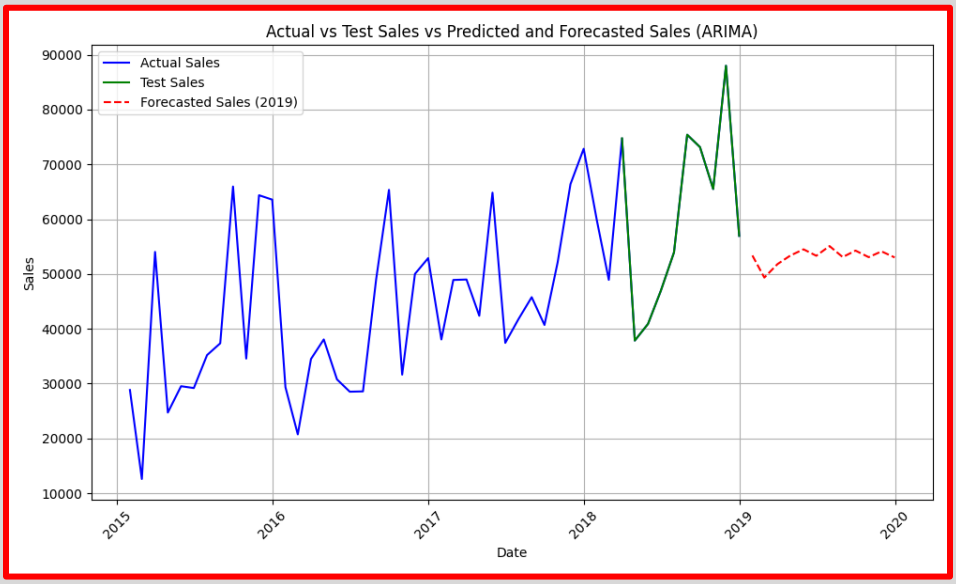
Forecasting Report

We have prepared a set of forecasting questions that we needed answers to in order to get a better picture of the upcoming work. We developed a model to predict those answers and evaluated each model to ensure that the error rate in the predictions was acceptable. For the evaluation, we relied on two key methods, MAE and RMSE, due to their effectiveness in assessing the accuracy of our forecasts in the context of our work.

The first question we aimed to answer was forecasting sales for the next year, focusing on time series sales

Initially, we used a linear regression model, but after evaluating it, the results were far off from what we expected. As a result, we moved on to a more advanced approach using the ARIMA model, which we also evaluated. However, as it turns out, the predictions were still significantly off from the actual values

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Total Predicted Sales for the Next Year: 638346.9730012219
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Mean Absolute Error (MAE): 14098.935405456423
Mean Squared Error (MSE): 287133172.8830357
Root Mean Squared Error (RMSE): 16945.004363618078
Mean Absolute Percentage Error (MAPE): 21.86%
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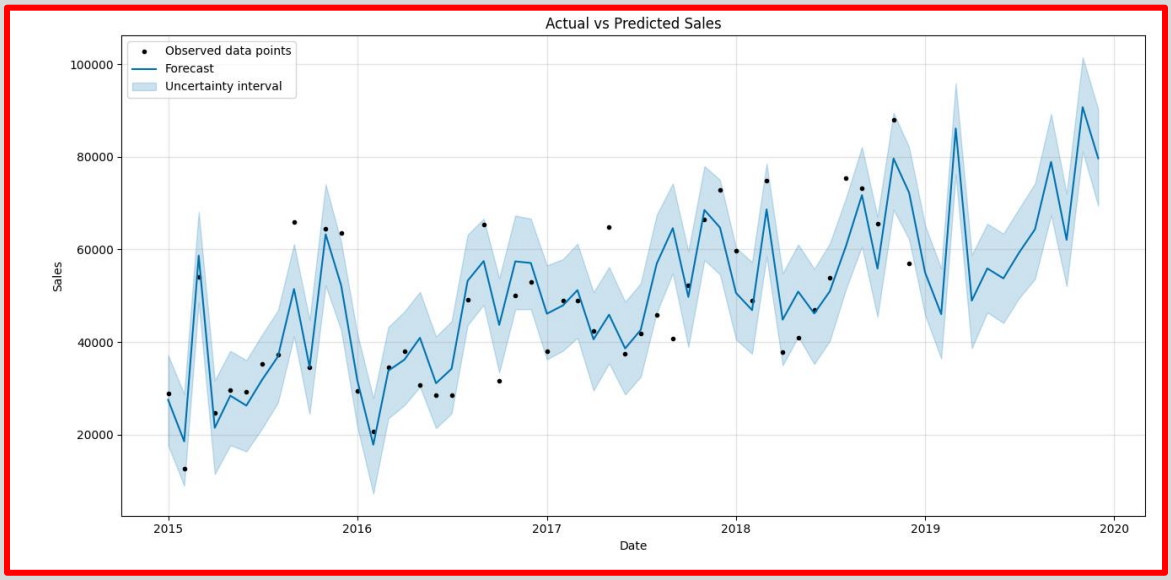
After that, we utilized the Prophet model, which provided us with significantly better results

