

# Types of attributes and methods of the SpectralAnalyzer class

## Notation

- $I$  denotes the number of items.
- $C$  denotes the number of separate categories associated with the items.
- $V_c$  denotes the number of separate values in the category  $c$ .
- $N$  denotes the number of nodes.
- $P$  denotes the number of patterns.
- $Y$  denotes the number of years for which observations exist.
- $+$  denotes public attributes and methods (i.e. exported attributes and methods).
- $-$  denotes private attributes and methods (i.e. attributes and methods not exported).

## Class attributes

- ***STATUS\_PERSISTENT***: character
- ***STATUS\_DECLINING***: character
- ***STATUS\_EMERGENT***: character
- ***STATUS\_LATENT***: character
- ***NODES***: character
- ***PATTERNS***: character
- ***RULES***: character
- ***NODES\_OR\_PATTERNS***: character
- ***NODES\_PATTERNS\_OR\_RULES***: character
- ***NODE\_LINKS***: character
- ***PATTERN\_LINKS***: character

## Attributes

+ **observations**: list

CODE	vector(character) or vector(numeric)	YEAR	numeric	...	...
CODE	vector(character) or vector(numeric)	YEAR	numeric	...	...
...	...	...	...	...	...
CODE	vector(character) or vector(numeric)	YEAR	numeric	...	...

+ **items**: named vector(character) or named vector(numeric)

+ **items\_categories**: data.frame

	category 1	category 2	...	category C
item 1	factor	factor	...	factor
item 2	factor	factor	...	factor
...	...	...	...	...
item I	factor	factor	...	factor

+ **categories\_colors**: list(named vector(character))

\$category1

value 1	character
value 2	character
...	...
value $V_1$	character

\$category2

value 1	character
value 2	character
...	...
value $V_2$	character

...

\$categoryC

value 1	character
value 2	character
...	...
value $V_C$	character

+ **status\_colors**: vector(character)

+ **parameters**: list(**target**: character,  
**count**: numeric,  
**min\_length**: numeric,  
**max\_length**: numeric,  
**status\_limit**: numeric)

+ **nodes**: data.frame

node	length	weight
vector(character)	numeric	numeric

+ **nodes\_per\_year**: matrix

	year 1	year 2	...	year Y
node 1	numeric	numeric	...	numeric
node 2	numeric	numeric	...	numeric
...	...	...	...	...
node N	numeric	numeric	...	numeric

+ **n\_links**: matrix

	node 1	node 2	...	node N
node 1	numeric	numeric	...	numeric
node 2	numeric	numeric	...	numeric
...	...	...	...	...
node N	numeric	numeric	...	numeric

+ **node\_links**: data.frame

endpoint.1	endpoint.2	items	weight
numeric	numeric	character	numeric

+ **obs\_patterns**: matrix

	pattern 1	pattern 2	...	pattern P
node 1	logical	logical	...	logical
node 2	logical	logical	...	logical
...	...	...	...	...
node N	logical	logical	...	logical

+ **patterns**: data.frame

pattern	year	frequency	weight	order	specificity	status
vector(character)	numeric	numeric	numeric	numeric	numeric	character

+ **patterns\_per\_year**: matrix

	year 1	year 2	...	year Y
pattern 1	numeric	numeric	...	numeric
pattern 2	numeric	numeric	...	numeric
...	...	...	...	...
pattern P	numeric	numeric	...	numeric

+ **p\_links**: matrix

	pattern 1	pattern 2	...	pattern P
pattern 1	numeric	numeric	...	numeric
pattern 2	numeric	numeric	...	numeric
...	...	...	...	...
pattern P	numeric	numeric	...	numeric

+ **pattern\_links**: data.frame

endpoint.1	endpoint.2	items	weight	year
numeric	numeric	character	numeric	numeric

## Methods

+ **spectral.analyzer**(**observations**: see attribute **observations**, **items**: see data.frame below, **target**: character, **count**: numeric, **min\_length**: numeric, **max\_length**: numeric, **status\_limit**: numeric, **init**: logical, **verbose**: logical): SpectralAnalyzer

item	name	category 1	category 2	...	category C
character	character	factor	factor	...	factor

+ **reset**(**object**: SpectralAnalyzer, **from**: numeric, **verbose**: logical)

