Unveiling Patterns in NYC 311 Calls Data: Towards Smarter City Management

Asiya Shakeel

Data Science Capstone project Aug 2023

Springboard

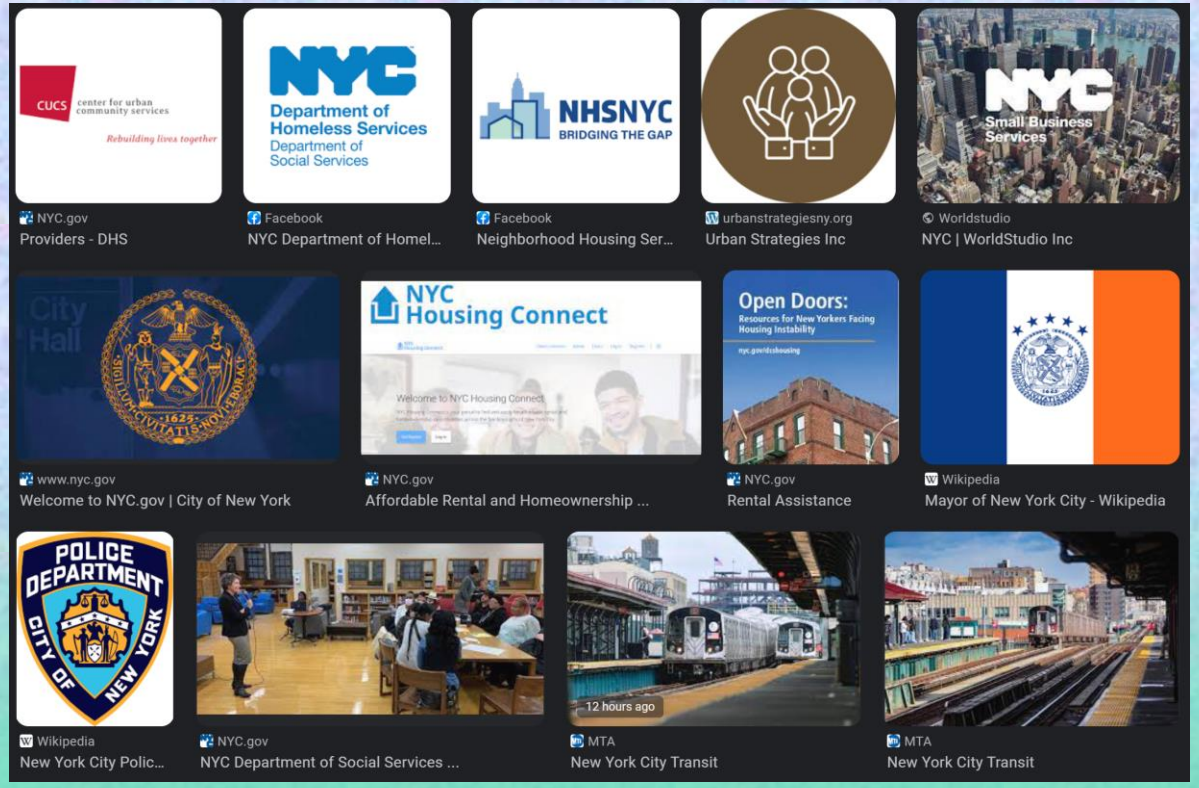
Thanks to Springboard Mentor
AJ Sanchez, Ph.D.

Goals :

- **Accurately predict the future call load for NYC 311.**
- **To improve urban service management and delivery in New York City by analyzing and gaining insights from the 311 calls data.**
- **Provide valuable insights to key stakeholders regarding patterns and trends.**

