

# 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,  
    **min\_frequency**: integer,  
    **min\_length**: integer,  
    **max\_length**: numeric,  
    **status\_limit**: numeric)

- + **nodes**: data.frame

| node              | length  | frequency |
|-------------------|---------|-----------|
| vector(character) | integer | integer   |

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

|          | year 1  | year 2  | ... | year $Y$ |
|----------|---------|---------|-----|----------|
| node 1   | integer | integer | ... | integer  |
| node 2   | integer | integer | ... | integer  |
| ...      | ...     | ...     | ... | ...      |
| node $N$ | integer | integer | ... | integer  |

- + **n\_links**: matrix

|          | node 1  | node 2  | ... | node $N$ |
|----------|---------|---------|-----|----------|
| node 1   | integer | integer | ... | integer  |
| node 2   | integer | integer | ... | integer  |
| ...      | ...     | ...     | ... | ...      |
| node $N$ | integer | integer | ... | integer  |

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

| endpoint.1 | endpoint.2 | items     | weight  |
|------------|------------|-----------|---------|
| integer    | integer    | character | integer |

+ **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) | integer | integer | numeric | integer   | integer | numeric     | character |

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

|             | year 1  | year 2  | ... | year $Y$ |
|-------------|---------|---------|-----|----------|
| pattern 1   | integer | integer | ... | integer  |
| pattern 2   | integer | integer | ... | integer  |
| ...         | ...     | ...     | ... | ...      |
| pattern $P$ | integer | integer | ... | integer  |

+ **p\_links**: matrix

|             | pattern 1 | pattern 2 | ... | pattern $P$ |
|-------------|-----------|-----------|-----|-------------|
| pattern 1   | integer   | integer   | ... | integer     |
| pattern 2   | integer   | integer   | ... | integer     |
| ...         | ...       | ...       | ... | ...         |
| pattern $P$ | integer   | integer   | ... | integer     |

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

| endpoint.1 | endpoint.2 | items     | weight  | year    |
|------------|------------|-----------|---------|---------|
| integer    | integer    | character | integer | integer |

## Constructor

+ **transaction.analyzer**(**transactions**: TransactionSet, **items**: see data.frame below,

**target**: character, **min\_frequency**: 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       |

# Methods

- + **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, min\_frequency: numeric, min\_length: numeric, max\_length: numeric, arules: logical):** itemsets (class object from arules package) or data.frame

| pattern           | support | frequency |
|-------------------|---------|-----------|
| vector(character) | numeric | integer   |

- **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):** vector(integer)
- | end     | period  |
|---------|---------|
| integer | integer |
- **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)): integer
- **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    |
|---------|---------|---------|---------|---------|-----------|-----------|----------|---------|-------------|-----------|
| integer | vector  | integer | integer | numeric | integer   | integer   | integer  | integer | 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(integer) |
|-----|-----------------|
| 2   | vector(integer) |
| ... | ...             |
| P   | vector(integer) |

[[ "lengths" ]]:

| 1   | vector(integer) |
|-----|-----------------|
| 2   | vector(integer) |
| ... | ...             |
| P   | vector(integer) |

- + **frequency\_by\_complexity**(**patterns**: list(vector(character))): matrix

| complex | simple  |
|---------|---------|
| integer | integer |

+ **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  |
|---------|-------------------|---------|-----------|---------|
| integer | vector(character) | integer | integer   | integer |

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

| ID      | pattern           | year    | length  | support | frequency | weight  | specificity | status    | degree  |
|---------|-------------------|---------|---------|---------|-----------|---------|-------------|-----------|---------|
| integer | vector(character) | integer | integer | numeric | integer   | integer | numeric     | character | integer |

[["edges"]]: data.frame

| ID      | endpoint.1 | endpoint.2 | items     | weight  |
|---------|------------|------------|-----------|---------|
| integer | integer    | integer    | character | integer |

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

| ID      | endpoint.1 | endpoint.2 | items     | weight  | year    |
|---------|------------|------------|-----------|---------|---------|
| integer | integer    | integer    | character | integer | integer |

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

|                             | x       | y       |
|-----------------------------|---------|---------|
| vertex 1                    | numeric | numeric |
| vertex 2                    | numeric | numeric |
| ...                         | ...     | ...     |
| vertex <i>N</i> or <i>P</i> | 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 <i>N</i> or <i>P</i> | numeric | numeric |

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

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

+ **itemset\_chart**(**tnpc**: character or TransactionSet 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): TransactionSet or data.frame

| ID      | node              | length  | frequency |
|---------|-------------------|---------|-----------|
| integer | vector(character) | integer | integer   |

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

| ID      | pattern           | year    | length  | support | frequency | weight  | specificity | status    |
|---------|-------------------|---------|---------|---------|-----------|---------|-------------|-----------|
| integer | vector(character) | integer | integer | numeric | integer   | integer | 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    | frequency |
|-------------------|----|------------|---------|------------|---------|-----------|
| vector(character) | => | character  | numeric | numeric    | numeric | integer   |

or (**antecedent** and **consequent** types depend on the value of **as\_sets**; presence of **itemset** depends  
on the value of **itemsets**)

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

+ **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**: character or TransactionSet, **category**: character or numeric, **value**: character, **as\_indices**: logical): TransactionSet or named vector(integer)
  
- + **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):**  
TransactionSet or see attribute **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)