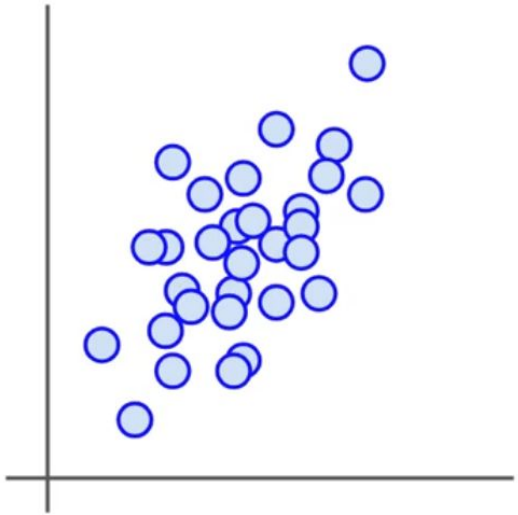
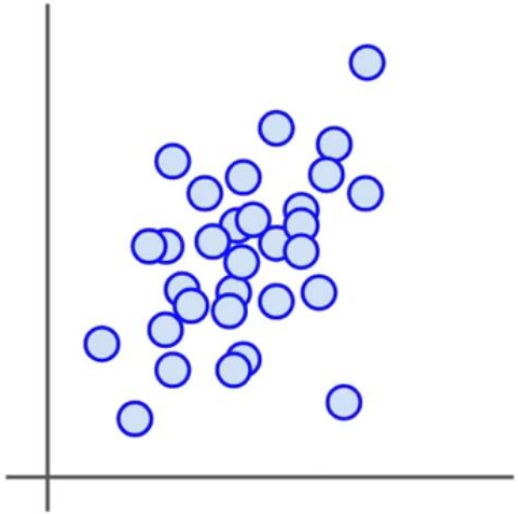
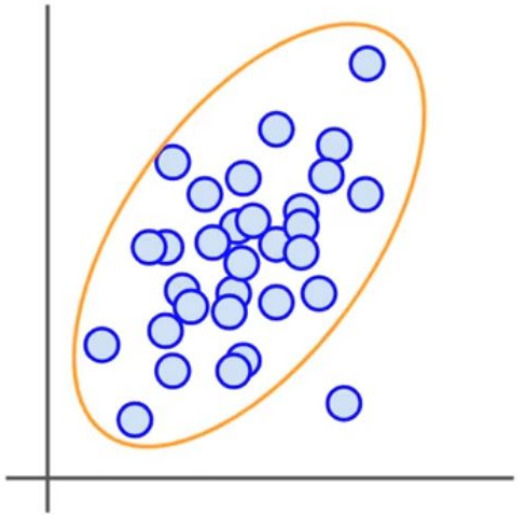
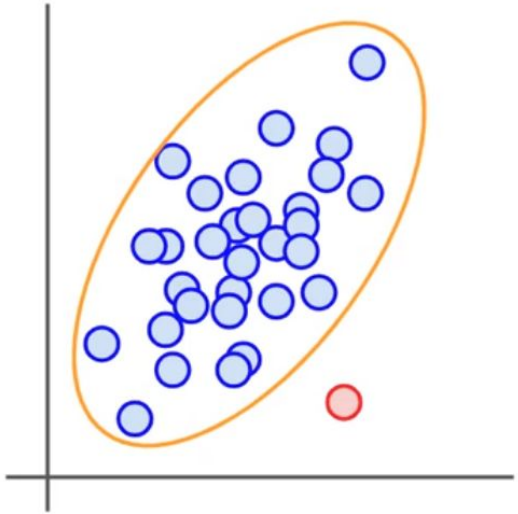
Anomaly Detection









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Wavelet filter-based weak signature detection method and its application on rolling element bearing prognostics

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[c]*Department of Mechanical and Industrial Engineering, Northeastern University, 60 Huntington Ave 334SN, Boston, MA 02115, USA*

Received 26 March 2004; accepted 10 March 2005
Available online 31 May 2005

Abstract

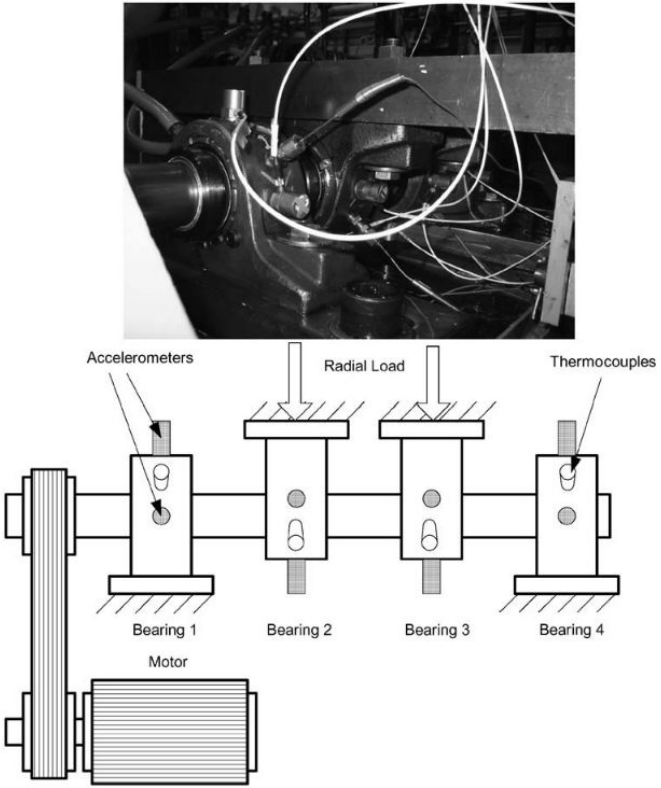

Fig. 16. Bearing test rig.

A magnetic plug installed in the oil feedback pipe collects debris from the oil as evidence of bearing degradation. The test will stop when the accumulated debris adhered to the magnetic plug exceeds a certain level and causes an electrical switch to close.

Four Rexnord ZA 2115 double row bearings were installed on one shaft as shown in Fig. 16.

