Energy Market and Battery Optimisation

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Lissy Xun (1074284) Haonan Zhong (867492) Jiabao Zhang (1118553)

Problem Overview and Objectives

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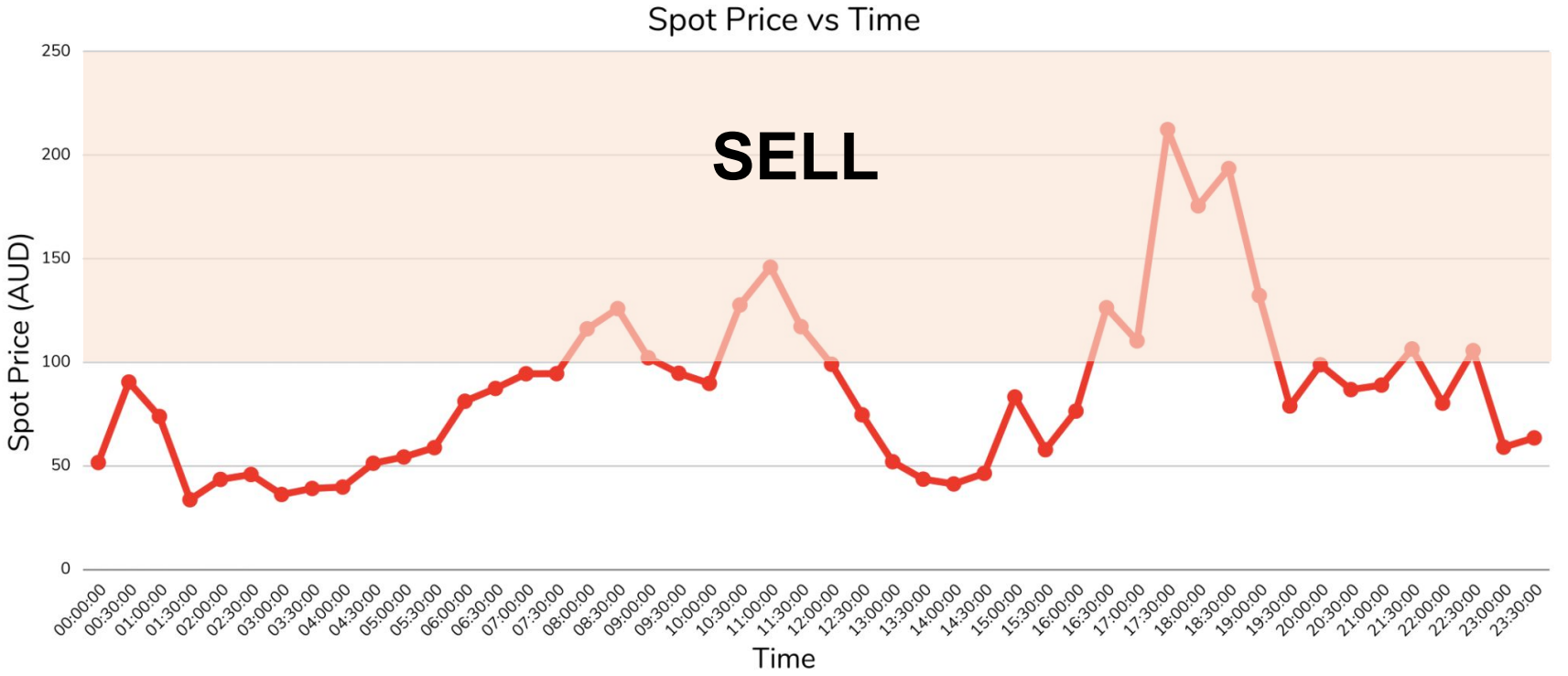

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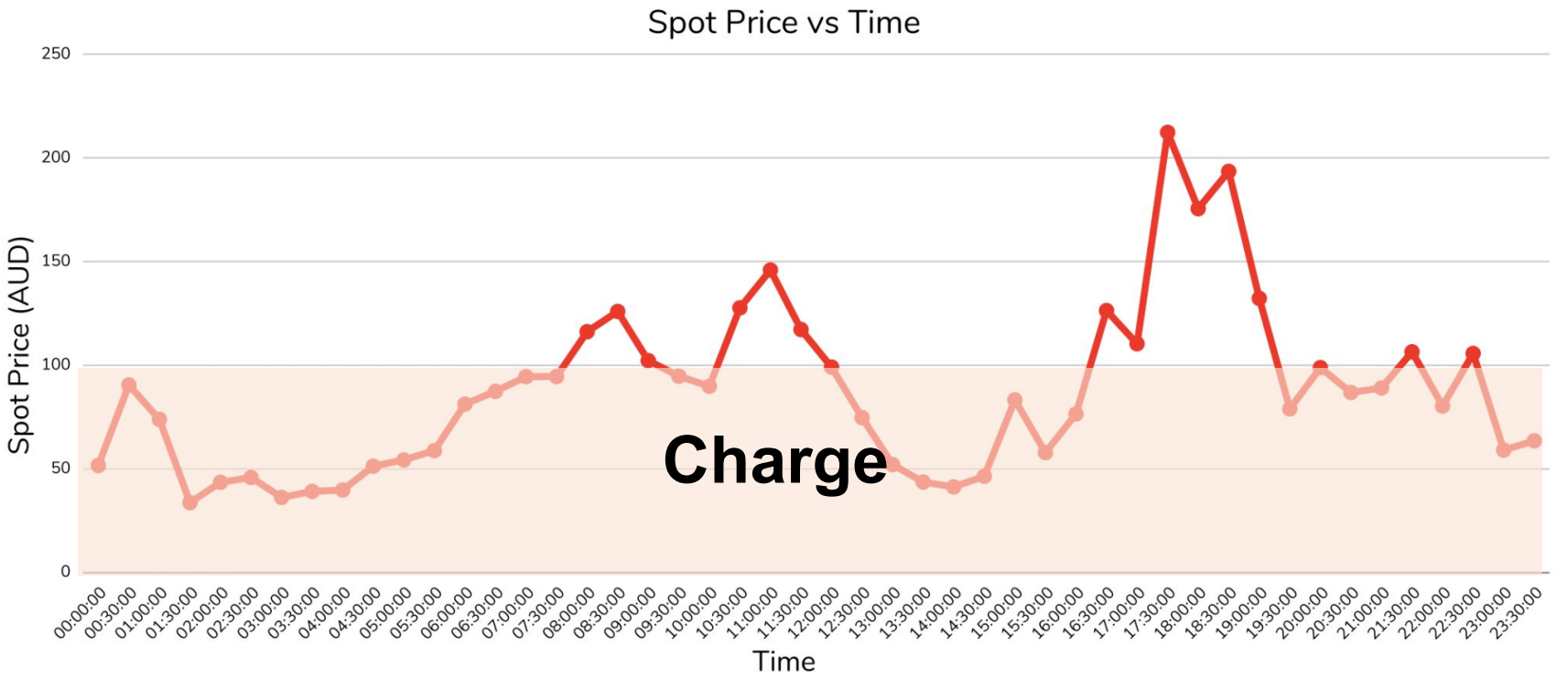

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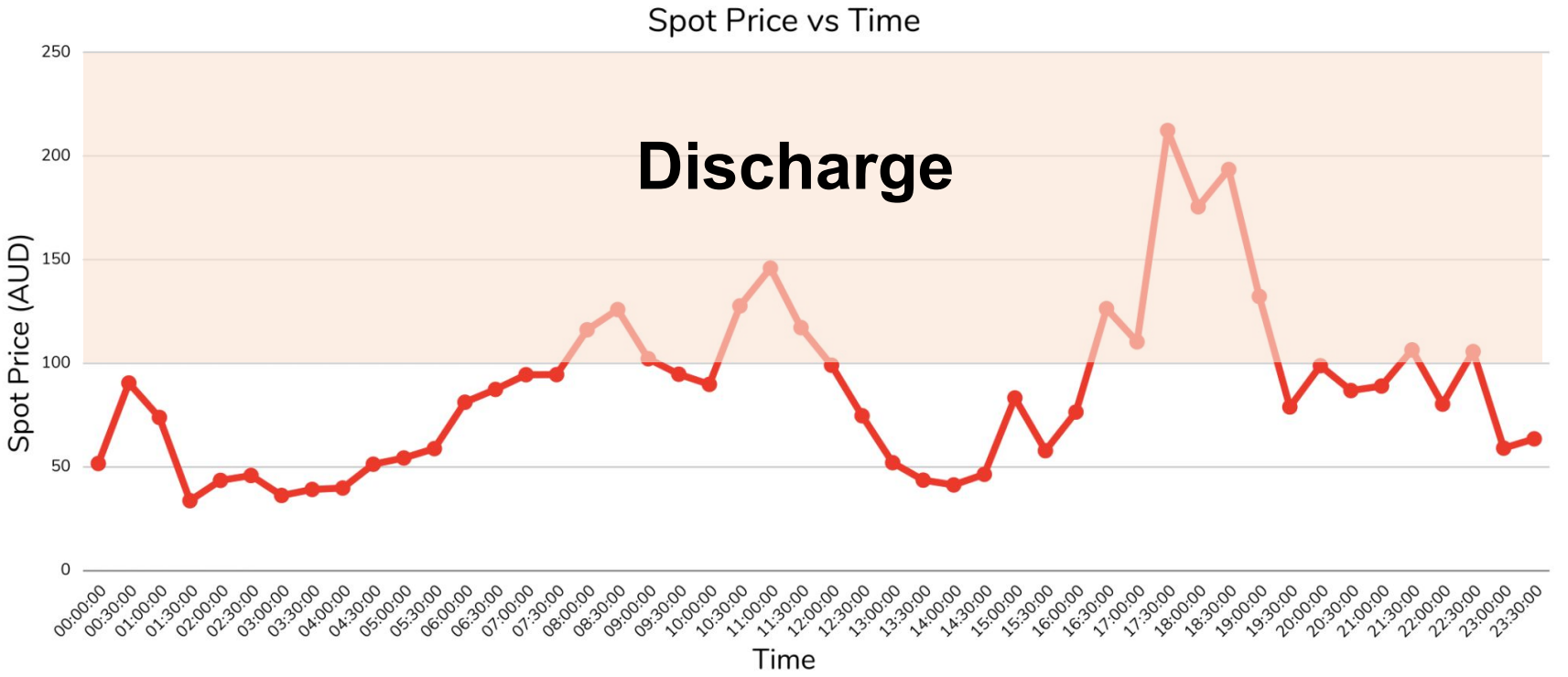

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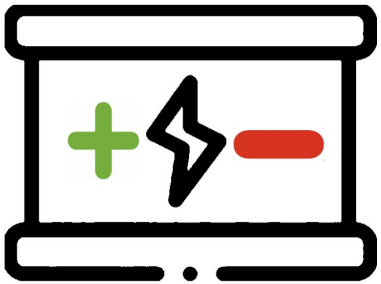
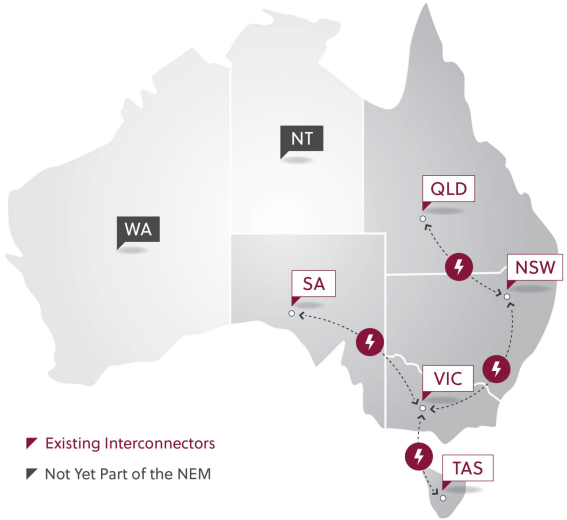


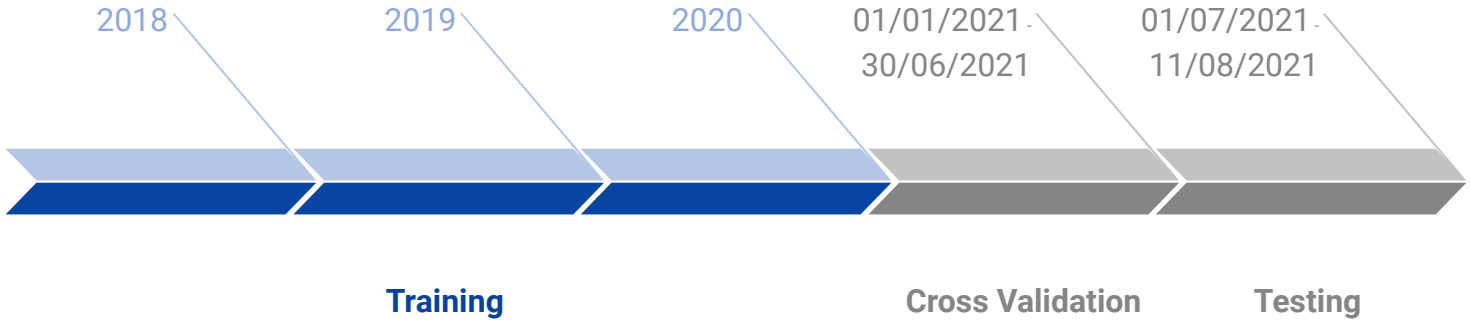
Mandatory Task

Problem Overview and Objectives



National Electricity Market

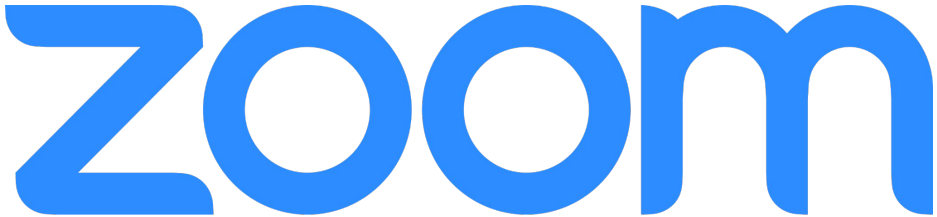
Dataset


2018
2019
2020
01/01/2021
30/06/2021
01/07/2021
11/08/2021
Training
Cross Validation
Testing

Dataset

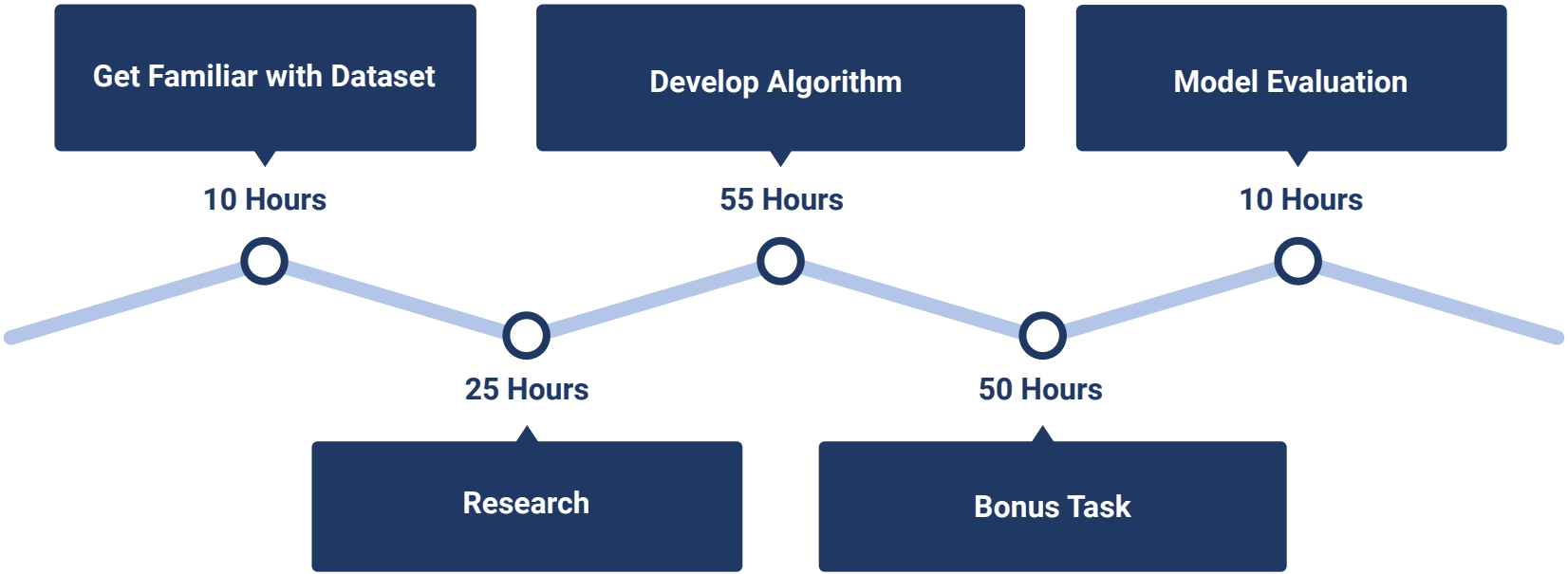

2018
2019
01/01/2021
20/06/2021
01/07/2021
11/08/2021
Training
Cross Validation
Testing

Communication

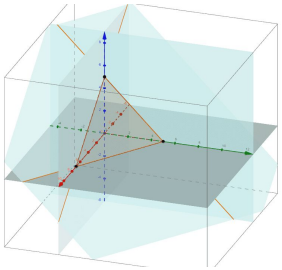


Security and Privacy

Project Timeline

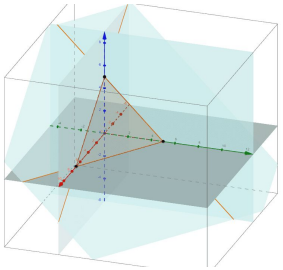


Pyomo and GLPK



Linear Programming

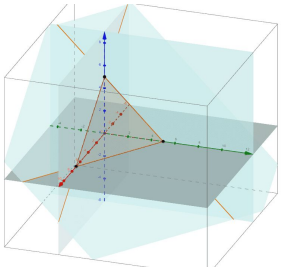
Pyomo and GLPK



Linear Programming

Pyomo

Pyomo and GLPK

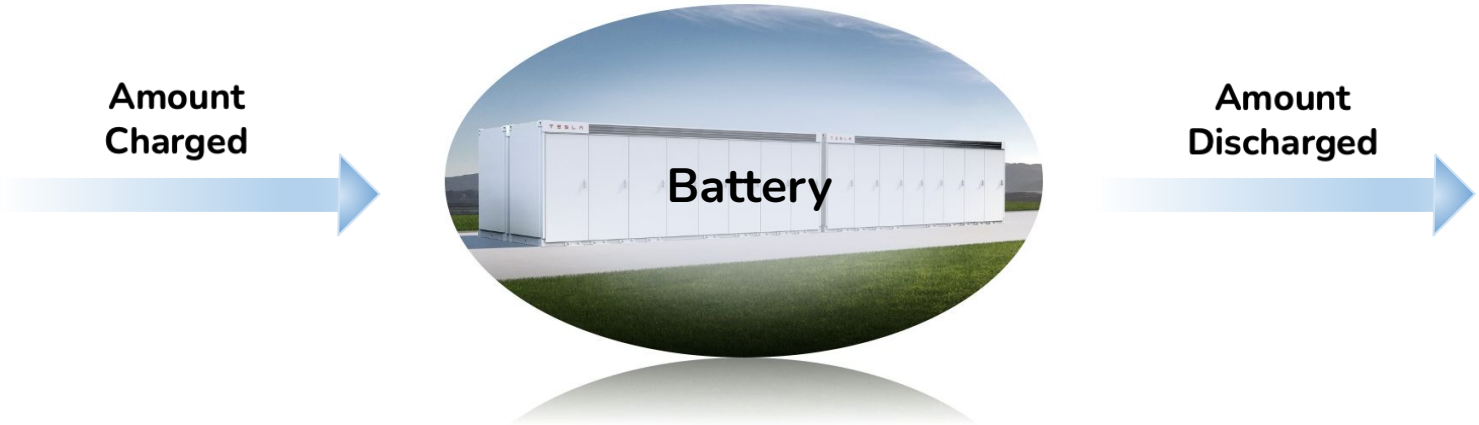


Linear Programming

Pyomo

GLPK

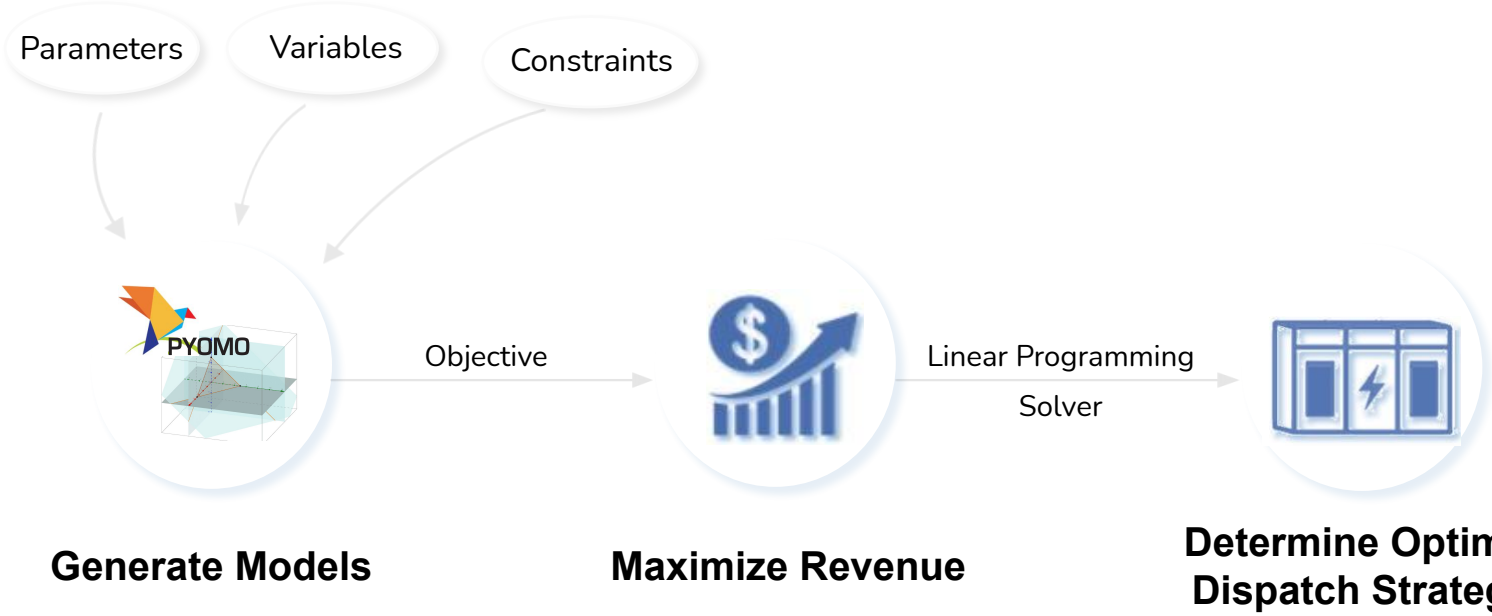
How do we calculate revenue?



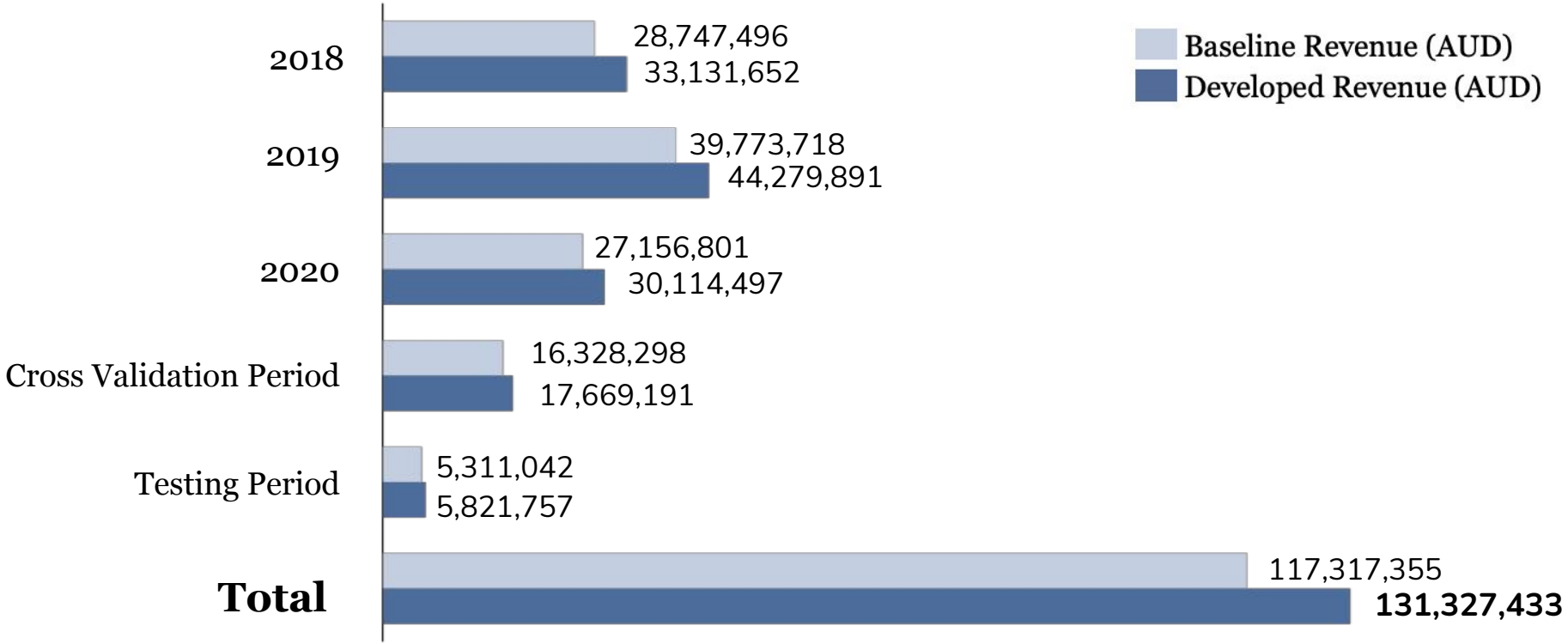
Expense = Amount Charged × Spot Price / Marginal Loss Factor
Income = Amount Discharged × Discharge Efficiency × Spot Price × Marginal Loss Factor

Revenue = Income – Expense

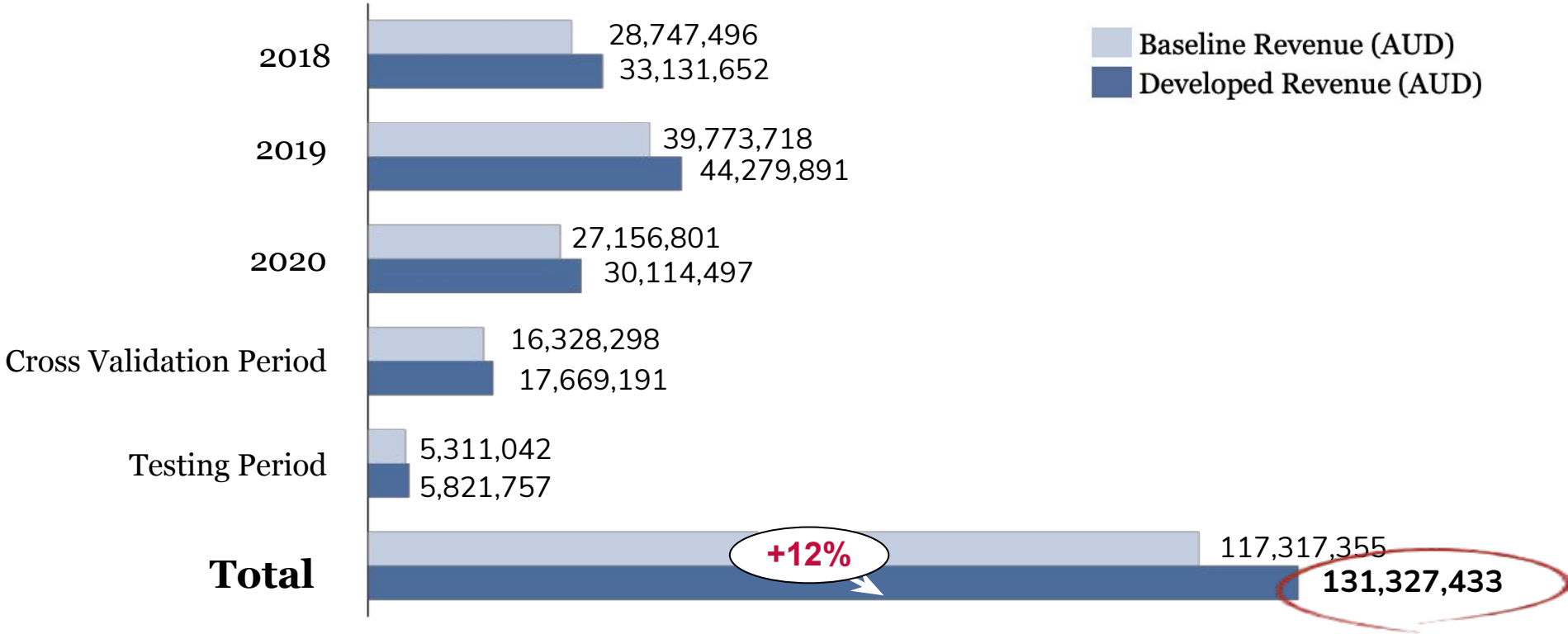
Mandatory Task Algorithm Steps



Mandatory Task Algorithm Performance



Mandatory Task Algorithm Performance



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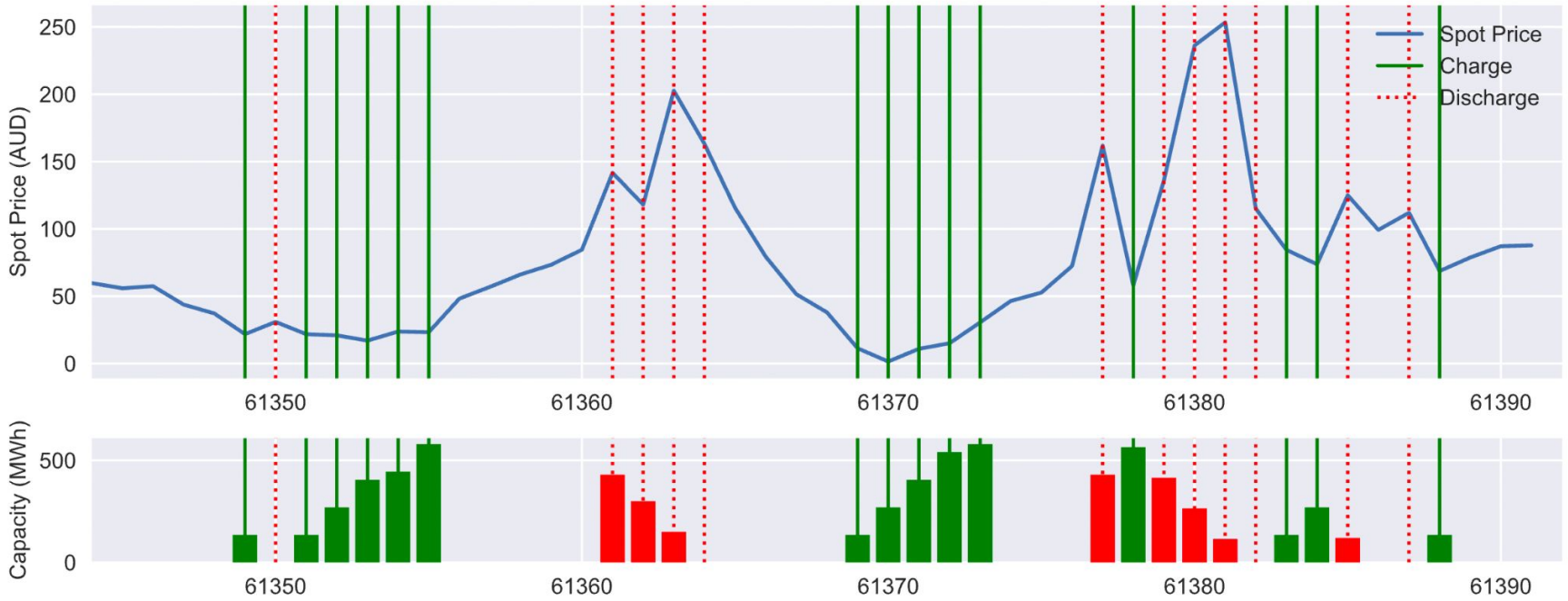
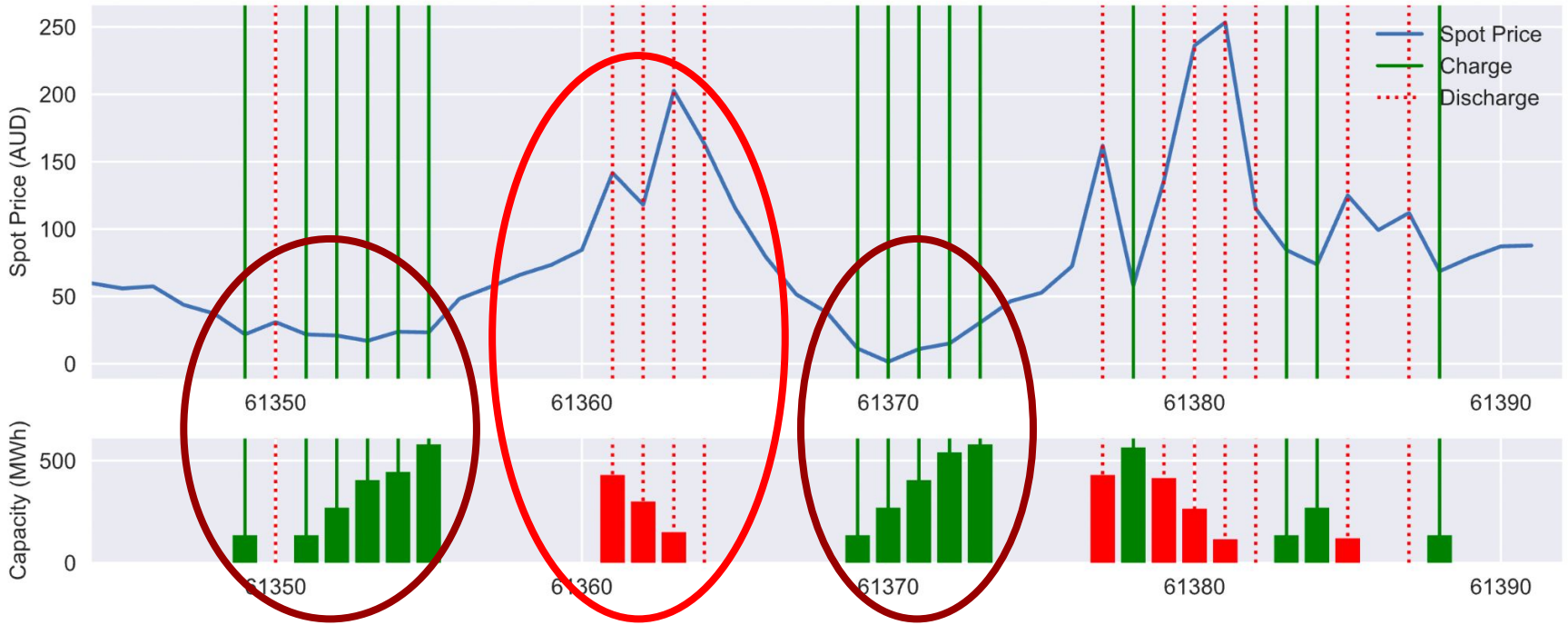
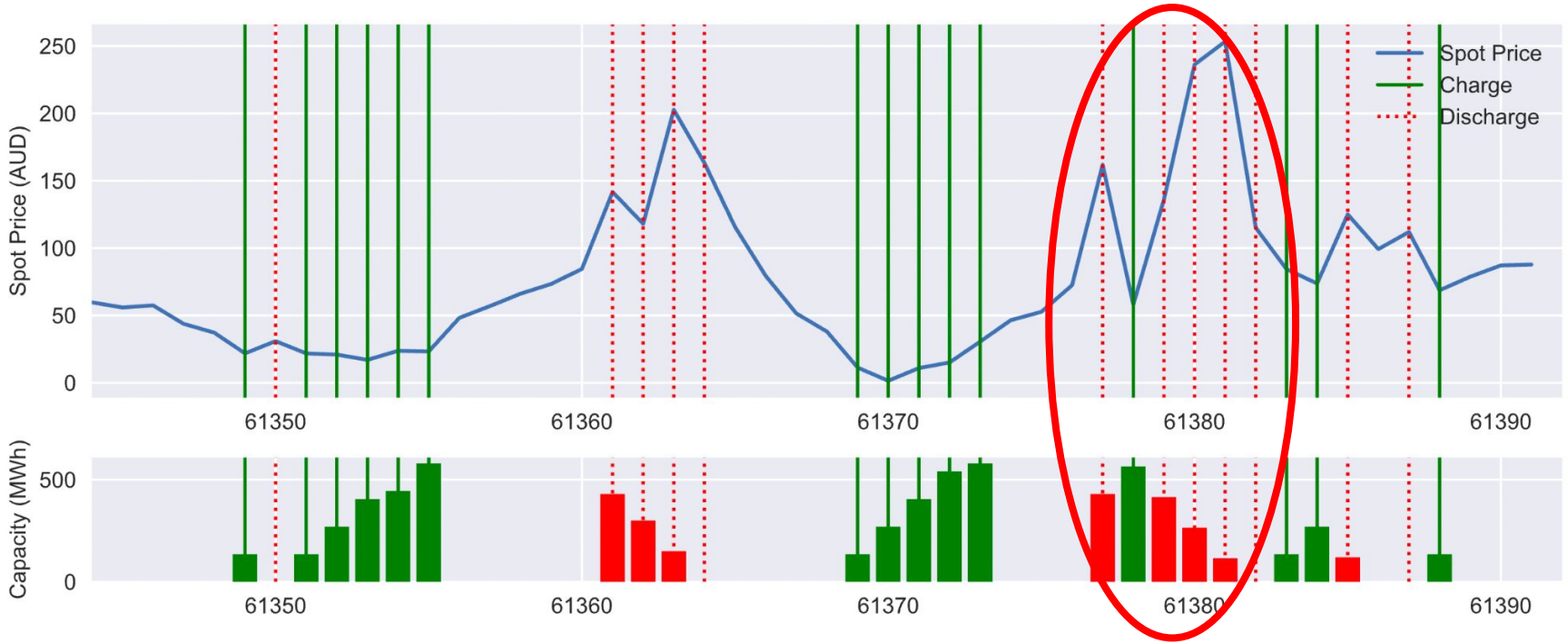


Mandatory Task Algorithm Performance



Mandatory Task Algorithm Performance



Limitation of Assuming Perfect Foresight

Impractical！

Future Price Unknown！

A More Realistic Approach?

Impractical！

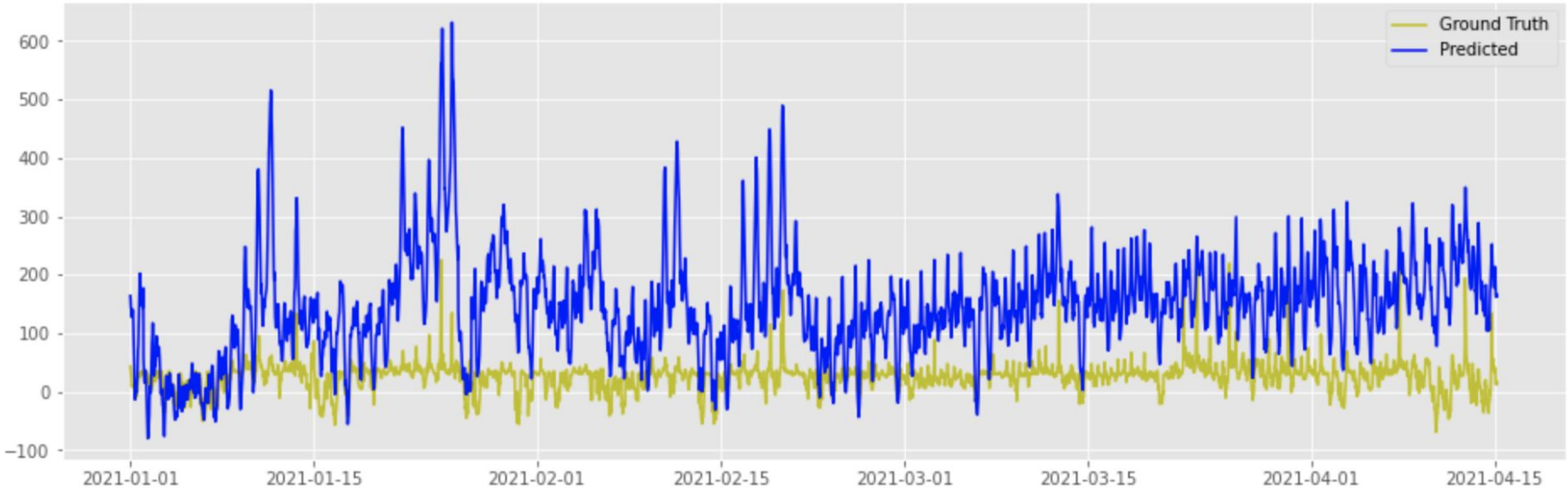
Future Price Unknown!

Bonus Task !

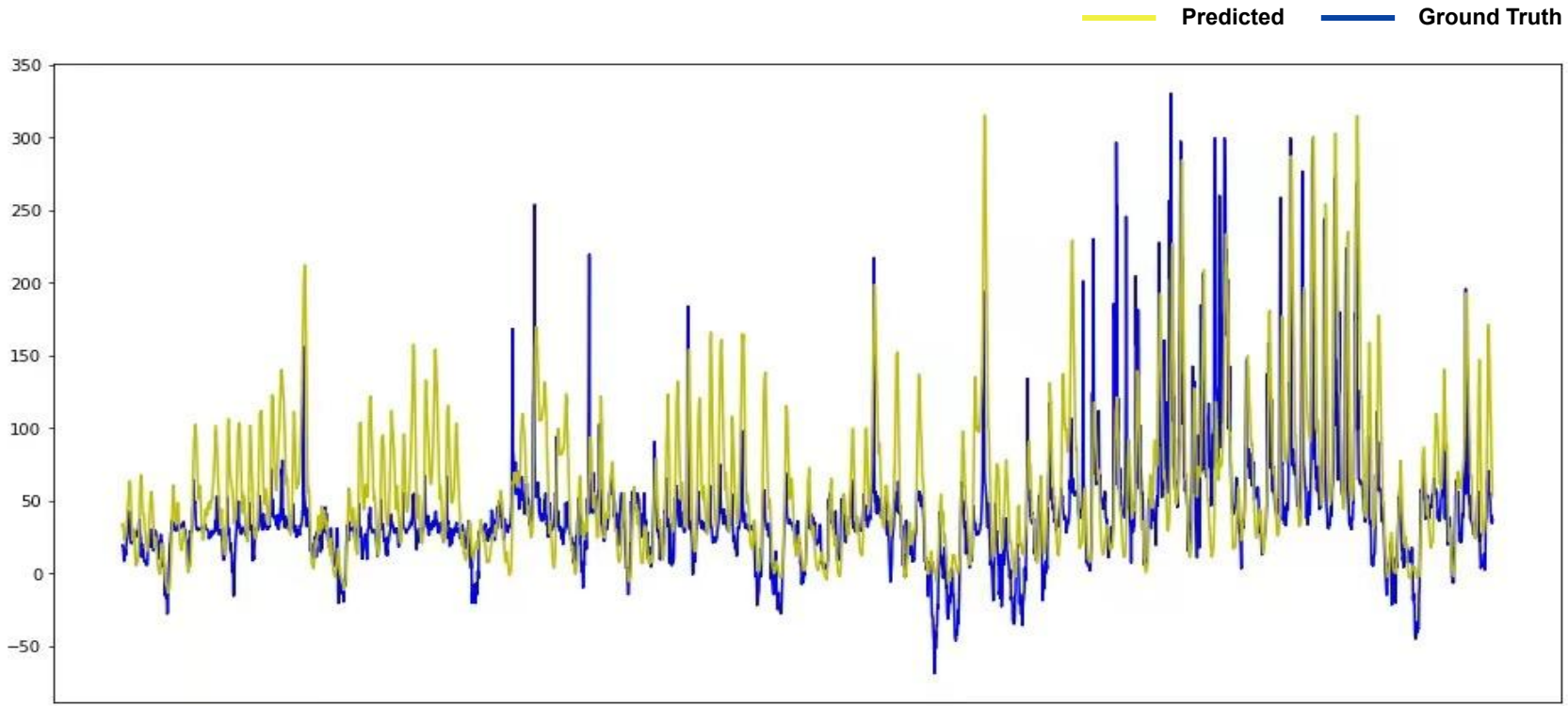
Impractical !

Future Price Unknown!

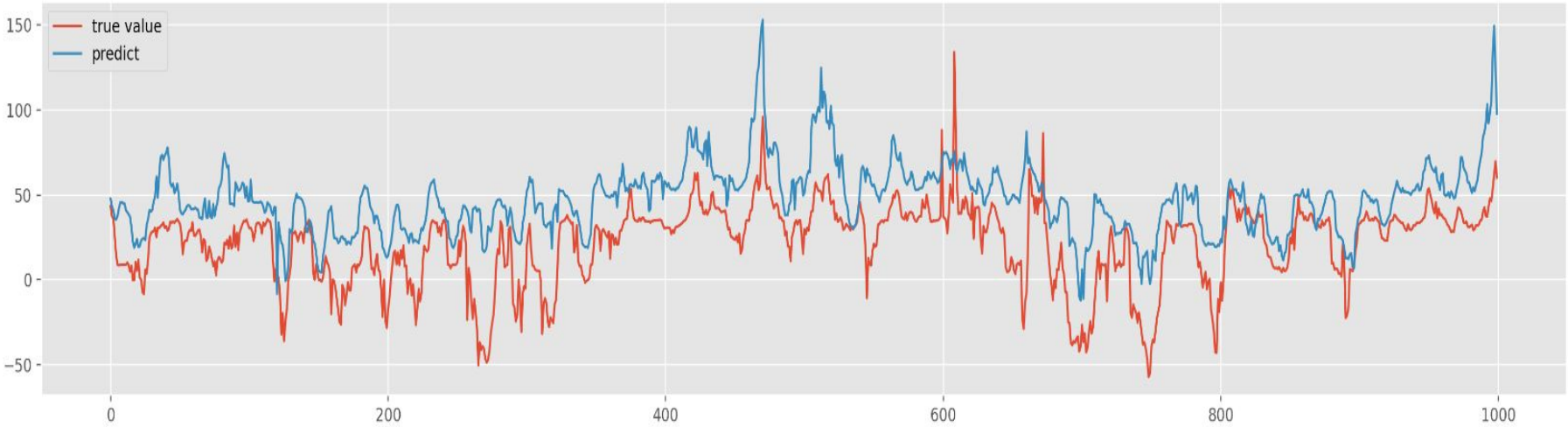
Prophet


Ground Truth
Predicted
600
500
400
300
200
100
0
−100
2021-01-01
2021-01-15
2021-02-01
2021-02-15
2021-03-01
2021-03-15
2021-04-01
2021-04-15

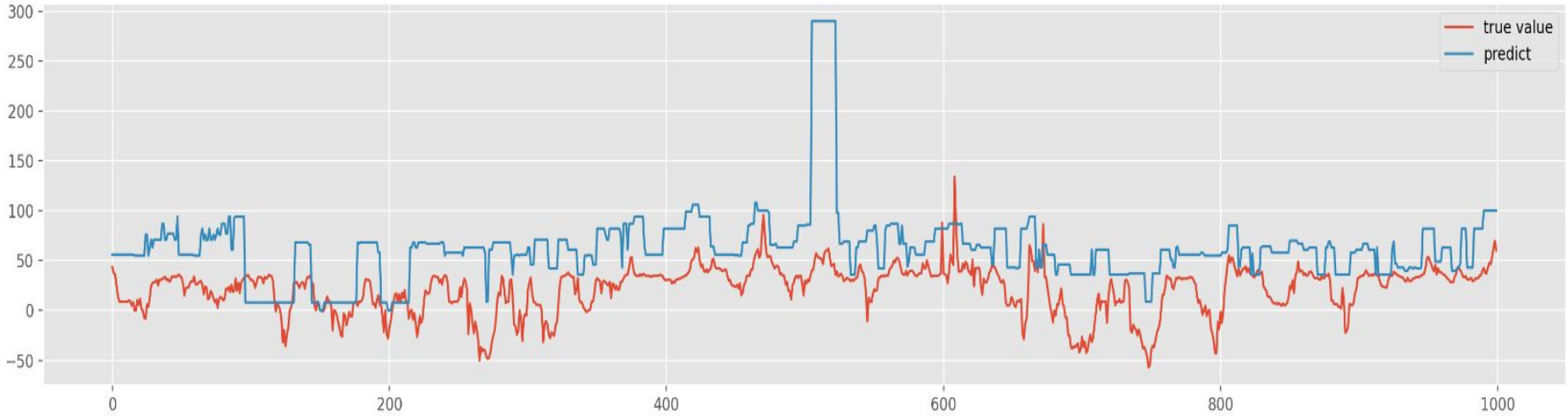
Long-Short Term Memory



Random Forest Regressor



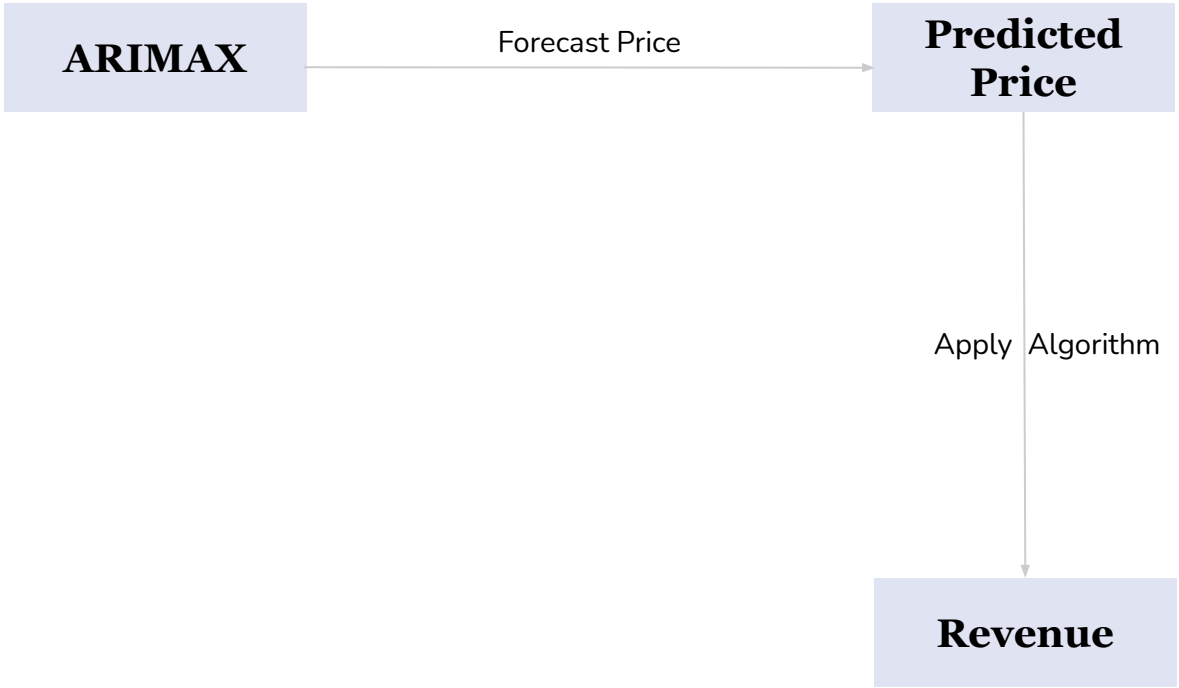
Support Vector Classification



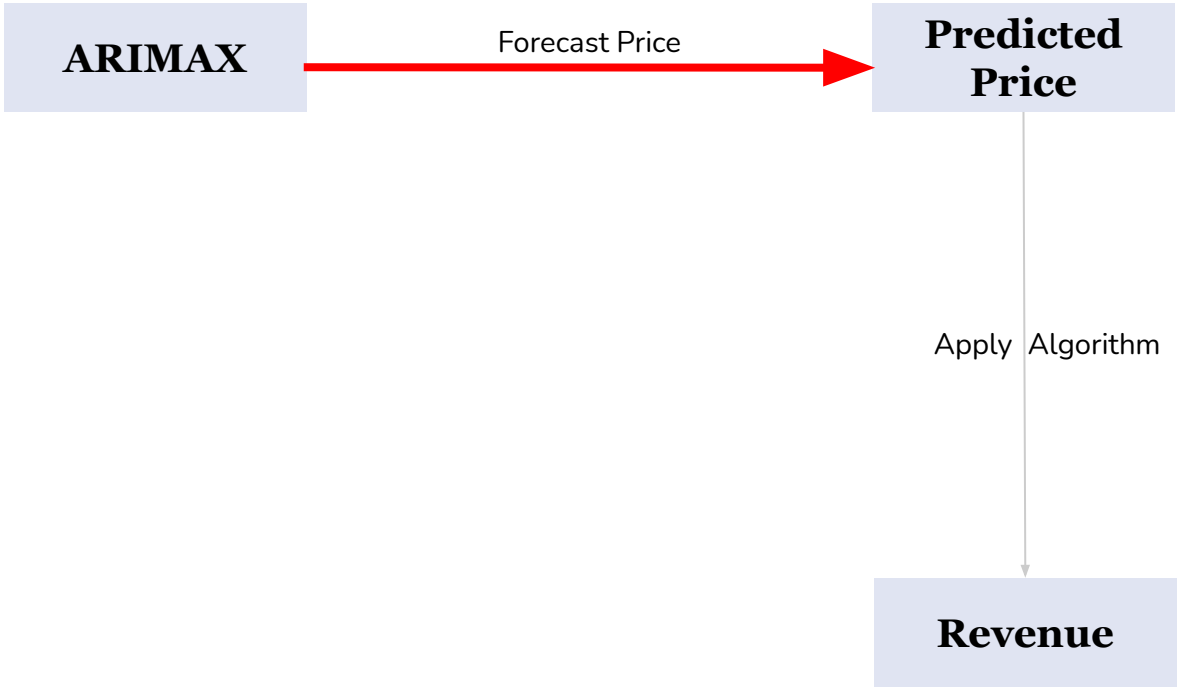
ARIMA


ARIMAX

Bonus Task Model



Bonus Task Model



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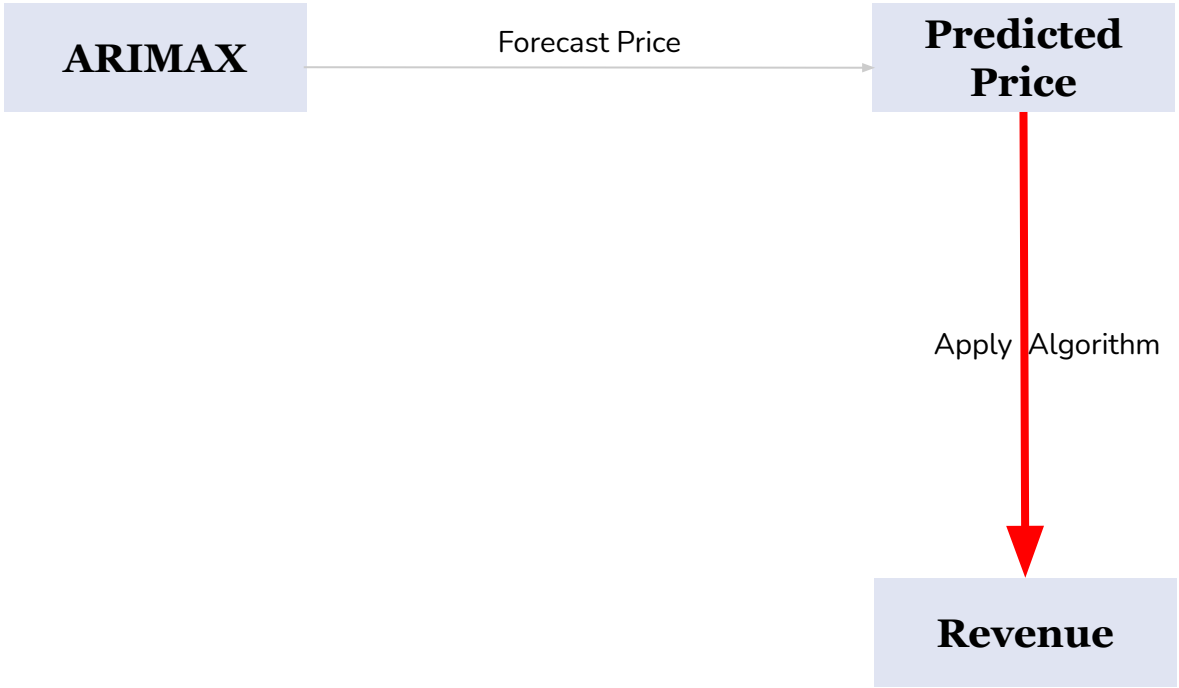

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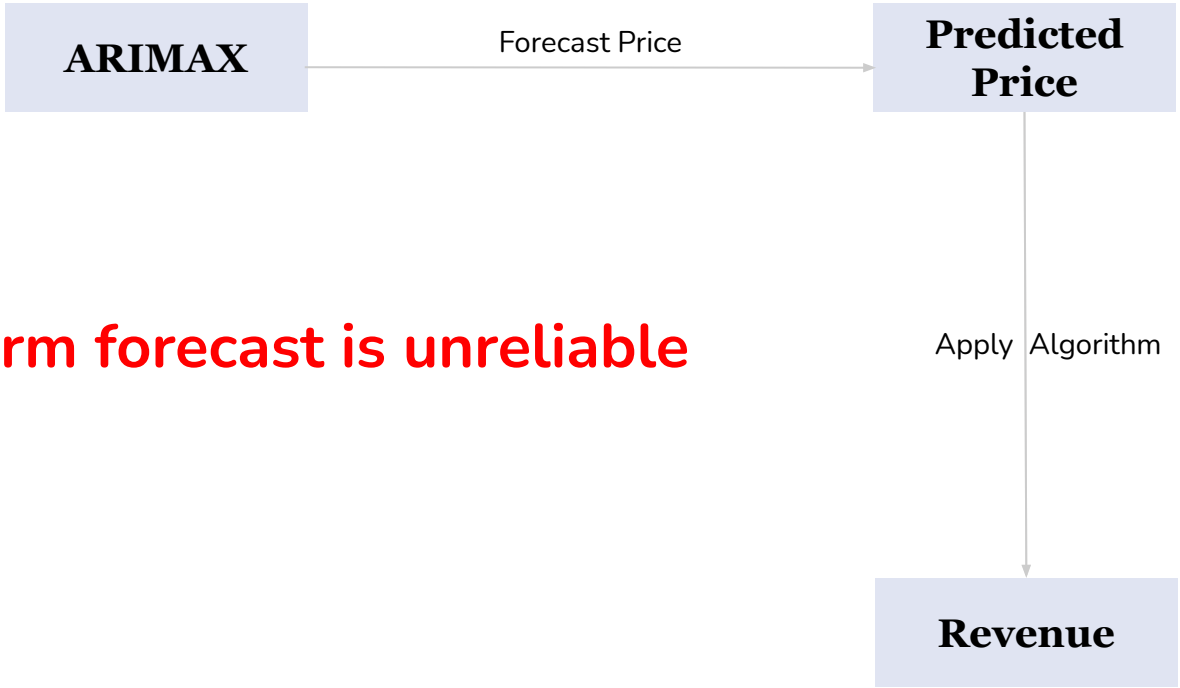
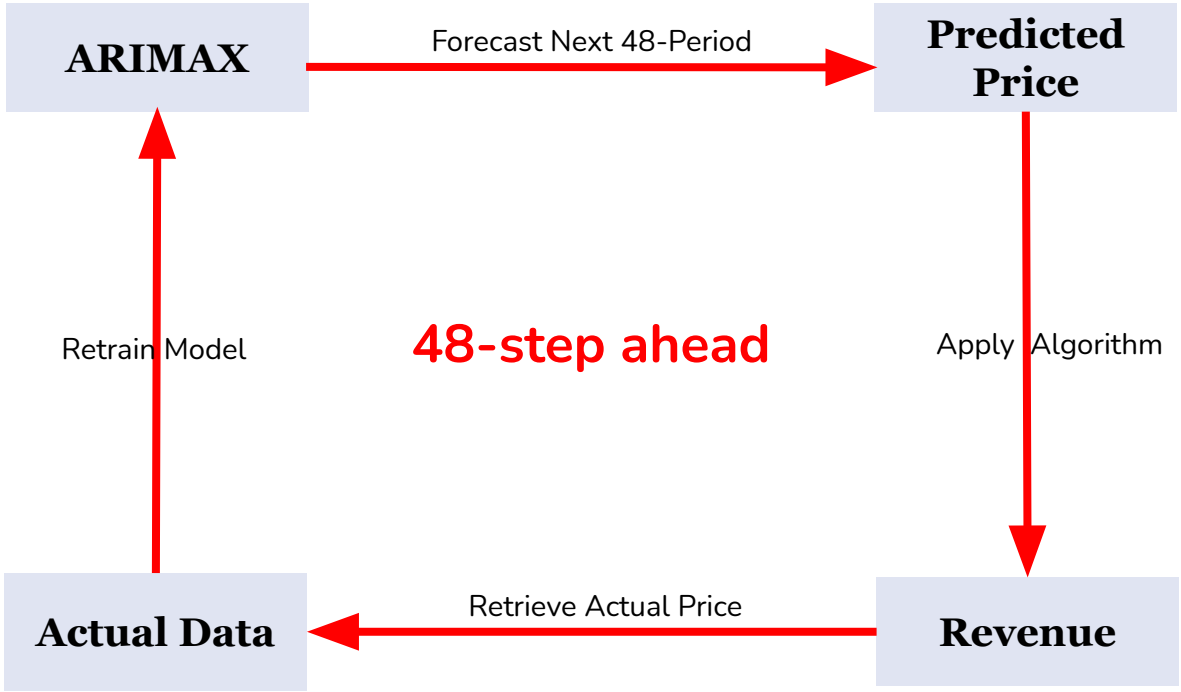