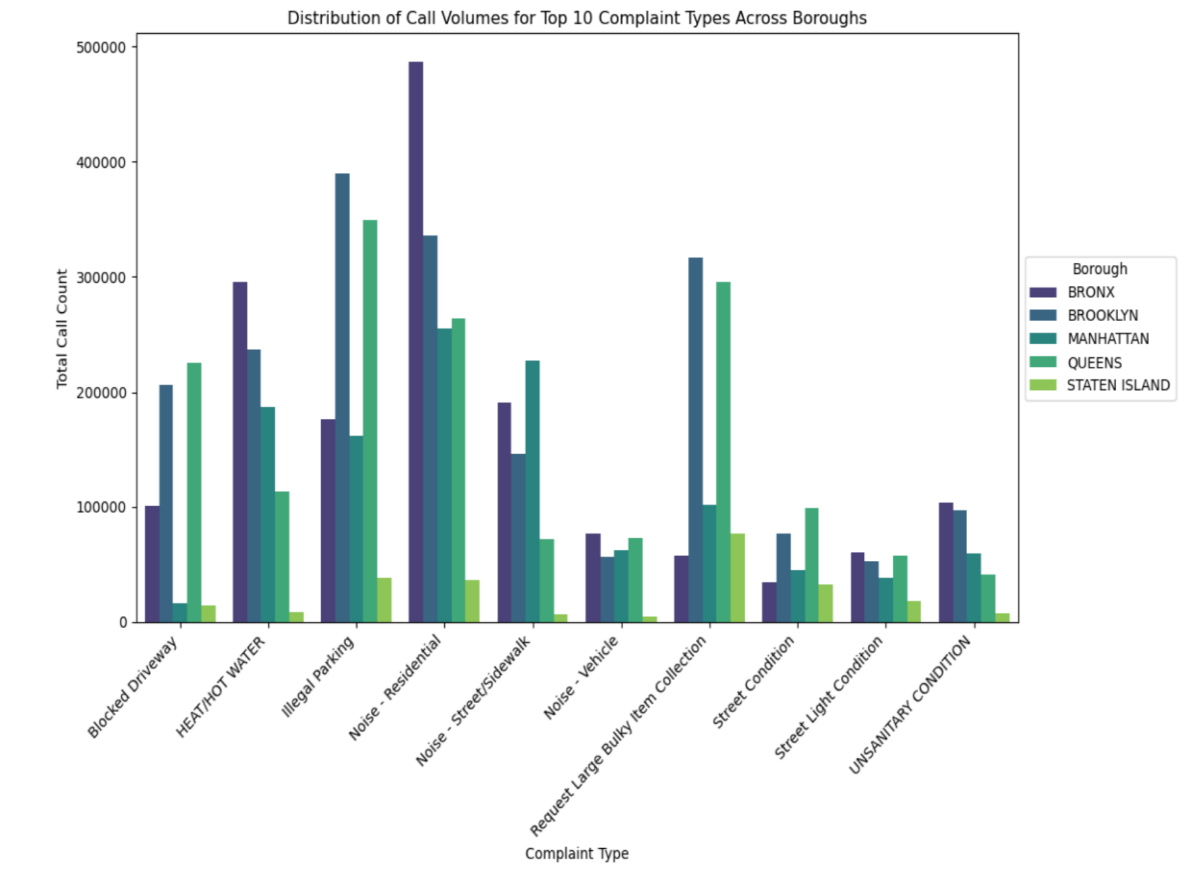
The intended stakeholders for the capstone project on analyzing 311 calls data may include

- **Local Government and City Administrators:**
- **City Planners:**
- **Urban Service Agencies**
- **Residents and General Public:**