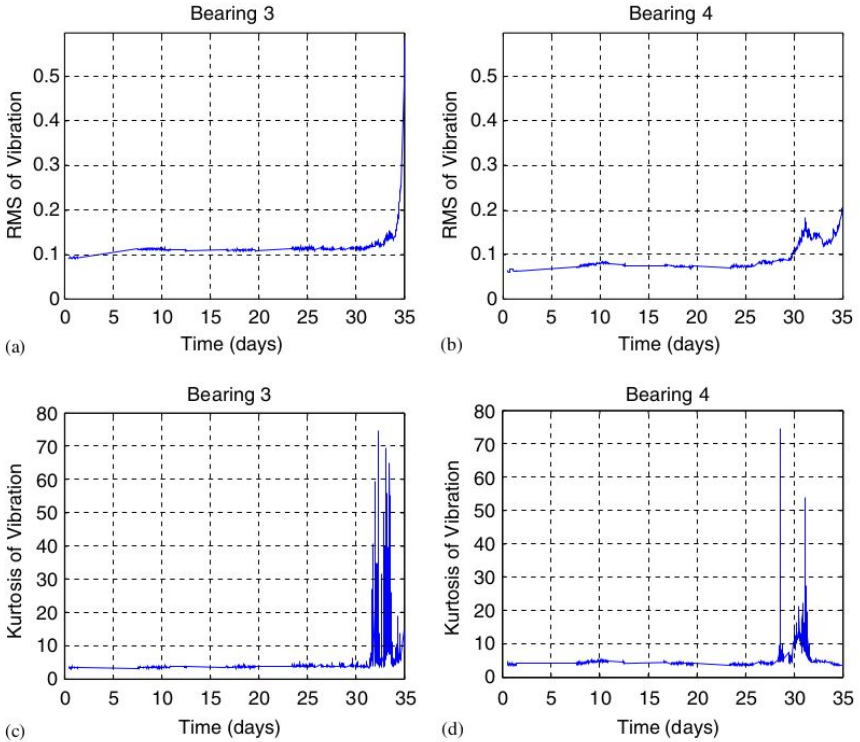

Fig. 18. Time feature (a) rms of bearing 3, (b) rms of bearing 4, (c) Kurtosis of bearing 3 and (d) Kurtosis of bearing 4 for the whole life cycle.

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Prognostics Center of Excellence Data Set Repository

The Prognostics Data Repository is a collection of data sets that have been donated by universities, agencies, or companies. The data repository focuses exclusively on prognostic data sets, i.e., data sets that can be used for the development of prognostic algorithms. Most of these are time-series data from a prior nominal state to a failed state. The collection of data in this repository is an ongoing process.

***** This page is also mirrored at the Prognostics Health Management (PHM) Society website.*****

Publications making use of databases obtained from this repository are requested to acknowledge both the assistance received by using this repository and the donators of the data. This will help others to obtain the same data sets and replicate your experiments. It also provides credit to the donators.

Users employ the data at their own risk. Neither NASA nor the donators of the data sets assume any liability for the use of the data, or any system developed using the data.

If you have suggestions concerning the repository, e-mail chetan.s.kulkarni@nasa.gov or christopher.a.teubert@nasa.gov

Data Sets

1. Algae Raceway

Experiments were conducted on 3 small raceways in which spirulina was inoculated. The growth and, ultimately, decline of the algae biomass was recorded along with several environmental parameters. Experiments were conducted by the Exobiology group at NASA Ames.

- **Download:** https://data.nasa.gov/download/bs7h-ane5/application%2Fzip
- **Download Mirror**: https://phm-datasets.s3.amazonaws.com/NASA/1.+Algae+Raceway.zip
- **Data Set Citation**: Brad Bebout, Leslie Profert-Bebout, Erich Fleming, Angela Detweiler, and Kai Goebel "Algae Raceway Data Set", NASA Prognostics Data Repository, NASA Ames Research Center, Moffett Field, CA

4. Bearings

Experiments on bearings. The data set was provided by the Center for Intelligent Maintenance Systems (IMS), University of Cincinnati.

- **Download:** https://data.nasa.gov/download/7wwx-fk77/application%2Fzip
- **Download Mirror**: https://phm-datasets.s3.amazonaws.com/NASA/4.+Bearings.zip
- **Data Set Citation**: J. Lee, H. Qiu, G. Yu, J. Lin, and Rexnord Technical Services (2007). IMS, University of Cincinnati. "Bearing Data Set", NASA Prognostics Data Repository, NASA Ames Research Center, Moffett Field, CA

5. Batteries

Experiments on Li-Ion batteries. Charging and discharging at different temperatures. Records the impedance as the damage criterion. The data set was provided by the NASA Prognostics Center of Excellence (PCoE).

- **Download Mirror**: https://phm-datasets.s3.amazonaws.com/NASA/5.+Battery+Data+Set.zip
- **Data Set Citation**: B. Saha and K. Goebel (2007). "Battery Data Set", NASA Prognostics Data Repository, NASA Ames Research Center, Moffett Field, CA

6. Turbofan Engine Degradation Simulation

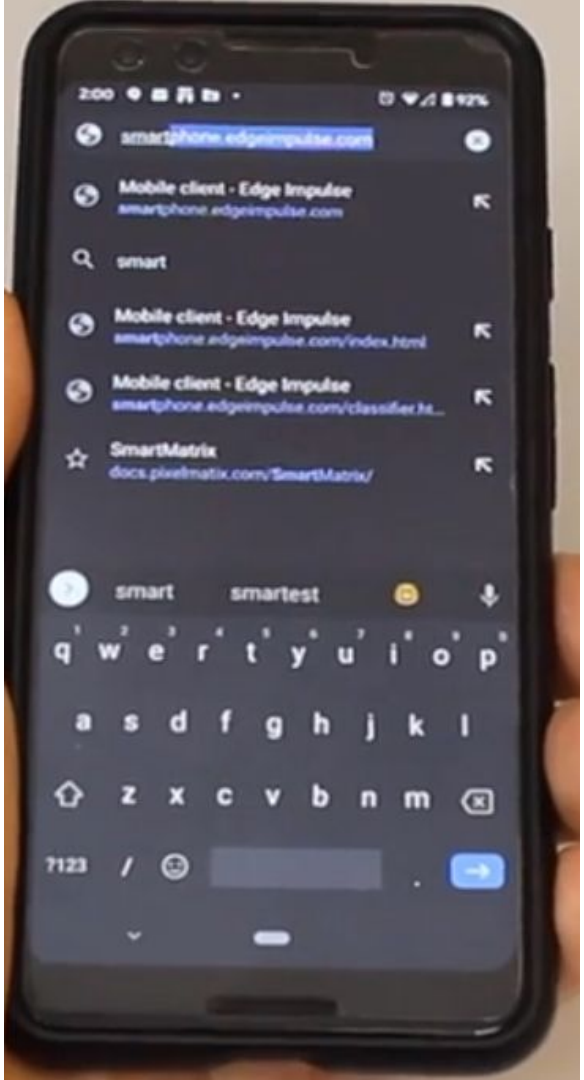
Engine degradation simulation was carried out using the Commercial Modular Aero-Propulsion System Simulation (C-MAPSS). Four different sets were simulated under different combinations of operational conditions and fault modes. This records several sensor channels to characterize fault evolution. The data set was provided by the NASA Ames Prognostics Center of Excellence (PCoE).

