

# Package ‘pasadr’

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**Type** Package

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

**Version** 1.0

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## 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/rahu1rajpl/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

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pasad\_test

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

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### Description

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

### Usage

```
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)

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## References

Wissam Aoudi, Mikel Iturbe, and Magnus Almgren (2018) <DOI:10.1145/3243734.3243781>. *In Proceedings of the 2018 ACM SIGSAC Conference on Computer and Communications Security*, pp. 817-831.

<https://github.com/mikeliturbe/pasad> <https://github.com/rahu1rajpl/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)
```

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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)**

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**References**

Wissam Aoudi, Mikel Iturbe, and Magnus Almgren (2018) <DOI:10.1145/3243734.3243781>. *In Proceedings of the 2018 ACM SIGSAC Conference on Computer and Communications Security*, pp. 817-831.  
<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)
```

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\* **trajectory matrix**

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