



Haier

Haier Europe Forecasting Hackathon

Case Presentation

We Bears

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Problem Statement

Is it possible to predict the demands of the upcoming period?

- The data consists of demands from the last **3 years**.
- Forecast short-term, next **12 weeks** demand.
- Forecast mid-term, next **3 months** demand.
- The evaluation metric is **RMSE**.

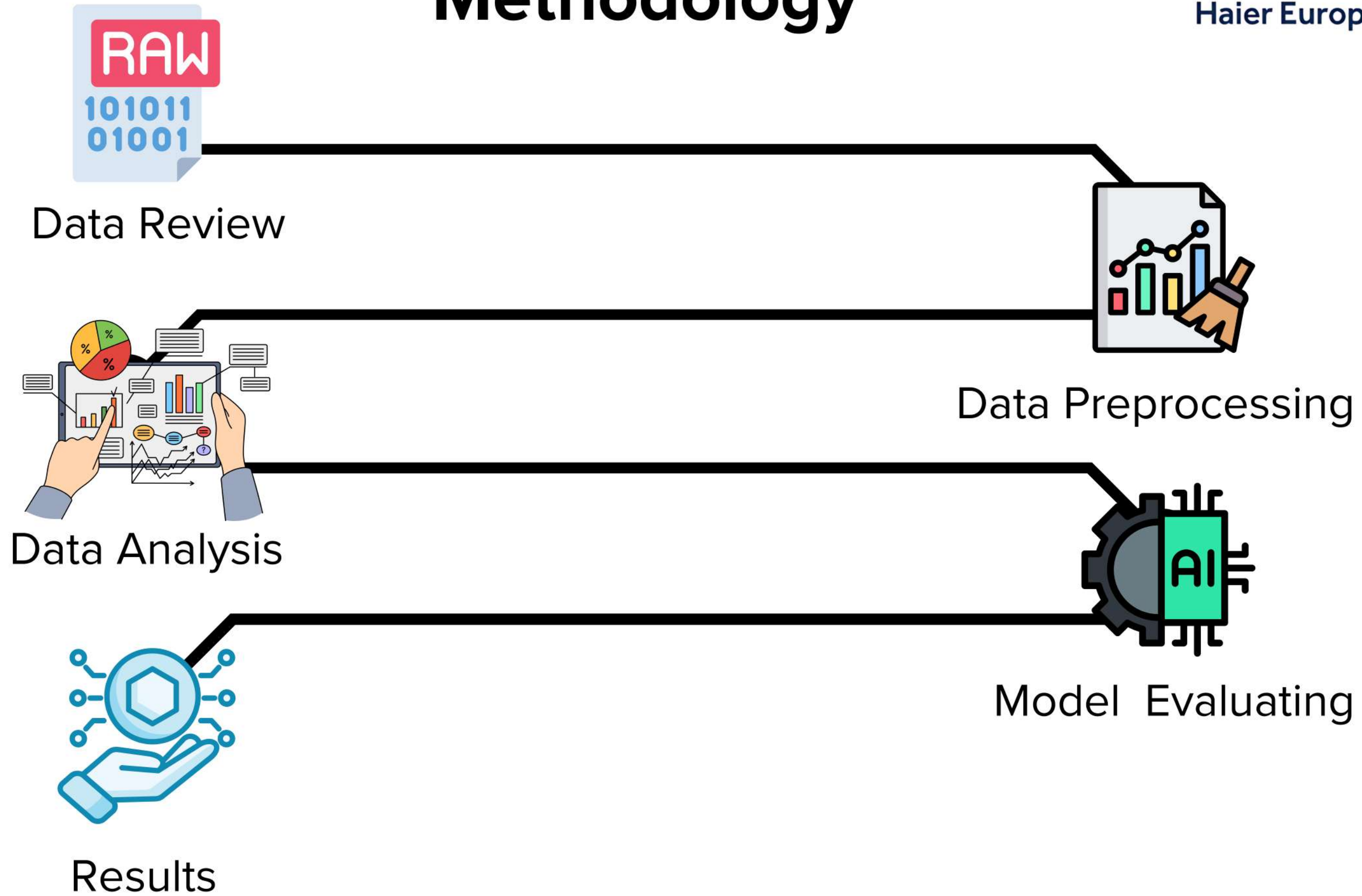


Methodology

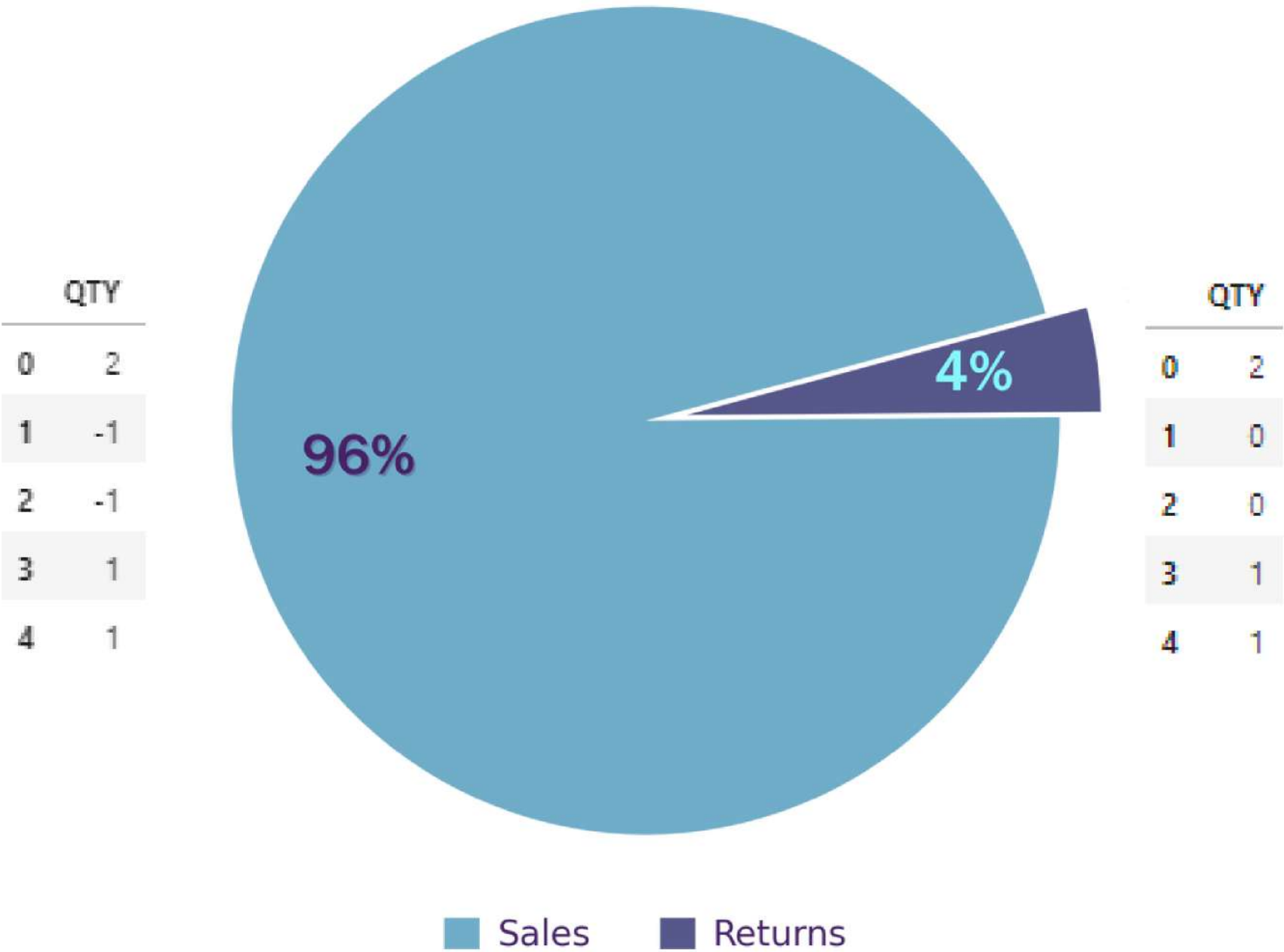
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Data Preprocessing



Data Preprocessing

Time Series - Weekly



P_Id	DATE	QTY
P5432,45	2021-01-04	2
P5432,45	2021-01-05	1
P5432,45	2021-01-05	2
P5432,45	2021-01-07	1
P5432,45	2021-01-11	10
P5432,45	2021-01-11	1
P5432,45	2021-01-12	7
P5432,45	2021-01-12	4
P5432,45	2021-01-12	1
P5432,45	2021-01-13	1



P_Id	DATE	QTY
P5432,45	2021-01-04	6
P5432,45	2021-01-11	24



Data Preprocessing

Time Series - Weekly

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P_Id	DATE	QTY
P999,47	2021-01-04	1.000
P999,47	2021-01-11	4.000
P999,47	2021-01-18	6.000
P999,47	2021-01-25	NaN
P999,47	2021-02-01	9.000
...
P999,47	2023-08-28	1.000
P999,47	2023-09-04	NaN
P999,47	2023-09-11	6.000
P999,47	2023-09-18	NaN
P999,47	2023-09-25	4.000