- **Download**: https://data.nasa.gov/Aeorspace/CMAPSS-Jet-Engine-Simulated-Data/ff5v-kuh6
- **Download Mirror**: https://phm-datasets.s3.amazonaws.com/NASA/6.+Turbofan+Engine+Degradation+Simulation+Data+Set.zip
- **Data Set Citation**: A. Saxena and K. Goebel (2008). "Turbofan Engine Degradation Simulation Data Set", NASA Prognostics Data Repository, NASA Ames Research Center, Moffett Field, CA

7. Prognostics Health Management 8 (PHM08) Challenge

Data from the data challenge competition held at the 1st international conference on Prognostics and Health Management (PHM08) is similar to the one posted above (see the Turbofan Engine Degradation Simulation data set) except the true Remaining Useful Life (RUL) values are not revealed. Users are expected to develop their algorithms using training and test sets provided in the package. The data set was provided by the NASA Prognostics Center of Excellence (PCoE).

- **Download**: https://data.nasa.gov/download/nk8v-ckry/application%2Fzip
- **Data Set Citation**: A. Saxena and K. Goebel (2008). "PHM08 Challenge Data Set", NASA Prognostics Data Repository, NASA Ames Research Center, Moffett Field, CA
- **Evaluation Link:** Currently Unavailable
- **Notes:**


2:00
92%
smartphone.edgeimpulse.com
Mobile client - Edge Impulse
smartphone.edgeimpulse.com
smart
Mobile client - Edge Impulse
smartphone.edgeimpulse.com/index.html
Mobile client - Edge Impulse
smartphone.edgeimpulse.com/classifier.ht...
SmartMatrix
docs.pixelmatix.com/SmartMatrix/
smart
smartest
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a s d f g h j k l
z x c v b n m
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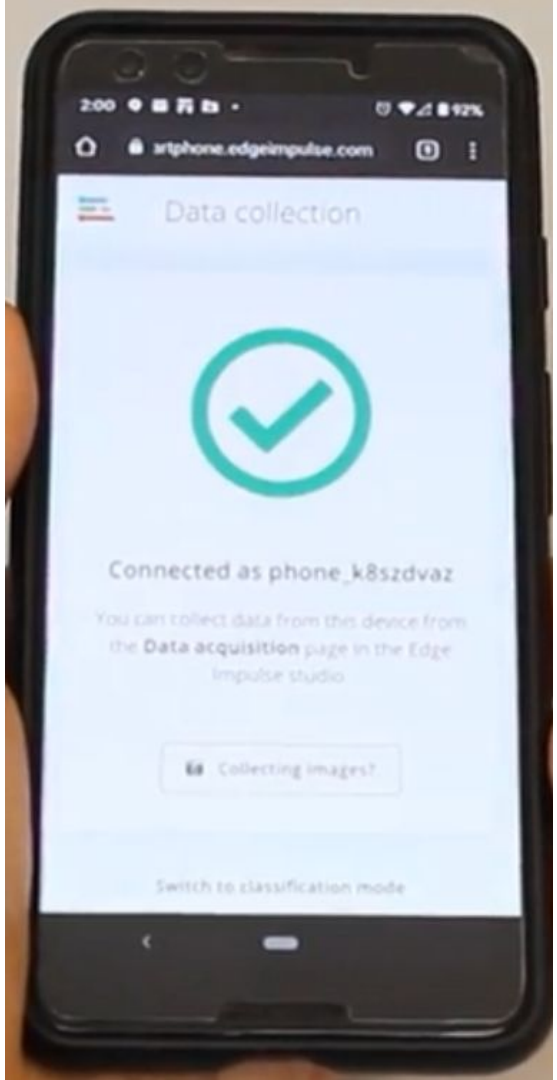
2:00
92%
xrtphone.edgeimpulse.com
Data collection
Connected as phone_k8szdvaz
You can collect data from this device from the Data acquisition page in the Edge Impulse studio.
Collecting images?
Switch to classification mode

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GETTING STARTED

Classify new data

Device ⓘ: No devices connected

Sensor:

Sample length (ms.): 10000

Frequency:

Start sampling

Classify existing test sample

testing.4736d624 (testing)

Load sample

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Classify new data

Device: phone_lks6zv8d
Sensor: Accelerometer
Sample length (ms.): 10000
Frequency: 62.5Hz

Sampling... (7s left)

Classify existing test sample

testing.4736d624 (testing)

Load sample

EDGE IMPULSE

Classification result

Summary

Name: testing.47cde1pk

Expected outcome: testing

CATEGORY	COUNT
circle	13
idle	5
left-right	68
up-down	0
uncertain	15

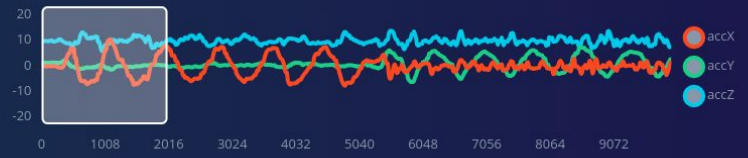
Detailed result

Show only unknowns

TIMESTAMP	CIRCLE	IDLE	LEFT-RIGHT	UP-DOWN
0	0	0	1.00	0
80	0	0	1.00	0
160	0	0	1.00	0
240	0	0	1.00	0

RAW DATA

testing.47cde1pk



Raw features

-0.1000, 1.3000, 9.7000, -0.1000, 1.3000, 9.7000, -0.1000, 1.3000, 9.7000, -0.1000, 1.3000, 9.7000, …

Spectral features

Processed features

4.3662, 0.2916, -0.3651, 5.6644, 32.3026, 1.9906, 2.6013, 2.8145, 1.9315, 1.2962, 1.2981, 0.7790, 0.…

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Name: testing.47cdicmm

Expected outcome: testing

CATEGORY	COUNT
circle	0
idle	20
left-right	67
up-down	0
uncertain	14

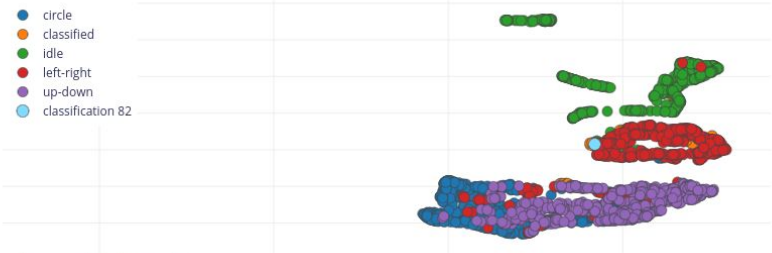
Detailed result — Show only unknowns

TIMESTAMP	CIRCLE	IDLE	LEFT-RIGHT	UP-DOWN
6480	0.07	0.46	**0.47**	0
6560	0.05	0.45	**0.50**	0
6640	0.04	0.47	**0.49**	0
6720	0.03	0.44	**0.53**	0
6800	0.04	**0.50**	0.45	0
6880	0.04	0.47	**0.48**	0
6960	0.01	**0.89**	0.08	0.01

Raw features

0.3000, -0.7000, 9.9000, 0.0000, -0.7000, 9.9000, 0.1000, -0.7000, 10.0000, 0.1000, -0.7000, 9.9000,…

Spectral features



Processed features

0.2187, -0.6214, 0.6641, 4.3262, 20.1005, -0.2590, -0.3010, -0.9241, -0.3647, -0.5047, 0.0289, 1.298…

EDGE IMPULSE

GETTING STARTED

An impulse takes raw data, uses signal processing to extract features, and then uses a learning block to classify new data.

Time series data

Input axes (3)

accX, accY, accZ

Window size

2000 ms.

Window increase

80 ms.

Frequency (Hz)

62,5

Zero-pad data

Spectral Analysis

Name

Spectral features

Input axes (3)

- accX
- accY
- accZ

Classification

Name

Classifier

Input features

Spectral features

Output features

4 (circle, idle, left-right, up-down)

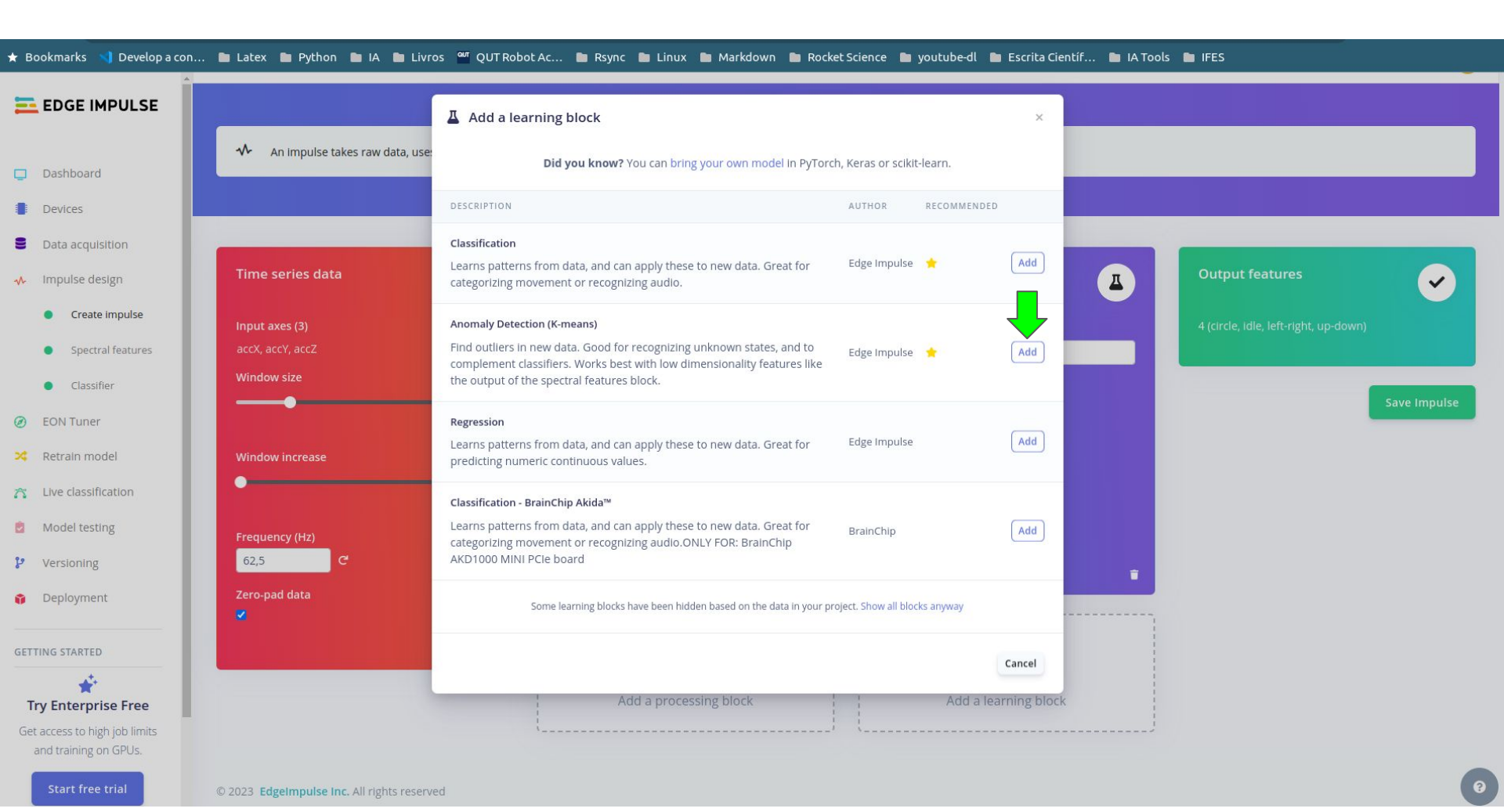
Output features

4 (circle, idle, left-right, up-down)

Save Impulse

Add a processing block

Add a learning block


Bookmarks
Develop a con…
Latex
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IA
Livros
QUT Robot Ac…
Rsync
Linux
Markdown
Rocket Science
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Escrita Científ…
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IFES
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An impulse takes raw data, uses
Time series data
Input axes (3)
accX, accY, accZ
Window size
Window increase
Frequency (Hz)
62,5
Zero-pad data
Add a learning block
Did you know? You can bring your own model in PyTorch, Keras or scikit-learn.
DESCRIPTION
AUTHOR
RECOMMENDED
Classification
Learns patterns from data, and can apply these to new data. Great for categorizing movement or recognizing audio.
Edge Impulse
Add
Anomaly Detection (K-means)
Find outliers in new data. Good for recognizing unknown states, and to complement classifiers. Works best with low dimensionality features like the output of the spectral features block.
Edge Impulse
Add
Regression
Learns patterns from data, and can apply these to new data. Great for predicting numeric continuous values.
Edge Impulse
Add
Classification - BrainChip Akida™
Learns patterns from data, and can apply these to new data. Great for categorizing movement or recognizing audio.ONLY FOR: BrainChip AKD1000 MINI PCIe board
BrainChip
Add
Some learning blocks have been hidden based on the data in your project. Show all blocks anyway
Cancel
Output features
4 (circle, idle, left-right, up-down)
Save Impulse
Add a processing block
Add a learning block
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Time series data

Input axes (3)

accX, accY, accZ

Window size

2000 ms.

Window increase

80 ms.

