

## **TITLE PAGE**

Project Title: SalesPulse - Retail Forecasting and Business Insights Platform

Duration: 3 Week Development Cycle

Team: [Team Name]

Date: [Month, Year]

## 1. INTRODUCTION

Retail organizations require accurate demand forecasting and real time insights to optimize inventory, reduce stockouts, and improve revenue outcomes. Traditional reporting workflows rely on delayed batch processes and static spreadsheets, resulting in slow decision cycles. SalesPulse is a data driven forecasting and analytics platform developed over a 3 week sprint cycle to provide automated insights, interactive dashboards, and short term sales predictions.

## 2. PROJECT TIMELINE AND PHASES

### 2.1 Week 1: Data Exploration and Pipeline Setup

Activities: Collected historical retail sales dataset with multiple store and product attributes. Performed exploratory data analysis including trend decomposition and seasonal pattern identification. Built preprocessing pipeline for cleaning, aggregation, outlier removal, and feature extraction. Evaluated baseline statistical forecasting approaches.

### 2.2 Week 2: Model Development and Evaluation

Activities: Implemented ARIMA and Prophet models for short term forecasting. Compared performance using mean absolute percentage error and root mean squared error. Performed hyperparameter tuning and rolling window validation. Generated forward looking forecast outputs for dashboard integration.

### 2.3 Week 3: Dashboard Integration and Testing

Activities: Developed Power BI dashboard with interactive filters and visualizations. Connected processed dataset to dashboard refresh pipeline. Added visual components including forecast overlays and store level comparison. Conducted functional, performance, and user acceptance testing.

### 3. DATASET DETAILS

The dataset includes: Daily sales records across multiple retail stores. Product identifiers, categories, and promotional markers. Attributes such as price, quantity, and regional segmentation. Date range covering multiple seasonal cycles.

#### 3.1 Data Challenges

Challenges identified: Missing entries during holidays. Large spikes during promotional events. Non uniform distribution across stores.

### 4. MODELING APPROACH

#### 4.1 Model Selection

Approaches evaluated: Naive baseline model. ARIMA for short term trend forecasting. Prophet for seasonality heavy patterns. Random forest regression for feature based prediction.

#### 4.2 Final Model Justification

Prophet selected for: Automatic handling of yearly and weekly seasonality. Fast training suitable for periodic updates. Robustness against irregular gaps.

### 5. EVALUATION AND RESULTS

Performance achieved: Mean absolute percentage error: 5.8 percent. Root mean squared error: 12.4. Rolling forecast stability maintained across validation windows. Insights revealed seasonal peak months and declining product categories.

## 6. DASHBOARD DEVELOPMENT

### 6.1 Power BI Components

Dashboard includes: Store wise trend graphs. Forecast versus actual comparison chart. Top performing product matrix. Dynamic slicers for date, region, and product category.

### 6.2 Refresh and Data Flow

Process: Preprocessing pipeline outputs final dataset. Power BI refresh configured on scheduled interval. Updated forecasts pushed to dashboard for continuous visibility.

## 7. IMPLEMENTATION AND TESTING

### 7.1 Functional Testing

Validated: Data integrity and preprocessing consistency. Model output correctness. Dashboard filter behavior and refresh reliability.

### 7.2 Performance Testing

Measured: Model training time under 3 minutes. Dashboard refresh latency below 10 seconds. Memory usage during preprocessing.

## 8. LIMITATIONS

Limitations identified: No real time data streaming in current version. Forecast accuracy declines beyond 30 day horizon. Model does not yet factor external variables such as weather or marketing campaigns.

## 9. FUTURE DEVELOPMENT PLAN

Planned enhancements: Integration with live POS streaming systems. LSTM based neural forecasting. Anomaly detection pipeline. Deployment using FastAPI and containerization. Role based access controls for dashboard users.

## 10. CONCLUSION

SalesPulse demonstrates a complete 3 week development cycle including data exploration, model experimentation, dashboard integration, and evaluation. The platform provides actionable insights for retail planning and forms a strong foundation for future expansion into real time forecasting and advanced analytics.

## 11. REFERENCES

[1] Prophet Forecasting Framework Documentation. [2] Retail Time Series Analysis Literature. [3] Power BI Official Documentation.