P_Id	DATE	QTY
P999,47	2021-01-04	1.000
P999,47	2021-01-11	4.000
P999,47	2021-01-18	6.000
P999,47	2021-01-25	7.500
P999,47	2021-02-01	9.000
...
P999,47	2023-08-28	1.000
P999,47	2023-09-04	3.500
P999,47	2023-09-11	6.000
P999,47	2023-09-18	5.000
P999,47	2023-09-25	4.000



Data Preprocessing

Time Series - Monthly

S_Id	DATE	QTY
ST1,64	2021-01-11	7
ST1,64	2021-01-18	3
ST1,64	2021-01-18	1
ST1,64	2021-01-25	2
ST1,64	2021-01-27	225
ST1,64	2021-01-28	1
ST1,64	2021-01-28	16
ST1,64	2021-01-28	1
ST1,64	2021-01-28	3
ST1,64	2021-01-28	40
ST1,64	2021-01-28	20
ST1,64	2021-01-28	10
ST1,64	2021-01-28	5
ST1,64	2021-02-03	1
ST1,64	2021-02-05	40



S_Id	DATE	QTY
ST1,64	2021-01-01	334
ST1,64	2021-02-01	41



Data Preprocessing

Time Series - Monthly

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ST1,67	2023-01-01	4339
ST1,67	2023-02-01	863
ST1,67	2023-03-01	5084
ST1,67	2023-04-01	4875
ST1,67	2023-05-01	8610
ST1,67	2023-06-01	3966



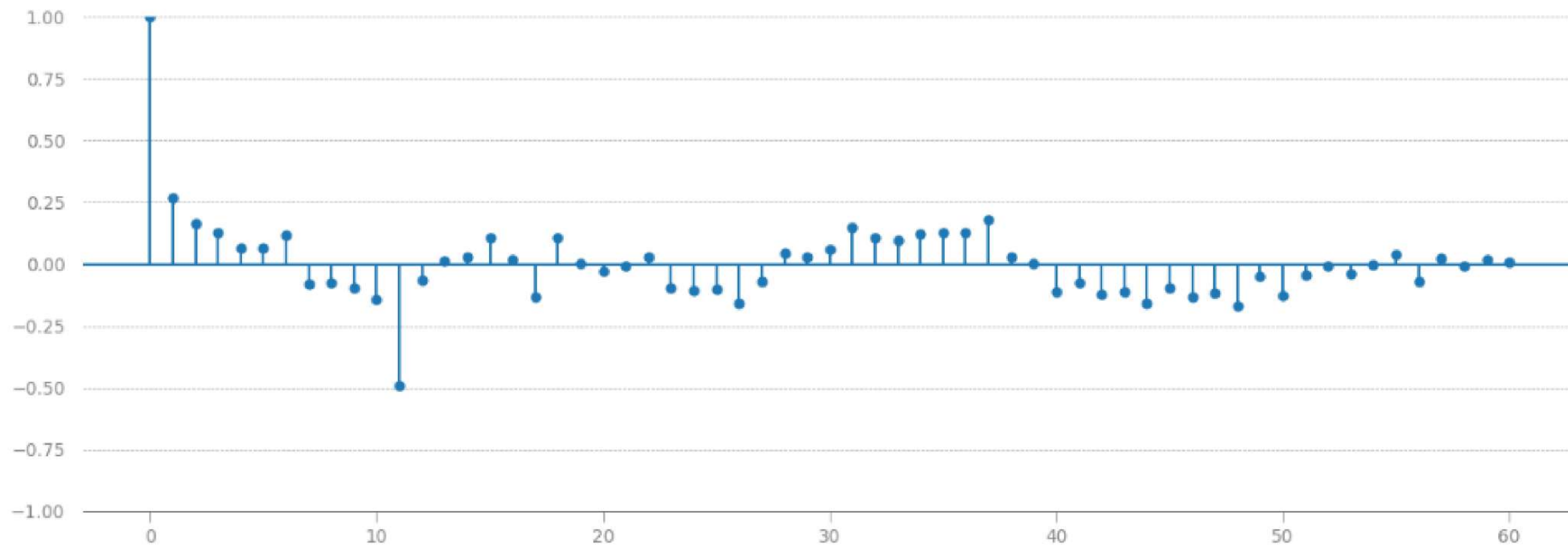
ST1,67	2023-01-01	4339
ST1,67	2023-02-01	4711
ST1,67	2023-03-01	5084
ST1,67	2023-04-01	4875
ST1,67	2023-05-01	8610
ST1,67	2023-06-01	3966