+ **init**(**part**: character, **verbose**: logical): itemsets (class object from arules package) or NULL

– **init\_nodes**(**verbose**: logical)

– **init\_node\_links**(**verbose**: logical)

- **init\_patterns(verbose: logical)**: itemsets (class object from arules package) or NULL
- **init\_pattern\_links(verbose: logical)**
  
- + **is\_init(part: character)**: logical or vector(logical)
- **is\_init\_nodes()**: logical
- **is\_init\_node\_links()**: logical
- **is\_init\_patterns()**: logical
- **is\_init\_pattern\_links()**: logical
- **check\_init(part: character or vector(character), stop: logical, prefix: character, suffix: character)**: logical or vector(logical)
  
- **list\_obs\_per\_year()**: see attribute **nodes\_per\_year**
- **list\_separate\_obs()**: see attribute **nodes**
- **count\_links(entities: character)**: see attributes **n\_links** and **p\_links**
- **search\_links(entities: character)**: see attributes **node\_links** and **pattern\_links**
  
- **list\_separate\_patterns(target: character, count: numeric, min\_length: numeric, max\_length: numeric, arules: logical)**: itemsets (class object from arules package) or data.frame

pattern	weight
vector(character)	numeric

- **list\_patterns\_by\_obs()**: see attribute **obs\_patterns**
- **list\_patterns\_per\_year()**: see attribute **patterns\_per\_year**
- **compute\_patterns\_characteristics()**: see attribute **patterns**
  
- **compute\_specificity(patterns: list(vector(character)), frequencies: vector(numeric), weights: vector(numeric))**: vector(numeric)
- **compute\_ksi\_threshold(reporting\_indexes: vector(numeric))**: numeric
- **compute\_ri\_threshold(reporting\_indexes: vector(numeric), ksi: numeric)**: numeric
- **compute\_reporting\_indexes(patterns: list(vector(character)), t: numeric, period: numeric)**: data.frame

pattern	Ri
vector(character)	Numeric

- **check\_params\_for\_RI(t: numeric, period: numeric)**: list

t	numeric
period	numeric

– **compute\_reporting\_indexes\_limits**(**patterns**: list(vector(character)), **first\_limit**: numeric, **t**: numeric, **period**: numeric): data.frame

pattern	ri_2	ri_period
vector(character)	numeric	numeric

– **define\_dynamic\_status**(**patterns**: list(vector(character)), **status\_limit**: numeric, **t**: numeric, **period**: numeric): data.frame

pattern	Status
vector(character)	character

+ **spectrum\_chart**(**pc**: character or see attribute **patterns**, **identifiers**: character, **sort**: logical, **title**: character, **path**: character, **name**: character): data.frame

ID	Pattern	frequency	weight	order	specificity	status
numeric	vector(character)	numeric	numeric	numeric	numeric	character

– **plot\_spectrum\_chart**(**pc**: see attribute **patterns**, **weights**: see method **weight\_by\_node\_complexity**, **title**: character)

– **pattern\_node\_characteristics**(**patterns**: list(vector(character))): list

[[**"weights"**]]:

1	vector(numeric)
2	vector(numeric)
...	...
P	vector(numeric)

[[**"lengths"**]]:

1	vector(numeric)
2	vector(numeric)
...	...
P	vector(numeric)

+ **weight\_by\_node\_complexity**(**patterns**: list(vector(character))): matrix

complex	simple
numeric	numeric

+ **spectrosome\_chart**(**nopc**: character or see attribute **nodes** or **patterns**, **identifiers**: character, **nb\_graphs**: numeric, **min\_link\_weight**: numeric, **vertex\_size**: character or numeric or vector(numeric), **size\_range**: vector(numeric), **vertex\_col**: character or vector(character), **clusters**: numeric, **highlight**: numeric, **use\_names**: logical, **n.cutoff**: numeric, **c.cutoff**: numeric, **display\_mixt**: logical, **title**: character, **path**: character, **name**: character, ...): list

[[**"vertices"**]]: data.frame

ID	node	length	weight	degree
numeric	vector(character)	numeric	numeric	numeric

or (depends on the type of entities contained in **nopc**)

ID	pattern	frequency	weight	order	specificity	status	degree
numeric	vector(character)	numeric	numeric	numeric	numeric	character	numeric

