

AZURE RED SHIRT DEV TOUR

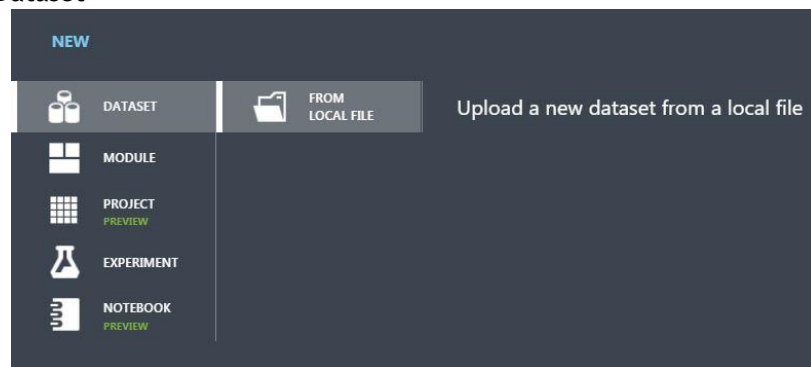
Hands On Lab Cognitive Services & AI

1- IOT

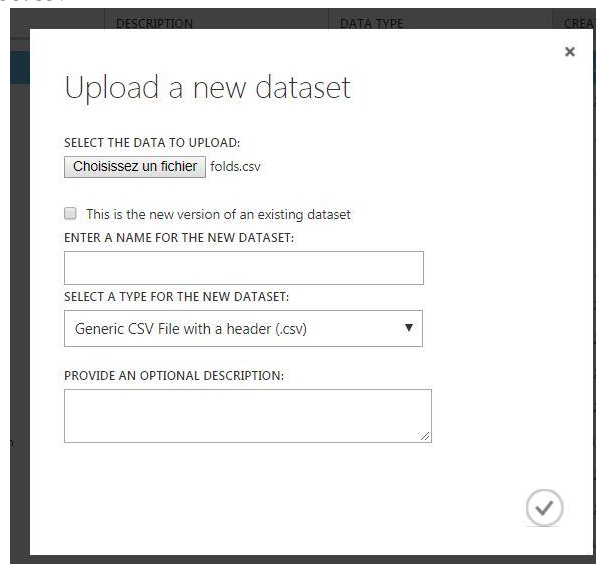
The dataset contains 9568 data points collected from a Combined Cycle Power Plant over 6 years (2006-2011), when the power plant was set to work with full load.

Features consist of hourly average ambient variables Temperature (T), Ambient Pressure (AP), Relative Humidity (RH), Exhaust Vacuum (V) and the net hourly electrical energy output (EP) of the plant.

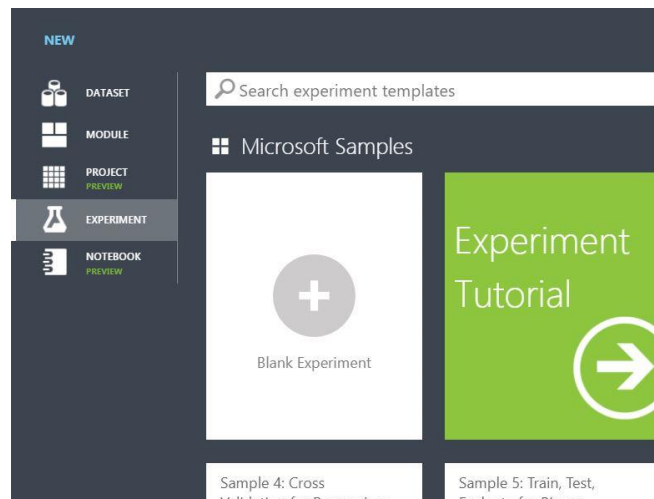
- Go to <https://studio.azureml.net/>
- Create a free account or sign in
- Click New, Dataset



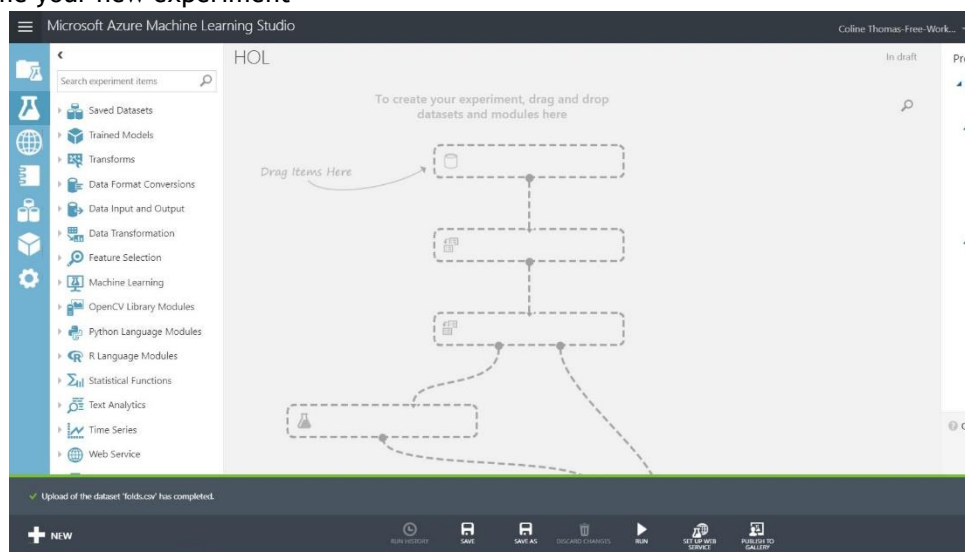
- Add the dataset “folds.csv”