Frequency (Hz)

62,5

Zero-pad data

Spectral Analysis

Name: Spectral features

Input axes (3)

- accX
- accY
- accZ

Add a processing block

Classification

Name: Classifier

Input features

- Spectral features

Output features

4 (circle, idle, left-right, up-down)

Anomaly Detection (K-means)

Name: Anomaly detection

Input features

- Spectral features

Output features

1 (Anomaly score)

Output features

5 (circle, idle, left-right, up-down, Anomaly score)

Save Impulse

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An impulse takes raw data, uses signal processing to extract features, and then uses a learning block to classify new data.

Time series data

Input axes (3)
accX, accY, accZ

Window size
2000 ms.

Window increase
80 ms.

Frequency (Hz)
62,5

Zero-pad data

Spectral Analysis

Name
Spectral features

Input axes (3)
- accX
- accY
- accZ

Add a processing block

Classification

Name
Classifier

Input features
- Spectral features

Output features
4 (circle, idle, left-right, up-down)

Anomaly Detection (K-means)

Name
Anomaly detection

Input features

Output features

5 (circle, idle, left-right, up-down, Anomaly score)

Save Impulse

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#1 Click to set a description for this version

Anomaly detection settings

Cluster count

32

Axes

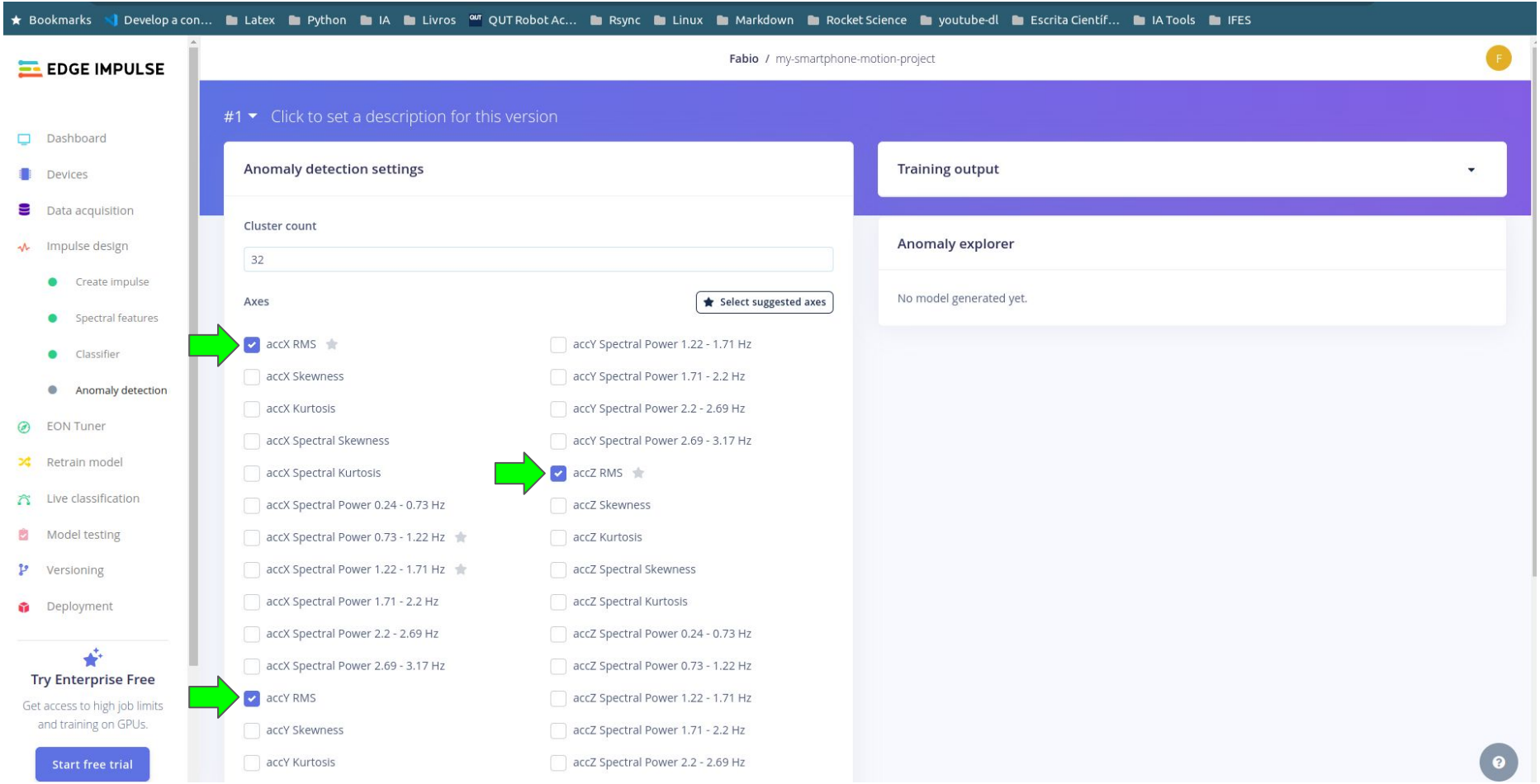
Select suggested axes

- [ ] accX RMS
- [ ] accX Skewness
- [ ] accX Kurtosis
- [ ] accX Spectral Skewness
- [ ] accX Spectral Kurtosis
- [ ] accX Spectral Power 0.24 - 0.73 Hz
- [ ] accX Spectral Power 0.73 - 1.22 Hz
- [ ] accX Spectral Power 1.22 - 1.71 Hz
- [ ] accX Spectral Power 1.71 - 2.2 Hz
- [ ] accX Spectral Power 2.2 - 2.69 Hz
- [ ] accX Spectral Power 2.69 - 3.17 Hz
- [ ] accY RMS
- [ ] accY Skewness
- [ ] accY Kurtosis
- [ ] accY Spectral Power 1.22 - 1.71 Hz
- [ ] accY Spectral Power 1.71 - 2.2 Hz
- [ ] accY Spectral Power 2.2 - 2.69 Hz
- [ ] accY Spectral Power 2.69 - 3.17 Hz
- [ ] accZ RMS
- [ ] accZ Skewness
- [ ] accZ Kurtosis
- [ ] accZ Spectral Skewness
- [ ] accZ Spectral Kurtosis
- [ ] accZ Spectral Power 0.24 - 0.73 Hz
- [ ] accZ Spectral Power 0.73 - 1.22 Hz
- [ ] accZ Spectral Power 1.22 - 1.71 Hz
- [ ] accZ Spectral Power 1.71 - 2.2 Hz
- [ ] accZ Spectral Power 2.2 - 2.69 Hz

Training output

Anomaly explorer

No model generated yet.