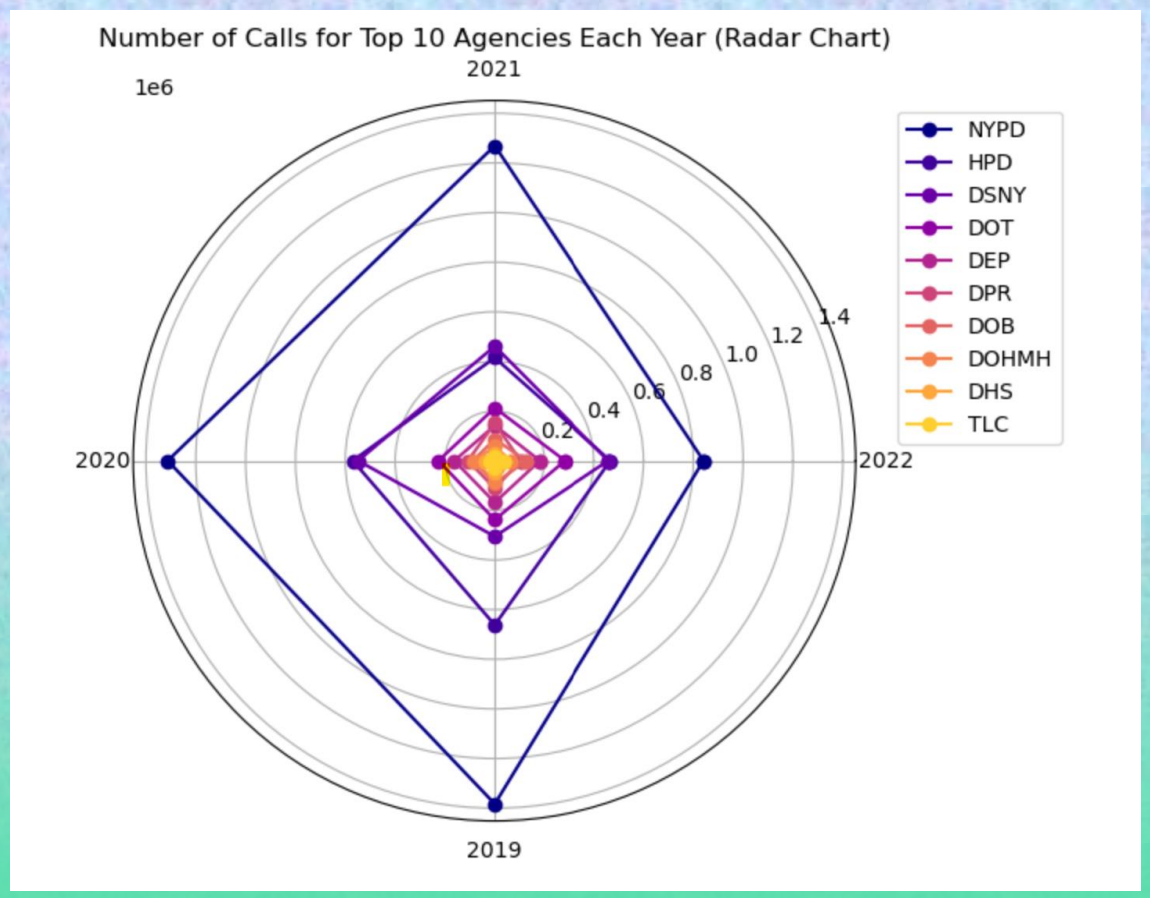


Data Exploration:

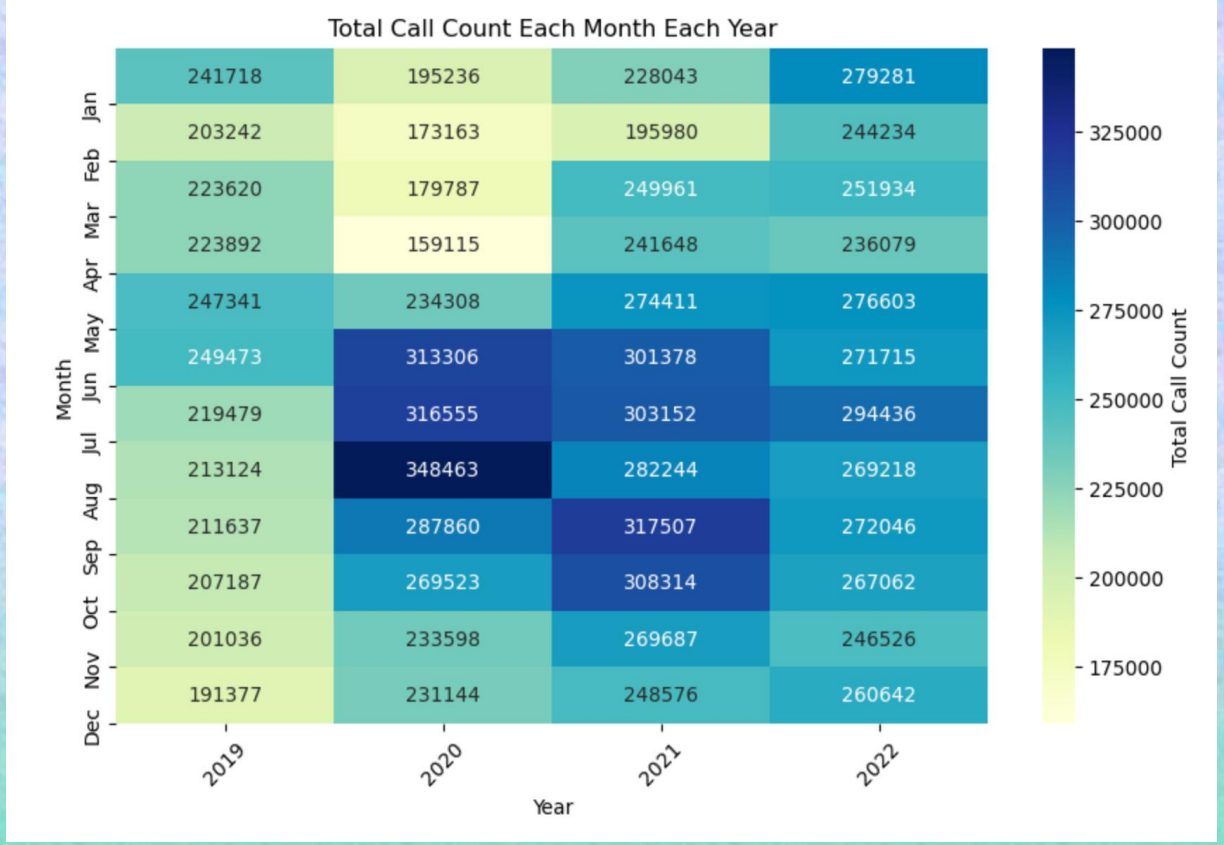
Bronx deals with highest noise complaints and Brooklyn have issues with illegal Parking