Data Analysis

Time Series - Weekly

Individual Autocorrelation



Data Analysis

Time Series - Weekly

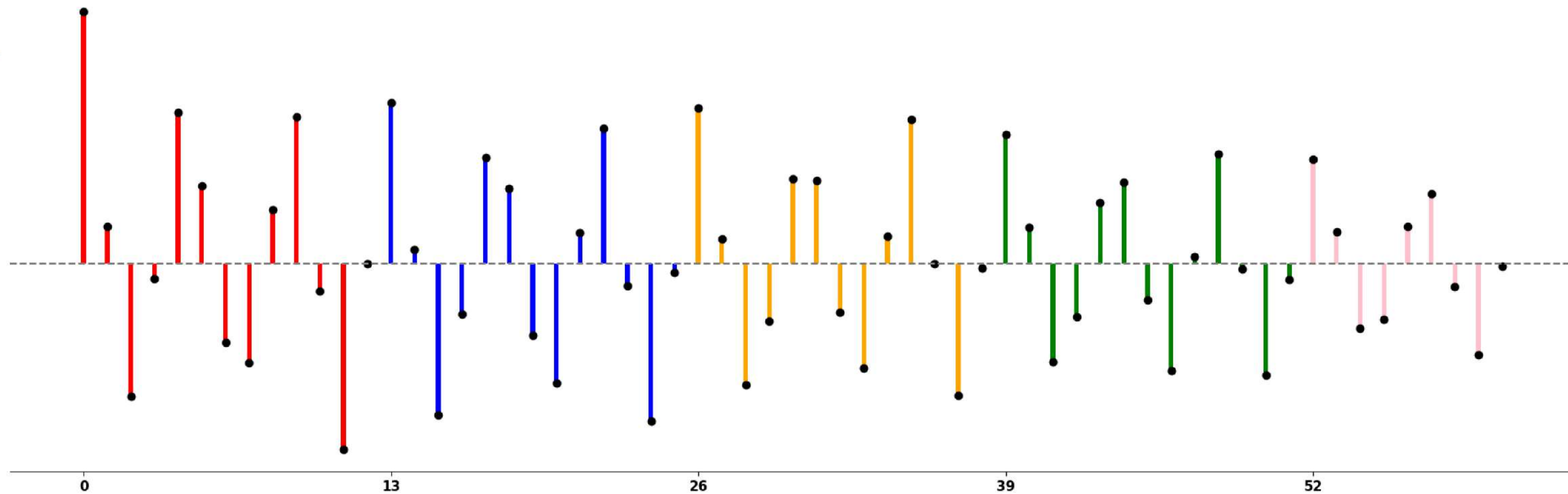
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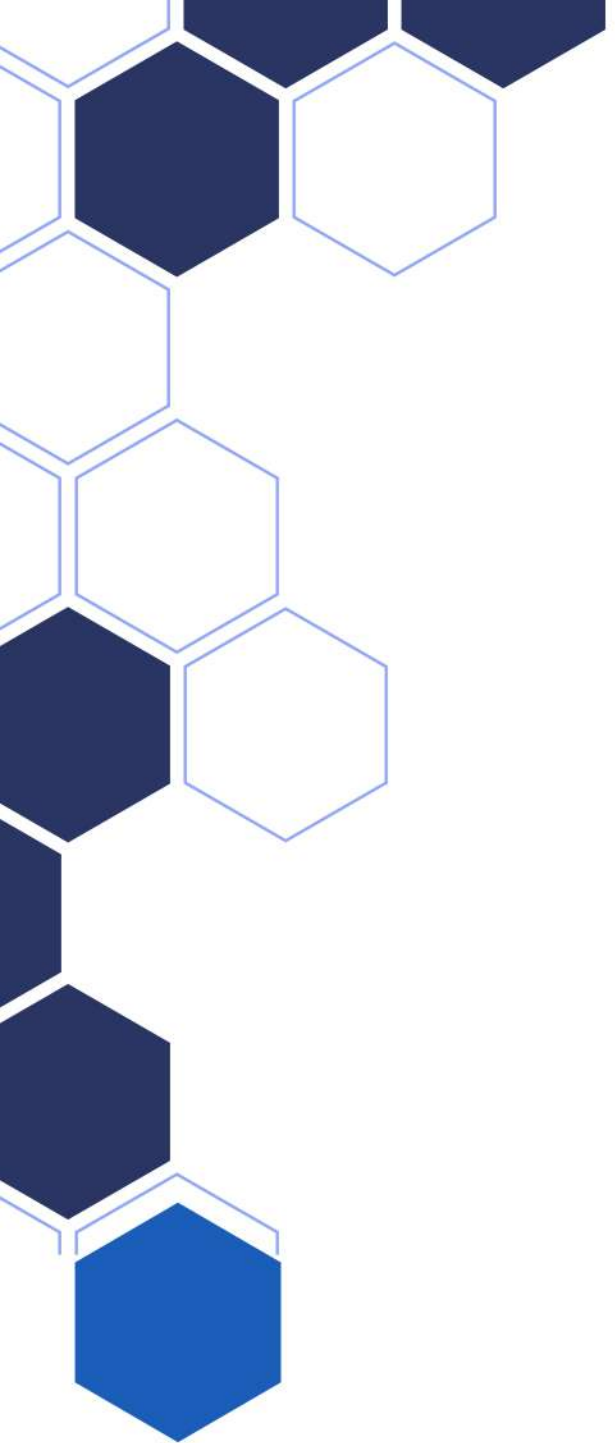
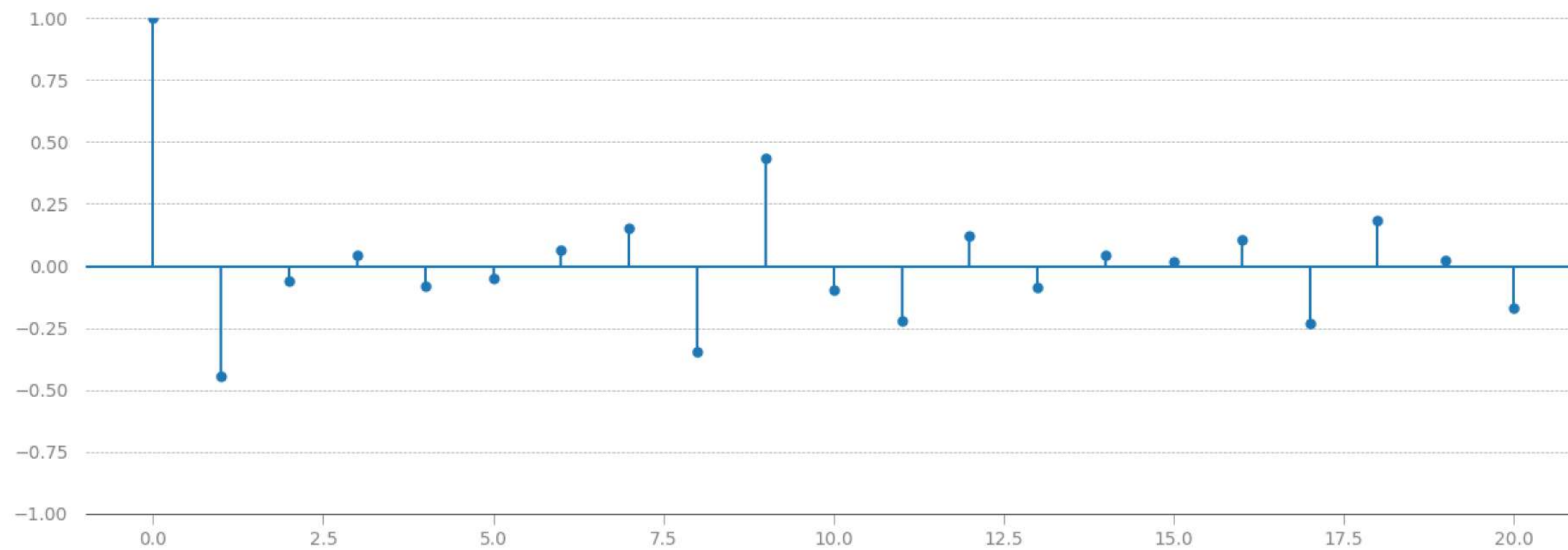
Collective Autocorrelation