Bookmarks
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Latex
Python
IA
Livros
QUT Robot Ac...
Rsync
Linux
Markdown
Rocket Science
youtube-dl
Escrita Científ...
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#1
Click to set a description for this version
Anomaly detection settings
Cluster count
32
Axes
Select suggested axes
accX RMS
accX Skewness
accX Kurtosis
accX Spectral Skewness
accX Spectral Kurtosis
accX Spectral Power 0.24 - 0.73 Hz
accX Spectral Power 0.73 - 1.22 Hz
accX Spectral Power 1.22 - 1.71 Hz
accX Spectral Power 1.71 - 2.2 Hz
accX Spectral Power 2.2 - 2.69 Hz
accX Spectral Power 2.69 - 3.17 Hz
accY RMS
accY Skewness
accY Kurtosis
accY Spectral Power 1.22 - 1.71 Hz
accY Spectral Power 1.71 - 2.2 Hz
accY Spectral Power 2.2 - 2.69 Hz
accY Spectral Power 2.69 - 3.17 Hz
accZ RMS
accZ Skewness
accZ Kurtosis
accZ Spectral Skewness
accZ Spectral Kurtosis
accZ Spectral Power 0.24 - 0.73 Hz
accZ Spectral Power 0.73 - 1.22 Hz
accZ Spectral Power 1.22 - 1.71 Hz
accZ Spectral Power 1.71 - 2.2 Hz
accZ Spectral Power 2.2 - 2.69 Hz
Training output
Anomaly explorer
No model generated yet.

EDGE IMPULSE

- [x] accX RMS
- [ ] accX Skewness
- [ ] accX Kurtosis
- [ ] accX Spectral Skewness
- [ ] accX Spectral Kurtosis
- [ ] accX Spectral Power 0.24 - 0.73 Hz
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- [ ] accX Spectral Power 1.22 - 1.71 Hz
- [ ] accX Spectral Power 1.71 - 2.2 Hz
- [ ] accX Spectral Power 2.2 - 2.69 Hz
- [ ] accX Spectral Power 2.69 - 3.17 Hz
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- [ ] accY Skewness
- [ ] accY Kurtosis
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- [ ] accY Spectral Power 0.24 - 0.73 Hz
- [ ] accY Spectral Power 0.73 - 1.22 Hz
- [ ] accY Spectral Power 1.22 - 1.71 Hz
- [ ] accY Spectral Power 1.71 - 2.2 Hz
- [ ] accY Spectral Power 2.2 - 2.69 Hz
- [ ] accY Spectral Power 2.69 - 3.17 Hz
- [x] accZ RMS
- [ ] accZ Skewness
- [ ] accZ Kurtosis
- [ ] accZ Spectral Skewness
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- [ ] accZ Spectral Power 0.24 - 0.73 Hz
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- [ ] accZ Spectral Power 1.22 - 1.71 Hz
- [ ] accZ Spectral Power 1.71 - 2.2 Hz
- [ ] accZ Spectral Power 2.2 - 2.69 Hz
- [ ] accZ Spectral Power 2.69 - 3.17 Hz

Start training

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Anomaly detection settings

Cluster count

32

Axes

Select suggested axes

- [x] accX RMS
- [ ] accX Skewness
- [ ] accX Kurtosis
- [ ] accX Spectral Skewness
- [ ] accX Spectral Kurtosis
- [ ] accX Spectral Power 0.24 - 0.73 Hz
- [ ] accX Spectral Power 0.73 - 1.22 Hz
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- [ ] accX Spectral Power 2.2 - 2.69 Hz
- [ ] accX Spectral Power 2.69 - 3.17 Hz
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- [ ] accY Kurtosis
- [ ] accY Spectral Power 1.22 - 1.71 Hz
- [ ] accY Spectral Power 1.71 - 2.2 Hz
- [ ] accY Spectral Power 2.2 - 2.69 Hz
- [ ] accY Spectral Power 2.69 - 3.17 Hz
- [x] accZ RMS
- [ ] accZ Skewness
- [ ] accZ Kurtosis
- [ ] accZ Spectral Skewness
- [ ] accZ Spectral Kurtosis
- [ ] accZ Spectral Power 0.24 - 0.73 Hz
- [ ] accZ Spectral Power 0.73 - 1.22 Hz
- [ ] accZ Spectral Power 1.22 - 1.71 Hz
- [ ] accZ Spectral Power 1.71 - 2.2 Hz
- [ ] accZ Spectral Power 2.2 - 2.69 Hz

Training output

Cancel

```
Creating job... OK (ID: 11441368)

Scheduling job in cluster...
Container image pulled!
Job started
Copying features from processing blocks...
Copying features from DSP block...
Copying features from DSP block OK
Copying features from processing blocks OK

Training model
```

Anomaly explorer

No model generated yet.

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- [x] accX RMS
- [ ] accX Skewness
- [ ] accX Kurtosis
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- [ ] accX Spectral Power 2.69 - 3.17 Hz
- [x] accY RMS
- [ ] accY Skewness
- [ ] accY Kurtosis
- [ ] accY Spectral Skewness
- [ ] accY Spectral Kurtosis
- [ ] accY Spectral Power 0.24 - 0.73 Hz
- [ ] accY Spectral Power 0.73 - 1.22 Hz
- [ ] accY Spectral Power 1.22 - 1.71 Hz
- [ ] accY Spectral Power 1.71 - 2.2 Hz
- [ ] accY Spectral Power 2.2 - 2.69 Hz
- [ ] accY Spectral Power 2.69 - 3.17 Hz
- [x] accZ RMS
- [ ] accZ Skewness
- [ ] accZ Kurtosis
- [ ] accZ Spectral Skewness
- [ ] accZ Spectral Kurtosis
- [ ] accZ Spectral Power 0.24 - 0.73 Hz
- [ ] accZ Spectral Power 0.73 - 1.22 Hz
- [ ] accZ Spectral Power 1.22 - 1.71 Hz
- [ ] accZ Spectral Power 1.71 - 2.2 Hz
- [ ] accZ Spectral Power 2.2 - 2.69 Hz
- [ ] accZ Spectral Power 2.69 - 3.17 Hz

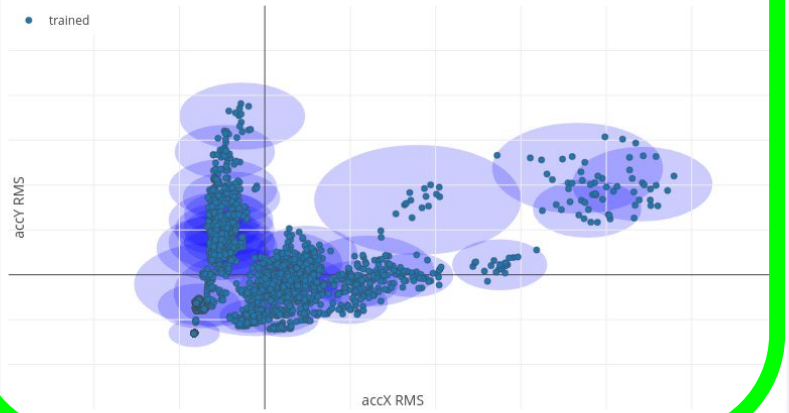
Start training

{'center': [0.4928151071071625, 0.49114906787872314, 0.1746135801076889], 'max_error': 0.5785746082572852}, {'center': [1.7903897762298584, 1.6694589853286743, -0.6729831695556641], 'max_error': 1.2010872308713791}, {'center': [-0.5041754841804504, 0.7269828915596008, 2.5376219749450684], 'max_error': 0.6112434066748279}]

