PARKING SPOT PREDICTOR

Presentation - 2024

DSPT05- GROUP 10

Business Understanding

Motorists in the urban environments of major cities are in search of convenient and accessible parking solutions to accommodate their daily mobility needs. Their primary concerns include efficiently locating available parking spaces, avoiding congestion, and ensuring a seamless experience.

Target Beneficiaries

MOTORISTS (END USERS)

CITY AUTHORITIES

PARKING OPERATORS

Problem Statement

The absence of precise and current data regarding the availability of parking spaces impedes the development of effective predictive models and constrains the innovation of solutions for urban mobility. In the absence of comprehensive data, systems designed to predict parking availability face challenges in delivering dependable real-time information. This deficiency leads to suboptimal parking decisions and exacerbates traffic congestion.

Objectives

Main Objectives

- To develop a robust time series-based parking spot predictor that forecasts parking spot availability in urban areas, leveraging historical parking data
- To explore various time series forecasting techniques, including ARIMA and Prophet and evaluate performance of each technique using MAE, MSE and RMSE.

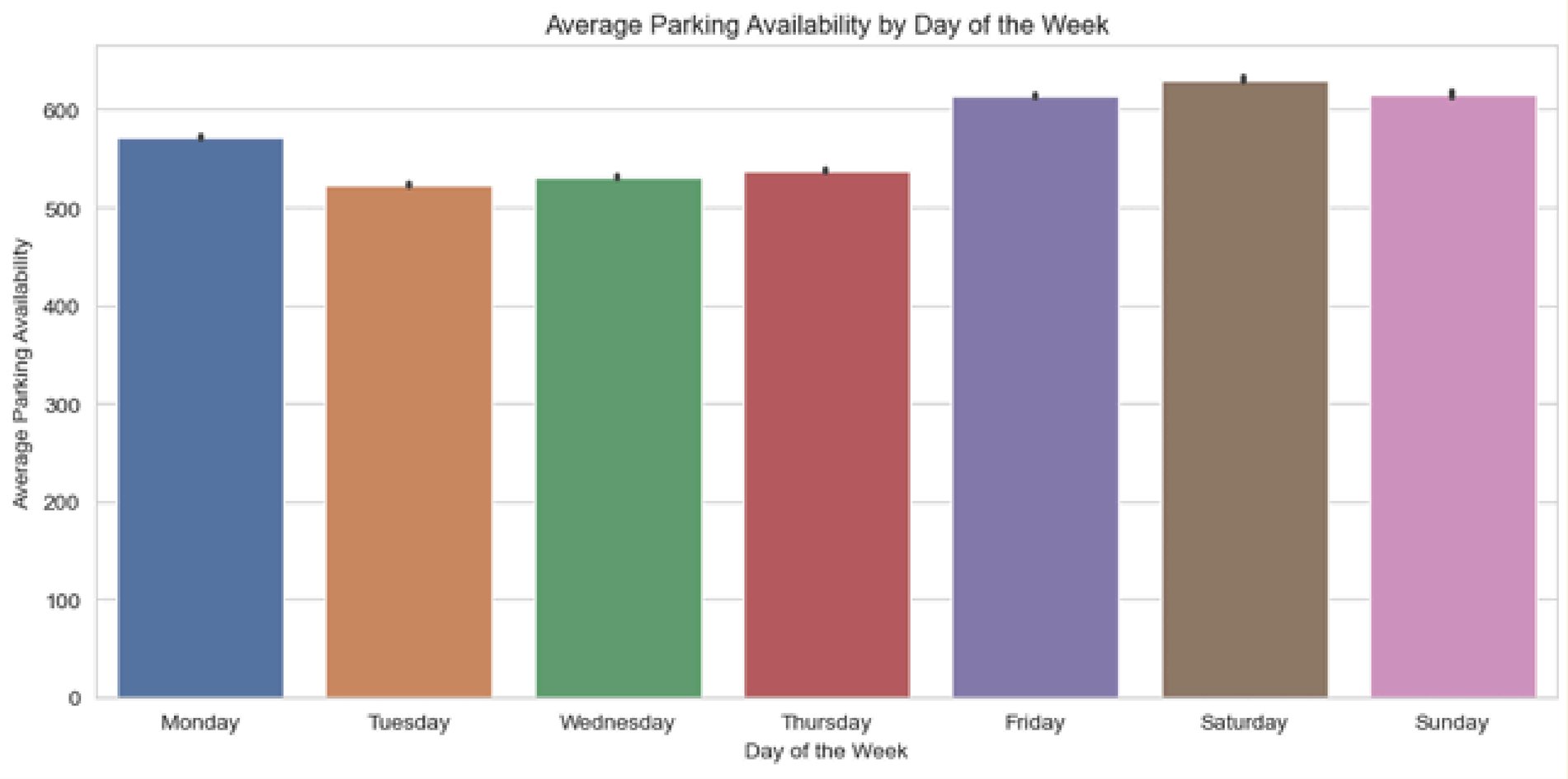
Supportive Objectives

- To investigate the impact of holidays, day of the week and time category on parking availability.