[["edges"]]: data.frame

ID	endpoint.1	endpoint.2	items	weight
numeric	numeric	numeric	character	numeric

or (depends on the type of entities contained in **nopc**)

ID	endpoint.1	endpoint.2	items	weight	year
numeric	numeric	numeric	character	numeric	numeric

[["coords"]]: list(matrix)

	x	y
vertex 1	numeric	numeric
vertex 2	numeric	numeric
...	...	...
vertex P	numeric	numeric

– **cluster\_text**(**graph**: see matrix below, **links**: see attributes **node\_links** and **pattern\_links**,  
**display**: numeric, **highlight**: numeric, **use\_names**: logical, **cutoff**: numeric)

	x	y
vertex 1	numeric	numeric
vertex 2	numeric	numeric
...	...	...
vertex P	numeric	numeric

+ **cluster\_chart**(**nopc**: character or see attribute **nodes** or **patterns**, **item**: numeric,  
**identifiers**: character, **use\_name**: logical, **n.cutoff**: numeric,  
**vertex\_size**: character or numeric or vector(numeric),  
**size\_range**: vector(numeric), **vertex\_col**: character or vector(character),  
**c.cutoff**: numeric, **display\_mixed**: logical, **title**: character, **path**: character,  
**name**: character, ...): list

[["vertices"]]: data.frame

ID	node	length	weight	degree
numeric	vector(character)	numeric	numeric	numeric

or (depends on the type of entities contained in **nopc**)

ID	pattern	frequency	weight	order	specificity	status	degree
numeric	vector(character)	numeric	numeric	numeric	numeric	character	numeric

[["edges"]]: data.frame

ID	endpoint.1	endpoint.2	items	weight
numeric	numeric	numeric	character	numeric

or (depends on the type of entities contained in **nopc**)

ID	endpoint.1	endpoint.2	items	weight	year
numeric	numeric	numeric	character	numeric	numeric

[["coords"]]: matrix

	x	y
vertex 1	numeric	numeric
vertex 2	numeric	numeric
...	...	...
vertex P	numeric	numeric

+ **network\_density**(links: see attribute **node\_links** or **pattern\_links**): numeric

+ **degree**(ID: numeric, links: see attribute **node\_links** or **pattern\_links**): numeric

+ **itemset\_chart**(nopc: character or see attribute **nodes** or **patterns**, identifiers: character, length\_one: logical, jitter: logical, under: character, over: character, use\_names: logical, n.cutoff: numeric, category: character or numeric, c.cutoff: numeric, sort\_by: character, title: character, path: character, name: character): data.frame

ID	node	length	weight
numeric	vector(character)	numeric	numeric

or (depends on the type of entities contained in **nopc**)

ID	pattern	frequency	weight	order	specificity	status
numeric	vector(character)	numeric	numeric	numeric	numeric	character

– **plot\_itemset\_chart**(nopc: see attribute **nodes** or **patterns**, items\_category: see data.frame below, category: character, c.cutoff: numeric, use\_names: logical, n.cutoff: numeric, jitter: logical, under: character, over: character, title: character)

item	category
character	character

+ **category\_tree\_chart**(category: character or numeric, items: see attribute **items**, use\_names: logical, n.cutoff: numeric, c.cutoff: numeric, vertex\_size: numeric, vertex\_alpha: numeric, leaf\_size: numeric, leaf\_alpha: numeric, leaf\_margin: numeric, label\_size: numeric, label\_margin: numeric): ggplot2 graph

+ **co\_occurrence\_chart**(**items**: see attribute **items**, **category**: character or numeric, **min\_occ**: numeric, **max\_occ**: numeric, **use\_names**: logical, **n.cutoff**: numeric, **c.cutoff**: numeric, **sort\_by**: character, **vertex\_size**: numeric, **vertex\_alpha**: numeric, **vertex\_margin**: numeric, **label\_size**: numeric, **label\_margin**: numeric, **edge\_tension**: numeric, **edge\_alpha**: numeric, **palette**: character or numeric, **palette\_direction**: numeric): ggplot2 graph