Data Analysis

Time Series - Monthly

Individual Autocorrelation



Data Analysis

Time Series - Monthly

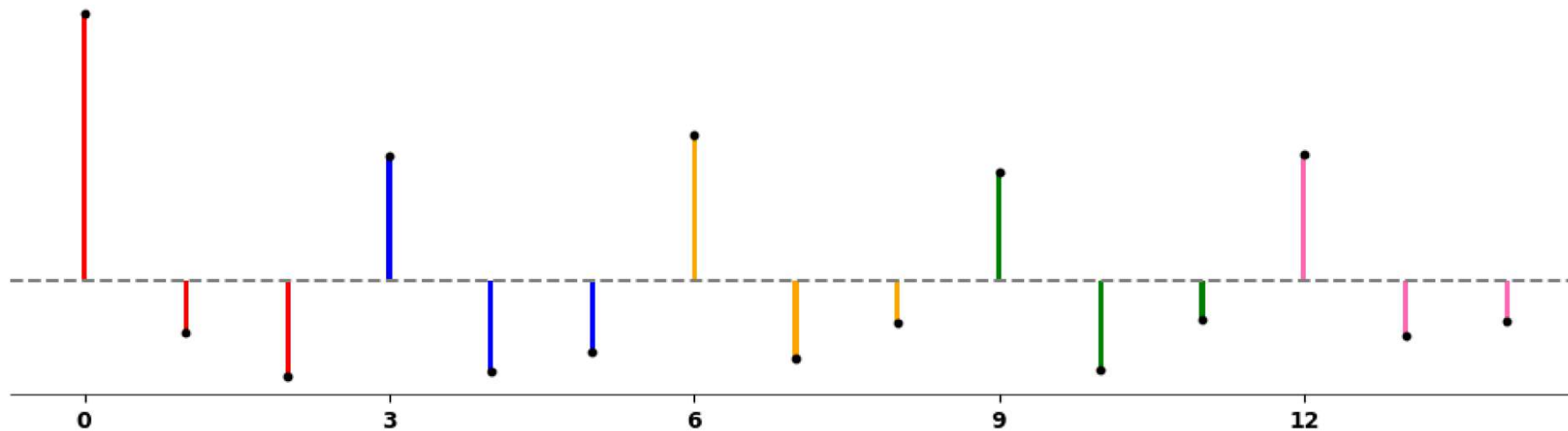
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Collective Autocorrelation



