Optimizing Call Center Operation

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Introduction

- Objectives of the analysis : Using the call center data provided, your task is to develop a forecasting model to predict future call volumes over the next quarter. Additionally, you are to analyze the data for patterns that could inform better resource allocation, identify peak call times, and understand the distribution of issue categories over time.
- Importance of optimizing call center: Optimizing call center operations is vital for cost-effectiveness, customer satisfaction, and business success. It ensures efficient resource utilization, enhances service quality, and enables informed decision-making. By optimizing operations, businesses can improve productivity, meet regulatory requirements, stay competitive, and adapt to evolving customer needs, fostering growth and profitability.

Methodology

- Data Collection: I utilized a Kaggle dataset of call center operations for my research.
- Data Analysis: Data analysis plays a crucial role in uncovering patterns and insights. During the analysis, I identified trends and seasonality over the years, months, and weekdays.
- Before creating a forecasting model, data preprocessing was conducted to address unsuitable data types. Many columns contained object data types, which are not conducive to model building.
- Forecasting Model: I developed two forecasting models, Sarimax and LSTM, and compared their metric scores. The model with the superior performance, LSTM, was ultimately selected for use.

Data Analysis and Insight:

- Weekly Trend: A clear weekly pattern emerges in the call volume. The highest number of calls is received on Monday, with a notable drop on Tuesday, followed by relatively steady numbers from Wednesday to Friday. There is a sharp decline in calls on Saturday, with a slight increase observed on Sunday.
- Monthly Trend: A significant increase in the number of incoming calls is expected from May 2024 to around July 2024. This surge could be attributed to various factors such as changes in marketing strategies, shifts in customer behavior, or improvements in service quality. After peaking around July, the number of incoming calls fluctuates but generally remains stable without a distinct upward or downward trend. This suggests that the call volume has reached a steady state following the initial increase.

Graph:


Line Plot
Incoming calls
250
200
150
100
Jan 2021
Jul 2021
Jan 2022
Jul 2022
Jan 2023
Jul 2023
Jan 2024
Date

Forecasting and predictive analysis:

Summary of the Forecasted Call Volumes Based on the LSTM Model:

The LSTM model produced the following metrics:

- Mean Absolute Error (MAE): 68.98
- Root Mean Squared Error (RMSE): 8.31

Evaluation of the Forecast Accuracy and Reliability: Comparing the LSTM model with SARIMAX, it demonstrates superior performance based on the evaluation metrics. It exhibits lower MAE, RMSE, and MAPE, indicating higher accuracy and reliability in predicting call volumes.

Presentation of Forecasted Trends and Patterns for Future Planning: The LSTM model forecasts call volumes with high precision and effectively captures underlying trends and patterns. This capability facilitates informed decision-making for future planning.

First suggestion:

- Peak Times: Allocate more resources during the peak times identified, such as July each year and Mondays each week. This could involve scheduling more staff during these times or using an automated system to handle some calls.
- Off-Peak Times: During off-peak times, such as Saturdays and the months with lower call volumes, consider scheduling staff training or maintenance activities. Alternatively, this could be a good time to give weekly offs to the staff.
- Forecasting: Use the identified trends and seasonality to forecast future call volumes and plan your resource allocation accordingly. For example, if the decreasing trend in call volumes continues, you might need fewer resources in the future.

Graph:


Line Plot
Incoming calls
200
190
180
170
160
150
140
130
May 5
2024
May 19
Jun 2
Jun 16
Jun 30
Jul 14
Date

Second suggestion:

- Actionable Insights to Reduce Call Volumes:
- Identify Common Issues : Analyze the reasons for incoming calls. If there are common issues that many customers are calling about, these could be addressed through customer education or service improvements.
- Customer Education : Create resources (like FAQs, tutorials, etc.) to educate customers about common issues. This could reduce the number of calls about these issues.
- Service Improvements : If calls are often about problems with your service, consider improving these aspects of your service to reduce the number of complaint calls.

Thank you