Package ‘pasadr’

October 14, 2022

Type Package

Title An Implementation of Process-Aware Stealthy Attack Detection(PASAD)

Version 1.0

Date 2021-06-22

Author Donghwan Kim

Maintainer Donghwan Kim <donhkim9714@korea.ac.kr>

Description Anomaly detection method based on the paper "Truth will out: Departure-based process-level detection of stealthy attacks on control systems" from Wissam Aoudi, Mikel Iturbe, and Magnus Almgren (2018) <DOI:10.1145/3243734.3243781>. Also referred to the following implementation: <https://github.com/rahulrajpl/PyPASAD>.

License GPL-3

Encoding UTF-8

LazyData no

Repository CRAN

URL https://github.com/ainsuotain/pasadr

Depends R (>= 3.5.0), pracma, scales

NeedsCompilation no

Date/Publication 2021-06-30 10:40:02 UTC

R topics documented:

  pasad_test  ................................................................. 2
  pasad_train ................................................................. 3

Index 6
**Description**

Singular value decomposition of log covariance matrix (Trajectory matrix). This is a test phase of pasad.

**Usage**

```r
pasad_test(obj, test_idx, newdata, r = 3, calib = 1, thres = NULL, movn = 10, plot = TRUE)
```

**Arguments**

- `obj` A pasad model object result from `pasad_train`.
- `test_idx` A test index for pasad. For example, `test_idx = c(1:4801)`.
- `newdata` A test data for pasad.
- `r` A cardinal number of eigen value. Generally, `r` is same by the training phase.
- `calib` A threshold multiplier. since the threshold calculated during the training phase is a rather small, so the calib can be multiplied to the threshold. (default is 1, should be bigger than 0).
- `thres` If user already know the threshold, user can input the threshold.
- `movn` A moving average window value to see the trend of the score.
- `plot` Whether to draw a anomaly score or not. (default : TRUE).

**Value**

An object of class `pasad_test`.

- `total_scores` Anomaly score results from the pasad.
- `tr_score` A pasad score of the training index.
- `te_score` A pasad score of the test index.
- `extraced` A noise-reduced signal.
- `threshold` A (calculated) threshold.
- `outidx` An index of a anomaly score greater than the threshold.

**Author(s)**

Donghwan Kim

<donhkim9714@korea.ac.kr> <dhkim2@bistel.com>
References

https://github.com/mikeliturbe/pasad https://github.com/rahulrajpl/PyPASAD

See Also

pasad_train

Examples

# data input
fpath = system.file("extdata", "sa.csv", package="pasadr")
sa = read.csv(fpath)

# check data
sig = sa$V5
plot(sig)

# training using pasad and check the scree plot
train_idx = c(1:500)
obj = pasad_train(x = sig, 
                  train_idx = train_idx, 
                  r = 1, 
                  ws = length(train_idx)/2, 
                  scree_plot = TRUE)

# test whole data and check the anomaly score of test data
pred = pasad_test(obj = obj, 
                  test_idx = 1:4801, 
                  newdata = sig, 
                  r = 1, 
                  calib = 1, 
                  plot = TRUE)

# check the structure of test results
str(pred)

---

pasad_train

A training function of Process-Aware Stealthy Attack Detection (PASAD)

Description

Singular value decomposition of log covariance matrix (Trajectory matrix). This is a training phase of pasad
Usage

pasad_train(x, train_idx, r = 3, ws, scree_plot = FALSE)

Arguments

x A signal data for inspection.

train_idx A training index for pasad. For example, train_idx = c(1:500).

r A cardinal number of eigen value. Generally r is smaller than 3. (default: 3).

ws A length of lag for creating covariance matrix. (default is a half of training length).

scree_plot Whether to draw a scree_plot or not. (default: TRUE).

Value

An object of class pasad_train.

N A length of signal data.

L A length of lag for creating covariance matrix.

U The r leading eigenvectors.

X A trajectory matrix.

x An original signal.

ws A length of lag for creating covariance matrix.

train_idx A training index for pasad.

x_train A data used for training.

singulars A transpose of singular matrix

Author(s)

Donghwan Kim
<donhkim9714@korea.ac.kr> <dhkim2@bistel.com>

References

https://github.com/mikeliturbe/pasad https://github.com/rahulrajpl/PyPASAD

See Also

pasad_test
Examples

# data input
fpath = system.file("extdata", "sa.csv", package="pasadr")
sa = read.csv(fpath)

## NOT RUN:
## data(package = "pasadr")

# check data
sig = sa$V5
plot(sig)

# training using pasad and check the scree plot
train_idx = c(1:500)
obj = pasad_train(x = sig, train_idx = train_idx, r = 1, ws = length(train_idx)/2, scree_plot = TRUE)

# check the pasad model objects
str(obj)
Index

* pasad
  pasad_test, 2
  pasad_train, 3
* trajectory matrix
  pasad_test, 2
  pasad_train, 3

pasad_test, 2, 4
pasad_train, 3, 3