

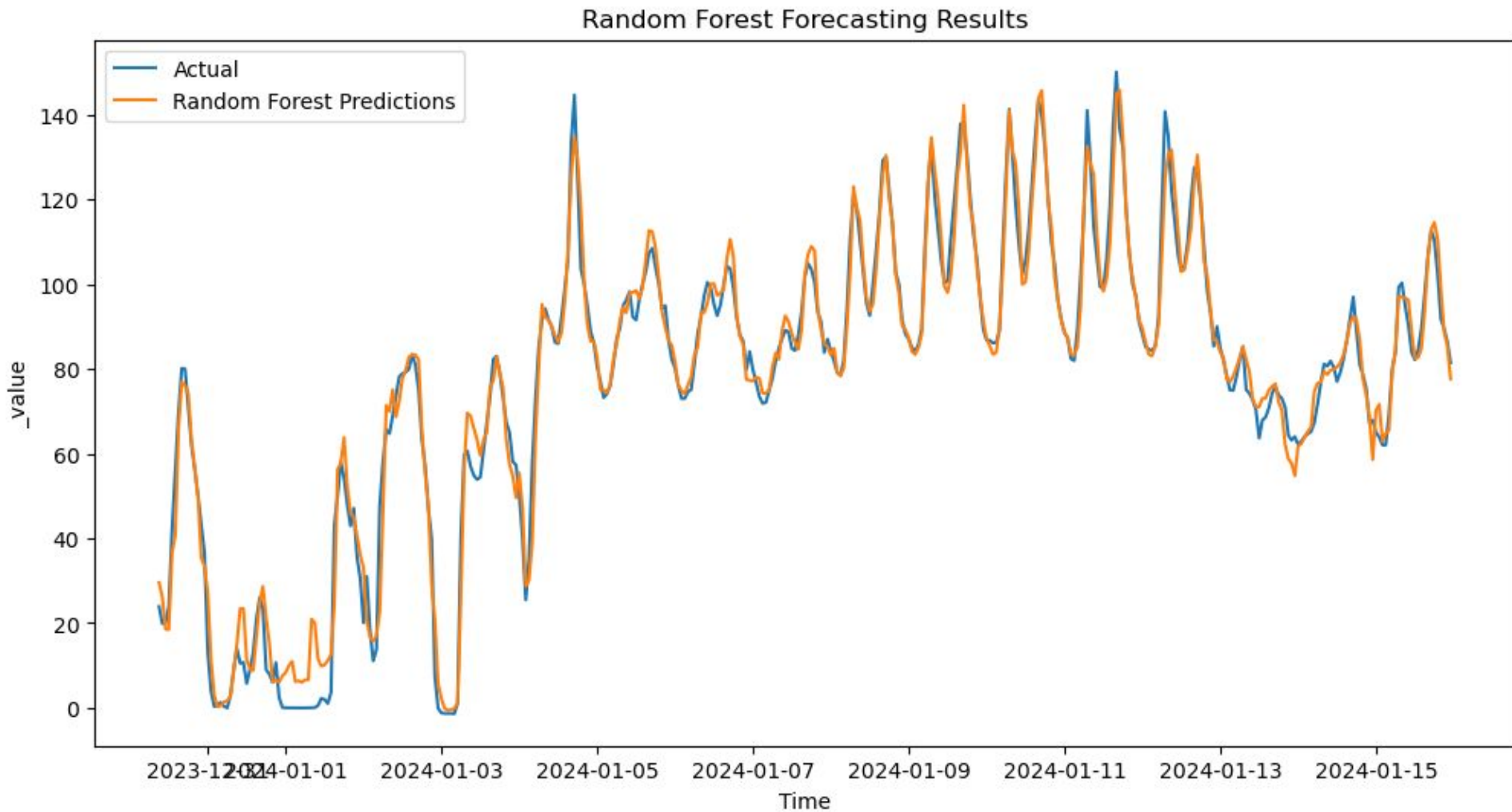
# **PTB Data Forecasting and Unified REST API**

**Namrata De, Manasi Acharya, Sahar Mehtab Nasir  
Saiyed, Alize Ispahani, Se Yeon Kim, Shipra Guin,  
Hanee Rai, Anuraj Suman**

# RF Predictions on training data

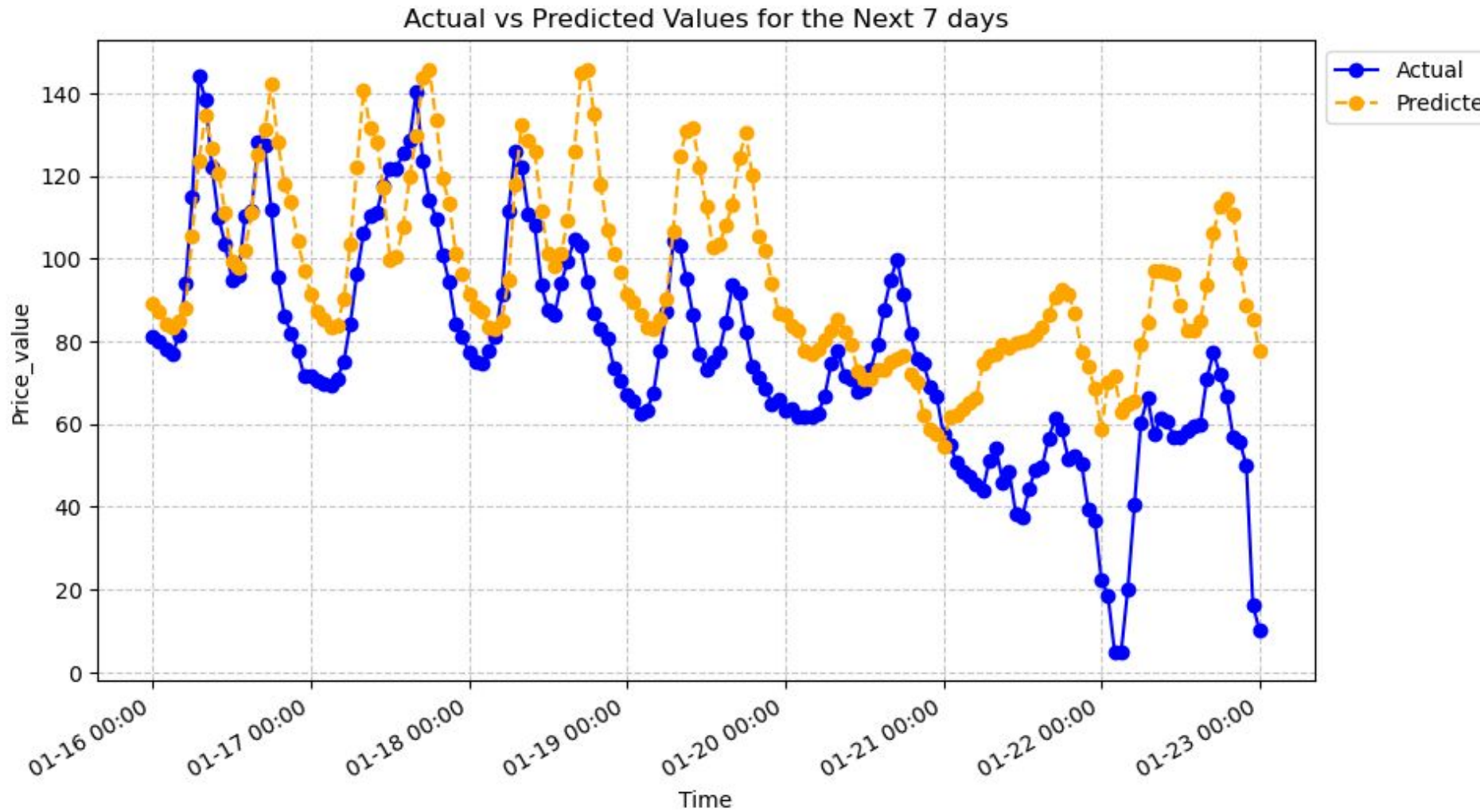
MAE (Random Forest): 3.82  
RMSE (Random Forest): 5.37  
R2 score: 0.9772276148801634

Start date: 2023-10-24 23:00:00  
End date: 2024-01-15 23:00:00



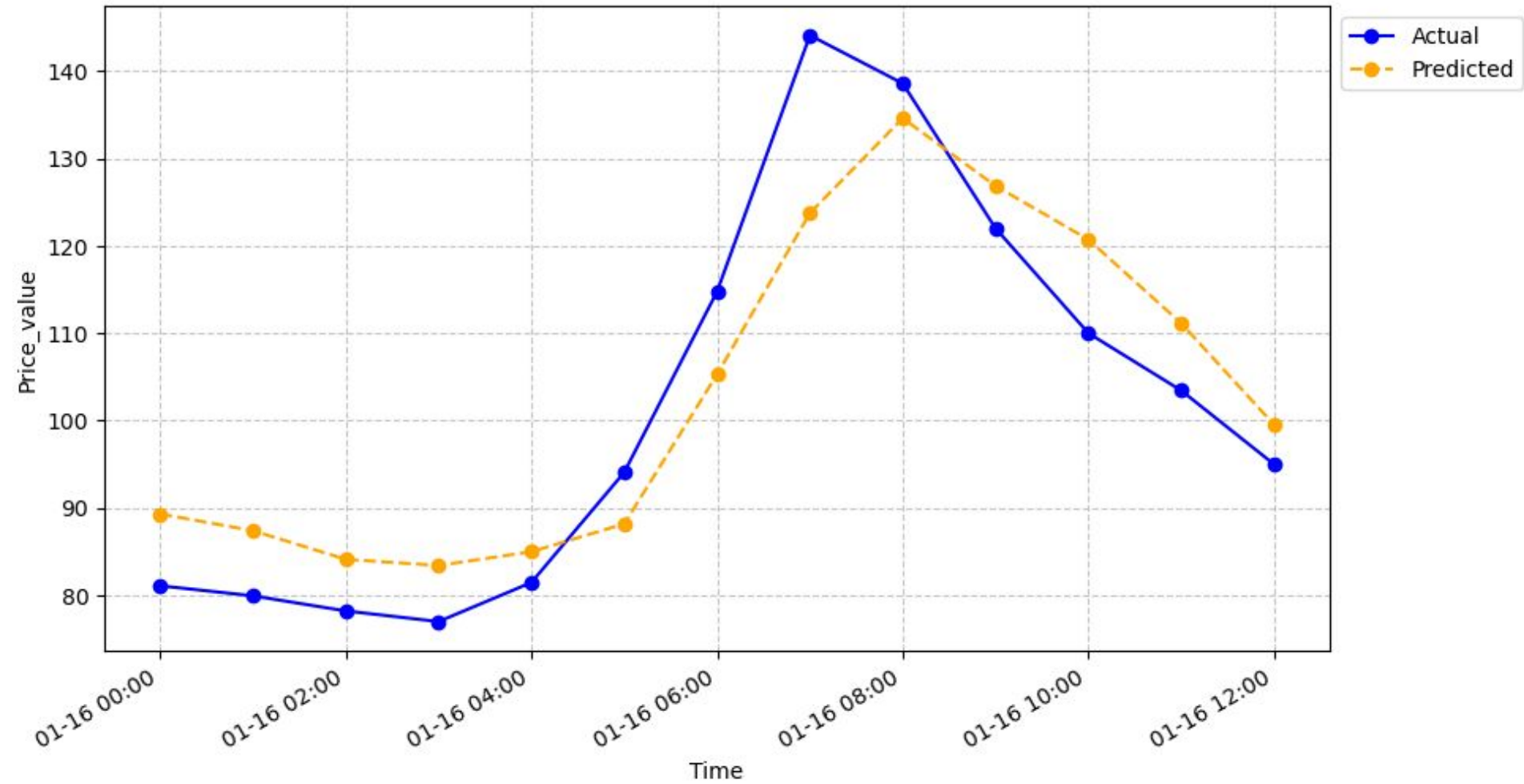
Forecasting for next 7 days: 2024-01-16 00:00:00 to 2024-01-22 23:00:00

Features: Rolling mean (3,6,9,18), Exponential Moving Average



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Actual vs Predicted Values for the Next 12 hours

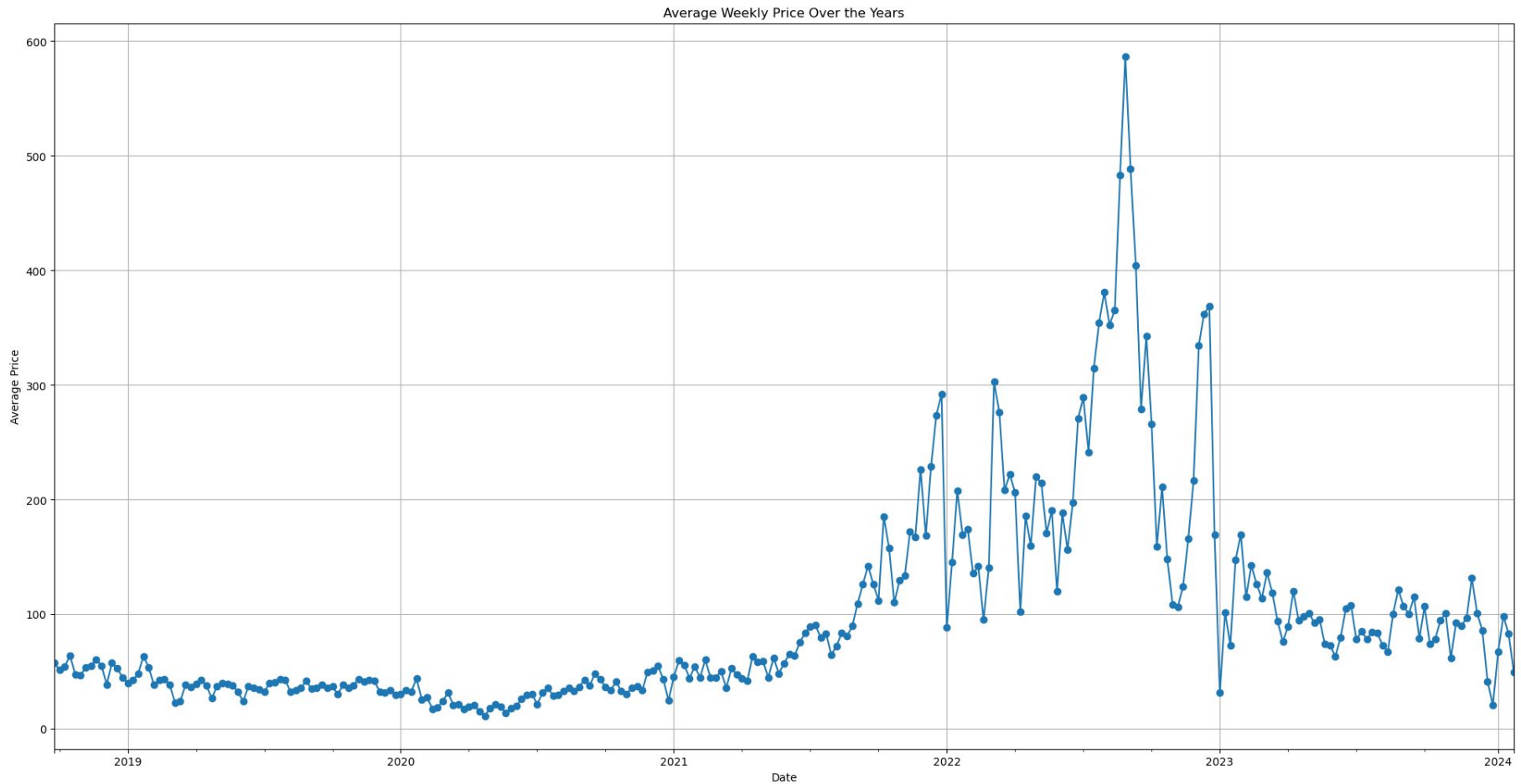


# Forecasting Team (Price Forecasting)

Algorithms:	Training Data	Rolling Mean Used	Test Data's 1st Rolling Mean (24 hrs) from
Type 1.1	Last 3 Months	No	n/a
Type 1.2	Last 3 Months	Yes	Day Before Test Start
Type 2.1	One* Year Ago	No	n/a
Type 2.2.1	One* Year Ago	Yes	One* Year Prior
Type 2.2.2	One* Year Ago	Yes	Day Before Test Start
Type 3.1	Last 3 Months + One* Year Ago	No	n/a
Type 3.2	Last 3 Months + One* Year Ago	Yes	Day Before Test Start

\* Which past values are to be taken are dependent on similar patterns over the years.

# Forecasting Team (Price Forecasting)



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## Proposed Algorithm (For Rolling Mean Process):

1. Calculate the average price,  $A$ , for the day before test period.
2. Replace occurrences of Rolling\_Mean for 1st day in test period with  $A$  (24 instances).
3. Apply pre-trained ML Model on occurrences of 1st day in test period and store predicted price values in a list  $B1$ .
4. Calculate mean of  $B1$  and replace occurrences of Rolling\_Mean for next day in test data.
5. Apply pre-trained ML Model on occurrences of next day in test data and store predicted price values in a list  $Bn$ .
6. Calculate mean of  $Bn$  and replace occurrences of Rolling\_Mean for next day in test data.
7. Repeat Steps 5 and 6 until values for each day in test data have been predicted.
8. Merge  $B1, Bn1, \dots Bnn$  to get the list of predictions for the entire test period.



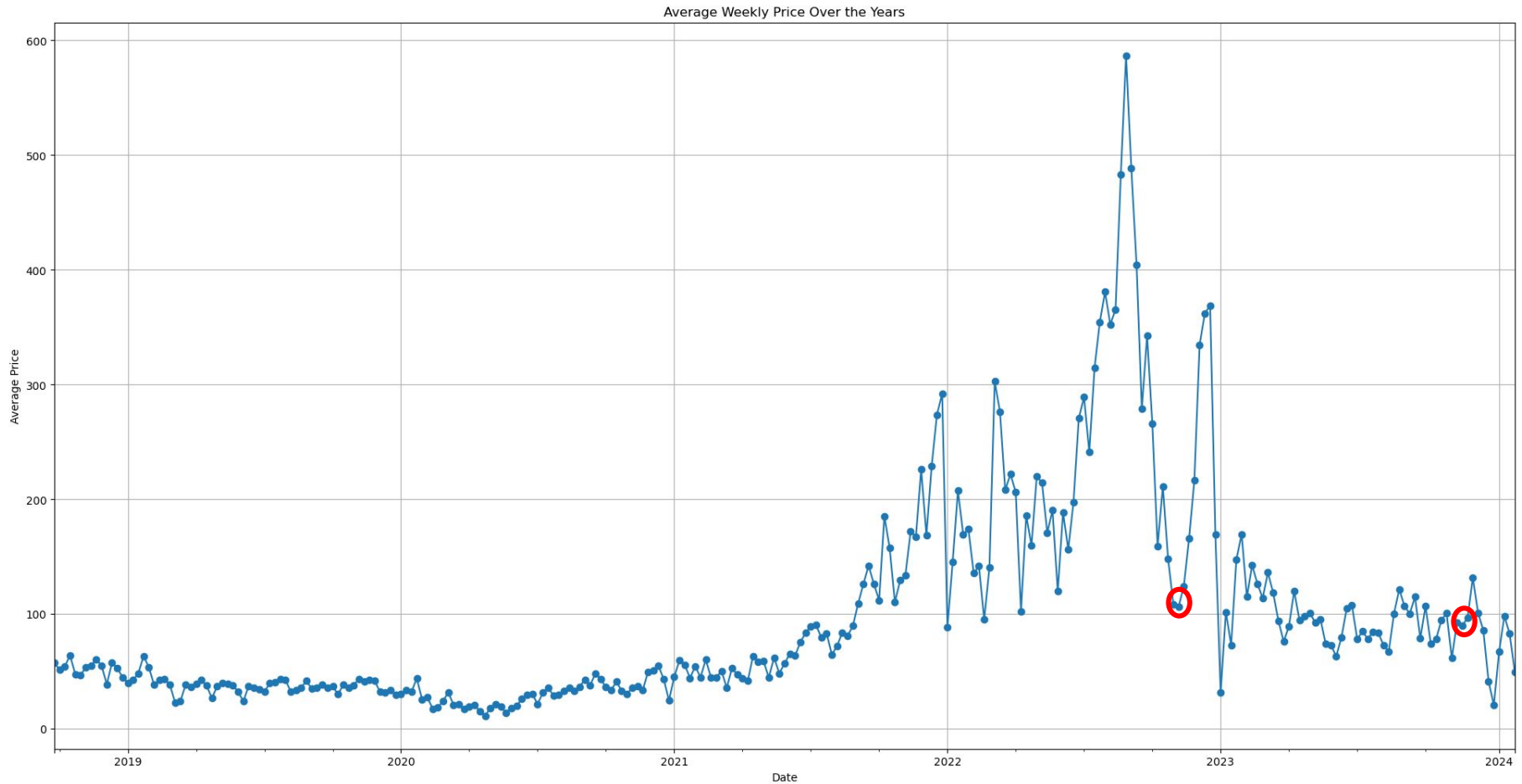
# Forecasting Team (Price Forecasting)

Week	Type1.1	Type1.2 (w RM)	Type2.1	Type2.2.1 (w RM)	Type2.2.2 (w RM)	Type3.1	Type3.2 (w RM)
6.11.2023	MAE: 41.34 RMSE: 48	MAE: * 45.81 RMSE: 51.14	MAE: 32.78 RMSE: 39.13	MAE: 18.23 RMSE: 24.19	MAE: 22.9 RMSE: 28.15	MAE: 32.77 RMSE: 38.49	MAE: 41.48 RMSE: 47.77
13.11.2023	MAE: 30.35 RMSE: 39.44	MAE: 28.15 RMSE: 33.57	MAE: 76.99 RMSE: 93.58	MAE: 69.91 RMSE: 79.61	MAE: 37.58 RMSE: 47.52	MAE: 74.84 RMSE: 92.24	MAE: 26.3 RMSE: 35.35
20.11.2023	MAE: 37.75 RMSE: 45.36	MAE: 39.78 RMSE: 48.33	MAE: 125.18 RMSE: 133.51	MAE: 113.49 RMSE: 121.24	MAE: 73.6 RMSE: 77.82	MAE: 126.19 RMSE: 135.44	MAE: 36.54 RMSE: 43.22
27.11.2023	MAE: 60.81 RMSE: 70.56	MAE: 29.52 RMSE: 42.18	MAE: 183.28 RMSE: 193.51	MAE: 137.66 RMSE: 146.57	MAE: 40.45 RMSE: 52.38	MAE: 194.41 RMSE: 201.6	MAE: 34.42 RMSE: 46.57
4.12.2023	MAE: 34.7 RMSE: 42.22	MAE: 27 RMSE: 32.19	MAE: 257.93 RMSE: 264.09	MAE: 213.68 RMSE: 216.99	MAE: * 25.62 RMSE: 32.15	MAE: 262.61 RMSE: 269.62	MAE: 35.39 RMSE: 41.35
11.12.2023	MAE: * 14.28 RMSE: 19	MAE: 19.01 RMSE: 23.35	MAE: 295.79 RMSE: 310.25	MAE: 297.3 RMSE: 304.85	MAE: 29.32 RMSE: 33.82	MAE: 292.54 RMSE: 307.56	MAE: 27.52 RMSE: 31.44
18.12.2023	MAE: 50.88 RMSE: 57.36	MAE: 50.27 RMSE: 56.76	MAE: 140.4 RMSE: 145.61	MAE: 151.68 RMSE: 157.04	MAE: 22.9 RMSE: 26.47	MAE: 152.3 RMSE: 159.15	MAE: 30.65 RMSE: 37.57
25.12.2023	MAE: 87.16 RMSE: 99.02	MAE: 18.31 RMSE: 21.91	MAE: 34.06 RMSE: 45.4	MAE: 86.06 RMSE: 93.19	MAE: 34.68 RMSE: 41.95	MAE: 33.46 RMSE: 43.74	MAE: 18.54 RMSE: 23.65
1.1.2024	MAE: 40.18 RMSE: 51.77	MAE: 29.16 RMSE: 34.46	MAE: 41.34 RMSE: 54.79	MAE: 34.05 RMSE: 43.37	MAE: 34.04 RMSE: 43.37	MAE: 42.42 RMSE: 55.92	MAE: 23.89 RMSE: 29.98
8.1.2024	MAE: 22.87 RMSE: 30.57	MAE: 13.2 RMSE: 15.88	MAE: 35.81 RMSE: 42.16	MAE: 23.53 RMSE: 29.92	MAE: 23.82 RMSE: 30.58	MAE: 31.88 RMSE: 38.98	MAE: 22.22 RMSE: 27.22
15.1.2024	MAE: 22.35 RMSE: 26.91	MAE: 16.72 RMSE: 20.57	MAE: 53.54 RMSE: 60.41	MAE: 26.48 RMSE: 31.69	MAE: 26.73 RMSE: 31.55	MAE: 57.08 RMSE: 64.51	MAE: 17.36 RMSE: 21.79
Avg:	44.22	31.6	120.88	110.03	37.15	123.07	31.8



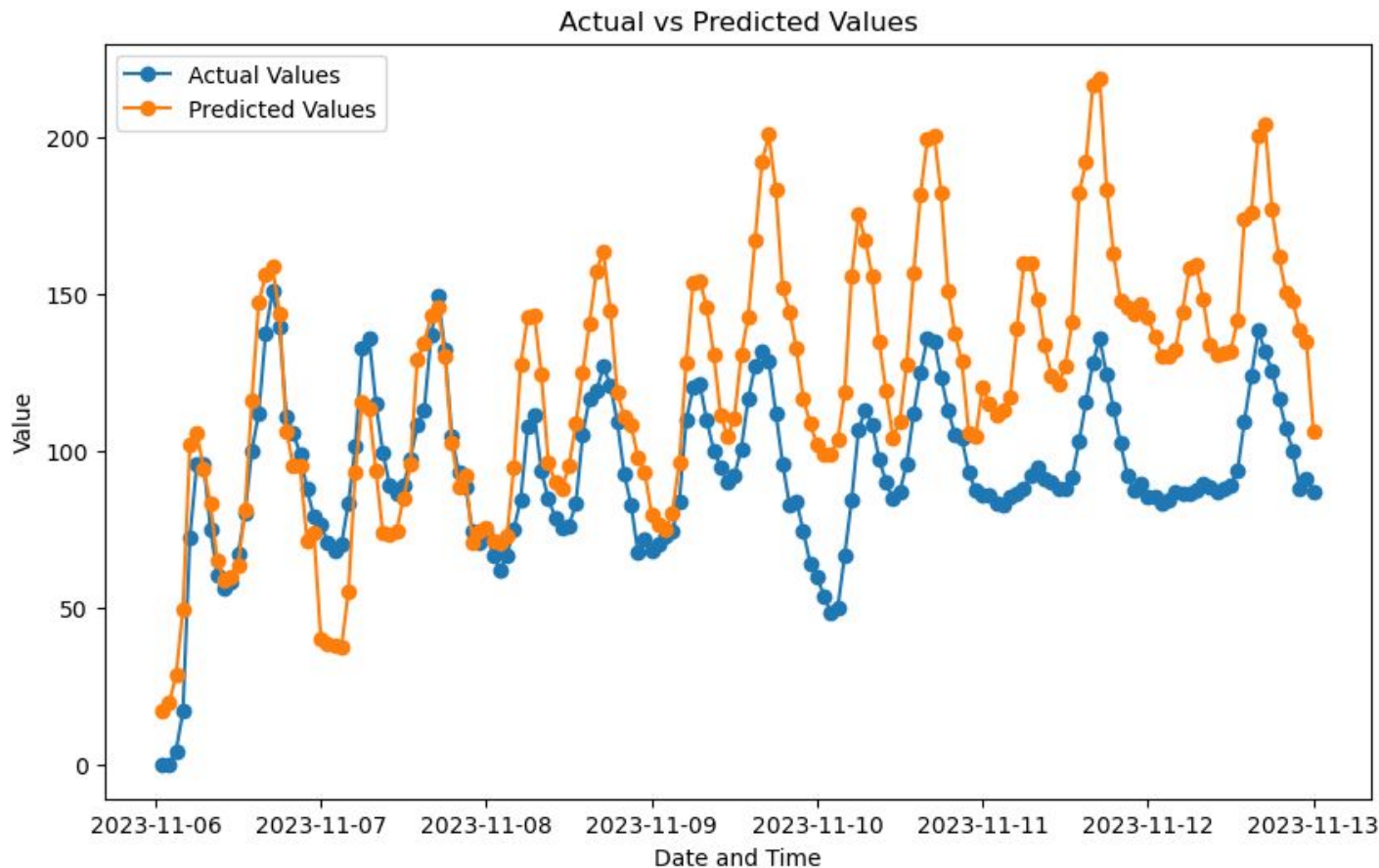
# Forecasting Team (Price Forecasting)

Analysing for 06.11.2023



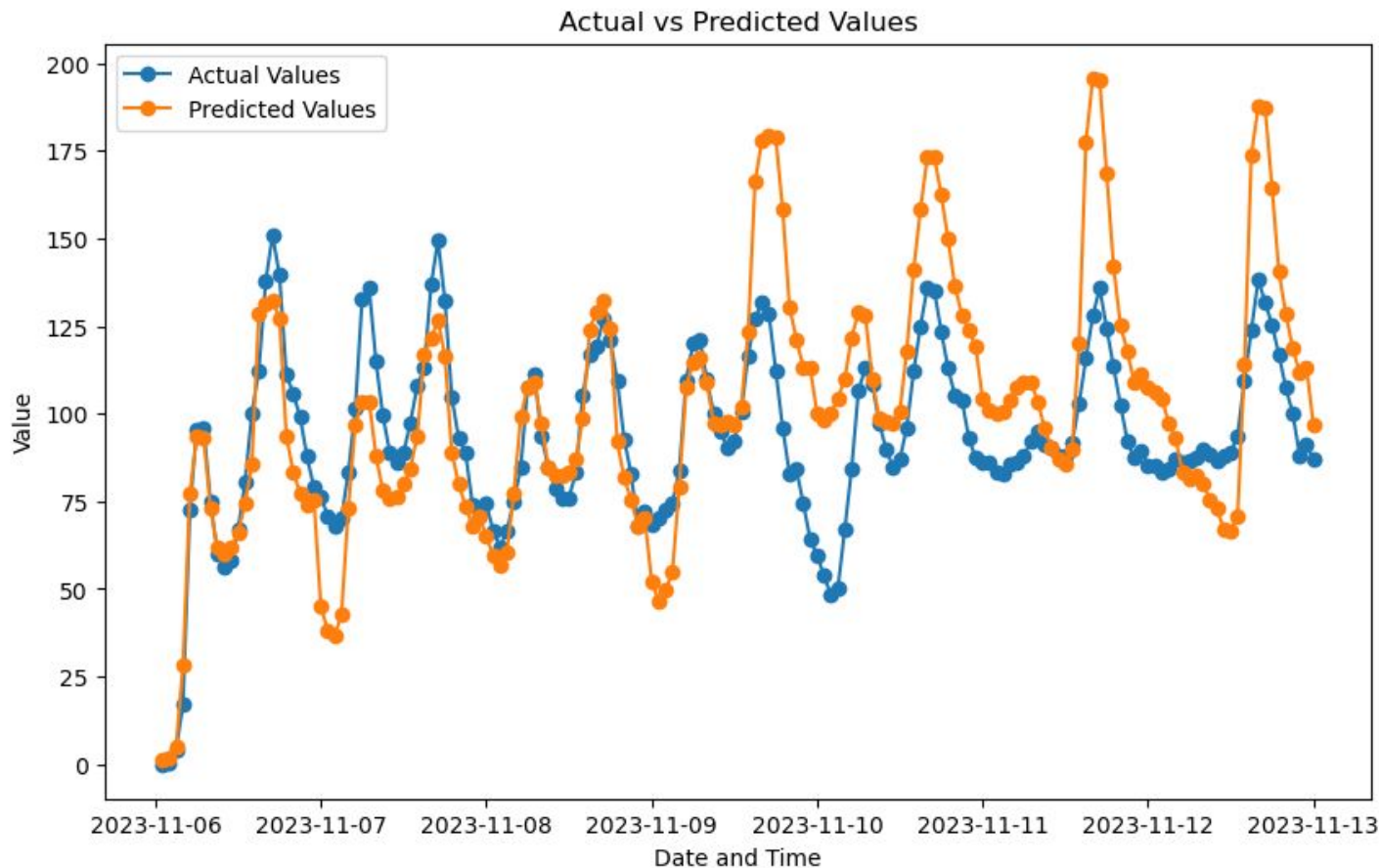
# Forecasting Team (Price Forecasting)

One Year Old Training Data with Rolling Mean (Type 2.2.1)



