# Types of attributes and methods of the class TransactionAnalyzer

## 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 transactions exist.
- $J$ denotes the number of itemsets.
- $+$ denotes public attributes and methods (i.e., exported attributes and methods).
- $-$ denotes private attributes and methods (i.e., non-exported attributes and methods).

## Class attributes

- ***STATUS_PERSISTENT***: character
- ***STATUS_DECLINING***: character
- ***STATUS_EMERGENT***: character
- ***STATUS_LATENT***: character

- ***TRANSACTIONS***: character
- ***NODES***: character
- ***PATTERNS***: character
- ***RULES***: character

- ***NODES_OR_PATTERNS***: character
- ***NODES_PATTERNS_OR_RULES***: character
- ***NODES_PATTERNS_OR_TRANSACTIONS***: character
- ***ANY_ITEMSETS***: character

- ***NODE_LINKS***: character
- ***PATTERN_LINKS***: character

# Attributes

+ **transactions**: TransactionSet
+ **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 | frequency |
|---|---|---|
| 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 |

+ **nodes_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 | length | support | frequency | weight | specificity | status |
|---|---|---|---|---|---|---|---|
| vector(character) | numeric | 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

+ **transaction.analyzer(transactions**: see attribute **transactions**, **items**: see data.frame below,
  **target**: character, **count**: numeric, **min_length**: numeric,
  **max_length**: numeric, **status_limit**: numeric, **init**: logical, **verbose**: logical**)**:
  TransactionAnalyzer

| item | name | category 1 | category 2 | … | category $C$ |
|---|---|---|---|---|---|
| character | character | factor | factor | … | factor |

+ **reset(object**: TransactionAnalyzer, **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_trx_per_year()**: see attribute **nodes_per_year**
- **list_separate_trx()**: 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 | support | frequency |
|---|---|---|
| vector(character) | numeric | numeric |

- **list_patterns_by_trx()**: see attribute **nodes_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(end**: numeric, **period**: numeric**)**: list

| end | numeric |
|---|---|
| period | numeric |

− **compute_reporting_indexes(patterns**: list(vector(character)), **end**: numeric, **period**: numeric**)**: vector(numeric)

− **compute_reporting_indexes_limits(patterns**: list(vector(character)), **end**: numeric, **overall_period**: numeric, **recent_period**: numeric**)**: matrix

| RI.overall | RI.recent |
|---|---|
| numeric | numeric |

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

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

+ **dynamic_status(patterns**: list(vector(character)), **end**: numeric, **overall_period**: numeric, **recent_period**: numeric**)**: list

[["res"]]: data.frame

| RI.overall | is.above.threshold.1 | RI.recent | 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 | year | length | support | frequency | f.complex | f.simple | weight | specificity | status |
|---|---|---|---|---|---|---|---|---|---|---|
| numeric | vector | numeric | numeric | numeric | numeric | numeric | numeric | numeric | numeric | character |

− **plot_spectrum_chart(pc**: see attribute **patterns**, **frequencies**: see method **frequency_by_node_complexity**, **title**: character**)**

− **pattern_node_characteristics(patterns**: list(vector(character))**)**: list

[["frequencies"]]:

| 1 | vector(numeric) |
|---|---|
| 2 | vector(numeric) |
| … | … |
| *P* | vector(numeric) |

[["lengths"]]:

| 1 | vector(numeric) |
|---|---|
| 2 | vector(numeric) |
| … | … |
| *P* | vector(numeric) |

+ **frequency_by_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 | frequency | degree |
|---|---|---|---|---|
| numeric | vector(character) | numeric | numeric | numeric |

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

| ID | pattern | year | length | support | frequency | weight | specificity | status | degree |
|---|---|---|---|---|---|---|---|---|---|
| numeric | vector(character) | numeric | numeric | 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 $N$ or $P$** | 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 $N$ or $P$** | 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 | frequency |
|---|---|---|---|
| numeric | vector(character) | numeric | numeric |

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

| ID | pattern | year | length | support | frequency | weight | specificity | status |
|---|---|---|---|---|---|---|---|---|
| numeric | vector(character) | numeric | numeric | 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, **co_occ**: matrix(numeric), **proportions**: logical, **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_looseness**: numeric, **edge_alpha**: numeric, **palette**: character or numeric, **palette_direction**: numeric**)**: ggplot2 graph

+ **extract_rules(itemsets**: 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 **itemsets**)

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

+ **rules_chart(rules**: see method **extract_rules**, **items**: see attribute **items**, **parameter**: list, **display**: character, **threshold**: numeric, **direction**: logical, **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_looseness**: numeric, **edge_alpha**: numeric, **palette**: character, **palette_direction**: numeric, **plot**: logical**)**: list

[["graph"]]: ggplot2 graph

[["rules"]]: see method **extract_rules**

+ **export(nporc**: see attribute **nodes** or **patterns** or return of function **extract_rules**, **…)**

+ **get_trx_from_category(trx**: TransactionSet, **category**: character or numeric, **value**: character, **as_indices**: logical**)**: TransactionSet or named vector(numeric)

+ **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**

+ **get_item_names(items**: vector(character) or vector(numeric) according to the attribute **items)**: vector(character)

+ **get_item_colors(category**: character or numeric,
**items**: vector(character) or vector(numeric) according to the attribute **items)**:
vector(character)

+ **category_values(itemsets**: list(vector(character)), **as_character**: logical, **unique**: logical**)**:
list(list(factor))

$category1

| itemset 1 | factor |
|---|---|
| itemset 2 | factor |
| … | … |
| itemset $J$ | factor |

$category2

| itemset 1 | factor |
|---|---|
| itemset 2 | factor |
| … | … |
| itemset $J$ | factor |

…

…

$categoryC

| itemset 1 | factor |
|---|---|
| itemset 2 | factor |
| … | … |
| itemset $J$ | factor |

or data.frame (according to the value of **as_character**)

| | category 1 | category 2 | … | category $C$ |
|---|---|---|---|---|
| itemset 1 | vector(character) | vector(character) | … | vector(character) |
| itemset 2 | vector(character) | vector(character) | … | vector(character) |
| … | … | … | … | … |
| itemset $J$ | vector(character) | vector(character) | … | vector(character) |

- **check_access_for_category(category**: character or numeric, **value**: character, **stop**: logical**)**:
logical
- **has_item_names()**: logical
- **get_items(items**: vector(character) or vector(numeric) according to the attribute **items)**:
see attribute **items**
- **get_items_from_category(category**: character or numeric, **value**: character,
**force_character**: logical**)**: vector(character) or vector(numeric)
- **get_tnp(tnp**: character or TransactionSet or see attribute **nodes** or **patterns**, **entities**: character**)**:
see attribute **transactions**, **nodes** or **patterns**
- **get_tnp_itemsets(tnp**: 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)