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Total Forecasted Sales for the Next 12 Months: 780437.6178264709
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We evaluated the model, and the results were promising. Even at a glance, it's clear that the predicted values are not far off from the actual data. Most of the predictions fall within the confidence interval (the shaded region), which represents the model's uncertainty. This indicates that the forecasted values closely follow the true values, making it a useful factor in evaluating the model's performanc .

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Mean Absolute Error (MAE): 5862.368392686803
Root Mean Squared Error (RMSE): 7900.52557026851
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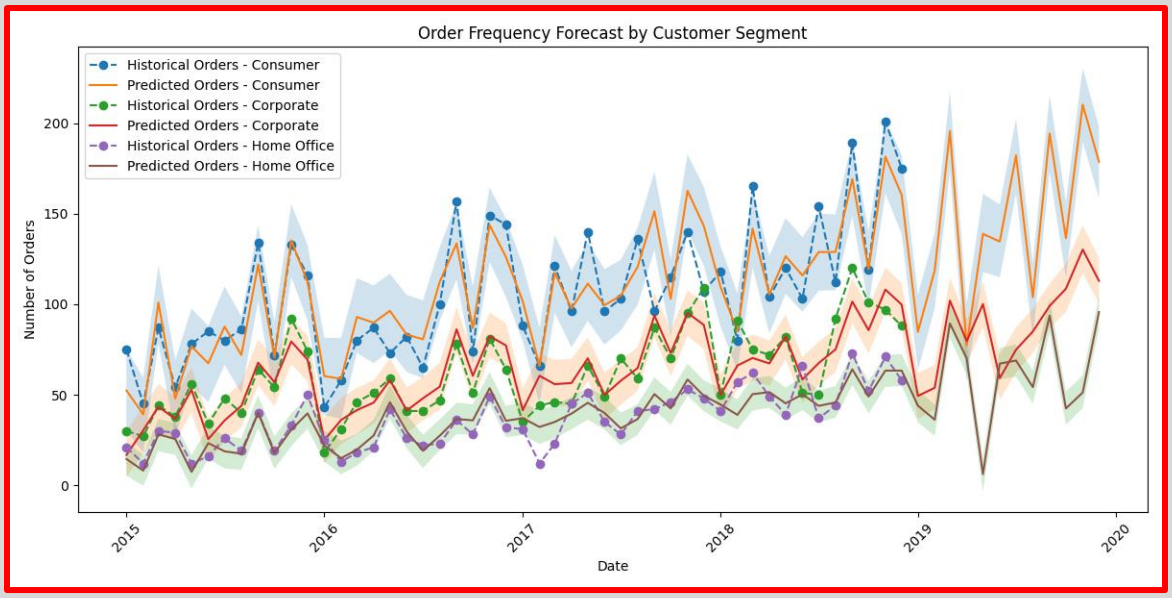
When we conducted the evaluation and reviewed the values of MAE and RMSE, we found that they were within an acceptable range. Specifically, the MAE (Mean Absolute Error) represents the average difference between the predicted and actual values, and in this case, it was relatively small compared to the overall sales values. This led us to conclude that the model performs well