Job completed

Anomaly explorer (6.161 samples)

X Axis: accX RMS | Y Axis: accY RMS | Test data: -- No test data



EDGE IMPULSE

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Classify new data

Device
phone_lks6zv8d
Sensor
Accelerometer
Sample length (ms.)
10000
Frequency
62.5Hz

Sampling... (7s left)

Classify existing test sample

testing.4736d624 (testing)

Load sample

EDGE IMPULSE

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Classification result

Summary

Name: testing.47cfji7c

Expected outcome: testing

CATEGORY	COUNT
circle	0
idle	0
left-right	61
up-down	0
uncertain	0
anomaly	40

Detailed result

Show only unknowns

TIMESTAMP	CIRCLE	IDLE	LEFT-RIGHT	UP-DOWN	ANOMALY
0	0	0	1.00	0	0.12
80	0	0	1.00	0	0.12

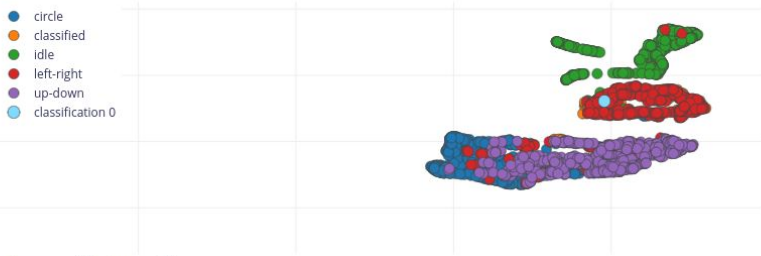
RAW DATA

testing.47cfji7c

Raw features

0.0000, 0.1000, 9.9000, 0.0000, 0.1000, 9.9000, -0.1000, 0.1000, 9.9000, 0.0000, 0.1000, 10.0000, -0…

Spectral features



Processed features

4.1668, -0.2586, -0.3548, 5.4675, 28.6675, 1.2603, 1.7172, 2.7498, 2.6457, 1.6847, 1.3127, 0.2040, -…

EDGE IMPULSE

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uncertain	0
anomaly	40

Detailed result — Show only unknowns

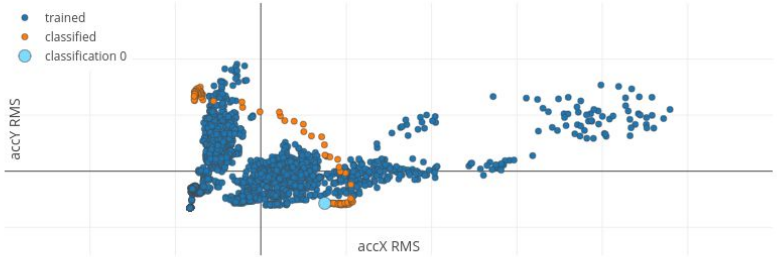
TIMESTAMP	CIRCLE	IDLE	LEFT-RIGHT	UP-DOWN	ANOMALY
4640	0	0	1.00	0	0.11
4720	0	0	1.00	0	0.09
4800	0	0	1.00	0	0.20
4880	0	0	1.00	0	0.32
4960	0	0	1.00	0	0.39
5040	0	0	1.00	0	0.43
5120	0	0	1.00	0	0.66
5200	0	0	0.99	0	0.89
5280	0	0	1.00	0	0.96
5360	0.40	0.01	0.59	0	1.29

Processed features

4.1668, -0.2586, -0.3548, 5.4675, 28.6675, 1.2603, 1.7172, 2.7498, 2.6457, 1.6847, 1.3127, 0.2040, -…

Anomaly explorer (6.262 samples)

X Axis: accX RMS — Y Axis: accY RMS



Distance from closest cluster

accX RMS: 0.2338, accY RMS: 0.5178, accZ RMS: 0.0021

EDGE IMPULSE

Classification result

Summary

Name: testing.47cfji7c

Expected outcome: testing

CATEGORY	COUNT
circle	0
idle	0
left-right	61
up-down	0
uncertain	0
anomaly	40

Detailed result — Show only unknowns

TIMESTAMP	CIRCLE	IDLE	LEFT-RIGHT	UP-DOWN	ANOMALY
6640	0.08	**0.88**	0.02	0.02	1.63
6720	0.09	**0.82**	0.07	0.03	1.58

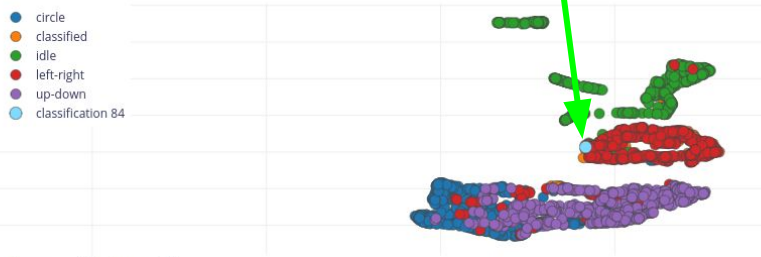
RAW DATA

testing.47cfji7c

Raw features

-0.5000, 3.1000, 9.8000, -1.1000, 4.2000, 10.0000, -0.6000, 9.4000, 10.0000, -0.3000, 5.3000, 9.9000…

Spectral features



Processed features

0.1894, 0.3170, -0.3393, 4.6556, 22.0625, -0.2078, -0.5680, -1.0635, -0.0779, -0.5682, -0.8863, 4.29…

