

# Sales Forecasting Project

## Project Overview

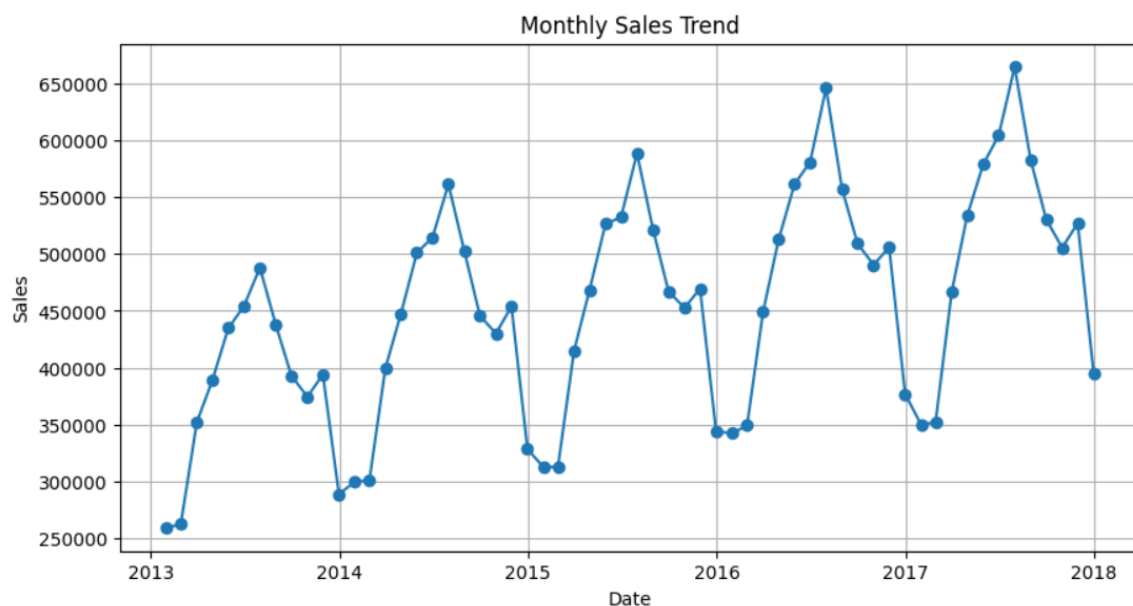
This project focuses on forecasting future monthly sales using a real-world retail dataset downloaded from Kaggle. We converted daily sales records into monthly aggregated data and built an ARIMA time series forecasting model to predict the sales values for the next 12 months. The insights gained from this project can help a business with better planning, inventory management, resource allocation, and demand estimation.

## Steps Completed

- Loaded the dataset into Python (train.csv).
- Converted 'date' column into datetime format.
- Aggregated daily sales into monthly totals.
- Renamed columns into Prophet/Time series format (ds = date, y = sales).
- Built an ARIMA model to learn from the historical monthly sales data.
- Forecasted the next 12 months future sales.
- Visualized the historical vs future forecasted sales on a line chart.
- Performed business-level insight analysis (trend, seasonality, peaks, growth %).

## Key Insights Found

**1. Sales show strong seasonality regular patterns repeating every year.**



We can clearly see a repeating seasonal pattern — sales rise and fall each year in cycles. There is also a general upward movement over time → meaning business growth.

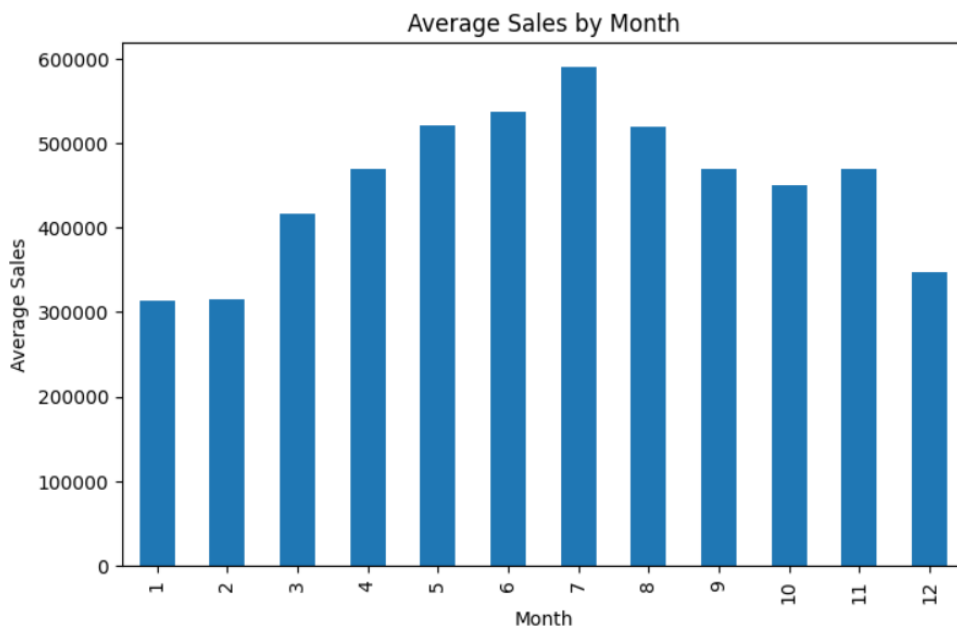
## 2 Average Sales by Month (Seasonality Strength)

This bar chart shows which monthly numbers have the highest average sales.

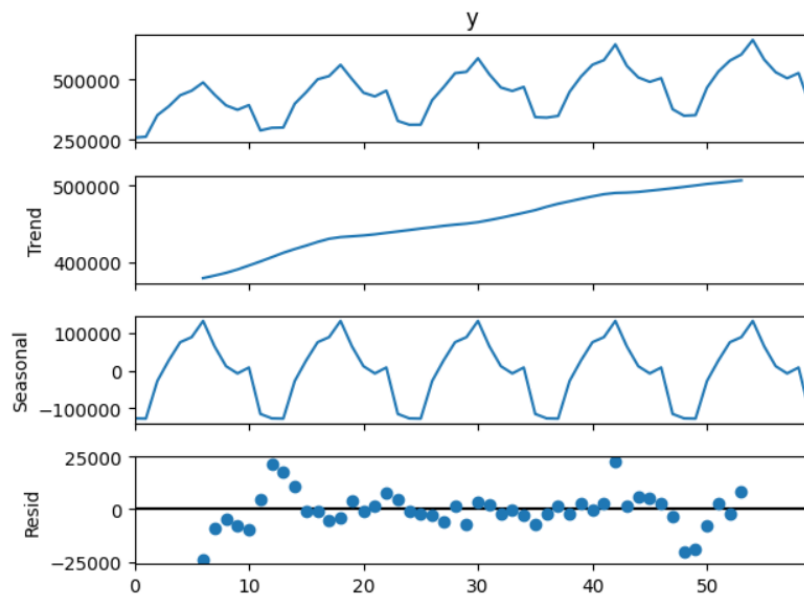
### Insight:

Some months (for example mid-year) consistently show higher demand.

This indicates seasonality — certain months are peak selling periods.



## 3. Decomposition (Trend / Seasonal / Residual)



Seasonality component clearly shows strong peaks → the business experiences repeatable seasonal cycles.

## final predicted monthly Sales

	Month	Forecasted_Sales
60	2018-01	380952.788459
61	2018-02	385836.013997
62	2018-03	421296.767998
63	2018-04	383358.047966
64	2018-05	430395.985964
65	2018-06	446686.289877
66	2018-07	466623.365089
67	2018-08	439308.333248
68	2018-09	461957.307777
69	2018-10	448265.846015
70	2018-11	446824.226178
71	2018-12	425404.525227

These are the predicted monthly sales values for the next 12 months. We can see that future sales continue within the same seasonal range as previous years. We expect the demand to stay stable with slight growth during certain months. Businesses can use these forecast values to plan stock, production, purchasing, and marketing according to upcoming demand.

### Why This Project is Useful for Business

Time-series forecasting is a core function in retail and supply chain analytics. Being able to predict future sales allows companies to reduce over-stocking, prevent stockouts, schedule production intelligently, and improve profitability. This project demonstrates how data science, machine learning, and visualization can be combined for actionable business intelligence.

### Final Conclusion

This model helps decision-makers anticipate upcoming demand patterns and plan operational activities more efficiently. With better predictions, businesses can improve product availability, plan inventory strategy, optimize logistics, lower holding costs, and ultimately increase customer satisfaction. This project is a strong example of how data-driven insights support business goals.