Data Analysis

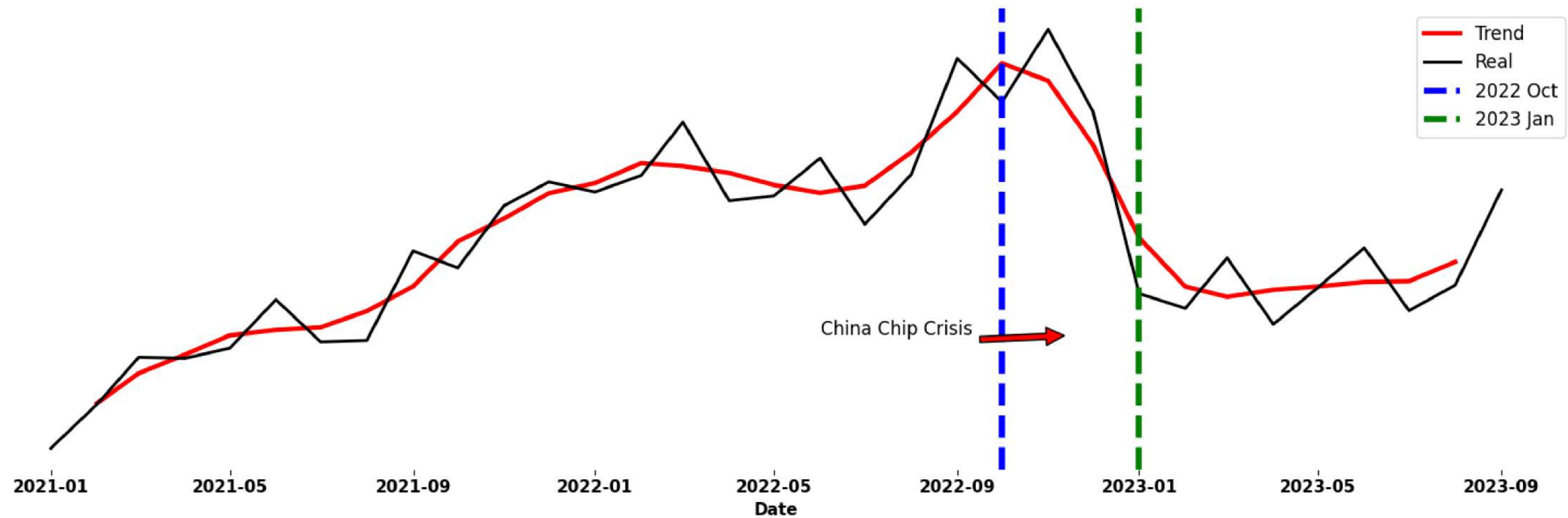
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Trend Analysis

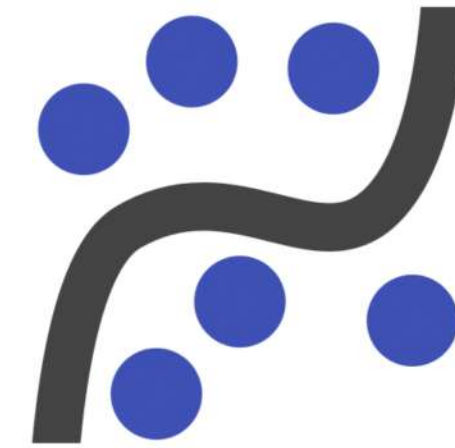


Model Selection



Autogluon

- Automatic model selection.
- Automatic hyperparameter optimization.
- Can use deep learning models.
- Has a user-friendly API.
- Open-Source



Sarima

- A statistical model.
- Seasonal modeling .
- Requires more data preprocessing.
- Careful seasonality settings is necessary.
- Open-Source



