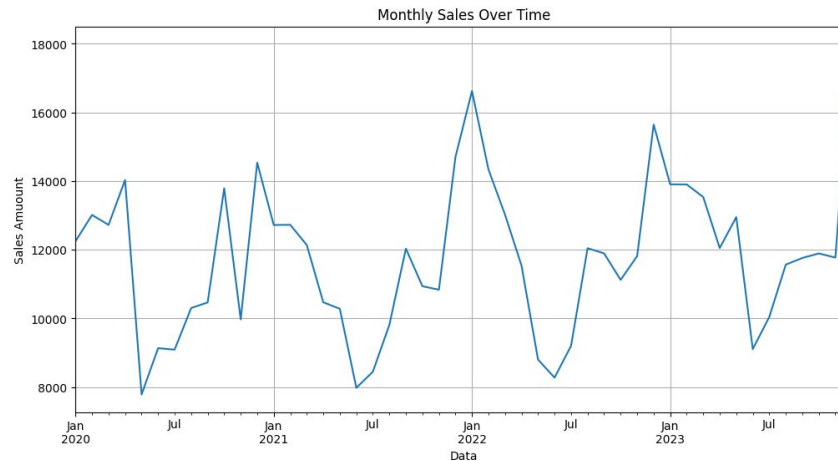


Sales Forecasting for a Retail Store

Name: Muhammad Zamin

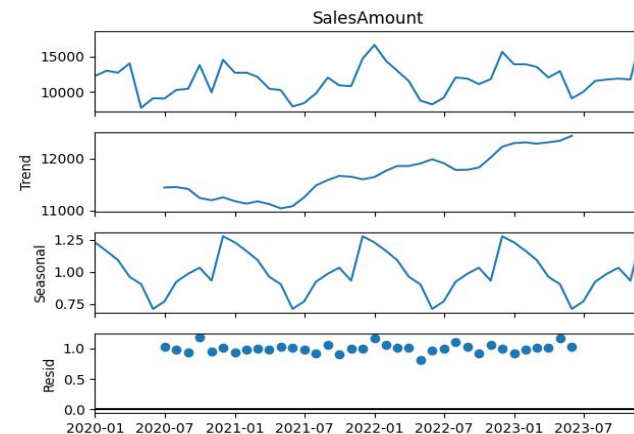
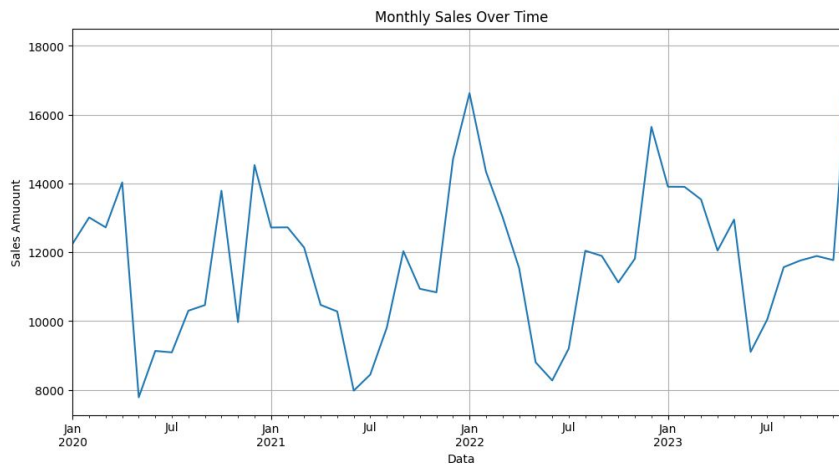
Project Overview

- **Objective:** Forecast next 6 months of retail sales
- **Duration:** 5 days
- **Data:** 4 years of monthly sales, promotion, and holiday flags



Step 1: Data Exploration

- Time series plot shows trend and seasonality
- Seasonal peaks in Q4 (holidays)
- Decomposition used to view trend/seasonal/residual
- ACF/PACF plots used for model setup



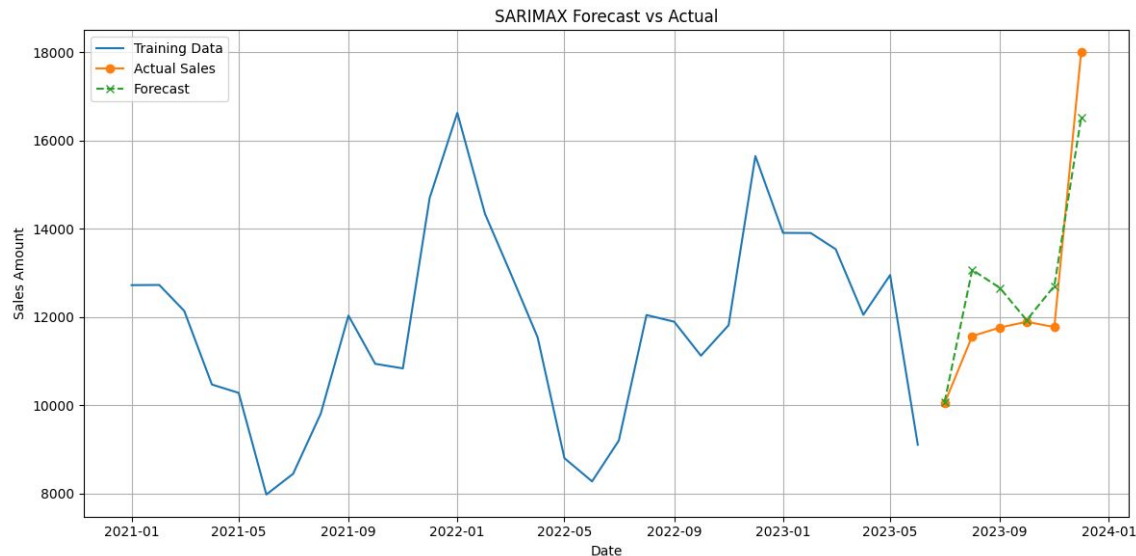
Step 2: Feature Engineering

- **Lag features:**
Previous month, same month last year
- **Rolling averages:**
3-month smoothing
- **Date parts:**
Month, year, quarter
- Promotion & HolidayMonth used as regressors

	SalesAmount	Promotion	HolidayMonth	lag_1	lag_3	lag_12	rolling_mean_3	rolling_mean_6	month	year	quarter
Date											
2021-01-01	12720	0	0	14534.0	13786.0	12248.0	12407.666667	11962.166667	1	2021	1
2021-02-01	12724	0	0	12720.0	9969.0	13011.0	13326.000000	12366.166667	2	2021	1
2021-03-01	12136	0	0	12724.0	14534.0	12722.0	12526.666667	12644.833333	3	2021	1
2021-04-01	10468	0	0	12136.0	12720.0	14030.0	11776.000000	12091.833333	4	2021	2
2021-05-01	10279	1	0	10468.0	12724.0	7783.0	10961.000000	12143.500000	5	2021	2

