**Sales Forecasting and Demand Prediction**

**Project Objectives:**

This project aims to develop a **machine learning-based model** for predicting future sales trends based on historical data and external factors. The project will enable businesses to **optimize inventory management, improve marketing strategies, and enhance operational planning** by providing accurate demand forecasts.

**Key Goals:**

* **Develop an accurate forecasting model** using time-series analysis and machine learning techniques.
* **Enhance business decision-making** by predicting sales trends and demand fluctuations.
* **Reduce inventory costs** and prevent overstocking or stock shortages.
* **Deploy a web-based application** to provide real-time sales predictions.
* **Monitor and optimize model performance** through MLOps practices.

**Team Members:**

| **Name** | **Contact Information** |
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**Project Plan:**

To ensure the successful execution of the **Sales Forecasting and Demand Prediction** project, the following structured plan outlines key phases, tasks, and timelines.

**Phase 1: Planning (Week 1-2)**

**Objectives:**

* Define the problem and scope of the project.
* Identify the required data sources and tools.
* Assign tasks to team members.

**Tasks:**

* Conduct research on **sales forecasting techniques**.
* Identify key **features** influencing sales and demand.
* Gather **datasets** from sources like Kaggle, UCI, or real-world company data.
* Define **success metrics** (e.g., RMSE, MAPE, MAE).

**Phase 2: Design (Week 3-4)**

**Objectives:**

* Define the overall **system architecture**.
* Select appropriate **machine learning models**.

**Tasks:**

* Design the **data pipeline** (collection, preprocessing, storage).
* Choose forecasting models (**ARIMA, Prophet, XGBoost, LSTM**).
* Plan the **web application architecture** (Flask/FastAPI backend, Streamlit/Dash frontend).
* Develop a preliminary **dashboard layout**.

**Phase 3: Implementation (Week 5-8)**

**Objectives:**

* Develop the **machine learning models** and integrate them into a prototype.

**Tasks:**

* **Data preprocessing** (handling missing values, feature engineering).
* Train and evaluate **multiple forecasting models**.
* Optimize models using **hyperparameter tuning**.
* Build the **web application** (backend API + frontend interface).
* Deploy the **initial version** of the model.

**Phase 4: Testing and Evaluation (Week 9-10)**

**Objectives:**

* Validate model performance and optimize predictions.

**Tasks:**

* Compare model performance using **RMSE, MAE, and MAPE**.
* Test real-world forecasting scenarios.
* Evaluate **system scalability** and response time.
* Identify and fix **bugs or inaccuracies**.

**Phase 5: Deployment & Monitoring (Week 11-12)**

**Objectives:**

* Deploy the model for **real-time or batch predictions**.
* Implement **MLOps** for continuous monitoring and improvement.

**Tasks:**

* Deploy the **final model** on cloud platforms (AWS, Google Cloud, or Heroku).
* Set up a **dashboard for visualization and reporting**.
* Monitor **forecast accuracy** and retrain the model periodically.
* Create a **final project report** and **presentation**.

**GitHub Repository:** *(https://github.com/2hmed-magdiii/Sales-Forecasting-and-Demand-Prediction.git)*