# Types of attributes and methods of the class SpectralAnalyzer

## 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**: ObservationSet

$+$ **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 | length | 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)


— **check_RI_params(t**: numeric, **period**: numeric**)**: list

| t | numeric |
|---|---|
| **period** | numeric |


— **compute_reporting_indexes(patterns**: list(vector(character)), **t**: numeric, **period**: numeric**)**: vector(numeric)

— **compute_reporting_indexes_limits(patterns**: list(vector(character)), **t**: numeric, **period**: numeric, **short_limit**: numeric**)**: matrix

| RI.period | RI.limit |
|---|---|
| numeric | numeric |


— **compute_xi_threshold(reporting_indexes**: vector(numeric)**)**: numeric

— **compute_ri_threshold(reporting_indexes**: vector(numeric), **xi**: numeric**)**: numeric

+ **define_dynamic_status(patterns**: list(vector(character)), **t**: numeric, **period**: numeric, **short_limit**: numeric**)**: list

[["res"]]: data.frame

| RI.period | is.above.threshold.1 | RI.limit | is.above.threshold.2 | status |
|---|---|---|---|---|
| numeric | logical | numeric | logical | character |

[["thresholds"]]: matrix

|  | threshold.1 | threshold.2 |
|---|---|---|
| xi | numeric | numeric |
| RI | numeric | numeric |

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

| ID | pattern | frequency | weight | length | 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 | length | 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_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 | length | 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 | length | specificity | status |
|---|---|---|---|---|---|---|
| numeric | vector(character) | numeric | numeric | numeric | numeric | 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)