UNIVERSITI TEKNOLOGI MARA

ANALYZING UITMCTKKT VEHICLE UTILIZATION AND TRAVEL PATTERN USING PREDICTIVE ANALYTICS

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ABSTRACT

In the context of institutional vehicle management, data-driven insights play a vital role in optimizing resource allocation and reducing operational inefficiencies. This study focuses on analyzing vehicle utilization and travel patterns at Universiti Teknologi Mara Cawangan Terengganu Kampus Kuala Terengganu (UiTMCTKKT), aiming to improve decision-making for the Vehicle Management Unit (VMU) using predictive analytics. The primary objective of this project is to identify vehicle usage trends, monitor driver workload, and predict day types associated with peak or low demand periods. The project does not involve scheduling automation but instead emphasizes visualizing mileage and trip frequency to assist VMU in planning maintenance schedules, rotating vehicle use, and supporting budget allocation. The CRISP-DM framework was adopted as the methodology to guide data preparation, modeling, and evaluation. Two key experiments were conducted using machine learning models. The Experiment 1 focused on classifying vehicle types based on utilization and Experiment 2 involved predicting no of trips per day using classifiers such as Random Forest, Decision Tree, and Support Vector Machine (SVM). Data from 2023 to 2024 was cleaned and analyzed, and visualizations were developed through an interactive dashboard using Power BI. Results from the experiments showed that cars and buses were the most frequently used vehicle types, particularly during lecture days and the month of October. The Random Forest model outperformed other algorithms in predicting the daily number of vehicle trips, achieving the lowest RMSE and absolute error values among all models tested. This indicates its strong ability to model temporal and operational patterns in the dataset accurately. The dashboard enabled users to trace mileage, detect underused vehicles, and identify periods suitable for vehicle maintenance. The findings confirm that predictive analytics can significantly enhance vehicle management efficiency by supporting data-driven decision-making and resource planning. Expert evaluations further validated the dashboard's usability and functionality. Future work may involve integrating real-time tracking, automating data entry, and including additional features such as fuel prediction, overtime claim analysis, and annual maintenance planning.

TABLE OF CONTENTS