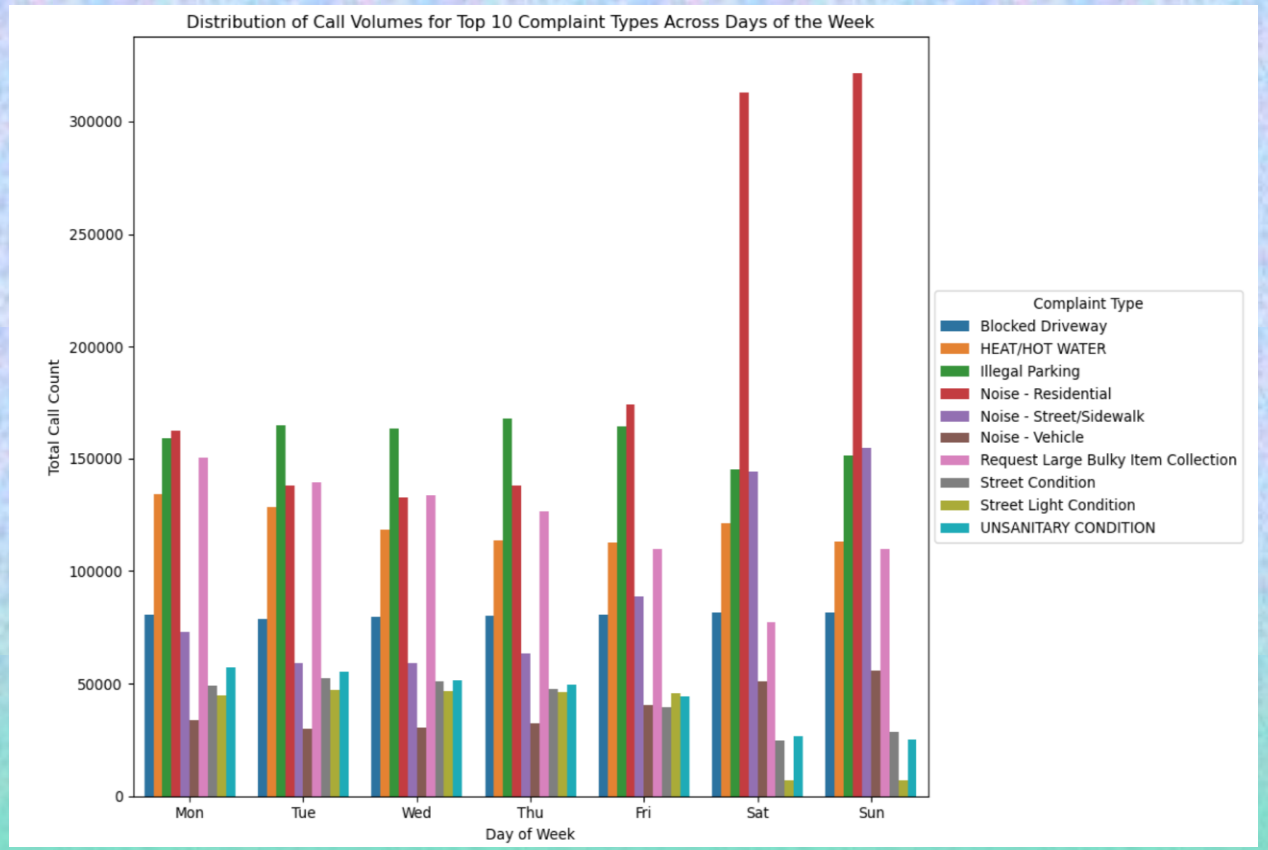
NYPD, HPD, and DSNY lead the call count, while others contribute to the full picture



Data Exploration:



Distinct patterns emerge in call times. Summer months (May-August) see a surge, while April remains consistently quiet across all years.