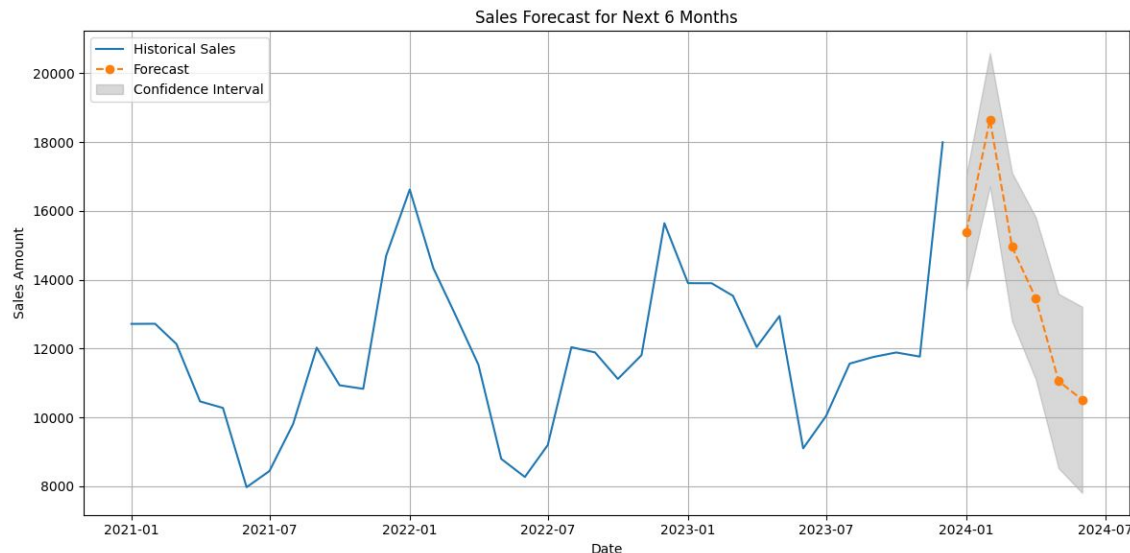
Step 3: Model Selection & Training

- Model: SARIMAX (1,1,1)(0,1,1,12)
- Trained on 42 months, validated on 6 months
- MAE: 814.37 | RMSE: 1012.38
- Promotion effect significant ($\sim +2800$ sales)



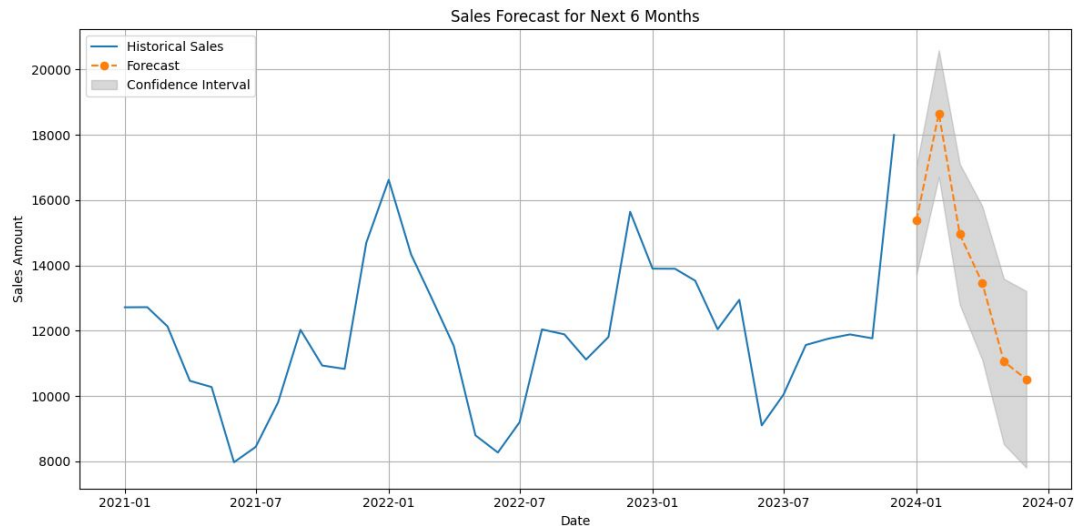
Step 4: Forecasting the Future

- Forecasted Jan–Jun 2024
- Included simulated promotion/holiday flags
- Confidence intervals calculated
- Sales expected to peak in Feb, then decline



6-Month Sales Forecast Summary

- Jan: 15,387 (CI: 13.7k–17.0k)
- Feb: 18,653 (CI: 16.7k–20.6k)
- Mar: 14,954
- Apr: 13,468
- May: 11,059
- Jun: 10,514



Business Recommendations

Inventory Management

- Stock up before Feb and Q4 (sales peaks)
- Reduce inventory in May–June

Marketing Strategy

- Focus campaigns in Q1 & Q4
- Boost slow months like March, October

Budget Planning

- Allocate more for high-demand months
- Use forecast range to plan buffers

Business Recommendations



Data Strategy

- Track external factors (e.g., economy)
- Improve holiday tagging



Future Improvements

- Explore weekly data
- Try Prophet or XGBoost

Conclusion & Insights

- SARIMAX worked well for seasonal sales
- Promotions boost sales clearly
- Holidays less consistent
- Accurate tool for planning inventory and budgeting

Thank You / Q&A

- Any questions?