Long-term forecast is unreliable

Bonus Task Model

Bonus Task Model

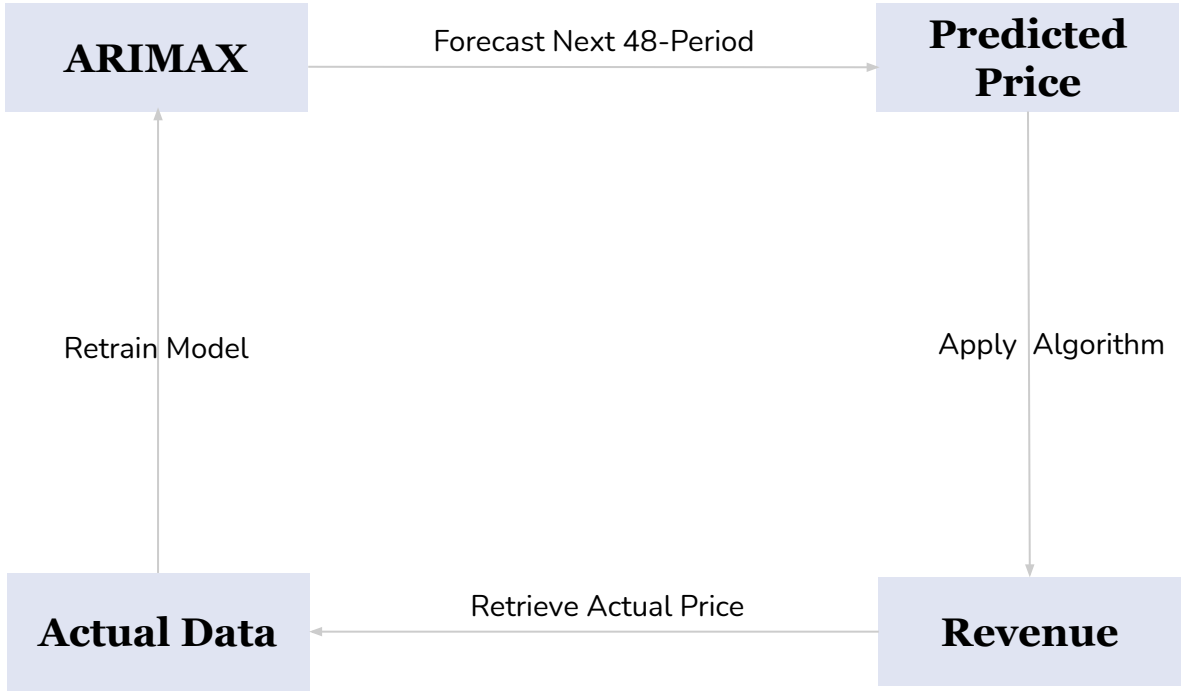
Bonus Task Model



Bonus Task Model

Assumption 1

Known Future Demand & Intermittent Generation



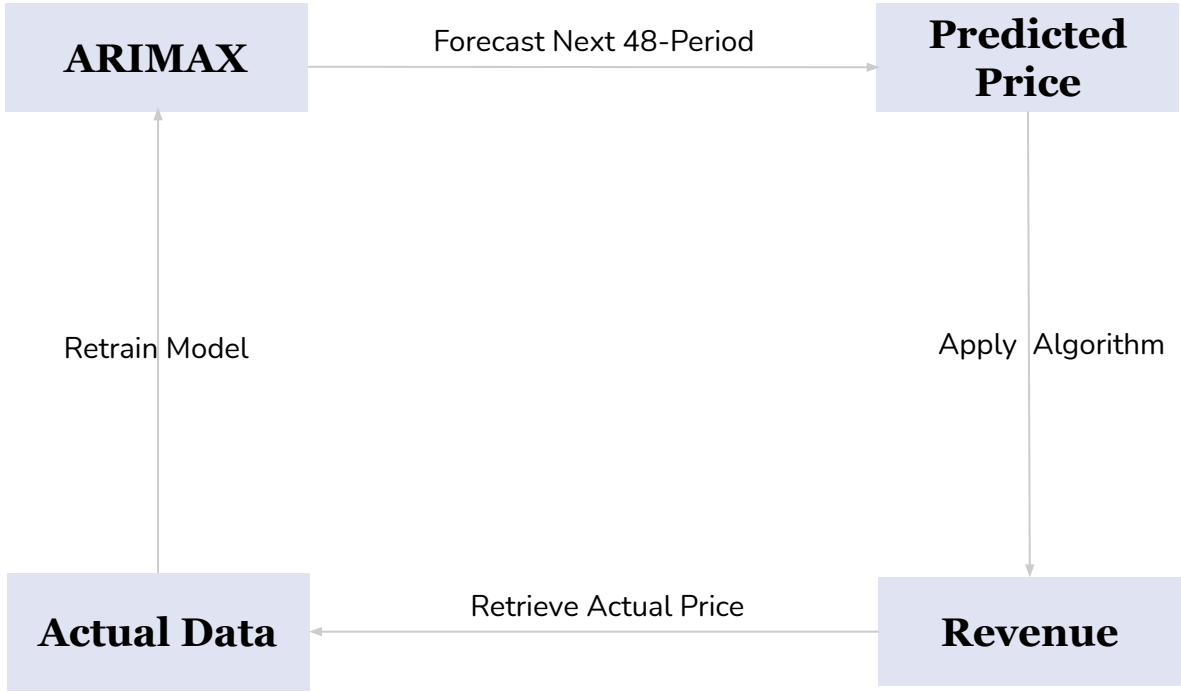
Bonus Task Model

Assumption 1

Known Future Demand & Intermittent Generation

Assumption 2

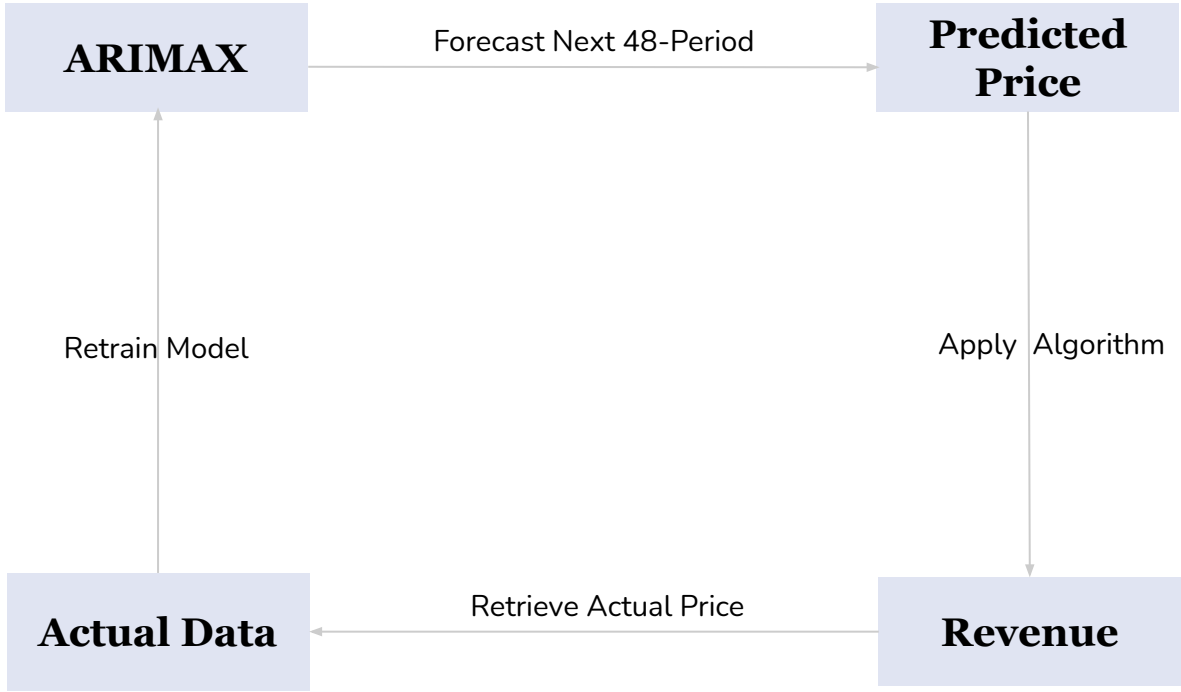
Unknown Future Data



Bonus Task Model

Assumption 1

Known
- Demand
- Intermittent Generation



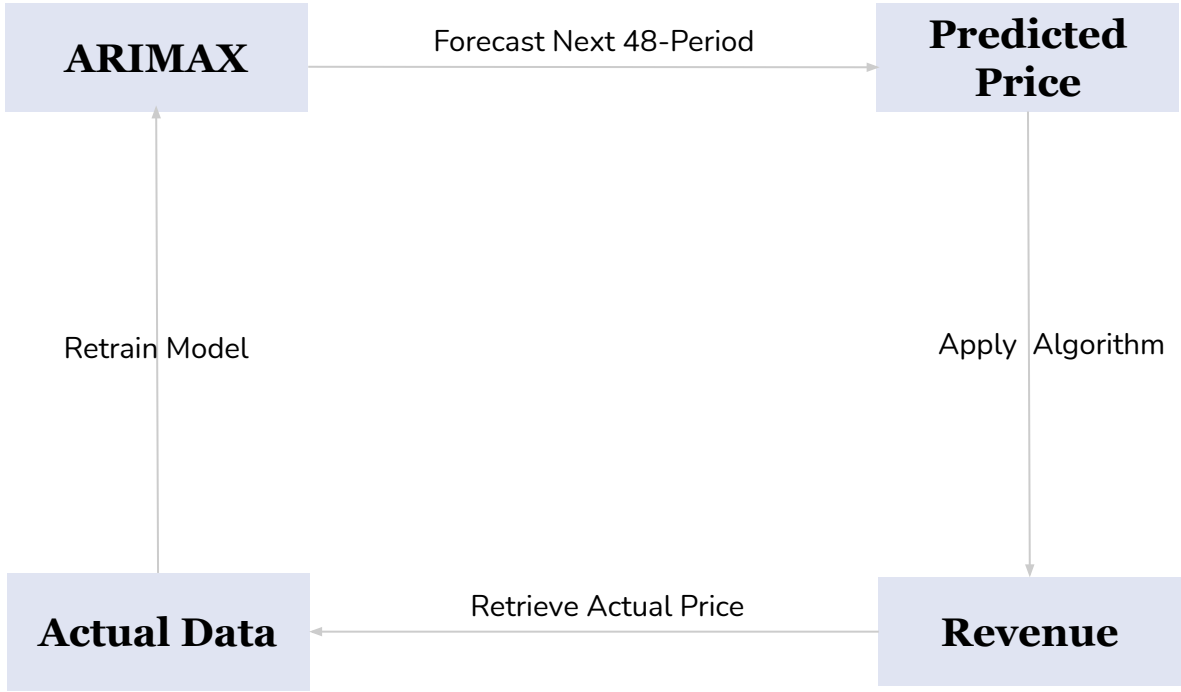
Bonus Task Model

Assumption 2

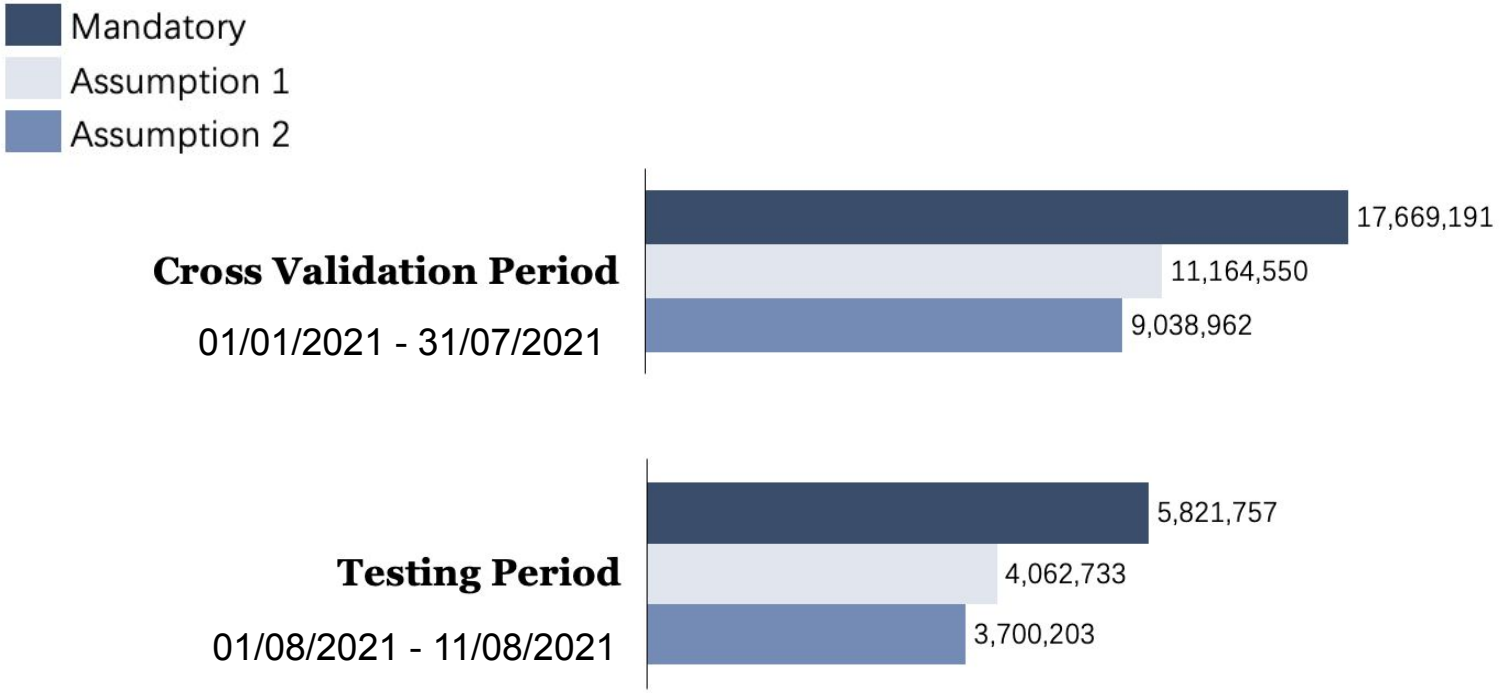
Random Forest Regressor

Predict

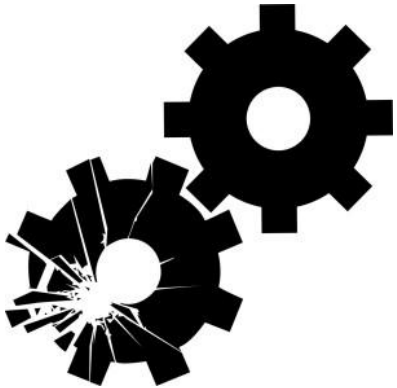
Demand



Bonus Task Performance



Conclusion



Unforeseeable Events


FEDERAL RESERVE NOTE
MB 39330505 K
B2

Conclusion

Five Minute Settlement and Global Settlement

On 1 October 2021, Five-Minute Settlement (5MS) commenced in the National Electricity Market (NEM), aligning operational dispatch and financial settlement at **five-minutes** in accordance with the AEMC's 5MS rule. On this day, AEMO also began reporting on unaccounted for energy (UFE) values as part of the Global Settlement (GS) soft-start. AEMO will continue to work with industry to implement the full GS changes on 1 May 2022, as per the AEMC's GS rule.

Learn more about the rule changes and what it means for Market Participants.

View Factsheets →

5-Minute Settlement Commenced on October 1st

THANK YOU

MAST30034 | Group 40

Reference

[1] Sandia National Laboratories. (2018). *About*. Pyomo. http://www.pyomo.org/about
[2] Free Software Foundation, Inc. (2012). *GLPK - GNU Project*. GNU. https://www.gnu.org/software/glpk/
[3] AEMO. (2021). *National Electricity Market (NEM)*.
https://aemo.com.au/energy-systems/electricity/national-electricity-market-nem