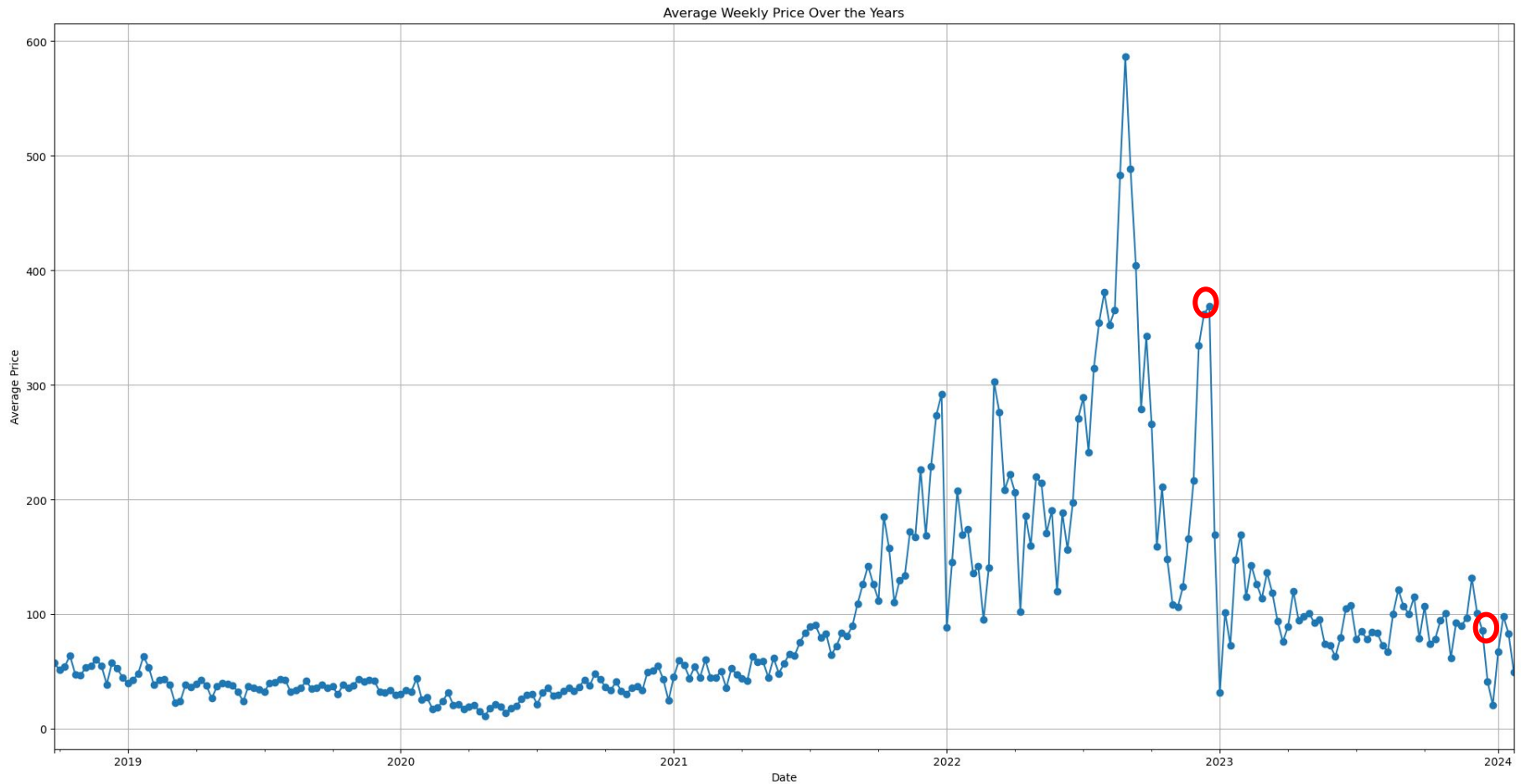
# Forecasting Team (Price Forecasting)

One Year Old Training Data with Rolling Mean (Type 2.2.2)



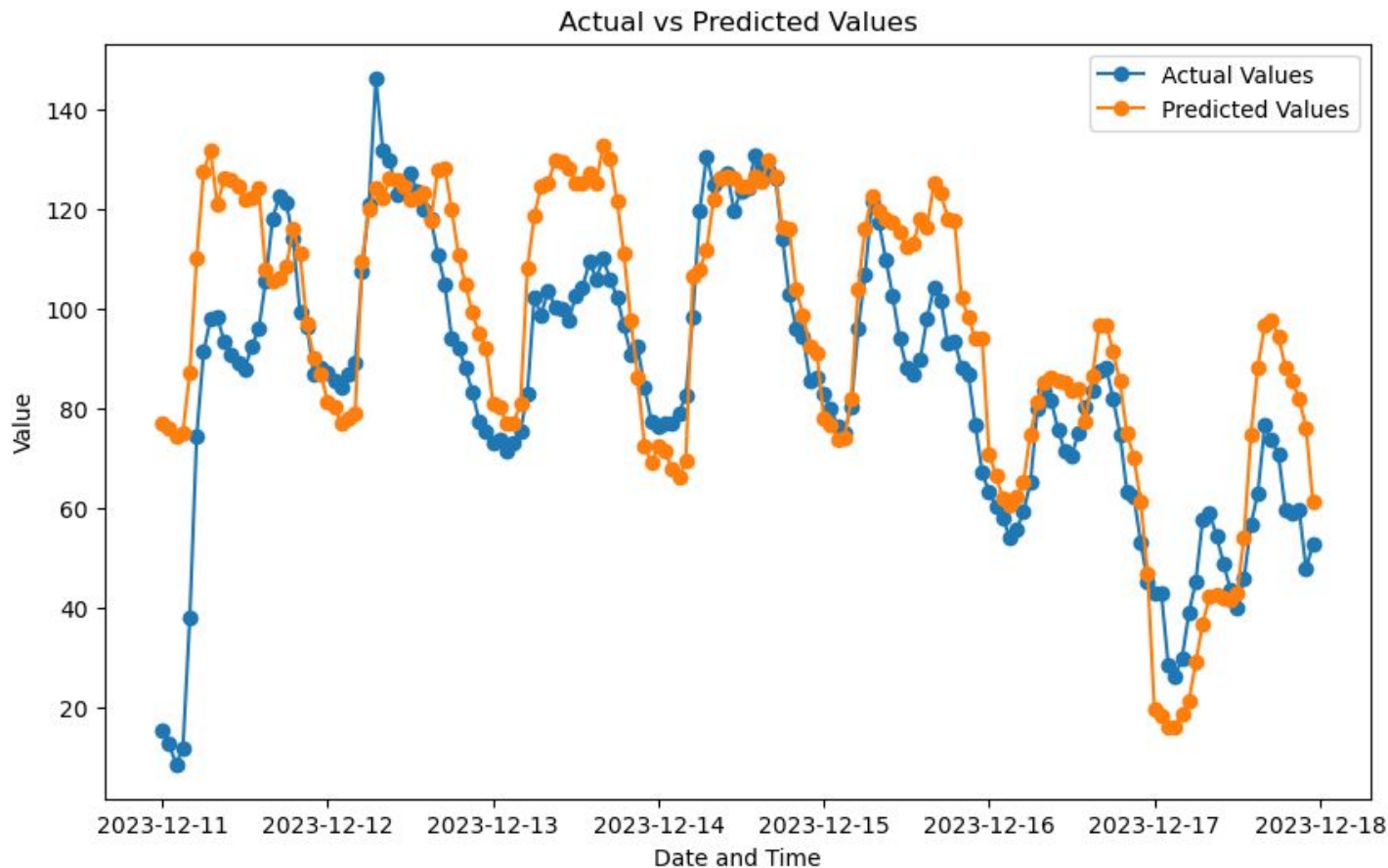
# Forecasting Team (Price Forecasting)

Analysing for 11.12.2023



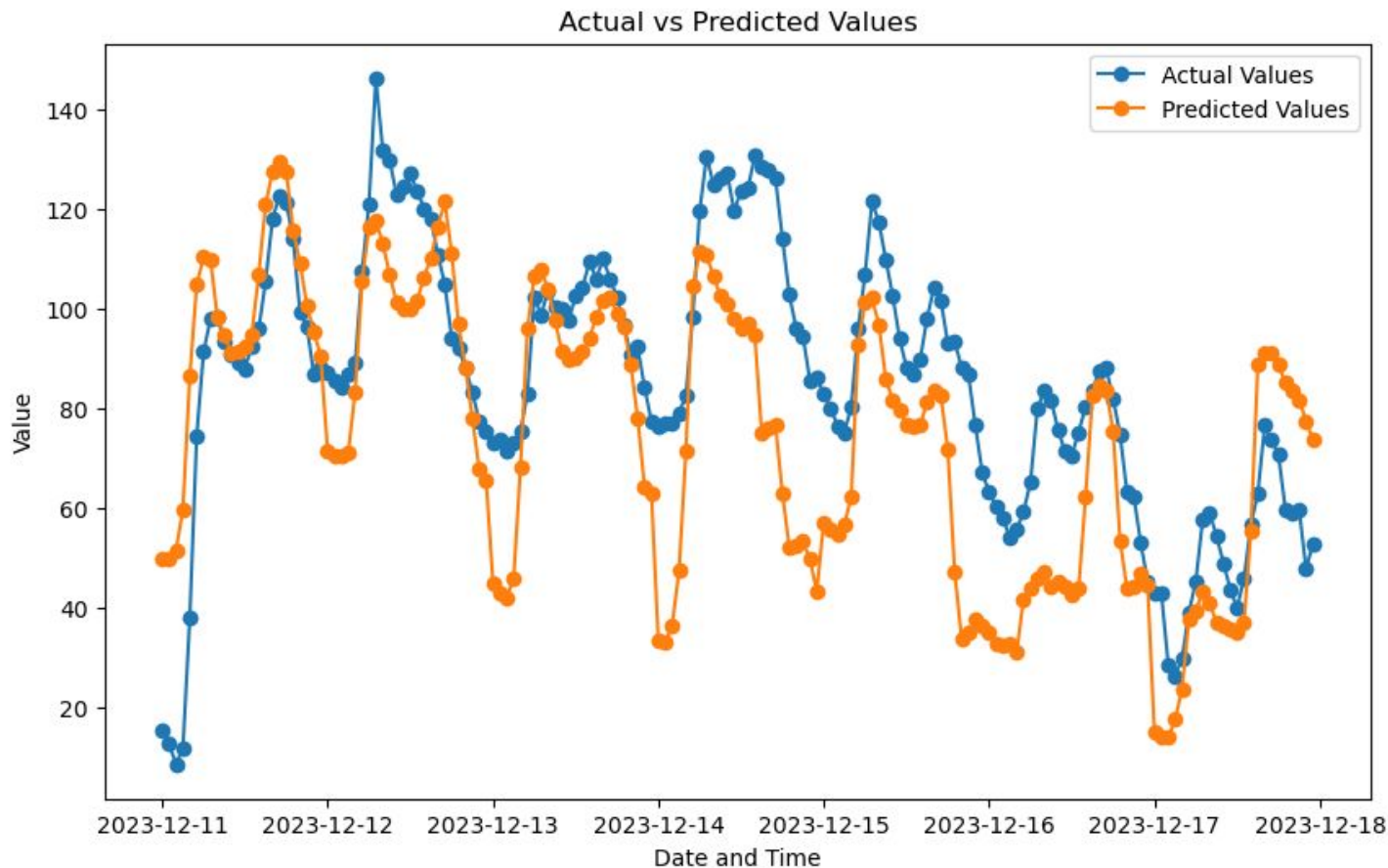
# Forecasting Team (Price Forecasting)