Data Understanding

We gathered parking data from the Transport for New South Wales (TfNSW) website utilizing their Car Park API. The dataset comprised both numerical and categorical variables, with parking availability designated as the target variable. The data cleaning process involved removing superfluous columns and rows, handling missing data, addressing outliers, and conducting feature engineering.

Exploratory Data Analysis



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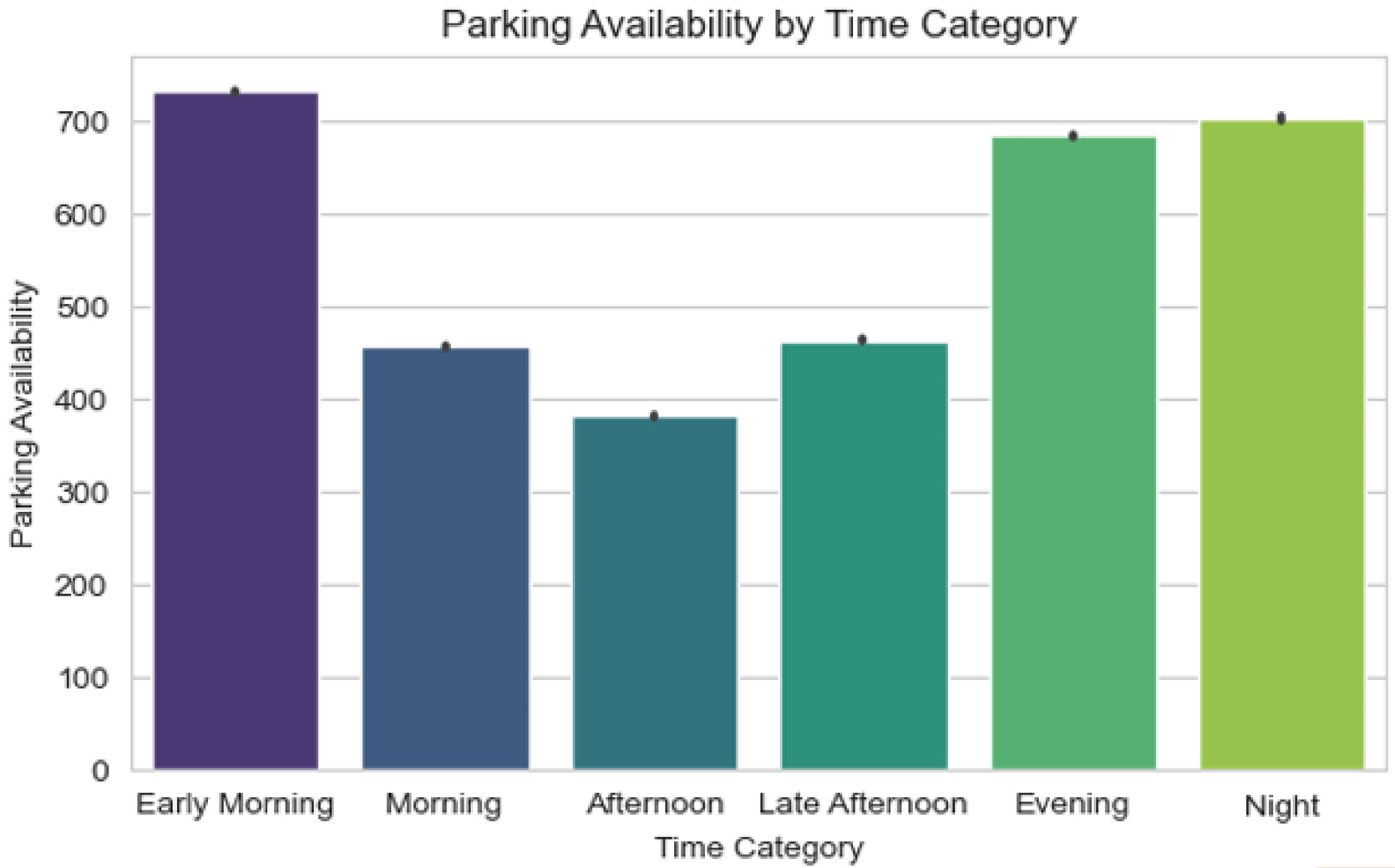
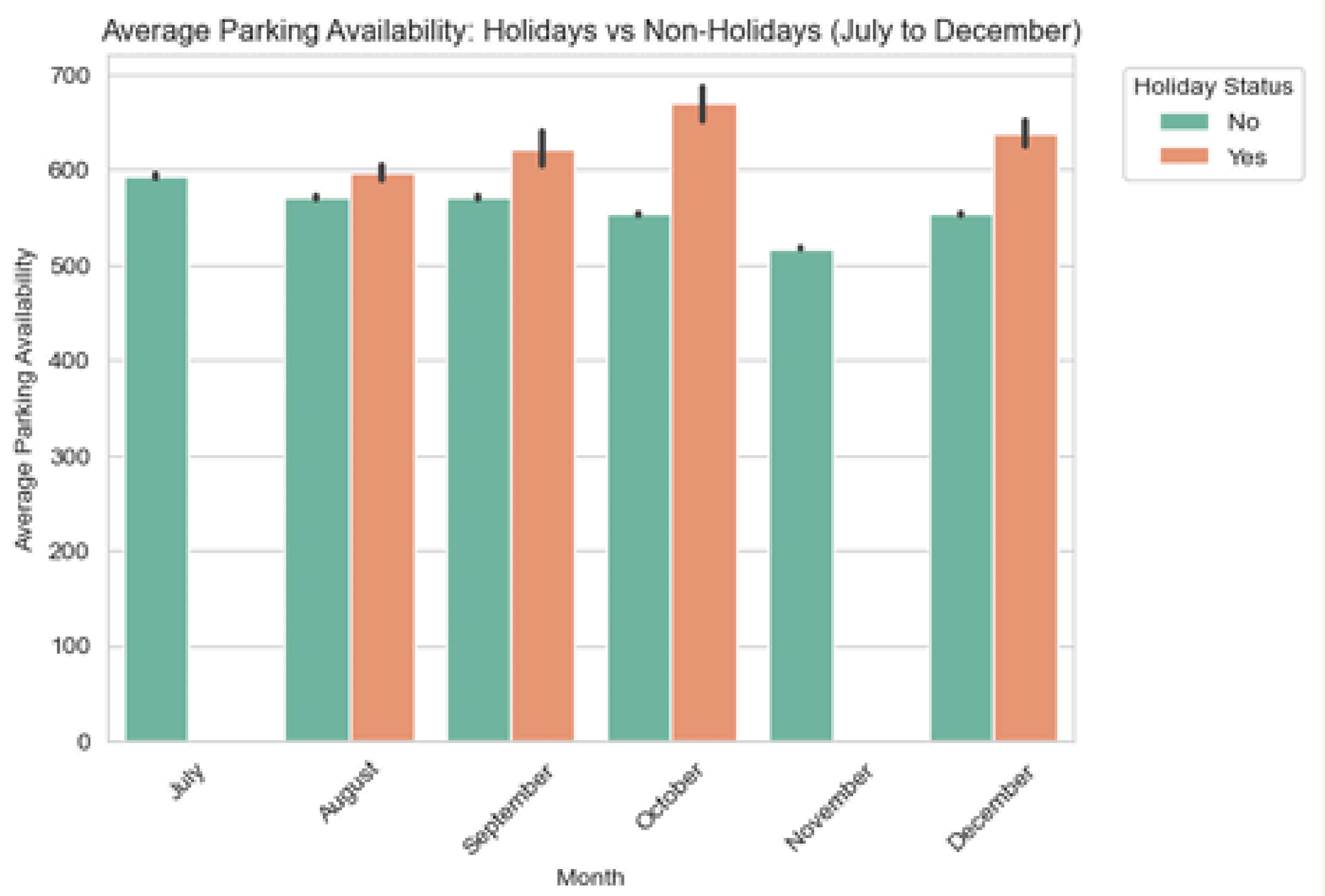
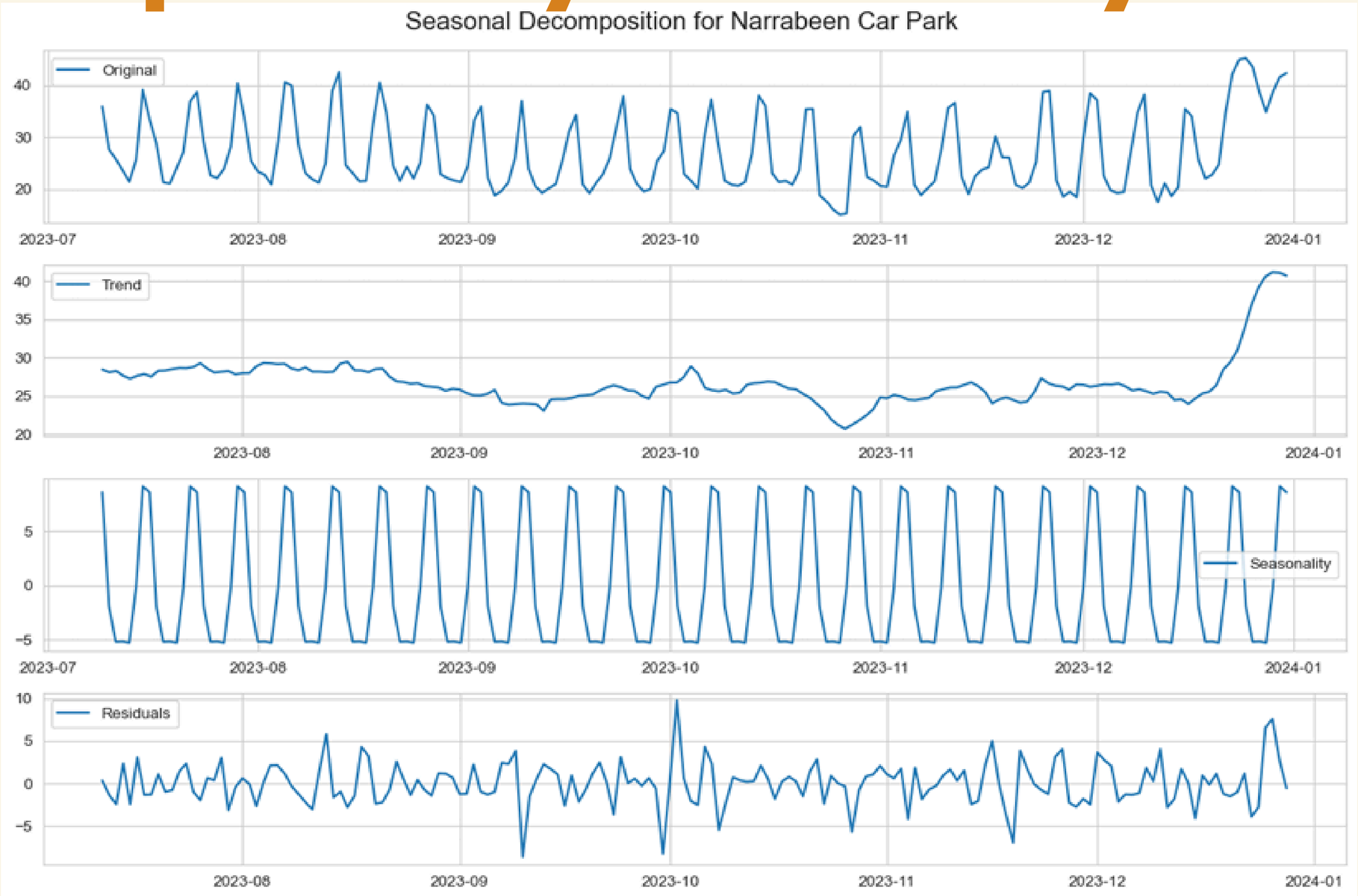


