**ALY 6080 - Integrated Experiential Learning**

Group Assignment XN Project:Project Roadmap

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**Introduction**

Financial decision-making and efficient budget planning are essential for public sector undertakings, especially when it comes to facility management. State facility projects are supervised by the Division of Capital Asset Management and Maintenance (DCAMM), while difficulties in making precise spending projections can result in resource inefficiencies and budget overruns. The goal of this project is to create a predictive model based on AI/ML that improves the accuracy of spending forecasts, guaranteeing improved resource allocation and financial planning. This effort aims to enhance transparency and decision-making skills among DCAMM stakeholders by utilizing data-driven techniques.

**1. Analytic Approach**

We will employ a structured analytical approach using the following approaches in order to create an AI/ML-based model for enhancing spending projections for the Division of Capital Asset Management and Maintenance (DCAMM):

**Data Preparation:**

Data Cleaning: To guarantee consistency, we will eliminate duplicates, standardize formats, encode categorical variables, and manage missing data using imputation techniques.

Data Integration: We will combine datasets while guaranteeing structural coherence and attribute alignment.

Data transformation entails arranging date fields, encoding categorical data, and normalizing numerical variables in order to get them ready for analysis.

**Exploratory Data Analysis (EDA):**

Outlier Detection: Boxplots and z-scores are two statistical techniques that can be used to find and handle extreme results that could distort model predictions.

Feature Engineering: To improve prediction capabilities, new attributes will be extracted from current variables.

Correlation Analysis: To find multicollinearity and choose the most significant features, we will evaluate the relationships between variables.

**Modeling Approach:**

* **Algorithm Selection:** We will experiment with multiple machine learning models, including:
  + **Linear Regression:** Baseline model for establishing spending trends.
  + **Random Forest:** For handling non-linearity in spending behaviors.
* **Model Evaluation:** Performance metrics such as RMSE, MAPE, and R-squared will be used to assess prediction accuracy.
* **Interpretability Considerations:** We will balance model complexity and explainability to align with stakeholder needs.

**2. Milestones to Measure Progress**

| **Milestone** | **Expected Completion** | **Key Deliverables** |
| --- | --- | --- |
| Data Cleaning & Integration | Week 2 | Processed and structured dataset |
| Exploratory Data Analysis | Week 3 | Summary statistics, visualizations, correlation matrix |
| Feature Engineering | Week 4 | New derived features, transformation logs |
| Model Selection & Training | Week 5 | Initial model results and evaluation metrics |
| Model Optimization & Validation | Week 6 | Final model with tuned hyperparameters |
| Deployment & Documentation | Week 7 | Final model report, implementation recommendations |

**3. Job Assignments**

Each team member will contribute based on expertise:

* **Shree Gounder:** Responsible for data cleaning, handling missing values, and encoding categorical variables. Additionally, Shree will assist with exploratory data analysis (EDA), contribute to model evaluation, and document data preparation steps in the final report.
* **Aniket Manishbhai Thakkar:** Focused on model selection, training, and hyperparameter tuning. Aniket will also take part in data integration, correlation analysis, and feature engineering to ensure model effectiveness. Additionally, he will help with risk mitigation strategies and final report documentation.
* **Shawn Njoroge:** Exploratory data analysis (EDA), visualizations, and presentation development. Shawn will generate summary statistics, detect outliers, and assist in feature engineering. Additionally, he will support model validation, optimize deployment in Power BI, and ensure an effective project presentation.

**4. Key Risks and Mitigation Strategies**

| **Risk** | **Mitigation Strategy** |
| --- | --- |
| Incomplete or inconsistent data | Implement robust cleaning and validation procedures |
| Model underperformance | Try multiple models, perform hyperparameter tuning |
| Difficulty in model interpretability | Use explainable AI techniques such as SHAP values |
| Resistance from stakeholders | Provide clear documentation and demonstrations |
| Time constraints | Follow structured project timelines and allocate tasks efficiently |

**5. Measures of Success**

Success will be determined based on:

* **Model Performance:** Accuracy measured by RMSE, MAPE, and R-squared.
* **Stakeholder Satisfaction:** Feedback from DCAMM representatives.
* **Actionability of Insights:** The model's ability to provide useful forecasting insights.
* **Scalability:** Adaptability of the model for future spending forecasts.

**6. Presentation Method and Proof of Concept Delivery**

* **Presentation Format:** PowerPoint slides, supplemented with interactive visualizations.
* **Delivery Mode:** Virtual presentation with a live demonstration of the model.
* **Proof of Concept:** The final model and its results will be shared via a detailed report including visualizations, performance metrics, and actionable recommendations.
* **Interactive Dashboard (if feasible):** A Power BI dashboard summarizing key insights.

**7. Conclusion**

Our methodical approach to creating a predictive AI/ML model for DCAMM's budget projections is described in this roadmap. Our goal is to improve the precision of budget planning and financial decision-making for state facility projects by following data-driven techniques, well-defined milestones, and strong risk mitigation strategies.

## ****References****

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