

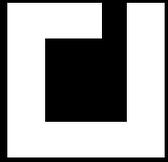


05 MAR 2021 15.00 - 15:15

Applicazione dell'Intelligenza artificiale nella Supply Chain: Gestione della pianificazione con l'ausilio di algoritmi di Machine Learning.

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d-one SIOP & Smart Factory Platform



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We help Customers in an end-to-end journey to develop
the enterprise of the future: a modern way to manage your business

Who we are

People, Processes and Technology

Our value stands not only in the solution of current inefficiency but in the power of developing the enterprise of the future

- Excellence is ensured by unrivaled expertise in technology combined with a supply chain mind-set and superior user experience
- Strong team of Technology, Supply chain and Digital Transformation experts supported by Italian designers
- Global presence serving high performance companies in diverse industries
- Enabling our Clients to increase efficiency and performance: driving an impressive, measurable evolution of their business
- PWC Strategy& ranks us among the top 10 globally in Integrated Business Planning

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AI & Machine Learning

Cognitive and Smart Algorithm supports early problem detection and predictive insights.



Voice Capabilities

Hands-free real-time command, control & reporting status



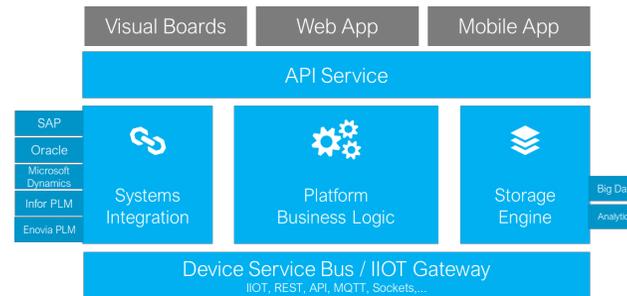
Big Data / Analytics

provides insights to support production optimization, reduce downtime and minimize manufacturing bottlenecks.



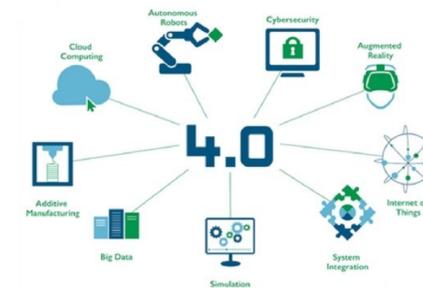
Financial Impact, Simulations & Optimization

Easy way to simulate different JIC scenarios, taking into account Sales, Profit, COGS & Inventory targets. Integrated Optimizer with goals functions



API and System Integration

Integration with Enterprise ecosystem (ERP, PLM) thru native connectors. API service for integration with other applications.



IOT and Machine Connection

Collect and store data from any device or cloud service.

 digitalsoft

Use Case:
Demand Forecasting

-oneplan

Supply Chain Management and Machine Learning

Today, we live in technology.

Machine learning is one such technology that is now being used in a wide variety of businesses. It is an application of Artificial Intelligence.

Machine Learning automates tasks and reduces human interference.

One of the industries where it is being most used is the supply chain management.

Machine learning increases productivity and makes optimization simpler throughout the supply chain. Once you discover new patterns in supply chain software development data, you can revolutionize any business.

Use Case

Client information:

- Market: Consumer Products
- Business Type: B2B and B2C
- Nr of Finish Goods: more than 5000
- Nr of SKUs: more than 70.000

Scope of the use case:

- Sales Forecast with Machine Learning.
- Predict the future demand to optimize the production plan.
- Machine learning algorithms that are capable of analyzing large data sets quite fast, thus, improving the demand forecasting accuracy.