Last 3 Months Training Data without Rolling Mean (Type 1.1)



# Forecasting Team (Price Forecasting)

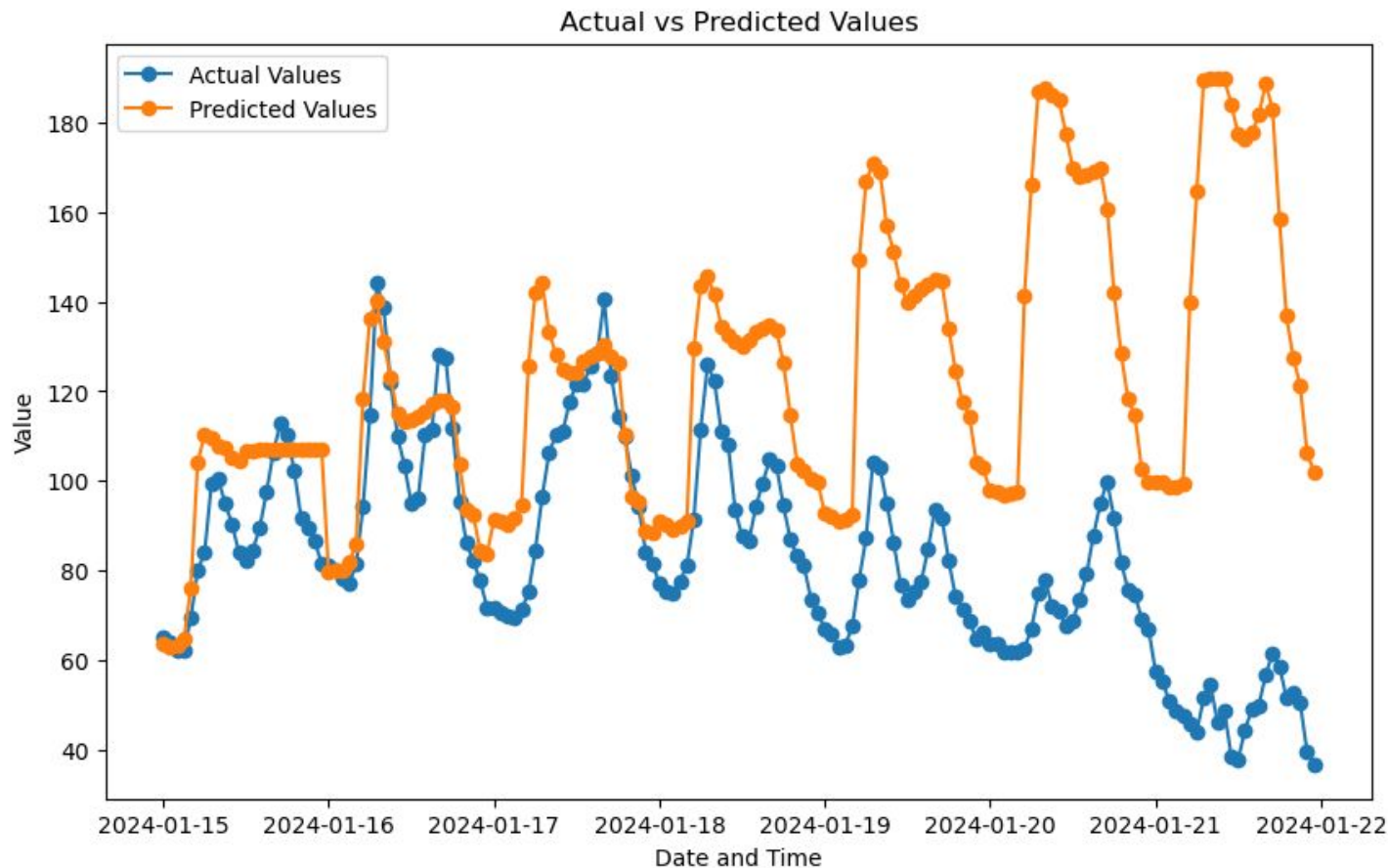
Last 3 Months Training Data with Rolling Mean of 24 hrs (Type 1.2)





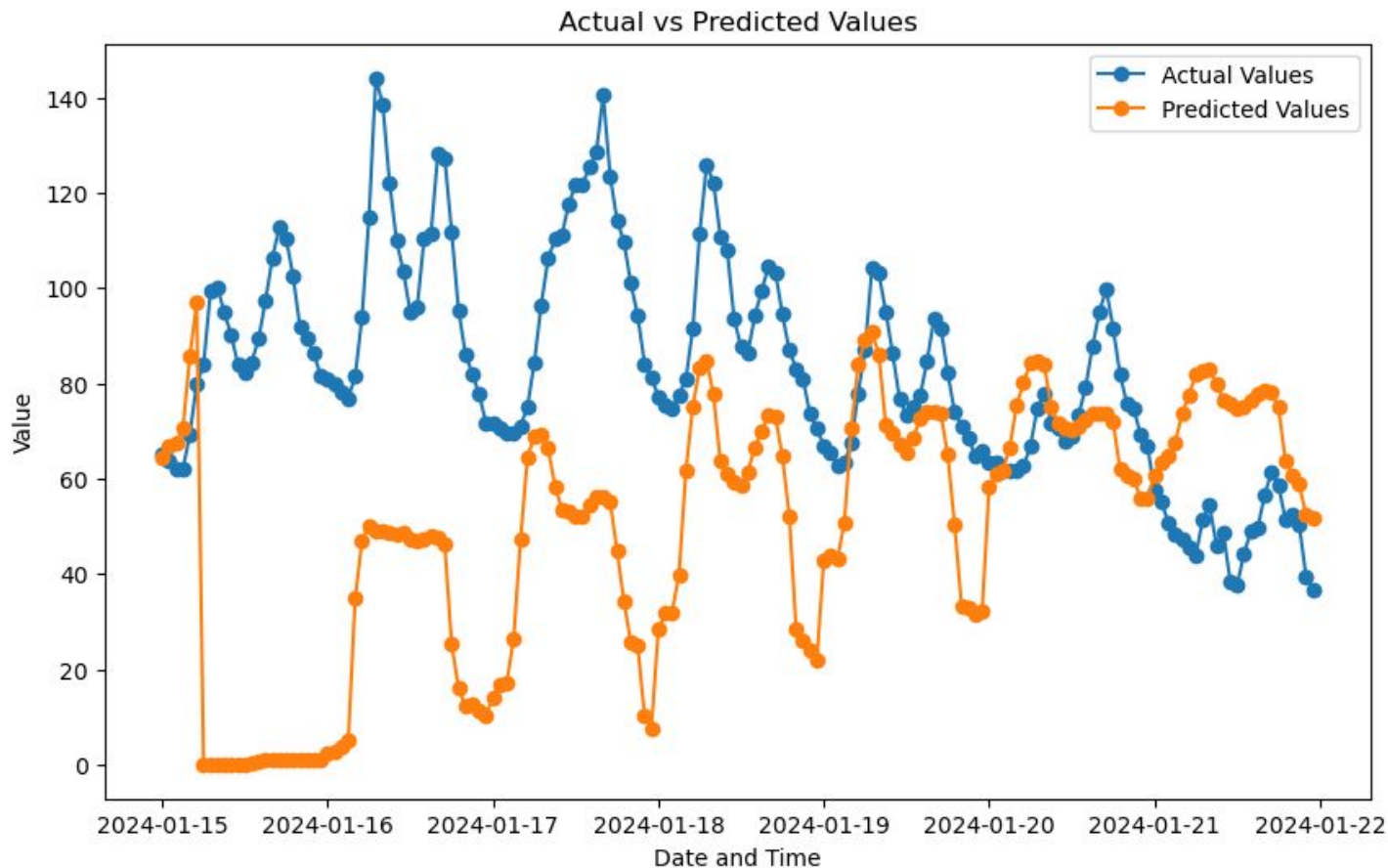
# Forecasting Team (Price Forecasting)