- Click New again
- Create a new Experiment

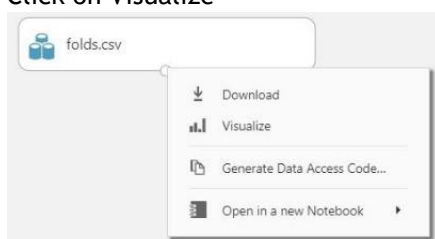


- Rename your new experiment

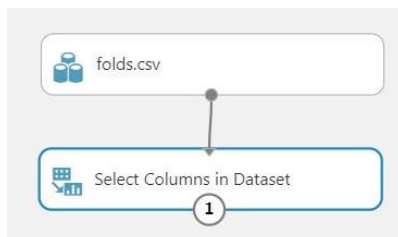


- Add to this experiment your newly added dataset

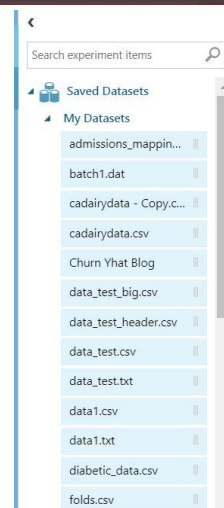
- Click on Visualize

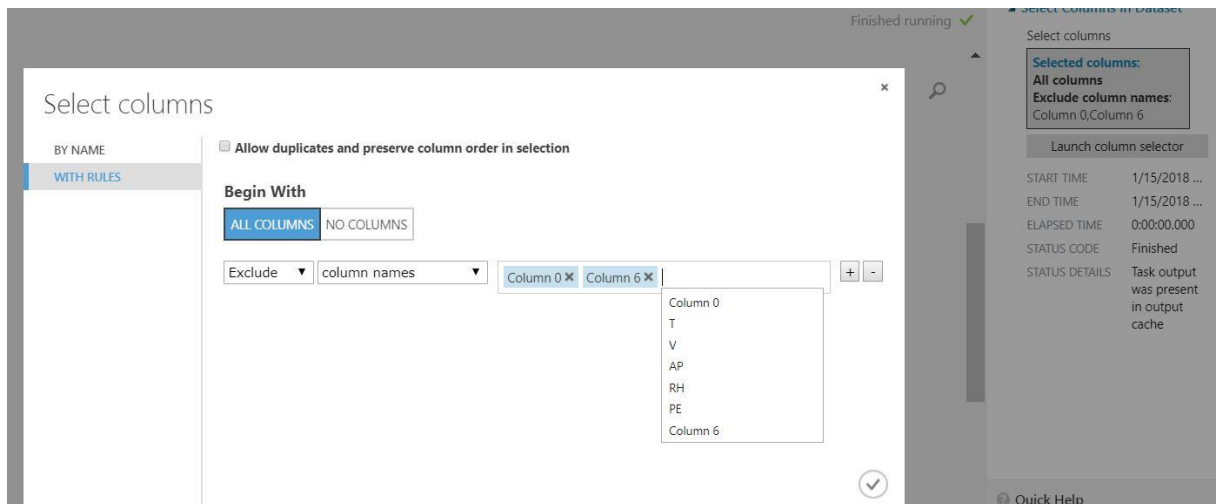


- We have 2 useless columns to remove
- Add a Select Column in Dataset

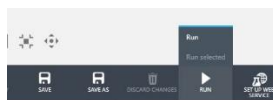


- Remove Column 0 and Column 6

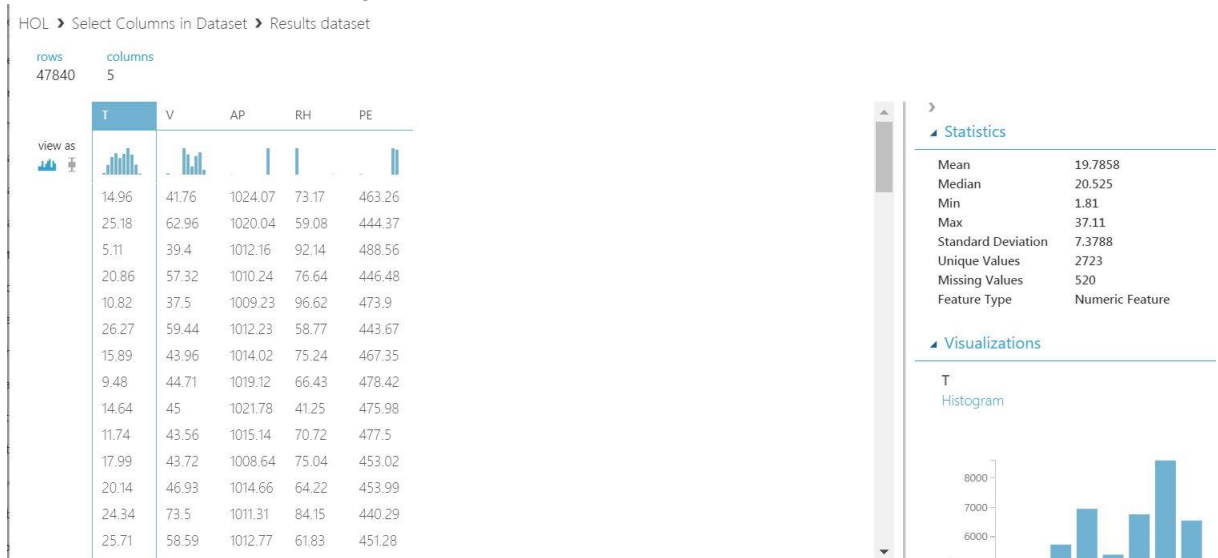




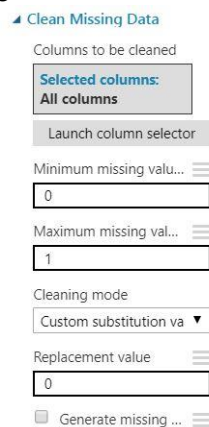
- Run



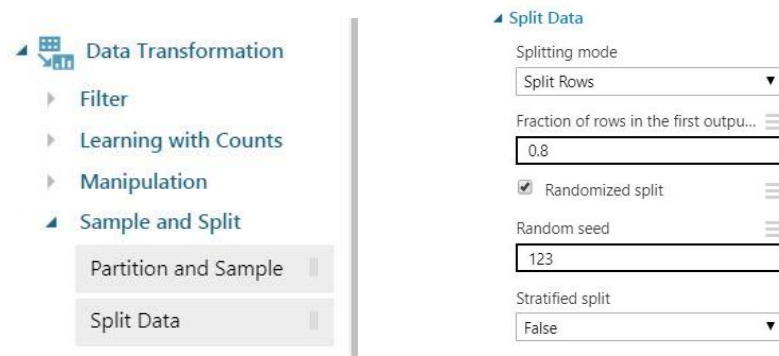
- Visualize. You have kind of a good dataset.



- We have some missing values. Our algorithm will ignore the entire line and predict nothing here...
- Add a Clean Missing Data with 0 for the replacement value



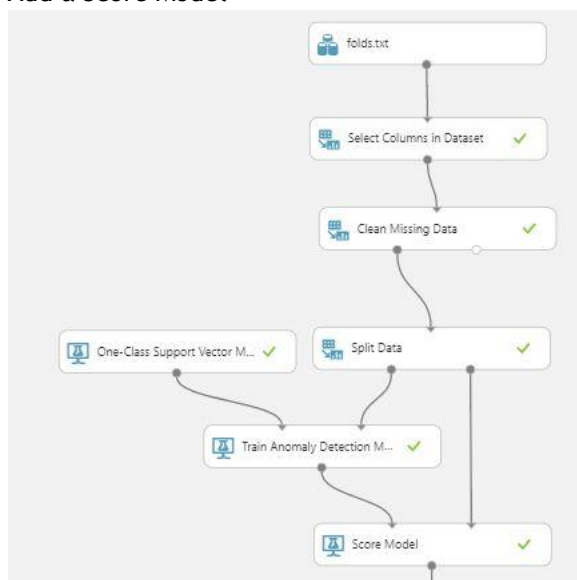
- To train then test our algorithm we need to split our data
- Add a Split Data



- We want to detect anomalies on future data using the dataset we have.
- We are going to use an algorithm called One-Class Support Vector Machine (<https://docs.microsoft.com/en-us/azure/machine-learning/studio-module-reference/one-class-support-vector-machine>) which enables unsupervised training on a dataset with few anomalies.
- Add it to the flow



- Add a Train Anomaly Detection Model
- Add a Score Model



- Run it
- Check your output

HOL > Score Model > Scored dataset

rows
9568

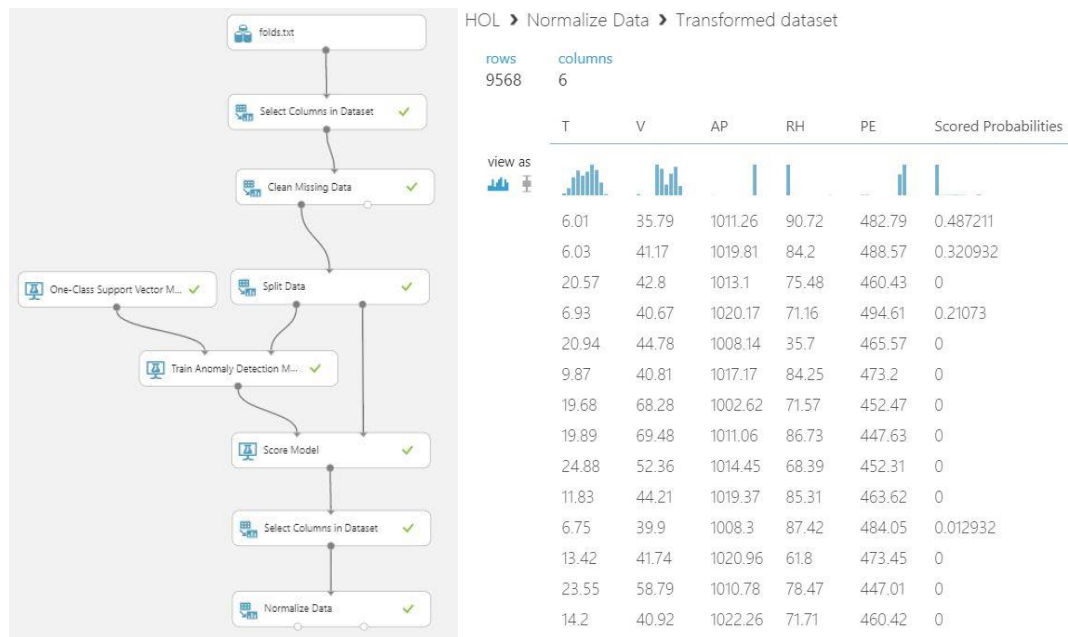
columns
7

	T	V	AP	RH	PE	Scored Labels	Scored Probabilities
view as							
	6.01	35.79	1011.26	90.72	482.79	1	21.015625
	6.03	41.17	1019.81	84.2	488.57	1	8.764404
	20.57	42.8	1013.1	75.48	460.43	0	-79.677734
	6.93	40.67	1020.17	71.16	494.61	1	4.421387
	20.94	44.78	1008.14	35.7	465.57	0	-77.637451
	9.87	40.81	1017.17	84.25	473.2	0	-36.084229
	19.68	68.28	1002.62	71.57	452.47	0	-75.962158
	19.89	69.48	1011.06	86.73	447.63	0	-73.871582
	24.88	52.36	1014.45	68.39	452.31	0	-78.897949
	11.83	44.21	1019.37	85.31	463.62	0	-62.183838
	6.75	39.9	1008.3	87.42	484.05	0	0.249023
	13.42	41.74	1020.96	61.8	473.45	0	-59.062744
	23.55	58.79	1010.78	78.47	447.01	0	-86.925781
	14.2	40.92	1022.26	71.71	460.42	0	-66.767334

- We have the Scored Labels Column which is useless
- Add a Select Column in Dataset and remove the Scored Labels column
- We would like the column Scored Probabilities to be more “expressive”
- Add a Normalize Data with a LogNormal transformation method on the Scored Probabilities column

The screenshot shows the HOL software interface. In the center, a 'Select columns' dialog box is open. It has a 'BY NAME' tab selected. Under 'Begin With', 'ALL COLUMNS' is selected. In the 'Include' list, 'column names' is selected, and 'Scored Probabilities' is added to the list. To the right, the 'Properties' panel is visible, showing the 'Normalize Data' transformation method set to 'LogNormal'. Below this, it says 'Selected columns: Column type: Numeric, All'. At the bottom right, there is a 'Quick Help' section with the text: 'Rescales numeric data to constrain dataset values to a standard range (more help)'.

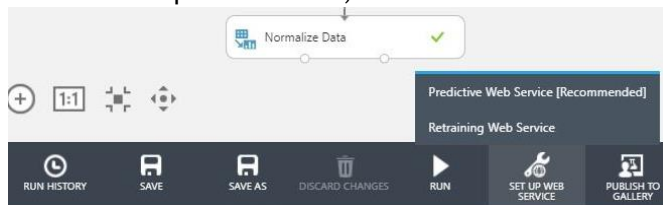
- Run it again and check your output



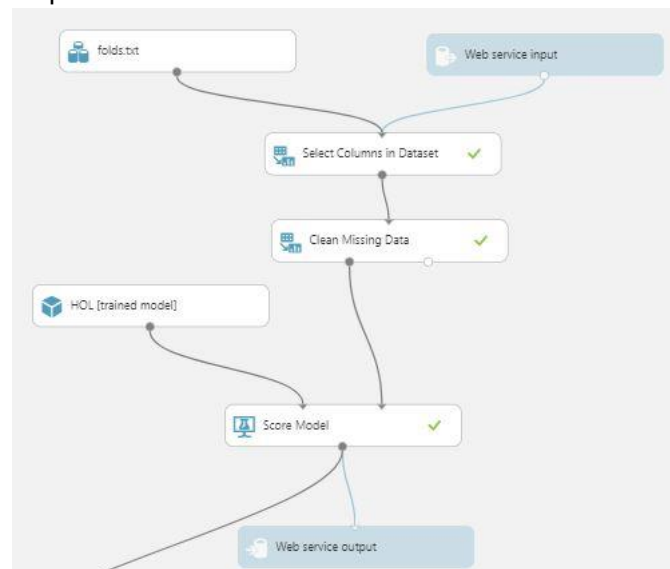
- We have a model which is able to detect anomaly risk in a dataset

We now need to use this model outside of Azure ML

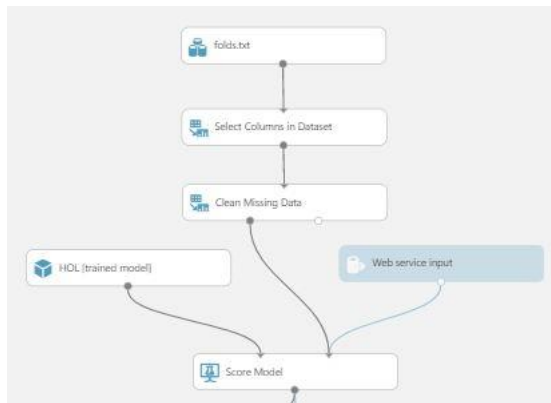
- Click on Set Up Web Service, Predictive Web Service



- Run the predictive experiment



- Check the input and the output. None of them is valid.
- Put the Web Service Input AFTER the transformation



- Add a Select Column in Dataset and keep only the Scored Probabilities column at the end. This is the only thing we want.
- Add a Normalize Data just as before.
- We now should rename the output column to make it easier to use.
- Add an Execute Python Script and paste the following code

```
import pandas as pd

def azureml_main(frame):

    l = frame.columns.tolist()

    l[0] = "Proba"
    frame.columns = l

    return frame,
```

In draft

Draft saved at 16:46:26

Execute Python Script

Python script

```
1 import pandas as pd
2
3 def azureml_main(frame):
4     l = frame.columns.tolist()
5     l[0] = "Proba"
6     frame.columns = l
7     return frame,
8
```

Python Version

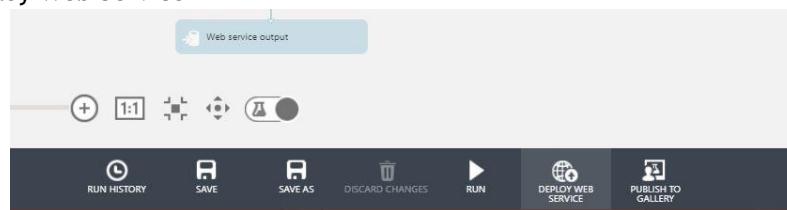
Anaconda 2.0/Python 2.7.7

[Quick Help](#)

- Run it. You should have a perfect output.

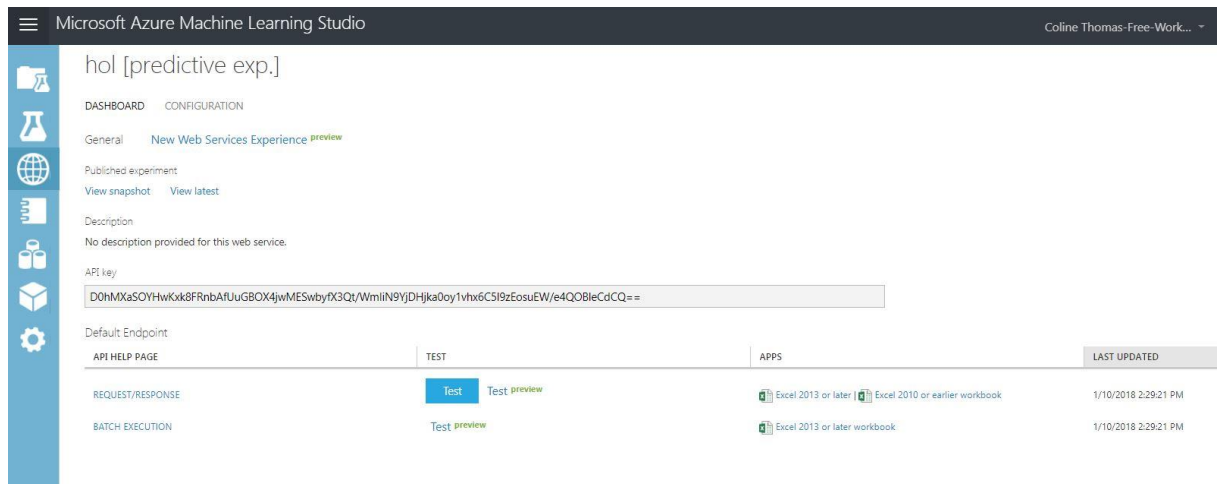


- Click on Deploy Web Service

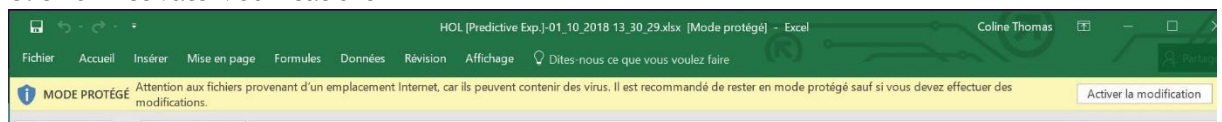


You now have access to your model throw an API which takes 5 floats as input and output a 0-1 probability

- Click on the link Excel 2013 or later



- Open the file
- Click on Activate Modifications



- You are now able to test your model throw Excel
- Click on HOL[predictive experiment]
- Check the Schema first

Azure Machine Learning

← HOL [Predictive Exp.]

1. VIEW SCHEMA

▼ Inputs

▼ input1

- > T (number)
- > V (number)
- > AP (number)
- > RH (number)
- > PE (number)

▼ Outputs

▼ output1

- > Proba (number)

- Click on use sample data

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	T	V	AP	RH	PE								
2		14,96	41,76	1024,07	73,17	463,26							
3		25,18	62,96	1020,04	59,08	444,37							
4		5,11	39,4	1012,16	92,14	488,56							
5		20,86	57,32	1010,24	76,64	446,48							
6		10,82	37,5	1009,23	96,62	473,9							
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													

Azure Machine Learning

2. PREDICT

▼ Input: input1

Type range or click button to select

☒ My data has headers

Use sample data

▼ Output: output1

Enter output cell (e.g. A20)

☒ Include headers

Predicting will override existing values. This can't be undone.

Got it!

Predict

☐ Auto-predict

- Select the entire created table as input and F1 as output

2. PREDICT

▼ Input: input1

Sheet1!A1:E6

☒ My data has headers

Use sample data

▼ Output: output1

Sheet1!F1

☒ Include headers

- Click predict
- You can modify values and click predict again to test your model

	A	B	C	D	E	F
1	T	V	AP	RH	PE	Proba
2		14,96	41,76	1024,07	73,17	463,26
3		25,18	62,96	1020,04	59,08	444,37
4		5,11	39,4	1012,16	92,14	488,56
5		20,86	57,32	1010,24	76,64	446,48
6		10,82	37,5	1009,23	96,62	473,9
7						

	A	B	C	D	E	F	G
1	T	V	AP	RH	PE	Proba	
2	14,96	41,76	1024,07	73,17	463,26	0	
3	25,18	62,96	1020,04	59,08	44,37	0.158655253931457	
4	55,11	39,4	1012,16	92,14	488,56	0.841344746068543	
5	20,86	57,32	1010,24	76,64	446,48	0	
6	10,82	37,5	1009,23	96,62	473,9	0	
7							

	A	B	C	D	E	F	G
1	T	V	AP	RH	PE	Proba	
2	14,96	21,76	1024,07	23,17	463,26	0.047578797951182	
3	25,18	62,96	1020,04	59,08	44,37	0.555479495417235	
4	55,11	39,4	1012,16	92,14	488,56	0.810386223265057	
5	20,86	57,32	1010,24	76,64	446,48	0	
6	10,82	37,5	109,23	0	473,9	0.742140610492608	
7							

We want to use it on streaming data to determine in real time if there are anomalies in our plant.

- Go to <https://portal.azure.com> and sign in using your account or create a free one.
- Create a new Resource Group

- Add a Storage Account, an Azure Stream Analytics and an Event Hubs

Microsoft Azure << Compte de stockage - blob, fichier, ta

Créer un compte de stockage

*** Nom** ⓘ
holrsstorage ✓
.core.windows.net

Modèle de déploiement ⓘ
Resource Manager Classique

Type de compte ⓘ
Storage (v1 à usage général) ▾

Performances ⓘ
Standard Premium

Réplication ⓘ
Stockage géo-redondant avec accès en... ▾

*** Transfert sécurisé requis** ⓘ
Désactivé Activé

*** Abonnement**
Pôle Cloud Integration ▾

*** Groupe de ressources**
☒ Créer nouveau ☐ Utiliser existant
DataColine ▾

*** Emplacement**
Europe du Nord ▾

☐ Épingler au tableau de bord

Créer Options d'automatisation

Nouvelle tâche Stream Analytics

*** Nom de la tâche**
hol_stream ✓

*** Abonnement**
Pôle Cloud Integration ▾

*** Groupe de ressources**
☒ Créer nouveau ☐ Utiliser existant
DataColine ▾

*** Emplacement**
Europe du Nord ▾

Environnement d'hébergement ⓘ
Cloud Périphérie

☐ Épingler au tableau de bord

Créer Options d'automatisation

Create namespace

Event Hubs

* Name
holEvents ✓
.servicebus.windows.net

* Pricing tier
Standard >

* Abonnement
Pôle Cloud Integration v

* Resource group ⓘ
☐ Créer nouveau ☒ Utiliser existant
DataColine v

* Emplacement
Europe du Nord v

Throughput Units ⓘ
1

☒ Enable auto-inflate? ⓘ

Specify Upper Limit ⓘ
20

☐ Épingler au tableau de bord

Créer Options d'automatisation

Choose your pricing tier

Browse the available plans and their features

★ Record

Basic	Standard
1 Consumer group	20 Consumer groups
100 Brokered connections	1000 Brokered connections
Ingress events \$0.028 per million	Ingress events \$0.028 per million
Message retention 1 day	Message retention 1 day
	Additional storage Up to 7 days
	Publisher policies
9,41 EUR/MONTH/TU (ESTIMATED)	18,82 EUR/MONTH/TU (ESTIMATED)

Sélectionner

- Go back to your Resource Group
- Open the newly created Event Hubs and click on add an Event Hub, call it datatostream
- Go back to your Resource Group
- Open your newly created Storage Account and open Blob Objects
- Add a new Container

+ Conteneur Actualiser

Nouveau conteneur

* Nom
folds

Niveau d'accès public ⓘ
Conteneur (accès en lecture anonyme pour les conteneurs et les objets blob) v

OK Annuler

- Go back to your Resource Group
- Open your Stream Analytics
- Click on input and add an input from your Event Hub
- Go back to your Stream Analytics
- Click on output and add an output to your Blob Storage to archive outputs

Nouvelle entrée

* Alias de l'entrée
holBlobIn ✓

* Type de source ⓘ
Flux de données ▾

* Source ⓘ
Hub d'événements ▾

* Option d'importation
Sélectionner un hub d'événements dans v... ▾

Espace de noms Service Bus
holEvents ▾

Nom de l'Event Hub
datastream ▾

Nom de la stratégie du hub d'événements
RootManageSharedAccessKey ▾

Groupe de consommateurs Event Hub ⓘ
▾

* Format de sérialisation de l'événement ⓘ
JSON ▾

Codage ⓘ
UTF-8 ▾

Type de compression d'événement ⓘ
Aucun ▾

Créer

Nouvelle sortie

* Alias de sortie
holBlobOut ✓

* Récepteur ⓘ
Stockage d'objets blob ▾

* Option d'importation
Sélectionner un stockage blob dans vo... ▾

Compte de stockage
holrsstorage ▾

Clé du compte de stockage

Conteneur
folds ▾

Modèle de chemin d'accès ⓘ
▾

Format de date
YYYY/MM/DD ▾

Format d'heure
HH ▾

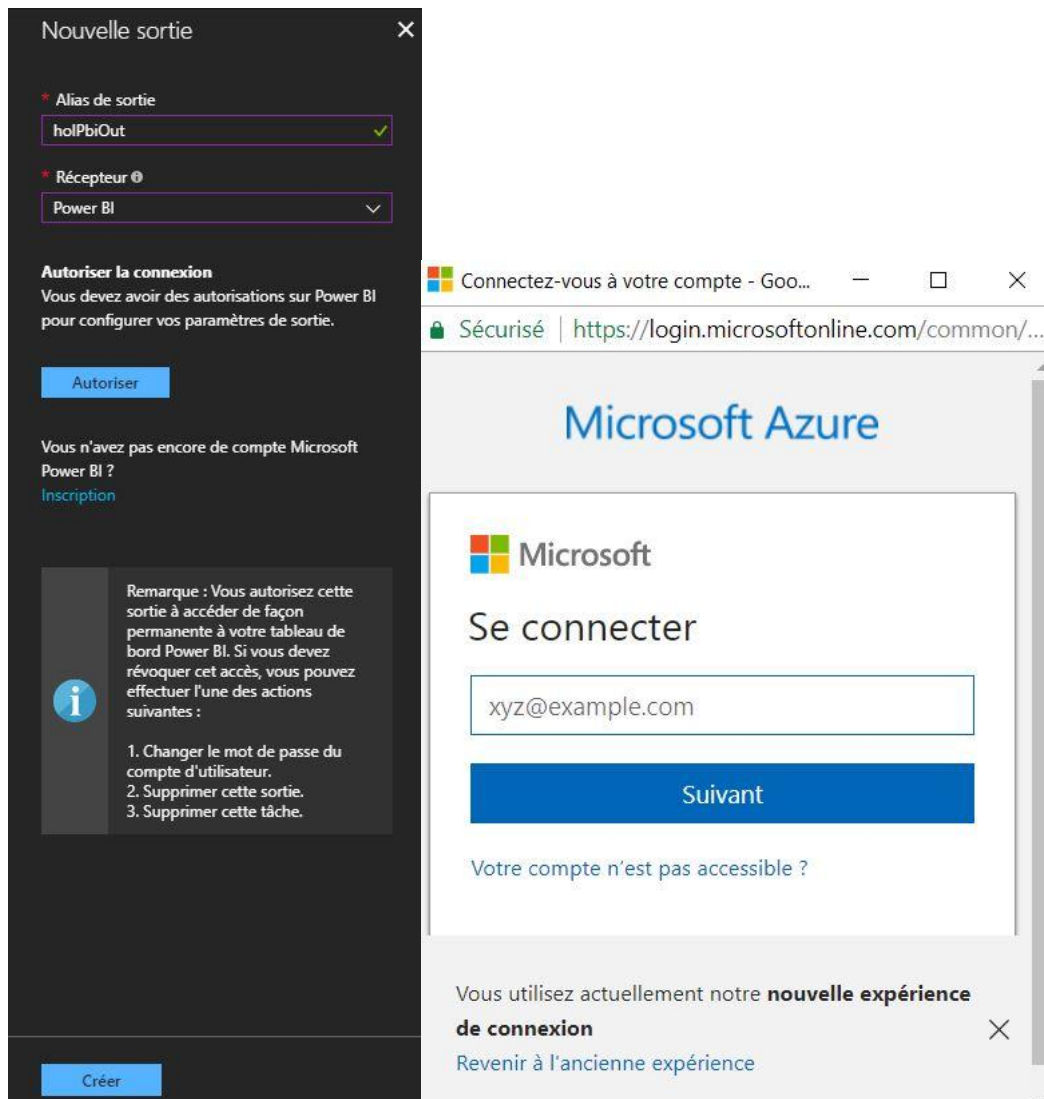
* Format de sérialisation de l'événement ⓘ
CSV ▾

Délimiteur ⓘ
virgule (,) ▾

Codage ⓘ
UTF-8 ▾

Créer

- Add an output to your PowerBi Account (you can create a free one) to visualize your data in real time



- Go back to your Stream Analytics
- Click on Functions
- Add a new function connected to your predictive API

Nouvelle fonction

* Alias de fonction
anomaly ✓

* Type de fonction
Azure ML ✓

* Option d'importation
Importer à partir d'un autre abonnement ✓

* URL
https://ussouthcentral.services.azureml.net...

* Clé
.....

- You can find your key there

Microsoft Azure Machine Learning Studio Coline Thomas-Free Work...

hol [predictive exp.]

DASHBOARD CONFIGURATION

General [New Web Services Experience preview](#)

Published experiment
View snapshot View latest

Description
No description provided for this web service.

API key
D0hMXaSOYHwKxk8FRnbAFUuGBOX4jwMESwbyfX3Qt/WmliN9YjDHjka0oy1vhx6C5l9zEosuEW/e4Q08leCdCQ==

Default Endpoint

API HELP PAGE	TEST	APPS	LAST UPDATED
REQUEST/RESPONSE	Test Test preview	Excel 2013 or later Excel 2010 or earlier workbook	1/10/2018 2:29:21 PM
BATCH EXECUTION	Test preview	Excel 2013 or later workbook	1/10/2018 2:29:21 PM

- And the URL by clicking on REQUEST/RESPONSE and by copying the POST URL
- Go back to your Stream Analytics
- Click on Request
- Add the following request

```
WITH anomaly AS (
    SELECT cast(T as float) as T,
           cast(V as float) as V,
           cast(AP as float) as AP,
           cast(RH as float) as RH,
           cast(PE as float) as PE,
           cast(anomaly(T, V, AP, RH, PE) as float) as result
    from holBlobIn
)

Select System.Timestamp as date, 'Paris' as location, T, V, AP, RH, PE, result * 100 as
result

Into holBlobOut

From anomaly

Select System.Timestamp as date,T, V, AP, RH, PE, result

Into holPbiOut

From anomaly
```

- Now save it
- And launch your streaming task
- Nothing is now happening because our Event Hub does not receive anything
- Open any Python IDE
- Copy the following code

```
import json
import random
from datetime import datetime
from azure.servicebus import ServiceBusService
```

```

def rd(mu, sigma):
    return abs(round(random.normalvariate(mu, sigma), 2))

def main():
    sbs = ServiceBusService(service_namespace='holEvents',
                            shared_access_key_name='RootManageSharedAccessKey',
shared_access_key_value='ugV/8wxg/Z0ZoTWBZWRUP5j2cgaEDiJC26ZLuoshotY=')
    turn = 0
    while turn >= 0:
        t = rd(19.6, 67.6)
        ap = rd(1002.6, 101.1)
        rh = rd(54, 13.6)
        v = rd(83.5, 99.1)
        pe = rd(445.6, 61.1)

        now = datetime.now().strftime("%M")

        if turn == 0:
            time = now
        else:
            if now != time:

                data = {"T":str(t), "V":str(v), "AP":str(ap), "RH":str(rh),
"PE":str(pe) }

                body = str.encode(json.dumps(data))
                print(body)
                sbs.send_event('datatostream', body)

                time = now

            turn += 1

if __name__ == '__main__':
    main()

```

- And launch it
- It will send continuously values similar to what the plant is supposed to send but with some errors because it's not exactly the same.
- Let it turn and go to Power BI