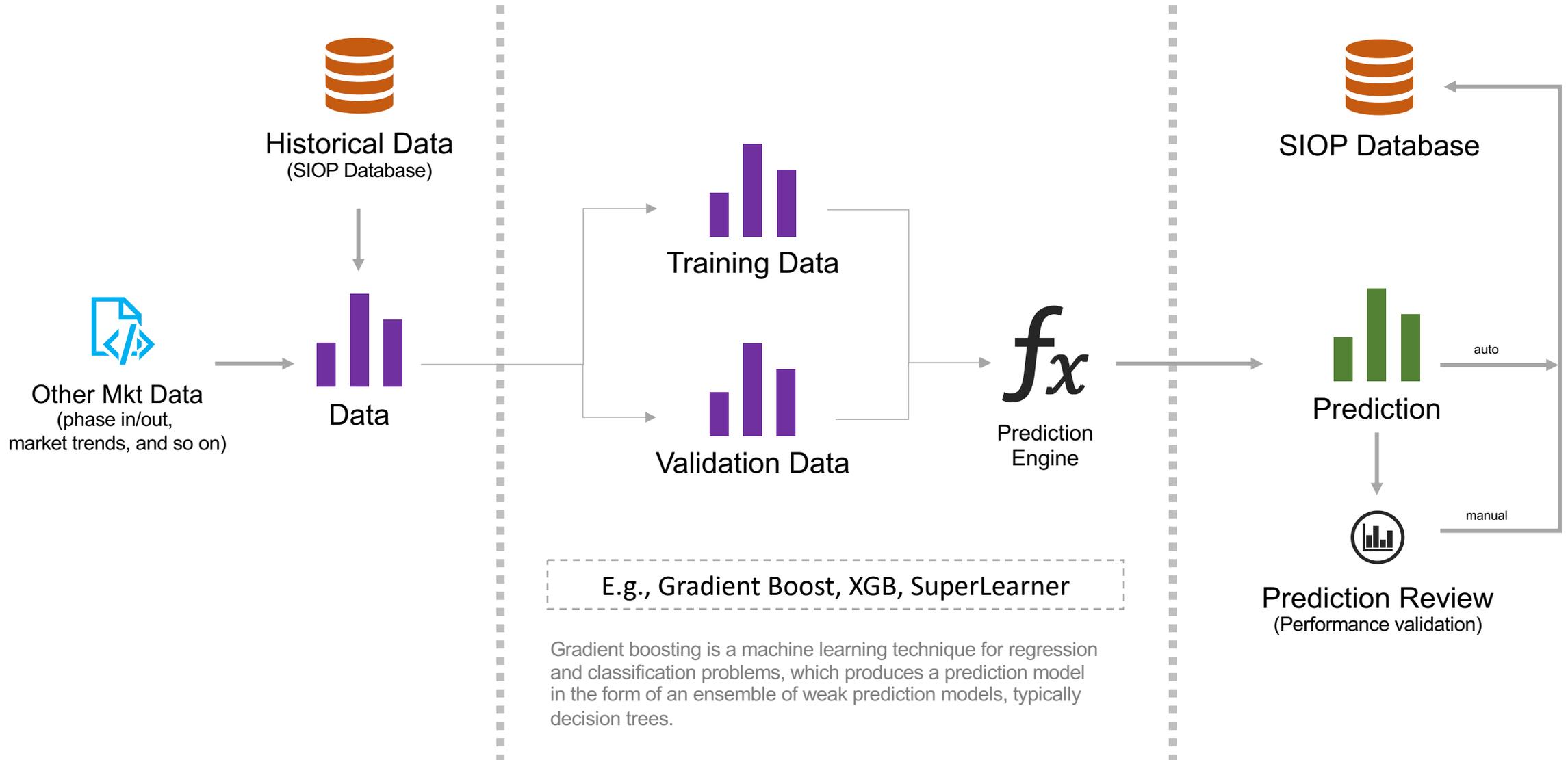
Objective:

The model has been built to predict customer demand for each month, therefore the accuracy has to be calculated summing the Demand for each month or summing the demand for top customers or by top families.

The accuracy does not have to be calculated for each row but on the sum of the demand, because it's impossible to do a forecast for customers or families with small dataset for the previous years used for training.