Last 3 Months Training Data with Rolling Mean of 12hrs (Type 1.2)



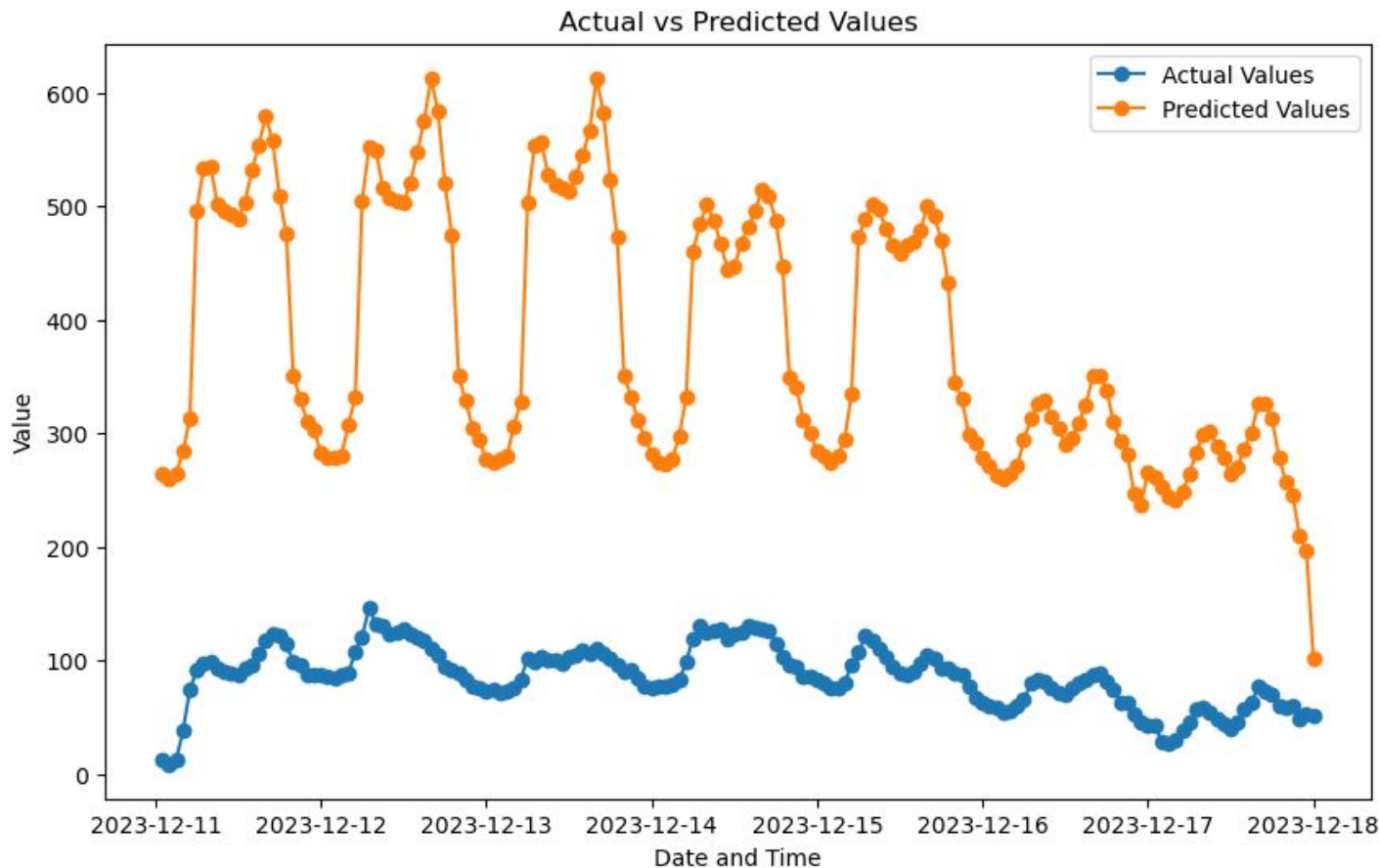
# Forecasting Team (Price Forecasting)

Last 3 Months Training Data with Rolling Mean of 6 hrs (Type 1.2)



# Forecasting Team (Price Forecasting)

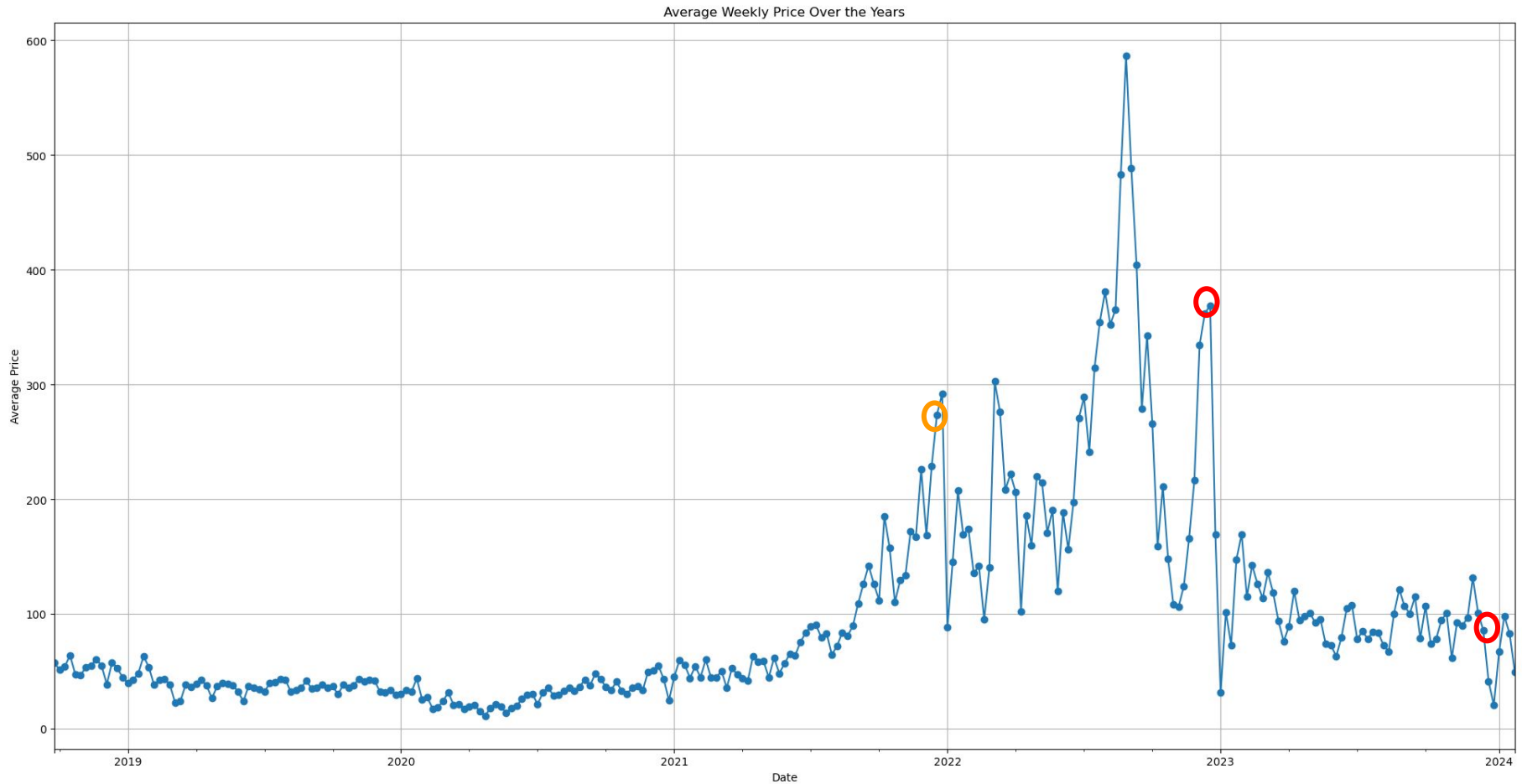
**One Year Old** Training Data without Rolling Mean (Type 2.1)