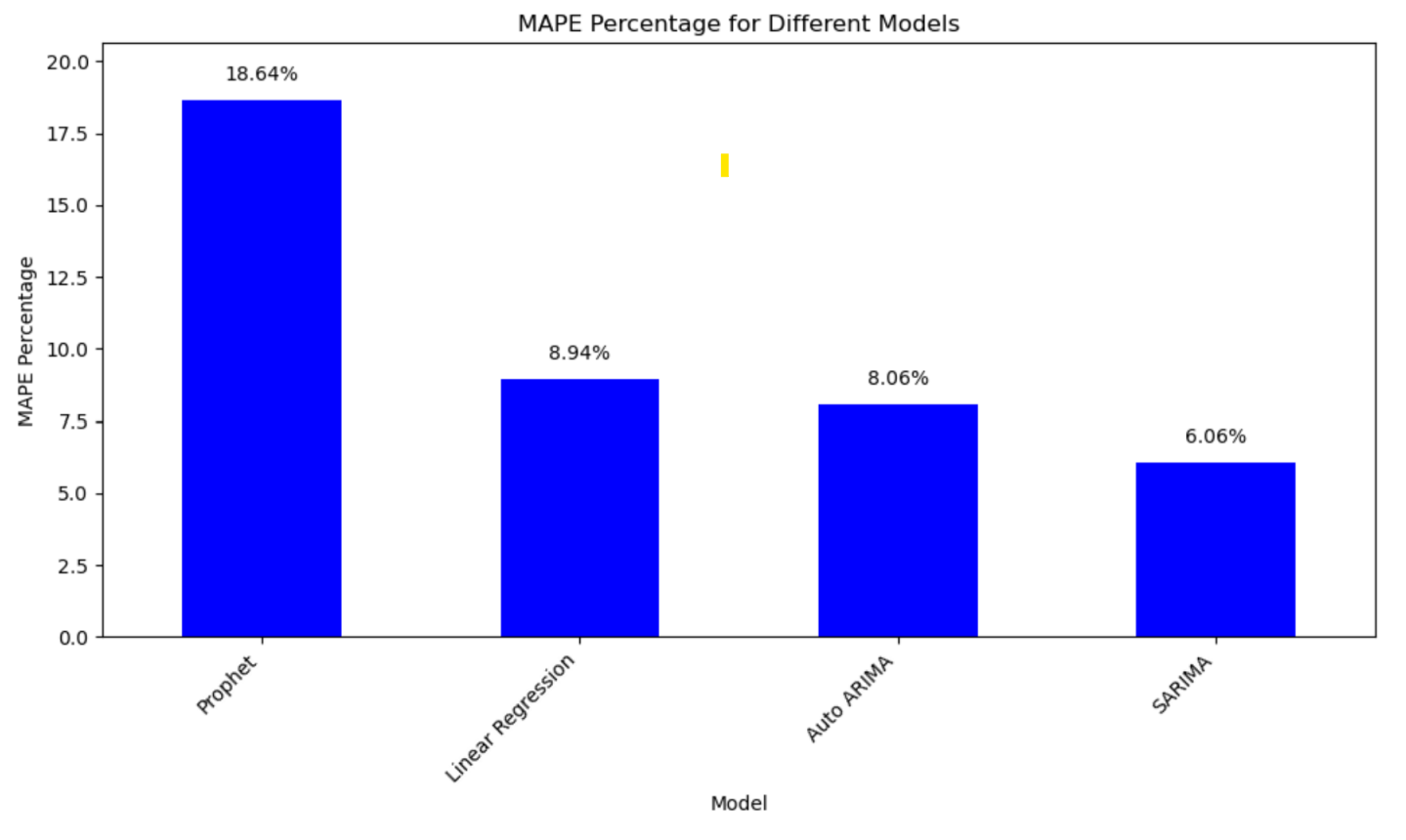


311 receives a surge of weekend noise complaints.

