A

SYNOPSIS

of

MINOR PROJECT

on

Store Item Demand Forecasting

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Darkness to Light

Submitted by

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Problem Statement:

Store Item Demand Forecasting

Brief Description:

The Store Item Demand Forecasting project aims to predict the future demand for items in a retail store. Accurate demand forecasting is crucial for inventory management, reducing stock outs, minimizing overstock, and optimizing supply chain operations. This project leverages historical sales data, promotional data, and other relevant factors to build predictive models that estimate future item sales.

Objective and Scope:

This project aims to :

- **Accurate Demand Prediction**: Develop a model that accurately forecasts the daily demand for each item in the store.

- **Inventory Optimization**: Use the demand forecasts to optimize inventory levels, ensuring products are available when needed while minimizing excess stock.

- **Sales and Revenue Maximization**: Improve sales by ensuring high-demand items are always in stock, thus reducing lost sales.

1. **Model Development**: Develop and evaluate multiple forecasting models, such as time series models (ARIMA, SARIMA), machine learning models (Random Forest, XGBoost), and deep learning models (LSTM, GRU).

2. **Model Evaluation**: Use appropriate metrics (e.g., RMSE, MAE) to evaluate model performance and select the best model.

3. **Implementation**: Deploy the selected model into a production environment, enabling real-time or batch prediction capabilities.

Methodology :

1. **Data Collection**
   - **Historical Sales Data**
   - **Promotional Data**

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- **Seasonal data**

2. **Data Processing**
   - **Data Cleaning**
   - **Transformation**

3. **Model Development**
   - **Baseline Model**
   - **Machine Learning Models**
   - **Advanced Time series Model**

4. **Evaluation**
   - **Cross Validation**
   - **Performance Metrics**

5. **Validation and Feedback**
   - **Stakeholder Feedback**

Hardware and Software Requirements:

Software:

- **Operating Systems : Windows 10/11 , macOS, Linux (Ubuntu 18.04 or higher)**

- **Programming Languages : Python 3.8 or higher**

- **Version Control : Git, GitHub / GitLab**

- **Machine Learning Services : AWS SageMaker , Google, Azure Machine Learning**

Hardware:
- Processor : Intel i7 or higher , AMD Ryzen 7 or higher
- Memory : Minimum 16 GB RAM
- Storage : SSD with at least 512 GB

Technologies:

Programming Language: Python (powerful and versatile for machine learning)

Libraries and Framework : Pandas , Numpy, Keras

Visualization Tools : Matplotlib , Plotly , Dash

Deployment Platforms : AWS , Google Cloud Platforms , Microsoft Azure

Version Control : Git/GitHub

Testing Techniques:

- **Data Accuracy:** Validate the accuracy of the data by cross-referencing with known benchmarks or manual records .

- **Trend Analysis:** Confirm that the identified trends are realistic and align with business expectations.

- **Feature Impact :** Assess the relevance and significance of engineered features through correlation analysis and domain expert validation.

- **Model Testing:** Divide the data into training and testing sets to evaluate model performance on unseen data.

- **Scenario Testing:** Evaluate model's performance under extreme conditions , such as

sudden spikes or drops in demand.

- **User-Acceptance Testing :** Ensure that the forecasting tool, including dashboards and reports , is user-friendly and provides actionable insights.

- **Deployment Testing :** Test the integration of different components (e.g., data pipeline, model, API)to ensure they function together correctly.

Project Contribution:

The Store Item Demand Forecasting project significantly contributes to the retail business by enhancing inventory management, reducing costs, and improving customer satisfaction. Moreover, the forecasting system allows for informed decision-making regarding promotions and supply chain management, ultimately increasing sales and revenue. The project's implementation fosters a data-driven culture within the organization, ensuring continuous improvement and competitive advantage in the retail market

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