**MAE: 295.79**  
**RMSE: 310.25**

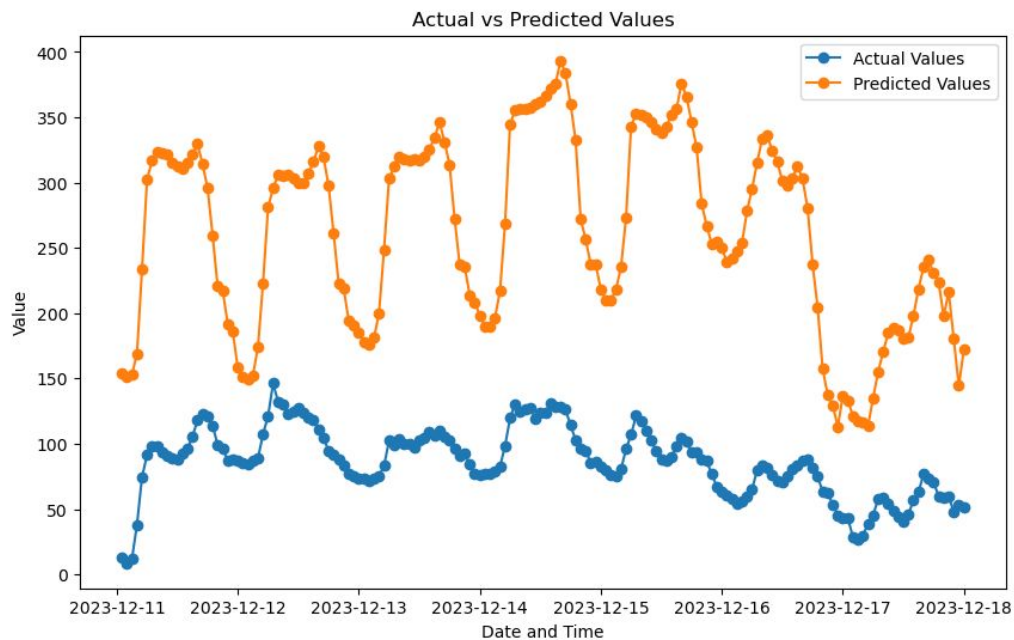
# Forecasting Team (Price Forecasting)

Analysing for 11.12.2023

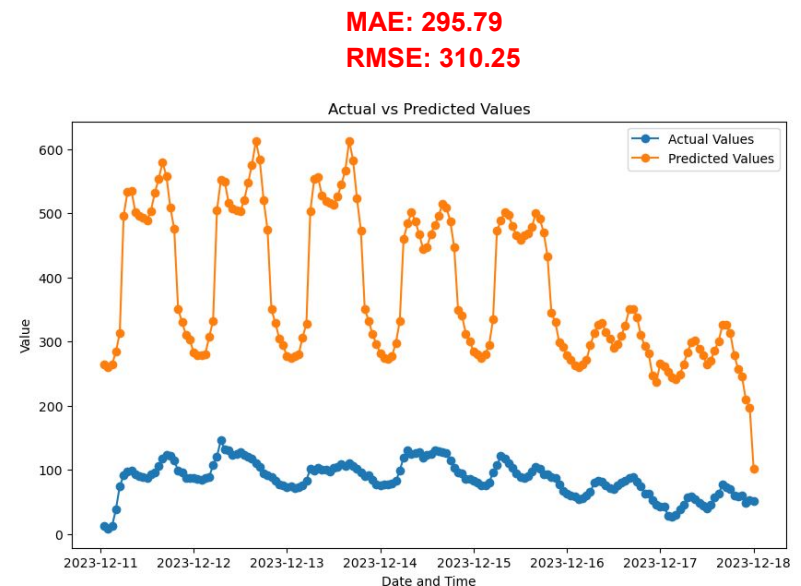


# Forecasting Team (Price Forecasting)

## Two Year Old Training Data without Rolling Mean (Type 2.1)



**MAE: 174.96**  
**RMSE: 183.35**



# Forecasting Team (Price Forecasting)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
		Type1.1		Type1.2 (w RM)		Type2.1		Type2.2.1 (w RM)		Type2.2.2 (w RM)		Type3.1		Type3.2 (w RM)	
22/01/2024 00:00		97.0524		70.9313		137.168		156.7689		130.5149		139.4299		59.8968	
22/01/2024 01:00		95.5089		70.7918		136.4775		149.9758		130.6833		140.4303		59.1219	
22/01/2024 02:00		94.0965		70.9409		138.1547		149.3355		131.8191		139.8531		58.9117	
22/01/2024 03:00		97.8908		73.6738		145.3012		146.052		141.0099		140.1278		60.7188	
22/01/2024 04:00		120.0624		77.1971		158.531		142.7492		154.38		141.8264		68.5634	
22/01/2024 05:00		124.74		83.6538		175.0371		149.8811		169.9311		191.7232		128.1349	
22/01/2024 06:00		155.8689		92.8081		177.5903		162.5712		185.5224		218.3595		152.9731	
22/01/2024 07:00		146.2236		95.1792		183.6765		162.2436		188.6089		251.5204		154.6156	
22/01/2024 08:00		129.1997		93.6002		186.9252		165.7775		184.2072		259.5706		138.2921	
22/01/2024 09:00		112.9108		90.0364		185.442		167.8893		181.9766		243.8351		123.0815	
22/01/2024 10:00		106.7142		88.7083		176.4246		167.344		179.3407		231.2396		118.8151	
22/01/2024 11:00		104.0921		89.8883		170.0055		165.1485		177.5178		220.4021		113.8601	
22/01/2024 12:00		105.4427		91.9015		168.2865		165.2019		177.9469		218.4716		113.8024	
22/01/2024 13:00		118.0843		97.2723		167.9753		180.7667		176.9643		217.1743		112.1838	
22/01/2024 14:00		119.9055		107.2612		178.65		194.2714		179.2466		218.384		111.5528	
22/01/2024 15:00		125.454		111.0641		199.0258		210.9662		184.2437		220.3839		112.1465	
22/01/2024 16:00		130.9477		112.7145		211.0661		216.9766		181.3278		240.9528		110.6345	
22/01/2024 17:00		129.7439		112.7048		204.9537		217.5729		179.6502		240.3412		108.1684	
22/01/2024 18:00		114.7402		109.9706		200.3034		204.7384		169.7553		224.7554		105.7981	
22/01/2024 19:00		103.3708		106.9243		178.4963		189.0751		152.1519		196.5765		99.382	
22/01/2024 20:00		99.3726		106.2882		176.4763		187.8629		151.2326		181.1466		91.3032	
22/01/2024 21:00		93.1338		100.4947		161.6461		180.1375		148.5711		170.4985		82.384	
22/01/2024 22:00		90.0027		94.9331		159.1772		172.2011		144.5549		163.6026		70.4218	
22/01/2024 23:00		84.4589		79.2596		119.7713		162.5355		160.3141		159.1124		68.2708	
23/01/2024 00:00		94.5669		72.4488		119.9488		162.0703		160.8313		148.5424		54.1445	

...

28/01/2024 06:00	82.7142	76.8527	206.9321	173.1825	171.0383	132.867	57.9343
28/01/2024 07:00	86.2148	77.286	206.9063	170.2604	168.6877	141.2971	61.3594
28/01/2024 08:00	86.7829	74.9864	196.8175	165.6416	163.8708	150.8042	64.2871
28/01/2024 09:00	82.7025	73.4302	196.2024	165.0926	162.6266	151.3974	62.4688
28/01/2024 10:00	81.4331	73.3886	183.8302	165.1331	161.3396	147.738	60.437
28/01/2024 11:00	77.8365	73.1333	181.7998	164.3631	159.7254	143.1984	57.684
28/01/2024 12:00	77.7375	73.9481	181.0827	166.6204	162.7268	138.893	57.23
28/01/2024 13:00	80.2761	76.2627	187.272	190.1277	186.4483	138.0253	61.4116
28/01/2024 14:00	82.2199	89.6863	210.7704	207.3016	211.5088	144.3952	66.4306
28/01/2024 15:00	93.6399	105.9526	239.9058	228.0309	233.6212	158.3308	72.1084
28/01/2024 16:00	98.5223	116.7457	256.7558	230.9727	237.0619	166.097	75.2693
28/01/2024 17:00	97.7851	112.6598	251.8757	230.772	239.7513	170.9499	75.7735
28/01/2024 18:00	88.8592	106.2977	245.6699	214.8556	222.8846	167.6744	73.5158
28/01/2024 19:00	81.176	104.061	207.9823	194.3066	201.573	156.1995	69.3241
28/01/2024 20:00	74.3557	100.1753	196.8268	184.593	191.4785	146.5624	61.0073
28/01/2024 21:00	61.4124	100.2657	182.8429	170.4255	179.0068	137.9076	54.6677
28/01/2024 22:00	43.2814	89.9678	178.1817	168.9121	178.8133	130.6973	42.4949
28/01/2024 23:00	29.9359	88.8349	65.6142	153.6051	154.6274	120.9381	37.6049