What is the expected future order frequency for specific customer segments?

we analyzed historical order data for different customer segments to identify their purchasing behaviors. By using statistical models and forecasting techniques, we were able to project the expected order frequency for each segment. The analysis showed that consumers segments are likely to place orders more frequently, while others may have less predictable purchasing patterns. Understanding these trends will enable us to tailor our marketing strategies and improve customer engagement for each segment



	Segment	Total Predicted Orders
0	Consumer	6854.259432
1	Corporate	4007.345146
2	Home Office	2465.420433

Subsequently, we conducted an evaluation of the model, and the results were consistent and favorable, indicating that the model is acceptable for our purposes

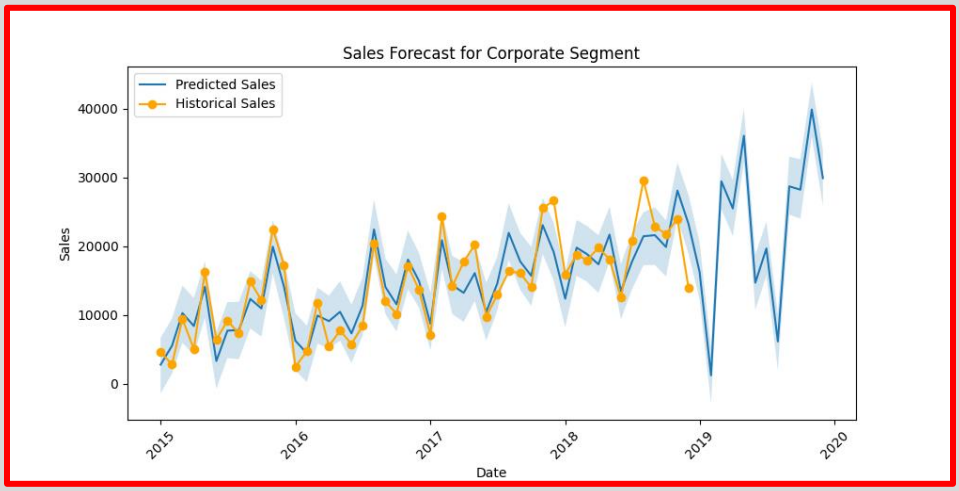
	Segment	RMSE
0	Consumer	29.471524
1	Corporate	31.301989
2	Home Office	21.968999

Which customer segments will contribute the most to future sales?

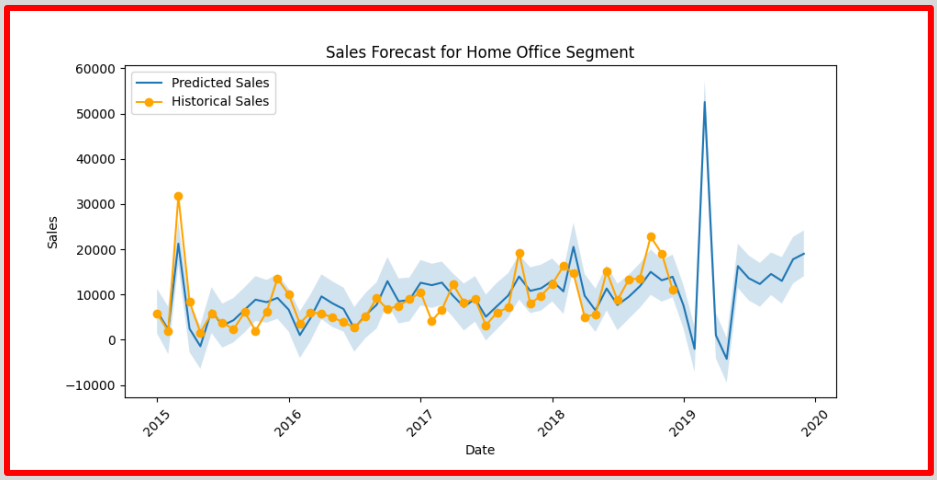
we will examine the projected sales for each customer segment over the upcoming year. This analysis will allow us to observe how sales are expected to fluctuate throughout the year for each segment. Additionally, we will present the total sales for each segment, providing a clear picture of their contribution to overall sales. This information will be valuable for understanding market trends and making strategic decisions