The following graphs will show the total demand over months. In red the historical data that we used for training the model and in blue the predicted demand.

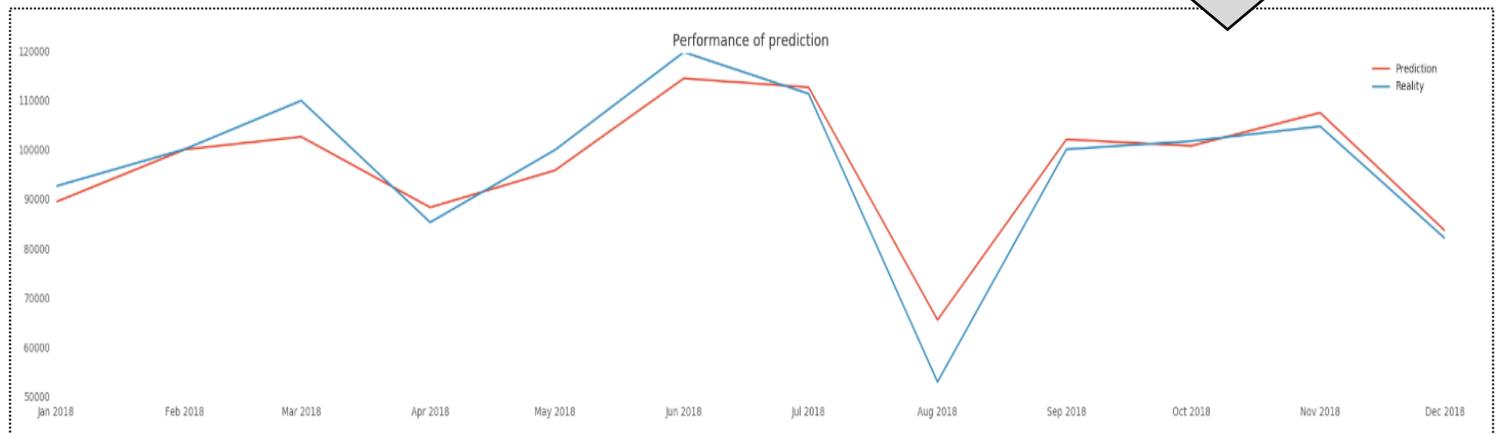
Technology Model



Use Case #1– B2C Monthly demand forecast for 12 months of 2018



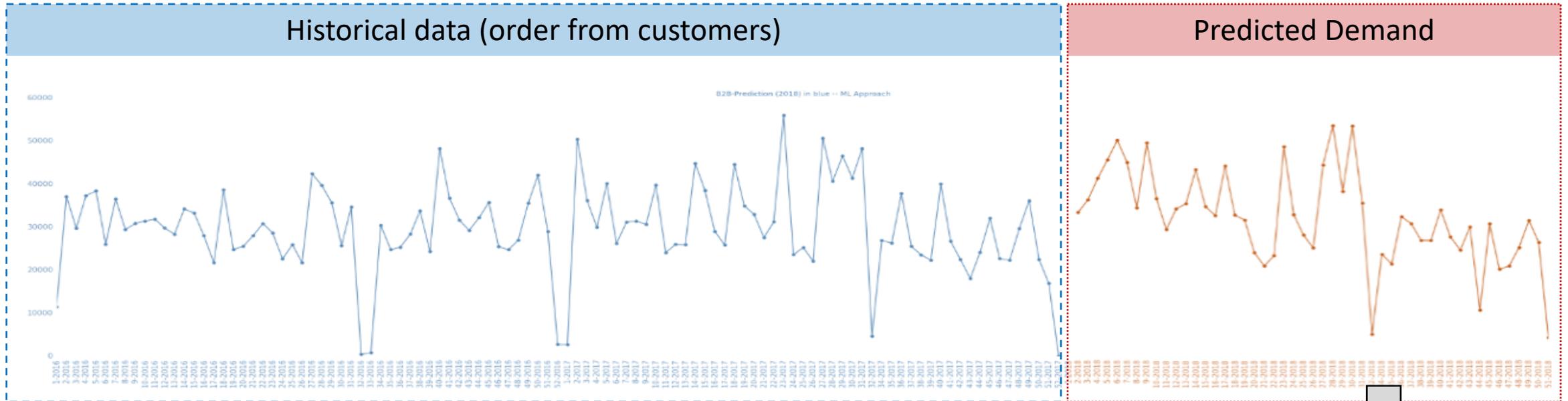
| | Delta | Demand | Demand_predicted | MAPE(%) | Requested Date |
|----|-------|--------|------------------|-----------|----------------|
| 0 | 3196 | 92827 | 89631 | 3.442964 | 2018-01-01 |
| 1 | 70 | 100340 | 100270 | 0.069763 | 2018-02-01 |
| 2 | 7320 | 110166 | 102846 | 6.644518 | 2018-03-01 |
| 3 | 3027 | 85508 | 88535 | 3.540020 | 2018-04-01 |
| 4 | 4129 | 100172 | 96043 | 4.121910 | 2018-05-01 |
| 5 | 5317 | 119992 | 114675 | 4.431129 | 2018-06-01 |
| 6 | 1308 | 111561 | 112869 | 1.172453 | 2018-07-01 |
| 7 | 12556 | 53180 | 65736 | 23.610380 | 2018-08-01 |
| 8 | 2016 | 100303 | 102319 | 2.009910 | 2018-09-01 |
| 9 | 965 | 101966 | 101001 | 0.946394 | 2018-10-01 |
| 10 | 2764 | 104957 | 107721 | 2.633459 | 2018-11-01 |
| 11 | 1545 | 82267 | 83812 | 1.878031 | 2018-12-01 |



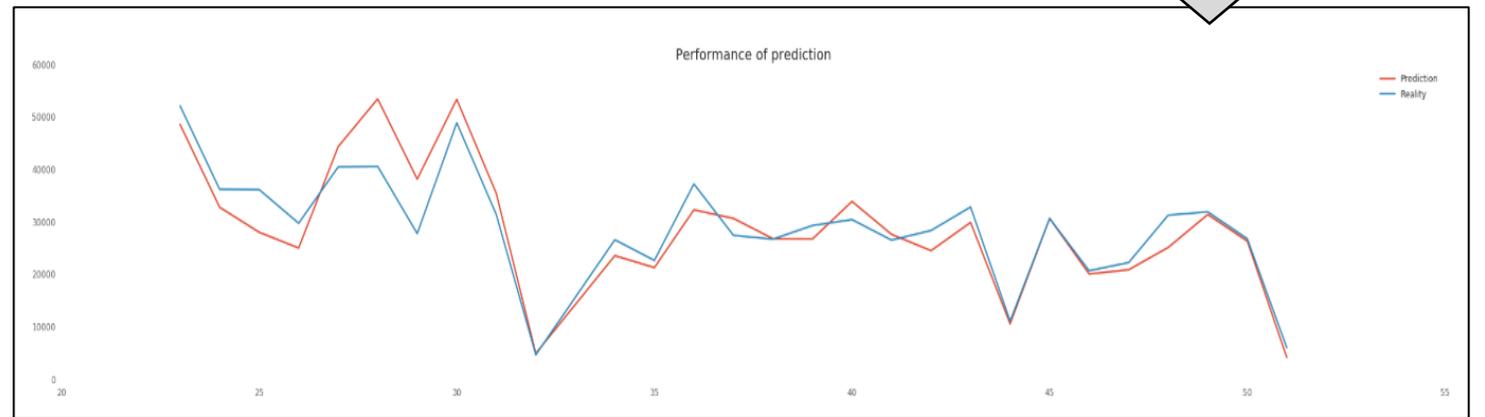
Comparison of Predicted Demand vs Real Demand.