Test Results

Weekly Test Results

Monthly Test Results

	RMSE	Accuracy		RMSE	Accuracy
Naive Forecast	92.3	92.9%		599	97.7%
Sarima	83.6	93.7%		581	97.9%
AutoGluon	70.3	95.6%		496	98.8%

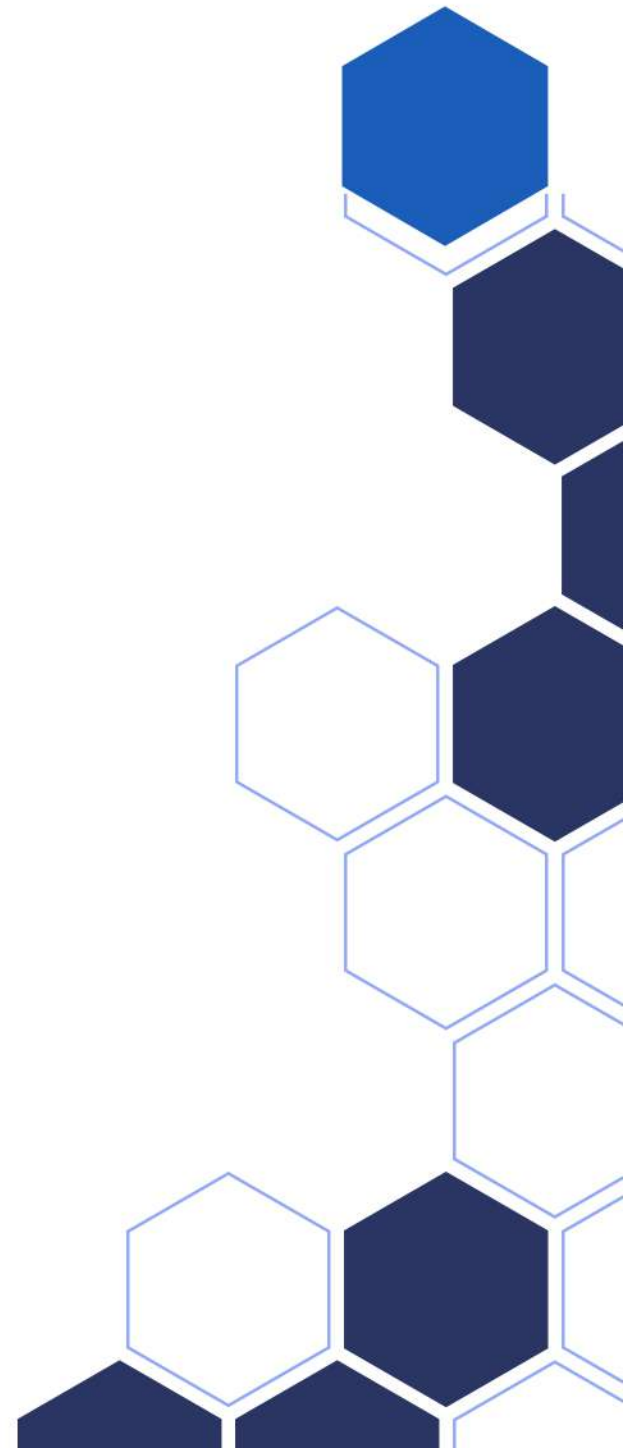
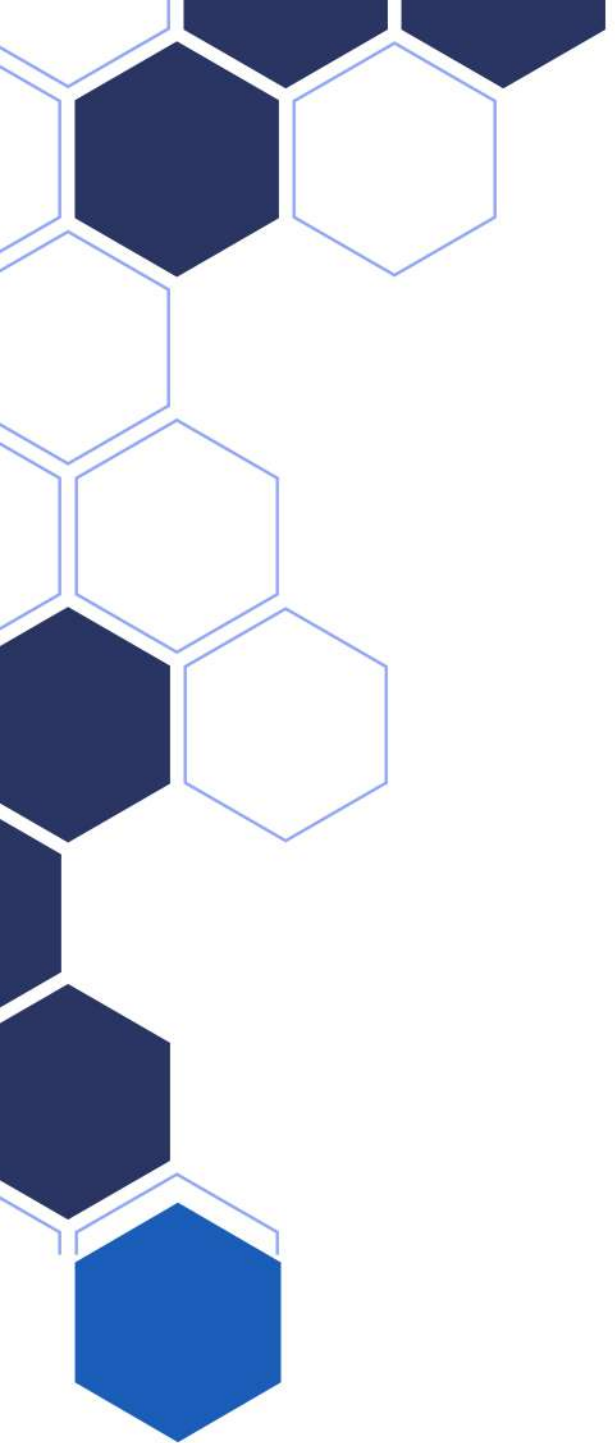


