# AI FOR INVENTORY MANAGEMENT IN 2 MONTHS

October 2021



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- **02. INVENTORY MANAGEMENT CHALLENGES**
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BOB Business



DAISY

Data Science



P	=	ΓI	Ξ	R

IT

Can we use ML predictions to improve our business process?



BOB



DAISY

Business

Data Science



PETER
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IT

Can we use ML predictions to improve our business process?

Sure. I will need to analyze available corporate and third-party data and test multiple hypotheses using my ML toolkit.



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### Do you run your analysis locally?

How much compute resources will you need?



PETER

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Data Science

Do you run your analysis locally?

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IT

How do we integrate your models into our applications?

Can we use ML predictions to improve our business process?



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**Business** 

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DAISY

Data Science



PETER

IT

How do we integrate your models into our applications?

> Is it complaint with security requirements?









BOB Business



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Can we use ML predictions to improve the UX of our employees?



BOB



DAISY



Data Science



IT

Can we use ML predictions to improve the UX of our employees?





BOB



DAISY

Business

Data Science



IT

Can we use ML predictions to improve the UX of our employees? We want to use current warehouse data to get insights into future demand - so that we replenish our stocks on time.

How would the new user journey look like?



BOB



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Data Science



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Can we use ML predictions to improve the UX of our employees? We want to use current warehouse data to get insights into future demand - so that we replenish our stocks on time.

How would the new user journey look like?



DAISY

Business

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The data you need is available in our Cloud Data Storage.



PETER

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We can grant access to resources and data using security policies



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Need integration? Just bring me your endpoints



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BOB

**Business** 



How would the new user journey look like?

Excellent, let's build a prototype with baseline models.



DAISY

Data Science

The data you need is available in our Cloud Data Storage.



PETER

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We can grant access to resources and data using security policies

Need integration? Just bring me your endpoints

Can we use ML predictions to improve the UX of our employees?

You're all set. Let's follow up in TWO weeks.

We want to use current warehouse data to get insights into future demand - so that we replenish our stocks on time.

BOB

Business

How would the new user journey look like?

Excellent, let's build a prototype with baseline models.



DAISY

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The data you need is available in our Cloud Data Storage.



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Need integration? Just bring me your endpoints



We need to adjust our model to better meet this specific business metric



BOB



DAISY

Business

Data Science



PETER

IT

We need to adjust our model to better meet this specific business metric

Let me analyze the latest results and iterate once more



BOB



DAISY

Business





PETER	
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IT

The predictions are not accurate enough to meet the expectations of our users.

Let's analyze the results and iterate one more time.



BOB



DAISY

Business

Data Science



PETER

IT

The predictions are not accurate enough to meet the expectations of our users.

Let's analyze the results and iterate one more time.



BOB



DAISY

Business

Data Science



PETER

IT

Also I will prepare



The predictions look really good now. Can we pilot it on a group of users? BOB DAISY

Business





IT

## ANOTHER TWO WEEKS LATER



## ANOTHER TWO WEEKS LATER





Product journey

## COOPERATION FROM DIFFERENT SIDES



Inventory management challenges

## CHOOSE ROLE OF AI IN PRODUCT



Inventory management challenges

## BE READY TO GOING LIVE IN 2 MONTHS



Inventory management challenges

## INVENTORY MANAGEMENT PROCESS



Reduced inventory, while avoiding understocking

**ROI based on 10% capital freed** 

## **DEMAND PREDICTION**



### Demand prediction DEMAND PREDICTION ALGORITHMS





### PROPHET

Start modelling from Facebook Prophet if there is strong seasonality patterns in the data

Make Forecast with Deep AR+ if you have supplementary time series data and meta

and big number of target

time series

Traditional Statistical Approaches for Time Series Modellina



Machine Learning Technique

## EXAMPLE 1: GCP AUTOML WITH VERTEX AI

Vertex AI is a Google Cloud Platform service designed for building, deploying and scale different ML models.

It provides the ability to upload your own custom models or use pre-trained tools for forecasting.

You can create a complete ML pipeline in a short time using a simple user interface or using familiar code and Vertex SDK.

ACTIVITY RECOMM	IENDATIONS					CUSTOMIZE
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Project info Project name	ı	-Ô- App Engine	20)	:	Google Cloud Platform status	1
31258 COE IE DSG -training lab Project ID coe-ie-dsg-training-lab				0.8	→ Go to Cloud status dashboard	
Project number 994212091105				0.6	Billing	:
→ Go to project settings				0.2	Estimated charges For the billing period starting Oct 1, 2021	USD \$0.00
Resources	:	11 AM	11:15 11:30	11:45 0	Take a tour of billing	
<ul> <li>App Engine</li> <li>1 version</li> </ul>					$\rightarrow$ View detailed charges	
Compute Engine 7 instances		→ Go to the App Engir	ne dashboard		Monitoring	
Storage 53 buckets		Compute Engi	ne	:	Create my dashboard	
BigQuery 10 datasets		CPU (%)		100%	Set up alerting policies	

## EXAMPLE 2: AUTOML WITH PYCARET

#### Harris H

### PyCaret

PyCaret is an open source, low-code machine learning library in Python that allows you to go from preparing your data to deploying your model within minutes in your choice of notebook environment.

When importing a pycaret.regression, you may encounter models import errors. To fix this, manually install the package with conda install

```
In [ ]: import pandas as pd
import numpy as np
from pycaret.regression import *
import shap
```

```
In [ ]: # loading data in RAM-saving manner
data_types = {"event_name_1":"object", "event_type_1":"object",
                             "demand":"int16", "wm_yr_wk":"int16", "wday":"int8",
                             "month":"int8", "year":"int16", "snap_CA":"int8", "snap_TX":"int8", "snap_WI":"int8",
                          "sell_price": "float32"}
columns = ['item_id', 'dept_id', 'cat_id', 'store_id', 'state_id', 'demand', 'date', 'wm_yr_wk',
                         'wday', 'month', 'year', 'event_name_1', 'event_type_1', 'finap_CA', 'snap_TX', 'snap_WI',
                         'sell_price']
sales = pd.read_csv("sales.gzip", compression="gzip", dtype=data_types, parse_dates=["date"], usecols=columns)
In [ ]: # initial preprocessing
sales = sales[(sales["date"] > "2015-01-01") & (sales["date"] < "2015-02-01")]
sales.replace({"event_name_1": np.nan, "event_type_1": np.nan}, "no_event", inplace=True)</pre>
```

# sorting dataset by date and droping the date column

sales["sell price"].replace(np.nan, 0, inplace=True)

PyCaret is an open source, low-code machine learning framework.

This allows you to prepare the data, train the model, perform its evaluation, and execute the prediction in a few lines of code.

Using this library, it is very easy to experiment with different models, you can compare metrics in real time, perform hyper-tuning of parameters and choose the most suitable for a specific task.

```
softserve
```

## EXAMPLE 3: PROTOTYPING WITH STREAMLIT

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Streamlit is an easy and fast way to transform a data manipulation script into a modern, interactive and dynamic prototype.

In addition, one of the advantages of using this framework is that it is open source and free, there is a large amount of documentation and examples.



### **Demand Prediction**

This application allows to forecast the unit sales of Walmart retail goods

Plase, load CSV file to start

Made with Streamlit

 $\equiv$ 

## DEMAND FORECAST IS NOT EVERYTHING



Product journey YOU CAN START TODAY **COLLECT DATA CHOOSE ALGORITHM TRAIN MODEL** date id country\_id product id department id Check scores achieved with the following Train scores Test scores hyperparameters: Objective function Choose learning rate Number of estimators 2017-02-13T00:00:00 1  $\odot$ 1 \* f 🚯 - f 1000 \* f 💿 quantile "MAE" : 26.45 "MAE" : 30.56 1 2020-01-21T00:00:00 1 -0 0.010 "boosting\_type" : "goss" "RMSE" : 71.79 "RMSE" : 63.22 regression\_l1 100 1000 "objective" : "quantile" 2018-05-18T00:00:00 1 1 "R^2" : 0.85 🖹 "R^2":0.89 4 regression\_l2 "n\_estimators" : 1000 Select Alpha 2016-12-15T00:00:00 1 "learning rate" : 0.01 Δ ۰f ₹ f "alpha" : 0.5 "Mean R^2 per product" : 0.55 2020-01-24T00:00:00 1 "Mean R^2 per product" : 0.57 1 4 0,50 - + 2017-07-06T00:00:00 1 4 1 FEEDBACK LOOP

**6** DISCUSS RESULTS



### **4** GENERATE DECISIONS



## SOFTSERVE



Softserve

## SOFTSERVE IS YOUR DATA AND AI PARTNER

### COOPERATION WITH CARNEGIE MELLON, SOFTWARE ENGINEERING INSTITUTE



SoftServe's Smart Decisions Game is now a part of the SEI's Software Architecture course curriculum. www.smartdecisionsgame.com

### HUNDREDS OF SCIENTIFIC PUBLICATIONS



Including workshops and presentations at the top AI conferences, such as NeurIPS.

### 2ND PRIZE AT SAMSUNG AI CHALLENGE



Our award-wining deep neural network architecture is able to deblur and dehaze photos and video steams in real-time with state-ofthe-art quality.

### THE LARGEST AI & DATA SCIENCE CENTERS OF EXCELLENCE IN EASTERN EUROPE

100 +

Data Scientists and AI/ML Experts, including PhD level 300 +

Experts in BI, Big Data, IoT, AR/XR/VR and Robotics

150 +

AI/ML projects in last 3 years

### AI & DATA SCIENCE EXPERTISE PROVEN BY:

aws Azure Azure

### PROUD TO COLLABORATE WITH:









## **QUESTIONS & ANSWERS**