EDGE IMPULSE

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uncertain	0
anomaly	40

Detailed result — Show only unknowns

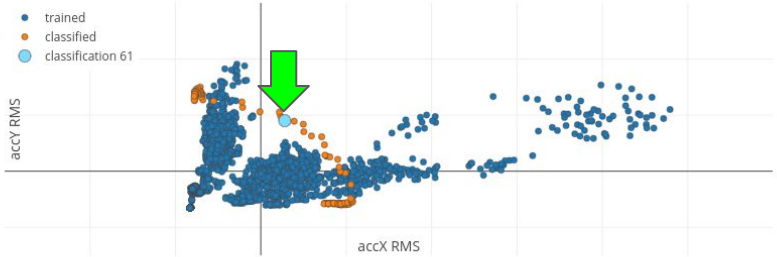
TIMESTAMP	CIRCLE	IDLE	LEFT-RIGHT	UP-DOWN	ANOMALY
4640	0	0	1.00	0	0.11
4720	0	0	1.00	0	0.09
4800	0	0	1.00	0	0.20
4880	0	0	1.00	0	0.32
4960	0	0	1.00	0	0.39
5040	0	0	1.00	0	0.43
5120	0	0	1.00	0	0.66
5200	0	0	0.99	0	0.89
5280	0	0	1.00	0	0.96
5360	0.40	0.01	0.59	0	1.29
5440	0.78	0.18	0.03	0	1.42

Processed features

2.9309, -0.2378, 2.2935, 4.6802, 22.4504, 0.7059, 1.5361, 1.9187, 2.3176, 2.1485, 1.7770, 3.2762, 0.…

Anomaly explorer (6.262 samples)

X Axis: accX RMS — Y Axis: accY RMS



Distance from closest cluster

accX RMS: 1.5097, accY RMS: 0.1317, accZ RMS: 0.0465

EDGE IMPULSE

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uncertain	0
anomaly	40

Detailed result — Show only unknowns

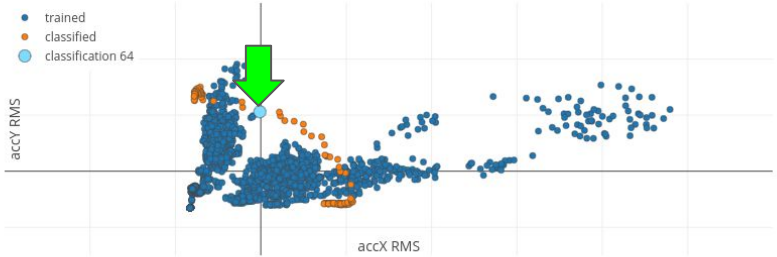
TIMESTAMP	CIRCLE	IDLE	LEFT-RIGHT	UP-DOWN	ANOMALY
4640	0	0	1.00	0	0.11
4720	0	0	1.00	0	0.09
4800	0	0	1.00	0	0.20
4880	0	0	1.00	0	0.32
4960	0	0	1.00	0	0.39
5040	0	0	1.00	0	0.43
5120	0	0	1.00	0	0.66
5200	0	0	0.99	0	0.89
5280	0	0	1.00	0	0.96
5360	0.40	0.01	0.59	0	1.29
5440	0.78	0.18	0.03	0	1.42

Processed features

2.1633, 1.0785, 3.1009, 4.5105, 21.2880, 0.8540, 1.3128, 1.5511, 2.0234, 1.8208, 1.6547, 3.6081, 0.0…

Anomaly explorer (6.262 samples)

X Axis: accX RMS — Y Axis: accY RMS



Distance from closest cluster

accX RMS: 1.8007, accY RMS: 0.4501, accZ RMS: 0.0482

EDGE IMPULSE

- Dashboard
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uncertain	0
anomaly	40

Detailed result — Show only unknowns

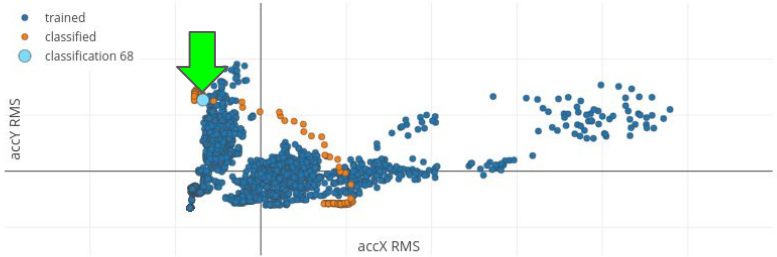
TIMESTAMP	CIRCLE	IDLE	LEFT-RIGHT	UP-DOWN	ANOMALY
4640	0	0	1.00	0	0.11
4720	0	0	1.00	0	0.09
4800	0	0	1.00	0	0.20
4880	0	0	1.00	0	0.32
4960	0	0	1.00	0	0.39
5040	0	0	1.00	0	0.43
5120	0	0	1.00	0	0.66
5200	0	0	0.99	0	0.89
5280	0	0	1.00	0	0.96
5360	0.40	0.01	0.59	0	1.29
5440	0.78	0.18	0.03	0	1.42

Processed features

0.4034, -0.2729, -0.9463, 6.3920, 42.7341, -0.9147, -0.0863, 0.3424, 0.7874, 0.0366, -0.3435, 4.0494…

Anomaly explorer (6.262 samples)

X Axis: accX RMS — Y Axis: accY RMS



Distance from closest cluster

accX RMS: 2.4678, accY RMS: 0.8732, accZ RMS: 0.0480

EDGE IMPULSE

- Dashboard
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uncertain	0
anomaly	40

Detailed result — Show only unknowns

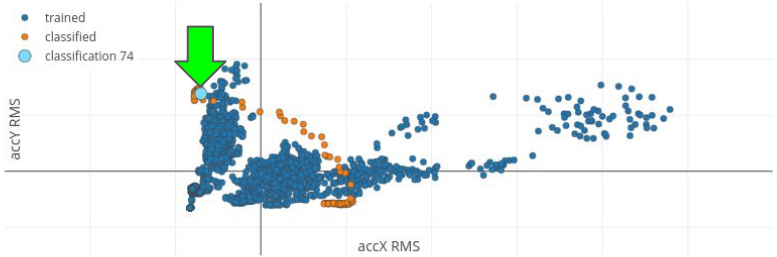
TIMESTAMP	CIRCLE	IDLE	LEFT-RIGHT	UP-DOWN	ANOMALY
5440	**0.78**	0.18	0.03	0	1.42
5520	**0.88**	0.09	0.03	0	1.49
5600	**0.64**	0.35	0	0	1.50
5680	**0.62**	0.37	0	0	1.47
5760	**0.67**	0.32	0.01	0	1.52
5840	**0.66**	0.33	0.01	0	1.55
5920	0.49	**0.51**	0	0	1.52
6000	0.23	**0.44**	0.32	0	1.54
6080	0.40	**0.52**	0.07	0.01	1.63
6160	0.31	**0.61**	0.07	0	1.57
6240	0.24	**0.66**	0.06	0.04	1.54

Processed features

`0.3410, -0.4911, -0.2904, 7.0156, 50.2714, -0.4302, -1.4920, -0.0206, 0.6779, -0.0003, -1.1093, 4.28…`

Anomaly explorer (6.262 samples)

X Axis: accX RMS — Y Axis: accY RMS



Distance from closest cluster

`accX RMS: 2.4915, accY RMS: 1.0969, accZ RMS: 0.0477`