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**Sales Forecasting and Demand Prediction**

**Project Team:**

1. Mariam Omran
2. Ahmed Ehab
3. Madline Raafat
4. Omar Gamal
5. Farah Elfayomi

**Project Planning and Management**

**Project Proposal:**

The Sales Forecasting and Demand Prediction project focuses on developing a machine learning model to anticipate future product sales and demand using historical data. By providing accurate predictions, this project aims to assist businesses in optimizing inventory control, workforce planning, and marketing strategies. The workflow includes data collection, analysis, model training, deployment, and continuous monitoring, ensuring that organizations can make informed, data-driven decisions.

**Project Plan:**

**Gantt Chart & Milestones:**

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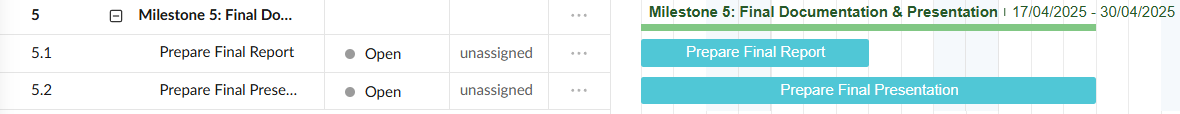
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**Deliverables of each milestone:**

* Milestone 1:
  + EDA Report
  + Cleaned Dataset
  + Interactive Visualizations
* Milestone 2:
  + Data Analysis Report
  + Enhanced Visualizations
  + Feature Engineering Summary
* Milestone 3:
  + Model Evaluation Report
  + Model Code
  + Final Model
* Milestone 4:
  + Deployed Model
  + MLOps Report
  + Monitoring Setup
* Milestone 5:
  + Final Project Report
  + Final Presentation

**Resource Allocation:**

|  |  |  |  |
| --- | --- | --- | --- |
| Resource | Role | Number of people | Responsibilities |
| Data Scientist | Lead Developer | 1 | Data preprocessing, feature engineering, model training |
| ML Engineer | Model Developer | 1 | Model optimization, deployment, and MLOps setup |
| Data Analyst | EDA & Visualization | 1 | Exploratory analysis, interactive visualizations |
| DevOps Engineer | Deployment & Monitoring | 1 | Model API setup, cloud deployment, monitoring |
| Project Manager | Coordination | 1 | Timeline management, stakeholder communication |

**Risk Assessment & Mitigation Plan:**

|  |  |  |
| --- | --- | --- |
| Risk Factor | Description | Mitigation Strategy |
| Data Quality Issues | Missing, inconsistent, or biased data | Perform thorough data cleaning, imputation, and validation |
| Model Overfitting | The model performs well on training data but poorly on real data | Use cross-validation, regularization, and feature selection |
| Computational Constraints | Limited processing power or memory for large datasets | Optimize code, use cloud computing, or downsample data |
| Deployment Challenges | Issues with API integration or real-time prediction speed | Conduct performance testing and use scalable infrastructure |
| Model Drift | Changes in data patterns over time affecting model accuracy | Implement continuous monitoring and periodic retraining |
| Stakeholder Adoption | Resistance to using machine learning forecasts in decision-making | Provide clear explanations and integrate intuitive dashboards |
| Security & Data Privacy Risks | Sensitive data exposure or unauthorized access | Follow best security practices and ensure data encryption |

**Key Performance Indicators (KPIs):**

To measure the success of the sales forecasting model, the following KPIs will be used:

**Model Performance Metrics:**

* Mean Absolute Error (MAE): Measures the average magnitude of errors in predictions.
* Root Mean Squared Error (RMSE): Evaluates prediction accuracy while penalizing larger errors.
* R-squared (R²): Indicates how well the model explains variance in the data.
* Mean Absolute Percentage Error (MAPE): Shows the model's accuracy as a percentage.

**Operational Metrics:**

* Prediction Latency: Measures the time taken for the model to generate forecasts.
* System Uptime: Ensures the deployed model is consistently available.

**Business Impact Metrics:**

* Inventory Optimization Rate: Measures how well forecasts reduce overstock or stockouts.
* Revenue Growth Contribution: Evaluates the impact of improved forecasting on sales revenue.

**Task Assignment & Roles:**