consumer

Corporate



Home office



Total order for each one

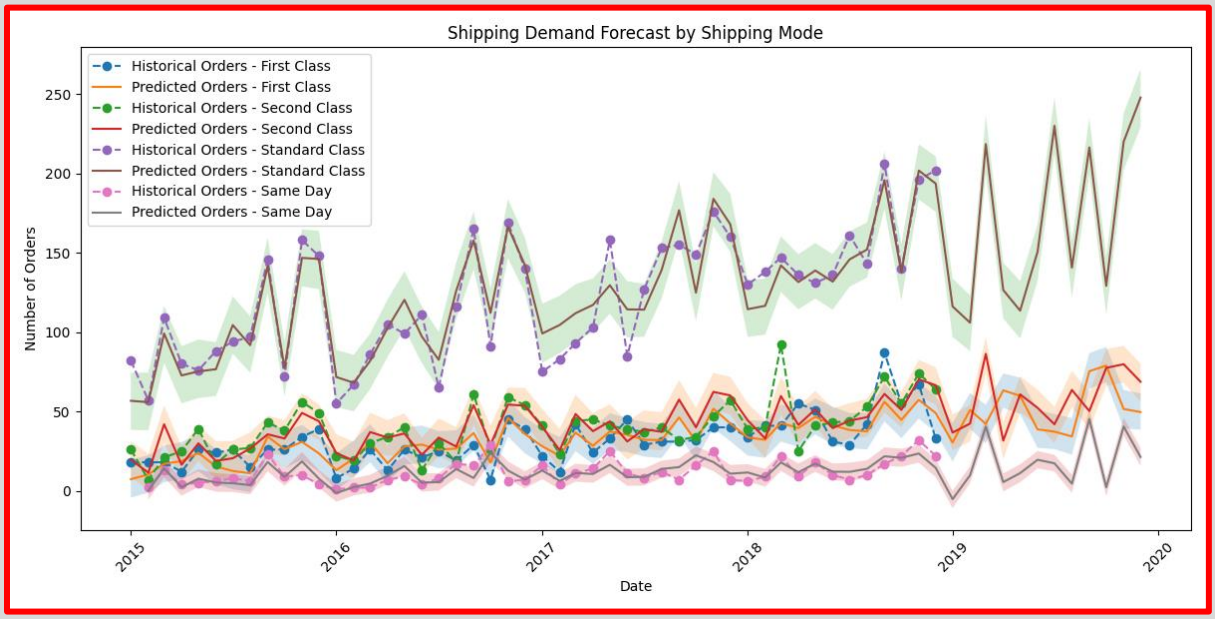
	Segment	Total Predicted Sales Last Year
0	Consumer	374729.225088
1	Corporate	298937.590845
2	Home Office	175340.821430

Afterward, we evaluated these models to assess their performance and reliability in predicting sales for each segment

	MAE	RMSE
Consumer	4369.511745	6014.861751
Corporate	2609.215744	3225.554864
Home Office	2999.852564	3850.637329

Which shipping modes will likely experience the highest demand in the near future?

we analyzed historical shipping data and customer preferences to identify trends in shipping modes. Based on our analysis, standard class shipping methods, such as express and overnight delivery, are projected to experience the highest demand in the near future.



	Ship Mode	Total Predicted Orders
0	First Class	2113.685664
1	Second Class	2595.195424
2	Standard Class	7874.617931
3	Same Day	750.402952

In conclusion, we evaluated the model, and the results were favorable, leading to its acceptance

	Ship Mode	RMSE
0	First Class	14.355860
1	Second Class	10.294853
2	Standard Class	41.006886
3	Same Day	7.699273