1. Project Planning & Management

Project Proposal

Sales forecasting and demand prediction play a crucial role in helping businesses make informed decisions regarding inventory management, resource allocation, and strategic planning. This project aims to develop a data-driven solution to forecast sales and predict demand using machine learning techniques. The objective is to enhance decision-making processes by providing accurate and timely predictions based on historical sales data and market trends.

Project Plan

The project will be completed in the following phases:

1. **Research & Data Collection (Weeks 1-2)**: Gathering historical sales data and understanding domain-specific trends.
2. **Data Preprocessing (Weeks 3-4)**: Cleaning, handling missing values, feature engineering, and exploratory data analysis.
3. **Model Development (Weeks 5-6)**: Implementing various forecasting models such as ARIMA, Prophet, LSTM, or other machine learning approaches.
4. **Evaluation & Optimization (Weeks 7-8)**: Measuring model performance using error metrics (MAE, RMSE) and refining the approach.
5. **Deployment & Reporting (Weeks 9-10)**: Deploying the model and presenting findings with visualizations.

Task Assignment & Roles

- **Data Collection & Cleaning** – [**Nourhan Abdelnafea**]
- **Exploratory Data Analysis (EDA)** – [**Mazen Emad Fawzy**]
- **Model Development** – [**Abdelrahman Ashraf Youssef**]
- **Evaluation & Optimization** – [**Mohamed Abdelhaq Mohamed**]
- **Deployment & Documentation** – [**Ahmed Badr Zaghloul**]

Risk Assessment & Mitigation Plan

Risk	Impact	Mitigation Strategy
Data quality issues	High	Implement robust data cleaning and validation techniques
Model underperformance	Medium	Experiment with different models and hyperparameter tuning
Scalability issues	Low	Optimize code and infrastructure for performance

KPIs (Key Performance Indicators)

- Model accuracy (e.g., Mean Absolute Error, RMSE)
- Prediction latency
- Business impact metrics (e.g., inventory cost reduction, revenue growth)

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2. Literature Review

Feedback & Evaluation

The literature review will include an analysis of existing research and methodologies in sales forecasting and demand prediction. The project will be assessed by the lecturer based on:

- The effectiveness of forecasting techniques applied.
- The clarity and comprehensiveness of the data analysis.
- The innovation in the approach taken.

Suggested Improvements

- Enhancing the dataset with external factors such as economic indicators or seasonal trends.
- Experimenting with advanced deep learning models like Transformers for time series forecasting.
- Improving visualization and interpretability of predictions for better business insights.

Final Grading Criteria

- Documentation (20%)
- Implementation and code quality (30%)
- Model performance and evaluation (30%)
- Presentation and explanation of results (20%)

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3. **Requirements Gathering**

Stakeholder Analysis

The primary stakeholders for this project include:

- **Business Owners & Managers**: Need accurate sales forecasts for inventory and financial planning.
- **Data Scientists & Analysts**: Require well-documented and structured data for building models.
- **Supply Chain & Logistics Teams**: Benefit from demand prediction to optimize stock levels and reduce waste.

User Stories & Use Cases

- **As a Business Owner,** I want to see sales forecasts for the next 3 months so that I can adjust my purchasing strategy.
- **As a Data Analyst,** I want to analyze past sales trends to improve forecasting accuracy.

- **As a Warehouse Manager,** I want to receive demand predictions to optimize inventory levels.

Functional Requirements

- Data ingestion from multiple sources (CSV, databases, APIs)
- Data preprocessing and feature engineering
- Forecasting model training and evaluation
- Dashboard for visualization of predictions
- API for accessing forecast results

Non-functional Requirements

- **Performance**: Model inference should take less than 2 seconds per query.
- **Security**: Data should be encrypted and access controlled.
- **Usability**: Intuitive UI for non-technical users.
- **Reliability**: System should maintain at least 99% uptime.

Milestone Table

Milestone	Description	Duration (Weeks)	Deliverables
Data Collection & Preprocessing	Gather historical sales data, clean, and preprocess it.	1-2	Cleaned dataset
Exploratory Data Analysis (EDA)	Identify trends, correlations, and seasonality in data.	3-4	EDA report, visualizations
Model Development	Train and test forecasting models (ARIMA, Prophet, LSTM, etc.).	5-6	Trained models, initial results
Evaluation & Optimization	Assess model accuracy, tune hyperparameters, and improve performance.	7-8	Model evaluation report, refined models
Deployment & Reporting	Deploy the model, create dashboards, and document findings.	9-10	Deployed model, final report, presentation