Baseline Modeling

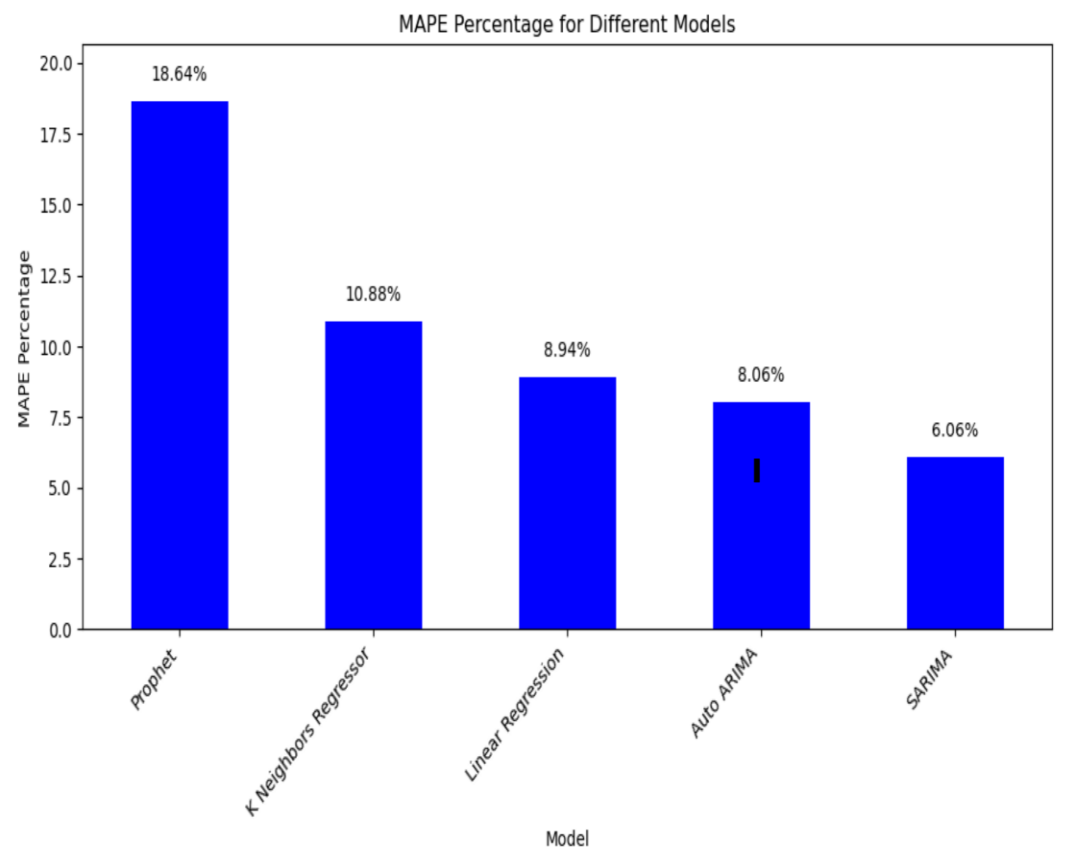
- **Model exploration: Began with Linear Regression, compared SARIMA, AutoARIMA, and Prophet.**
- **Optimal choice: SARIMA had the lowest RMSE (20161.45) and MAPE (6.1%), effectively capturing data patterns.**

Model	RMSE	MAPE (%)
AutoARIMA	27654.94	8.06
Linear Regression	29042.71	8.94
Prophet	56315.61	18.64
SARIMA	**20161.45**	**6.1**



The Best Model

SARIMA outperforms other models with the lowest RMSE (20161 calls) and MAPE (6.06%) values.



Model	RMSE	MAPE
Prophet	56315.61	18.64%
K Neighbors Regressor	33286.3	10.88%
Linear Regression	29042.71	8.94%
Auto ARIMA	27654.94	8.06%
SARIMA	20161.45	6.06%

Future Work and Recommendations:

- **Smarter Resource Use: Make the most of SARIMA's dependable predictions to plan resources well, like staff, equipment, and budget, to meet expected needs.**
- **Handling Seasonal Changes: Adjust staff smartly as call volumes change throughout the year, especially during busy times, ensuring top-notch service quality.**
- **Models that Work Together: Combine SARIMA's forecasts into operations, check the AutoML model often, and figure out why calls might drop. Improving data and feedback will make predictions better and help plan for the long term**

Summary:

- **Implementing these recommendations will empower clients to make informed decisions, optimize their operations, and better respond to changing call volume dynamics, ultimately leading to improved customer satisfaction and operational efficiency.**