luka Hobor, Mario Brcic, Lidija Polutnik, Ante Kapetanovic, “Comparative Analysis of modern machine learning models for retail sales forecasting (2025)”

[2] Santiago Mejia, Jose Aguilar, “A demand forecasting system of product categories defined by their time series using a hybrid approach of ensemble learning with feature engineering (2024)”

[3] Mehran Nasser, Taha Falatouri, Patrick Brandtner, Farzaneh Darbanian, “Applying Machine Learning in Retail Demand Prediction—A Comparison of Tree-Based Ensembles and Long Short-Term Memory-Based Deep Learning (2023)”

[4] Ziyi Gu, “Research on Optimization of Demand Forecasting Based Inventory Control Systems (2025)”

[5] Tong Zhou, “Improved Sales Forecasting using Trend and Seasonality Decomposition with LightGBM (2023)”

[6] Yue Zhou, Xiaobei Shen, “Inventory Control Strategy: based on demand forecast error (2023)”

[7] Srayanta Mukherjee, Devashish Shankar, Atin Ghosh, Nilam Tathawadekar, Pramod Kompalli, Sunita Sarawagi, Krishnendu Chaudhury, “AR-MDN: Associative and Recurrent Mixture Density Networks for eRetail Demand Forecasting (2018)”

[8] Yasaman Ensafi, Saman Hassanzadeh Amin, Guoqing Zhang, Bharat Shah, “Time-series forecasting of seasonal items sales using machine learning –A comparative analysis (2022)”

[9] Sri Darshan M, Nithiraj N, Jaisachin B, “Integrating Data Mining and Predictive Modeling (2024)”

Problem Statement:

Traditional retail demand forecasting methods fail to capture seasonality, promotions, and regional differences effectively. This project aims to develop a machine learning-based dashboard that predicts demand for each product/SKU and region, incorporates multiple influencing factors, and provides actionable insights such as restock alerts and promotional recommendations

Objectives:

The key objectives of our project are as follows:

- Accurate demand forecasts per SKU
- Interactive dashboard for decision-making.
- Restock and promotion recommendations.
- Reduced storage costs and improved product availability

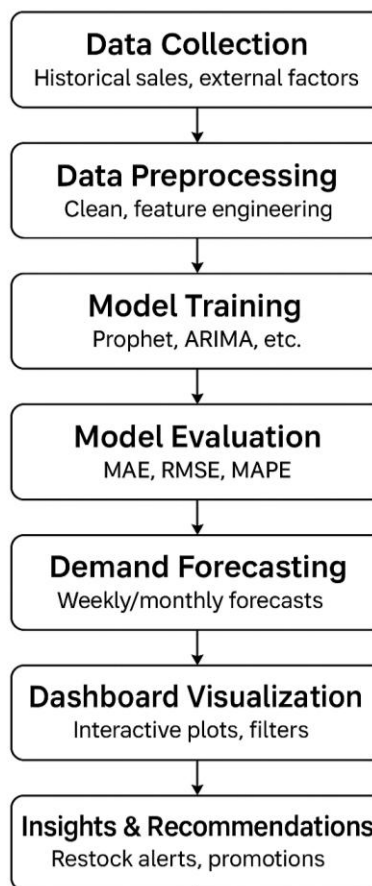
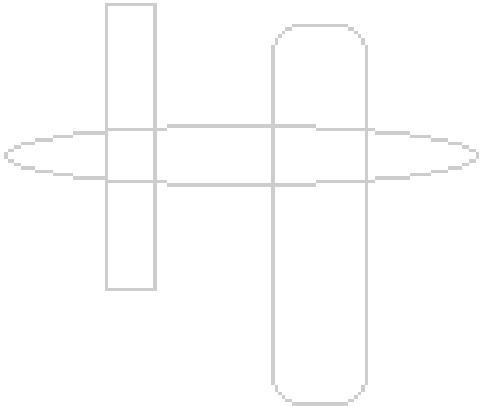
Flowchart:

Fig.1: Flowchart

This flowchart illustrates the end-to-end workflow of the Retail Demand Forecasting Engine. The process begins with Data Collection, where historical sales records and external influencing factors such as weather, holidays, and trends are gathered. Next, Data Preprocessing is performed to clean the dataset and create relevant features for the model. The refined data is then used in Model Training using algorithms like Prophet, ARIMA, or other suitable machine learning techniques. In the Model Evaluation phase, accuracy metrics such as MAE, RMSE, and MAPE are calculated to assess performance. Once validated, the system moves to Demand Forecasting, generating weekly or monthly predictions for each product or region. These results are presented through Dashboard Visualization, offering interactive plots and filters for user exploration. The system also provides Insights & Recommendations, such as restock alerts and promotional suggestions, before finally being Deployed as a Streamlit web application for easy access and use by decision-makers.

Group No.			
Activity	Review Schedule	Progress Review Report submitted	Signature of Guide
Review 1	Mid Sem. Semester	Yes / No	
Review 2	End of Semester	Yes / No	

Format of Progress Review Report:

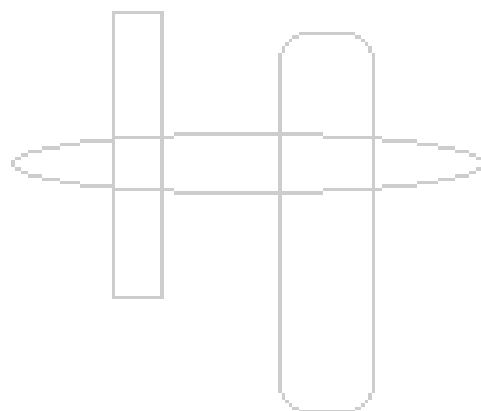
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Signature of Guide:		

Review No.: 2

Group No.: 2

Date: 13 May 2024

Progress Review Report



Signature of Guide: