

# Package ‘STMotif’

January 23, 2020

**Type** Package

**Title** Discovery of Motifs in Spatial-Time Series

**Version** 2.0.0

**Maintainer** Heraldo Borges <stmotif@eic.cefet-rj.br>

**Description** Allow to identify motifs in spatial-time series. A motif is a previously unknown subsequence of a (spatial) time series with relevant number of occurrences. For this purpose, the Combined Series Approach (CSA) is used.

**License** GPL-2 | GPL-3

**Encoding** UTF-8

**LazyData** true

**Imports** stats, ggplot2, reshape2, scales, grDevices, RColorBrewer, shiny

**RoxygenNote** 6.1.1

**Suggests** knitr, rmarkdown, testthat

**VignetteBuilder** knitr

**NeedsCompilation** no

**Author** Heraldo Borges [aut, cre] (CEFET/RJ),  
Amin Bazaz [aut] (Polytech'Montpellier),  
Eduardo Ogasawara [aut] (CEFET/RJ)

**Depends** R (>= 3.5.0)

**Repository** CRAN

**Date/Publication** 2020-01-23 13:20:05 UTC

## R topics documented:

CSAMiningProcess . . . . .	2
display_motifsDataset . . . . .	3
display_motifsSTSeries . . . . .	3
example_dataset . . . . .	4
NormSAX . . . . .	5

RankSTMotifs . . . . .	5
SearchSTMotifs . . . . .	6
STMotif . . . . .	7
STSADataSetAdjust . . . . .	7

<b>Index</b>	<b>8</b>
--------------	----------

---

CSAMiningProcess	<i>CSAMiningProcess</i>
------------------	-------------------------

---

## Description

CSA Datamining Process

## Usage

```
CSAMiningProcess(D, DS, w, a, sb, tb, si, ka)
```

## Arguments

D	Dataset containing numeric values
DS	Dataset containing SAX encoded values
w	Word Size
a	Number of letters to do the encode
sb	Spatial block size
tb	Temporal block size
si	Minimum number of occurrences inside each block
ka	Minimum number of spatial-time series with occurrences inside each block

## Value

Return a list of ranked motifs. Each motif contains the information [isaxcode, recmatrix, vectst, rank], as described:

isaxcode: Motif sequences in character format

recmatrix: Matrix giving as information the blocks containing this motif

vectst: Coordinate of the start positions of the motif in the original dataset

rank: L of information used for motif ranking, as [dist, word, qtd, proj]

## Examples

```
#CSA Datamining process
D <- STMotif::example_dataset
DS <- NormSAX(STMotif::example_dataset,5)
rmotif <- CSAMiningProcess(D,DS,4,5,4,10,2,2)
```

---

display\_motifsDataset *Plot a heatmap of the dataset and highlight the selected motifs from the list*

---

### Description

Plot a heatmap of the dataset and highlight the selected motifs from the list

### Usage

```
display_motifsDataset(dataset, rankList, alpha)
```

### Arguments

dataset	Numerical dataset
rankList	List of ranked motifs
alpha	The cardinality of the SAX alphabet

### Value

Heatmap dataset with selected motifs

### Examples

```
#Launch all the workflow
#Plot the result
D <- STMotif::example_dataset
DS <- NormSAX(STMotif::example_dataset,5)
stmotifs <- SearchSTMotifs(D,DS,4,5,4,10,2,2)
rstmotifs <- RankSTMotifs(stmotifs)
display_motifsDataset(dataset = STMotif::example_dataset, rstmotifs[c(1:4)], 5)
```

---

display\_motifsSTSeries *Plot the selected spatial-time series with the selected motifs highlighted*

---

### Description

Plot the selected spatial-time series with the selected motifs highlighted

### Usage

```
display_motifsSTSeries(dataset, rmotifs, space = c(1:length(dataset)))
```

**Arguments**

dataset	Dataset containing numeric values
rmotifs	List of ranked motifs
space	Select a range of columns to plot the corresponding spatial series

**Value**

Selected spatial series with the selected motifs highlighted

**Examples**

```
#Launch all the workflow
#Plot the result
D <- STMotif::example_dataset
DS <- NormSAX(STMotif::example_dataset,5)
stmotifs <- SearchSTMotifs(D,DS,4,5,4,10,2,2)
rstmotifs <- RankSTMotifs(stmotifs)
display_motifsSTSeries(dataset = STMotif::example_dataset,rstmotifs[c(1:4)],space = c(1:4,10:12))
```

---

example_dataset	<i>Example of dataset</i>
-----------------	---------------------------

---

**Description**

Toy example to launch functions.

**Usage**

```
example_dataset
```

**Format**

The dimensions of the dataset are 20 rows and 12 columns and this dataset contains 12 spatial-time series.

---

NormSAX	<i>Normalize the data and SAX indexing</i>
---------	--

---

**Description**

Normalize the data and SAX indexing

**Usage**

```
NormSAX(D, a)
```

**Arguments**

D	Dataset containing numeric values
a	Number of letters use to encode

**Value**

A normalized and encoded dataset for a given alphabet a

**Examples**

```
#Normalization and Sax Dataset  
DS <- NormSAX(STMotif::example_dataset, 5)
```

---

RankSTMotifs	<i>Rank the STMotifs Rank motifs by their quality</i>
--------------	---

---

**Description**

Rank the STMotifs Rank motifs by their quality

**Usage**

```
RankSTMotifs(stmotifs)
```

**Arguments**

stmotifs	List of identified motifs
----------	---------------------------

**Value**

The ranked version of the identified list of motifs

**Examples**

```
#Search for Spatial-time Motifs
D <- STMotif::example_dataset
DS <- NormSAX(STMotif::example_dataset,5)
stmotifs <- SearchSTMotifs(D,DS,4,5,4,10,2,2)
rstmotifs <- RankSTMotifs(stmotifs)
```

---

SearchSTMotifs	<i>SearchSTMotifs</i>
----------------	-----------------------

---

**Description**

Search for Spatial-time Motifs

**Usage**

```
SearchSTMotifs(D, DS, w, a, sb, tb, si = 3, ka = 3)
```

**Arguments**

D	Dataset containing numeric values
DS	Dataset containing SAX encoded values
w	Word Size
a	Number of letters to do the encode
sb	"Space slice" Number of columns in each block
tb	"Time slice" Number of rows in each block
si	Support of Global Occurrence (GO)
ka	Support for Spatial Occurrence (SO)

**Value**

Return a list of identified motifs. Each motif contains the information [isaxcode, recmatrix, vectst], as described:

isaxcode: Motif sequences in character format

recmatrix: Matrix giving as information the blocks containing this motif

vectst: Coordinate of the start positions of the motif in the original dataset

**Examples**

```
#Search for Spatial-time Motifs
D <- STMotif::example_dataset
DS <- NormSAX(STMotif::example_dataset,5)
stmotifs <- SearchSTMotifs(D,DS,4,5,4,10,2,2)
```

---

STMotif

*Package STMotif*

---

### Description

This package ‘STSMotifs’ allows to identify motifs in spatial-time series. A motif is a previously unknown subsequence of a (spatial) time series with relevant number of occurrences. For this purpose, the Combined Series Approach (CSA) is used.

### Details

To have more information about the package : [PACKAGE STMOTIF](#)

---

STSADatasetAdjust

*Adjust a Dataset Adjust the dimensions of a dataset to build the blocks*

---

### Description

Adjust a Dataset Adjust the dimensions of a dataset to build the blocks

### Usage

```
STSADatasetAdjust(D, tb, sb)
```

### Arguments

D	Dataset containing numeric values
tb	Temporal block size
sb	Spatial block size

### Value

Dataset adjusted to build the blocks.

### Examples

```
#Adjust a block  
D <- STSADatasetAdjust(STMotif::example_dataset, 20, 12)
```

# Index

\*Topic **example\_dataset**

example\_dataset, [4](#)

CSAMiningProcess, [2](#)

display\_motifsDataset, [3](#)

display\_motifsSTSeries, [3](#)

example\_dataset, [4](#)

NormSAX, [5](#)

RankSTMotifs, [5](#)

SearchSTMotifs, [6](#)

STMotif, [7](#)

STMotif-package (STMotif), [7](#)

STSDatasetAdjust, [7](#)