+ **extract\_rules**(**from**: character or list, **pruning**: logical, **arules**: logical, **as\_sets**: logical, ...): rules (class object from arules package) or data.frame

antecedent		consequent	support	confidence	lift	count
vector(character)	=>	character	numeric	numeric	numeric	numeric

or (**antecedent** and **consequent** types depend on the value of **as\_sets**. Presence of **count** or **itemset** depends on the value of **from**)

antecedent		consequent	support	confidence	lift	itemset
factor	=>	factor	numeric	numeric	numeric	numeric

+ **rules\_chart**(**rules**: see method **extract\_rules**, **items**: see attribute **items**, **parameters**: list, **display**: character, **threshold**: numeric, **use\_names**: logical, **n.cutoff**: numeric, **category**: character or numeric, **c.cutoff**: numeric, **sort\_by**: character, **vertex\_size**: numeric, **vertex\_alpha**: numeric, **vertex\_margin**: numeric, **label\_size**: numeric, **label\_margin**: numeric, **edge\_tension**: numeric, **edge\_alpha**: numeric, **palette**: character, **palette\_direction**: numeric): list

[[ "graph" ]]: ggplot2 graph

[[ "rules" ]]: see method **extract\_rules**

+ **save\_characteristics**(**characteristics**: character or see attribute **nodes** or **patterns** or return of function **extract\_rules**, ...)

+ **get\_nodes**(**nc**: character or see attribute **nodes**, **element**: character or numeric, **value**: numeric or vector(numeric) or character or vector(character), **condition**: character): see attribute **nodes**

– **get\_nodes\_from\_items**(**nc**: character or see attribute **nodes**, **items**: vector(numeric), **condition**: character): see attribute **nodes**

– **get\_nodes\_from\_characteristic**(**nc**: character or see attribute **nodes**, **characteristic**: character, **value**: numeric, **condition**: character): see attribute **nodes**

– **get\_nodes\_from\_category**(**nc**: character or see attribute **nodes**, **category**: character or numeric, **value**: character, **condition**: character): see attribute **nodes**

+ **get\_patterns**(**pc**: character or see attribute **patterns**, **element**: character or numeric, **value**: numeric or vector(numeric) or character or vector(character), **condition**: character): see attribute **patterns**



- **get\_patterns\_from\_items**(**pc**: character or see attribute **patterns**, **items**: vector(numeric),  
**condition**: character): see attribute **patterns**
- **get\_patterns\_from\_characteristic**(**pc**: character or see attribute **patterns**,  
**characteristic**: character, **value**: numeric, **condition**: character):  
see attribute **patterns**
- **get\_patterns\_from\_status**(**pc**: character or see attribute **patterns**, **value**: vector(character),  
**condition**: character): see attribute **patterns**
- **get\_patterns\_from\_category**(**pc**: character or see attribute **patterns**,  
**category**: character or numeric, **value**: character,  
**condition**: character): see attribute **patterns**
- + **get\_links**(**nopc**: character or see attribute **nodes** or **patterns**): see attribute **node\_links** or  
**pattern\_links**
- + **get\_isolates**(**nopc**: character or see attribute **nodes** or **patterns**): see attribute **nodes** or **patterns**
- + **get\_non\_isolates**(**nopc**: character or see attribute **nodes** or **patterns**): see attribute **nodes** or  
**patterns**
- + **get\_complexes**(**nopc**: character or see attribute **nodes** or **patterns**,  
**category**: character or numeric, **condition**: character, **min\_nb\_values**: numeric):  
see attribute **nodes** or **patterns**
- **check\_access\_for\_category**(**category**: character or numeric, **value**: character, **stop**: logical): logical
- **get\_item\_names**(**items**: vector(character) or vector(numeric) according to the attribute **items**):  
vector(character)
- **get\_items**(**items**: vector(character) or vector(numeric) according to the attribute **items**):  
see attribute **items**
- **get\_nopc**(**nopc**: character or see attribute **nodes** or **patterns**, **entities**: character): see attribute  
**nodes** or **patterns**
- **get\_nop**(**nop**: character or list(vector(character))), **entities**: character): list(vector(character))
- **which\_entities**(**npr**: see attribute **nodes** or **patterns** or return of function **extract\_rules**,  
**entities**: character): character
- **which\_associated\_links**(**name**: character): character
- **which\_name**(**name**: character or vector(character)): character or vector(character)