Real demand is the total orders received from customers in the period of the prediction

Use Case #3– B2C Monthly demand forecast for 12 months of 2018



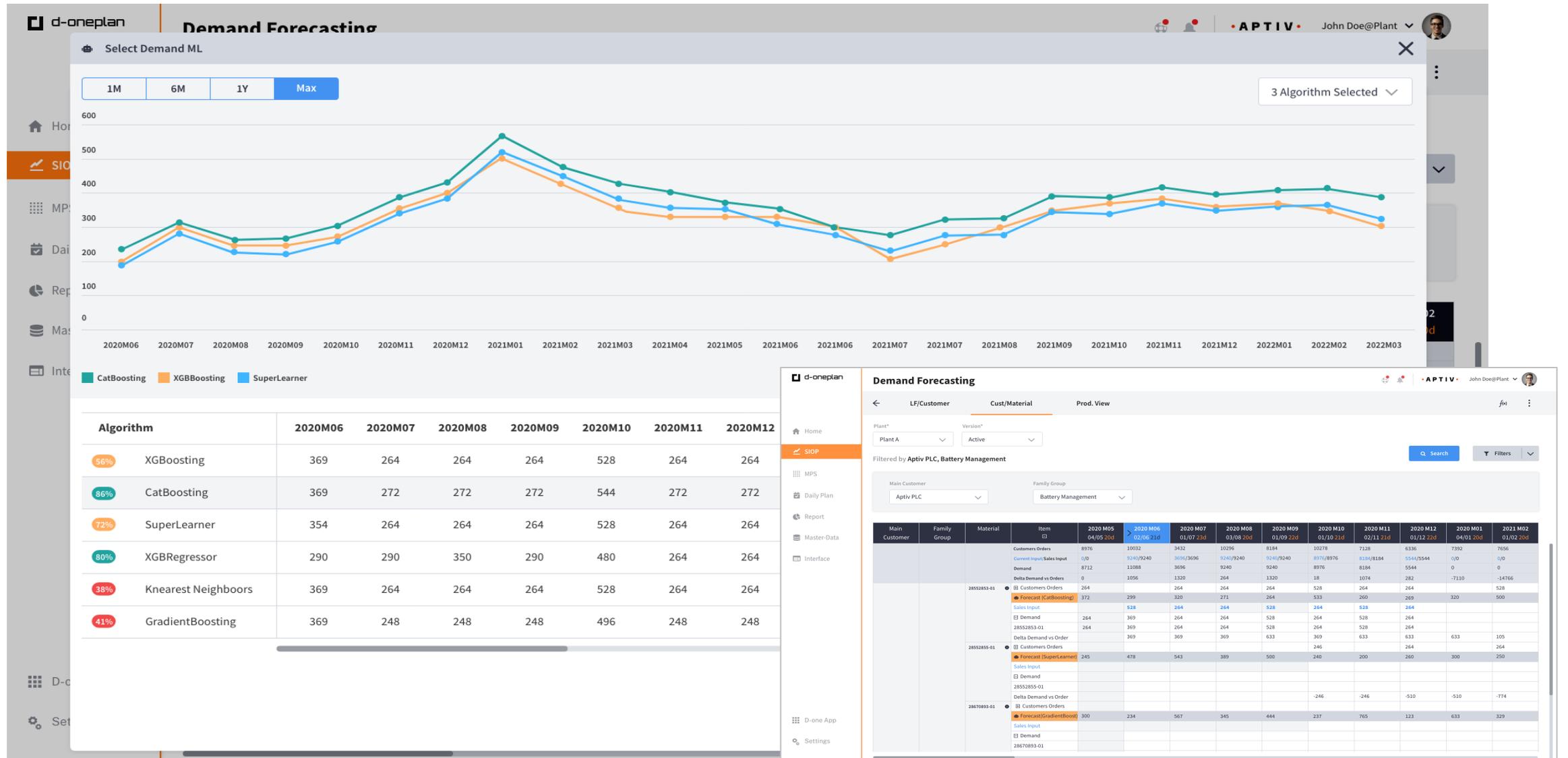
| | Delta | Demand | Demand_predicted | MAPE(%) | Requested Date |
|----|-------|--------|------------------|-----------|----------------|
| 0 | 3196 | 92827 | 89631 | 3.442964 | 2018-01-01 |
| 1 | 70 | 100340 | 100270 | 0.069763 | 2018-02-01 |
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| 11 | 1545 | 82267 | 83812 | 1.878031 | 2018-12-01 |