Exploratory Data Analysis



Exploratory Data Analysis



Modeling

1

ARIMA MODEL

MSE - 25663.6954
RMSE - 160.19892
MAE - 121. 49136

2

XGBOOST

MSE - 2245.7643
RMSE - 47.38
MAE - 111.0156

3

PROPHET (FINAL MODEL)

MSE -1598.314
RMSE - 39.97
MAE - 84.053

Recommendations

- Utilize data-driven insights to optimize the allocation of parking spaces during periods of peak demand and high traffic.
- Implement dynamic pricing strategies to encourage turnover and optimize revenue generation.
- Enhance security protocols by installing surveillance cameras, improving lighting, and deploying security patrols to ensure the safety of both vehicles and visitors.
- Promote alternative modes of transportation to decrease parking demand and mitigate congestion.

Next Steps

- Continue the collection of parking occupancy data to monitor trends and patterns over time.
- Engage with stakeholders, including facility owners, operators, and local authorities, to discuss findings and potential strategies.
- Solicit feedback from users of parking facilities to better understand their needs and preferences.

Conclusion

- Prophet is identified as the highest-performing model among the three evaluated, excelling in predicting parking spot availability due to its proficiency in managing seasonality, trends, and holiday effects, making it exceptionally suitable for time series forecasting tasks.
- XGBoost also demonstrates strong performance, utilizing its ensemble learning capabilities to effectively capture complex relationships within the data.
- Conversely, ARIMA falls short, suggesting its limited effectiveness in scenarios characterized by nonlinear and complex patterns.

Thank You

For Your Attention

PRESENTED BY:

- **JAMES NYAMU**
- **STEPHANIE MWAI**
- **CLARE GATAMBIA**
- **JOYLEEN CHERONO**
- **PRISCILLA NZULA**