



Limelight

Forecasting Broadway Sales using Time Series Analysis

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The Project

Key Performance Indicators:

- Accurate Predictions of **Annual box office gross**
- **Fluctuations** in the grosses on a week-week basis

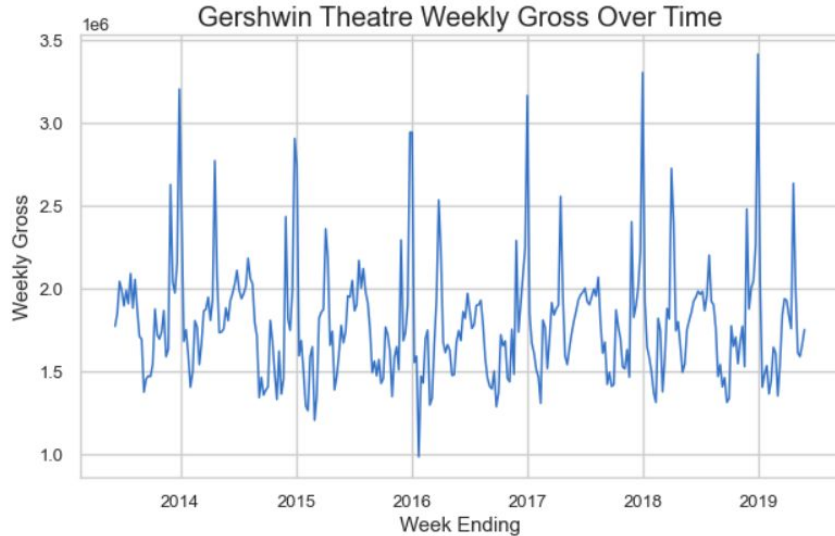
Stakeholders:

- Broadway theater owning conglomerates
- Production houses
- Investors and Financial Backers



Gershwint Theatre

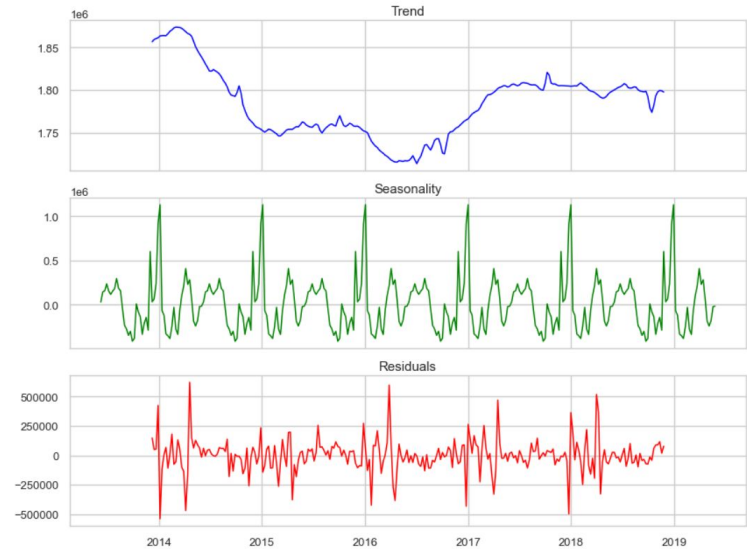
Exploratory data analysis



Trend

Seasonality

Residuals



Data Quality:

Check for stationarity: Augmented Dickey Fuller-test

Missing data: Imputation using backfill

Model Selection

- After exploration and cleaning was complete, we built models using all three methods, tuned them, and compared their error metrics on the test data.

	AR	SARIMA	Prophet
RMSE	\$382,071	\$173,965	\$131,508
MAE	\$260,860	\$108,366	\$98,811
MAPE	13.76%	5.8%	5.57%

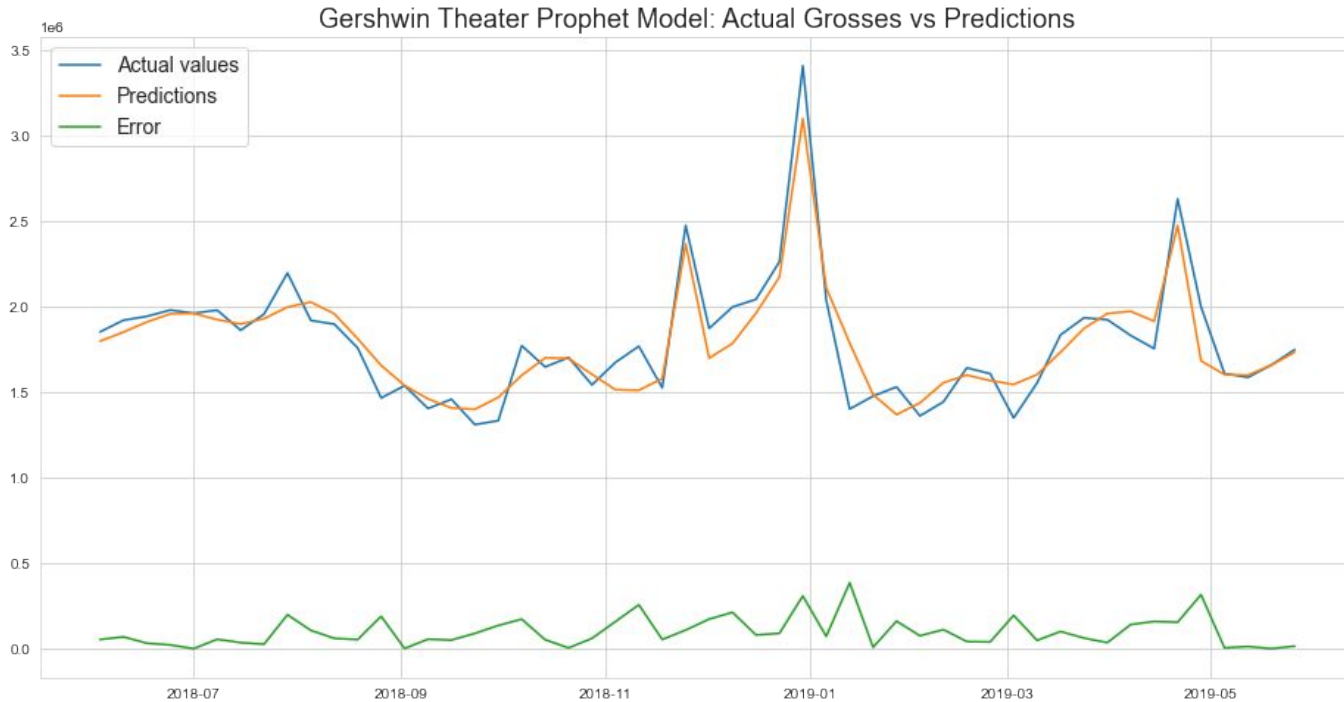
Gershwin Theater



	AR	SARIMA	Prophet
RMSE	\$167,139	\$149,642	\$93,458
MAE	\$124,602	\$114,953	\$69,875
MAPE	12.9%	11.39%	7.06%

Majestic Theater

Model Selection



Final conclusions

We recommend our trained **Prophet model** to our stakeholders due to:

1. Robust built-in fine-tuning capabilities
2. Feature to incorporate holidays
3. Reliable predictions with least error margins

Future Directions

- Generalize the model to smaller theaters
- Incorporate external features in addition to weekly grosses