Possible Model Improvements

Enhance models by adding more data and additional features

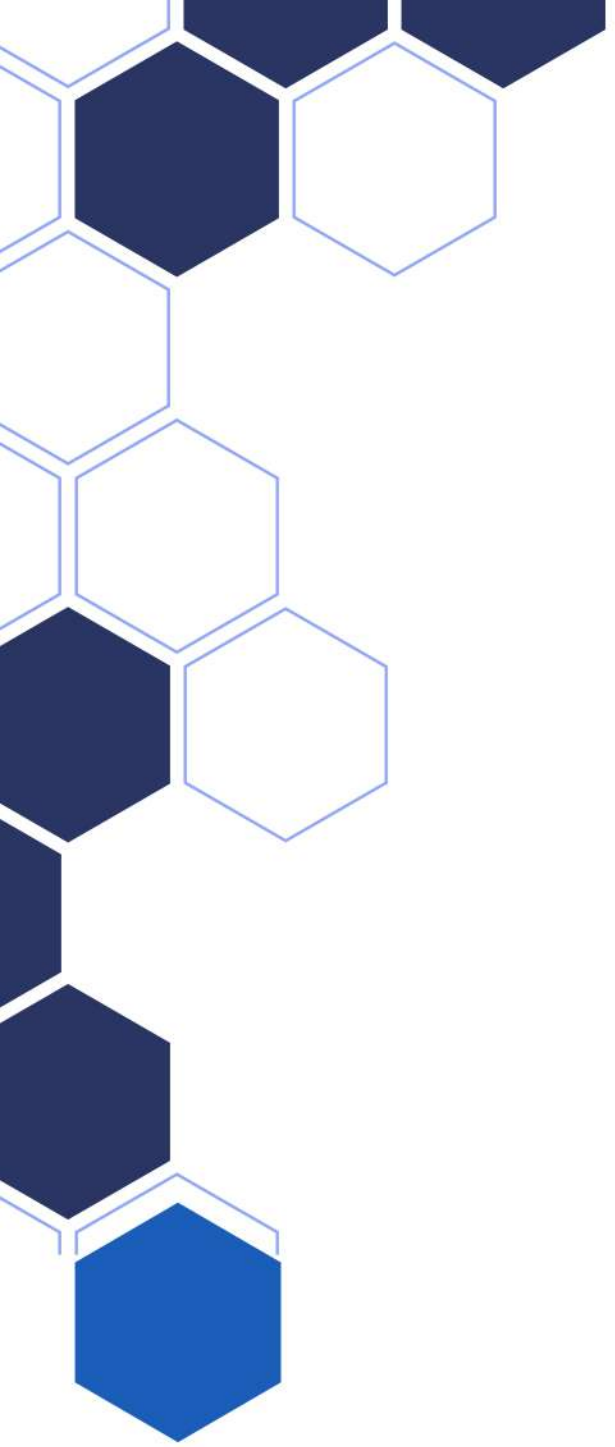
For example:

- Consumer opinions about brands and services.
- Capacity of production lines. Did an unexpected event occur?
- Competitor analysis on similar products.



Benefits of Predictive Modeling

- Planning for the Future
- Inventory Management
- Cost Reduction
- Customer Satisfaction
- Resource Management
- Competitive Advantage



**THANK
YOU**

