CERN openlab

Batch Anomaly Detection

Lightning Talks Session 2

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Topic

Problem

HTCondor batch system monitoring data is too “big” to be monitored to catch anomalies the traditional way.

Solution

Collectd metrics + HTC job data to spot the options for anomaly detection

Overview

Progress

- MONIT’s raw historical data was a challenge to deal with
- Data is collectable, clean, consumable
- Some anomaly detection techniques are applied on the metrics data

Steps

Data collection and manipulation

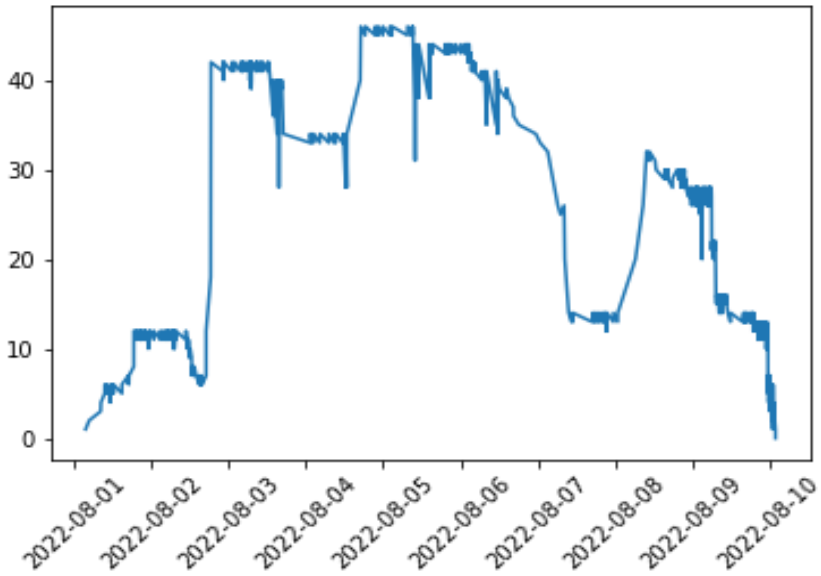
Pyspark within the *SWAN* services

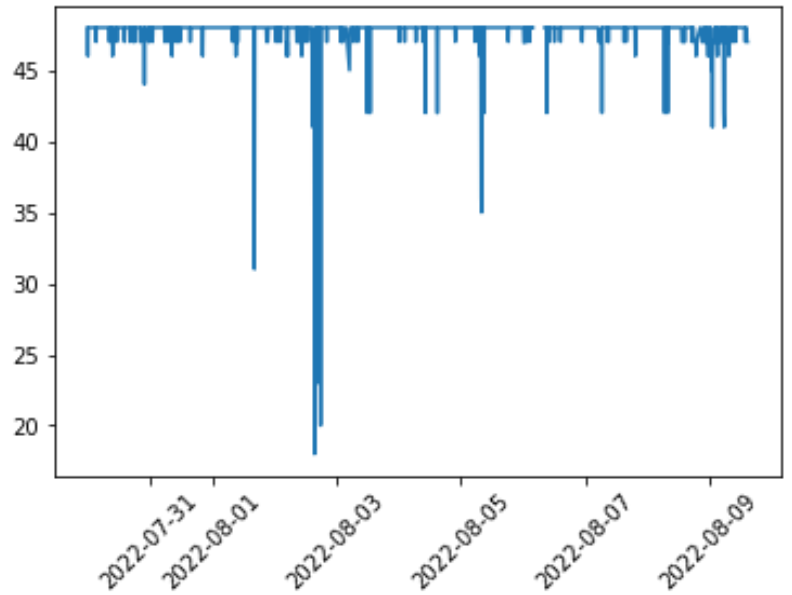
Data mining

ML techniques are used to get a better view and understanding of the Data,

Job Data

Procedure to create time-series from JobEvent data failed



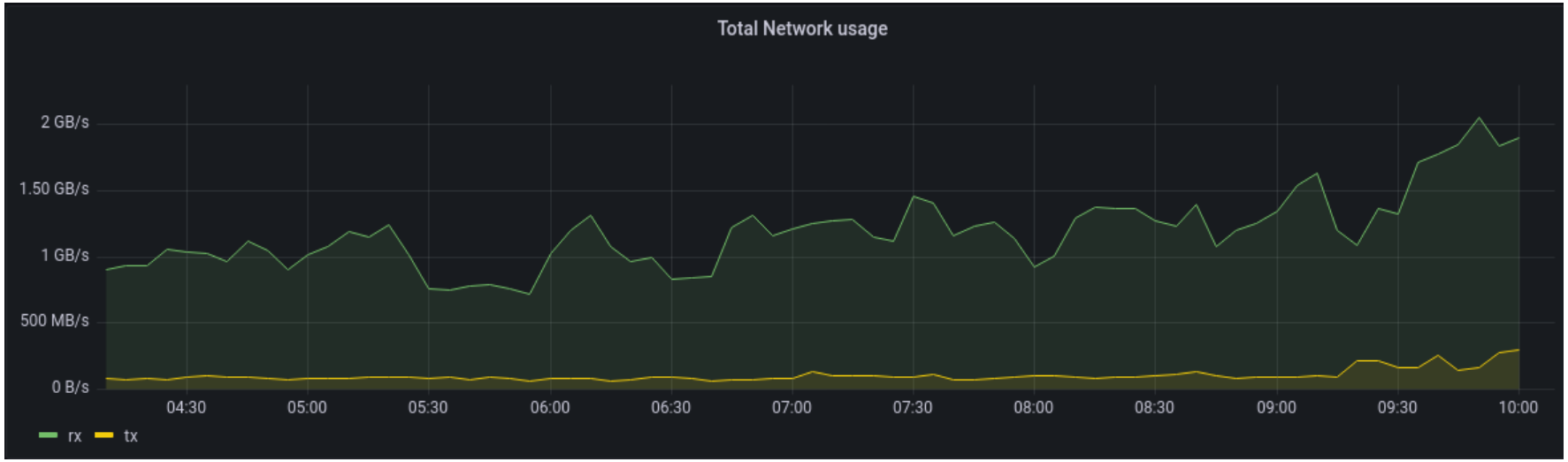


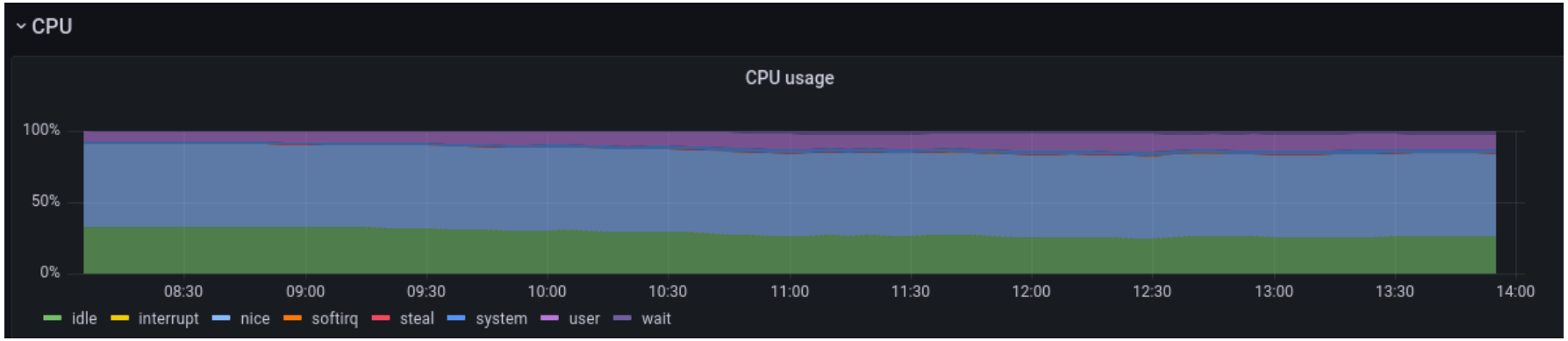
HW Data

- Network, CPU, Memory, and various metrics usage across the different collectd plugins for each hostgroup

- We tried using the ADMON Python API, but it was restricting our data manipulation process, we got back to manual processing.

Data Samples





Algorithms and results

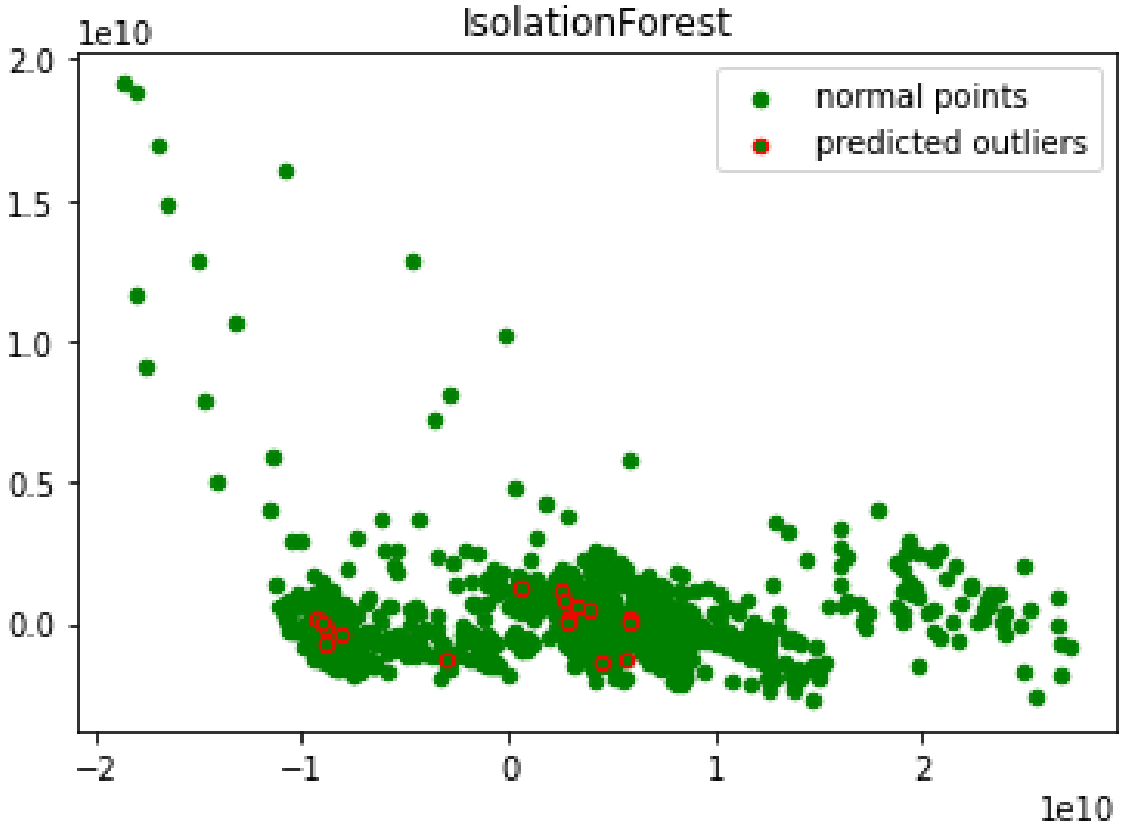
IsolationForest

predicted 17 anomalies in one day for a single hostgroup

OneClass SVM

more than 30 anomalies in one day for a single hostgroup

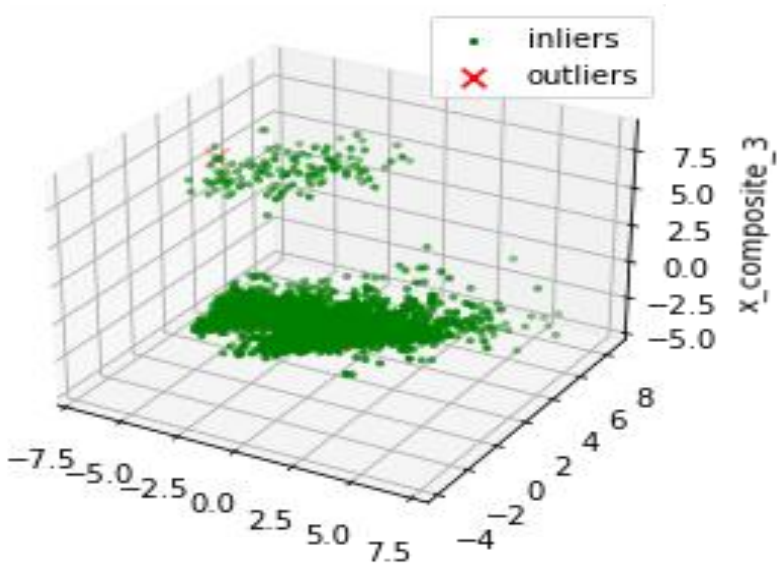
Results


IsolationForest
1e10
2.0
1.5
1.0
0.5
0.0
normal points
predicted outliers
−2
−1
0
1
2
1e10

Algorithms and results

K-means + PCA

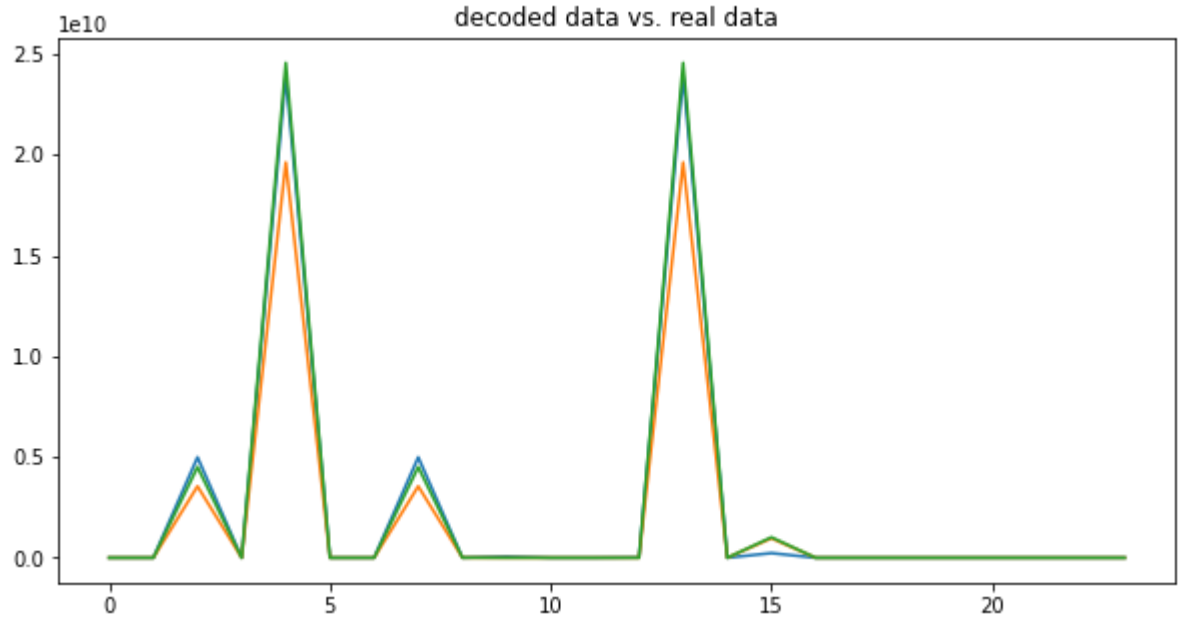
predicted 1 anomaly in one day for a single hostgroup

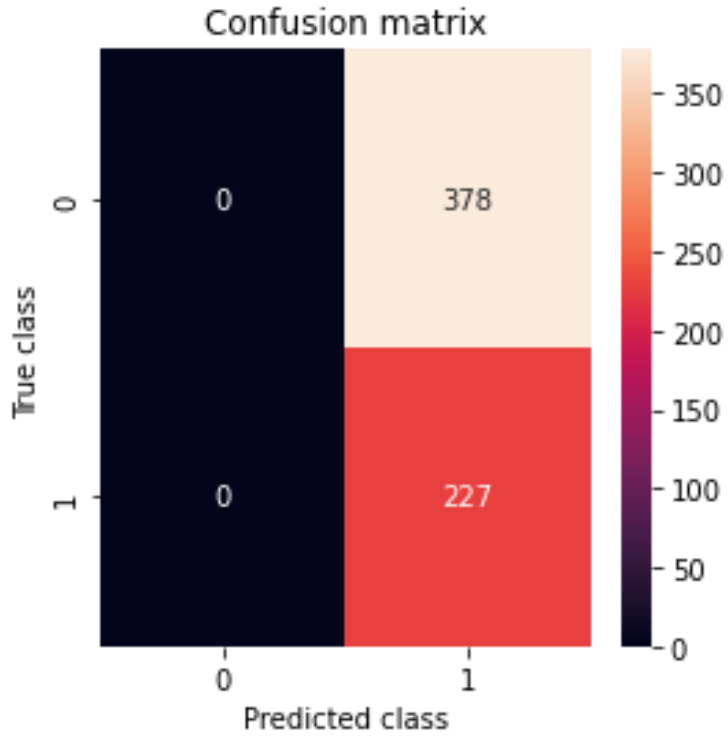


Algorithms and results

Autoencoders - Tensorflow

- Since we don’t have a solid ‘labeling’ to our data, we can not establish a good anomaly detection judgment.
- One more problem was the uniformity of the data - overfitting
- But the model was quite able to have a good encoding-decoding accuracy.


decoded data vs. real data
1e10
2.5
2.0
1.5
1.0
0.5
0.0
0
5
10
15
20


Confusion matrix
True class
Predicted class
0
1
0
1
0
378
0
227
350
300
250
200
150
100
50
0

Next steps

- Get a solid ground truth for the job data
- Merge the datasets for better anomaly results
- Finetune the algorithms

QUESTIONS?

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