Comparison of Predicted Demand vs Real Demand.

Real demand is the total orders received from customers in the period of the prediction

Demand Sensing with machine learning forecast



Up to 10 machine learning algorithms, applicable to each SKUs

Summary – *Use cases result*

Results

There are many algorithms usable to predict the demand and each one have their pros and cons. As we demonstrate in this use case, we can achieve great results taking in account a good amount of historical data and other information coming from the market.

In our example we used the **MAPE** (mean absolute percentage error) to quickly measure the algorithm prediction accuracy. This is a typical use as a loss function for regression problems in machine learning.

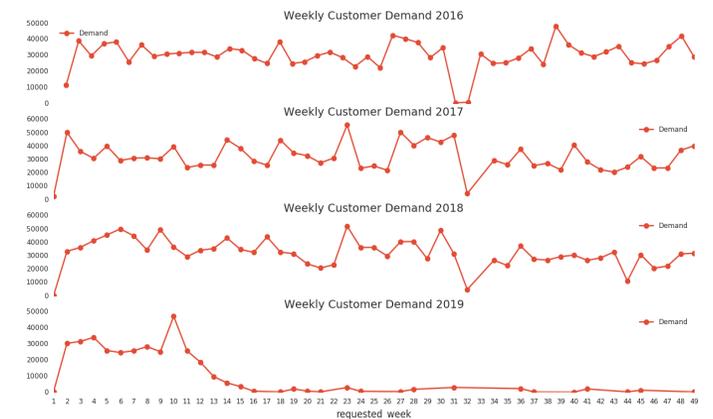
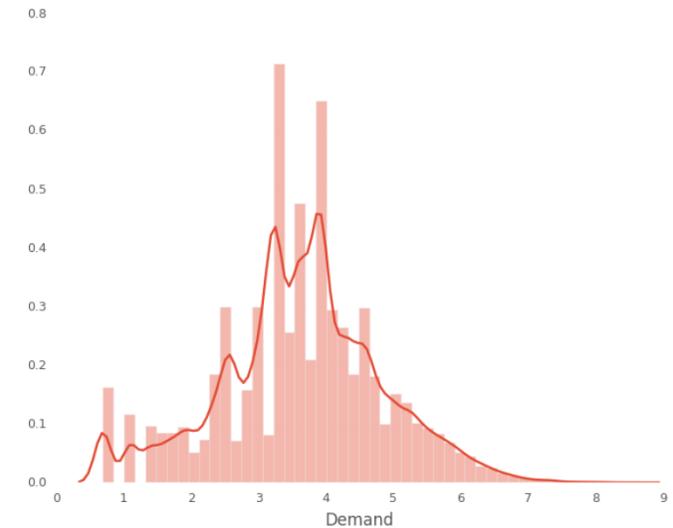
We can summarize the results like:

- Data quality and amount of data are critically for a good analysis
- In the B2C market an average of **96%** of accuracy (around 4% MAPE)
- About B2B market an average of **90%** of accuracy (around 9% MAPE)

Conclusion

In the end, this is just a simple proven case of capabilities and each business or product set might not neatly fit into a single model type.

We usually build an ensemble model, which takes models from multiple different classes and this approach has the benefit of incorporating effects generated from each of methodology; similar effects are strengthened, while inconsistent effects are cancelled out.



 Thank you