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Associate ^

Frequent Itemsets



Association Rules

Induction of association rules.

Inputs

- Data: Data set

Outputs

- Matching Data: Data instances matching the criteria.

This widget implements FP-growth **frequent pattern mining** (https://en.wikipedia.org/wiki/Association_rule_learning) algorithm [1] with bucketing optimization [2] for conditional databases of few items. For inducing classification rules, it generates rules for the entire itemset and skips the rules where the consequent does not match one of the class' values.

1. Information on the data set.

2. In *Find association rules* you can set criteria for rule induction:

- **Minimal support:** percentage of the entire data set covered by the entire rule (antecedent and consequent).
- **Minimal confidence:** proportion of the number of examples which fit the right side (consequent) among those that fit the left side (antecedent).
- **Max. number of rules:** limit the number of rules the algorithm generates. Too many rules can slow down the widget considerably. If *Induce classification (itemset → class) rules* is ticked, the widget will only generate rules that have a class value on the right-hand side (consequent) of the rule. If *Auto find rules is on*, the widget will run the search at every change of parameters. Might be slow for data sets with many attributes, so pressing *Find rules* only when the parameters are set is a good idea.



3. Filter rules by

Antecedent:

- **Contains:** will filter rules by matching space-separated **regular expressions** (https://en.wikipedia.org/wiki/Regular_expression) in antecedent items.
- **Min. items:** minimum number of items that have to appear in an antecedent.
- **Max. items:** maximum number of items that can appear in an antecedent.

Consequent:

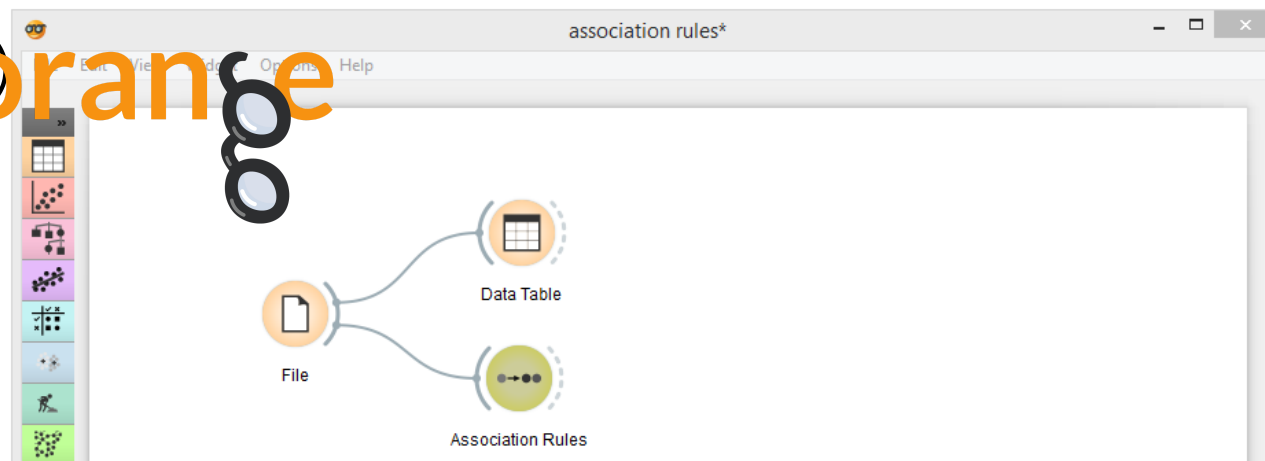
- **Contains:** will filter rules by matching space-separated regular expressions in consequent items.
- **Min. items:** minimum number of items that have to appear in a consequent.
- **Max. items:** maximum number of items that can appear in a consequent.

If *Apply these filters in search* is ticked, the widget will limit the rule generation only to rules that match the filters. If unchecked, all rules are generated, but only the matching are shown.

4. If *Auto send selection is on*, data instances that match the selected association rules are output automatically. Alternatively press *Send selection*.

Example

Association Rules can be used directly with the **File (.../data/file/)** widget.



Info

Number of rules: 10000

Filtered rules: 10000

Selected rules: 1

Selected examples: 56

Find association rules

Minimal support: 0.05%

Minimal confidence: 70%

Max. number of rules: 10000

☐ Induce classification (itemset → class) rules

☒ Auto find rules is on

Filter rules

Antecedent

Contains:

Min. items: 1 Max. items: 999

Consequent

Contains:

Min. items: 1 Max. items: 999

☒ Apply these filters in search

☒ Auto send selection is on

Association Rules

Supp	Conf	Covr	Strg	Lift	Levr	Antecedent	Consequent
0.01	0.70	0.01	31.41	2.74	0.00	tropical fruit, yogurt, root vegetables	whole milk
0.00	0.70	0.00	125.65	2.74	0.00	yogurt, other vegetables, bottled water, root vegetables	whole milk
0.00	0.75	0.00	209.42	2.94	0.00	yogurt, rolls/buns, bottled water, root vegetables	whole milk
0.00	0.75	0.00	314.12	2.94	0.00	yogurt, other vegetables, rolls/buns, bottled water, root vegetables	whole milk
0.00	0.77	0.00	146.38	3.98	0.00	yogurt, rolls/buns, soda, root vegetables	other vegetables
0.00	0.70	0.00	103.20	6.67	0.00	yogurt, whole milk, other vegetables, rolls/buns, bottled water	tropical fruit
0.00	0.88	0.00	171.50	6.27	0.00	tropical fruit, whole milk, other vegetables, rolls/buns, bottled water	yogurt
0.00	0.70	0.00	251.30	2.74	0.00	tropical fruit, yogurt, other vegetables, rolls/buns, bottled water	whole milk
0.00	0.70	0.00	190.30	3.62	0.00	tropical fruit, yogurt, whole milk, rolls/buns, soda	other vegetables
0.00	0.77	0.00	105.54	5.51	0.00	tropical fruit, rolls/buns, bottled water, soda	yogurt
0.00	0.83	0.00	228.67	5.97	0.00	tropical fruit, other vegetables, rolls/buns, bottled water, soda	yogurt
0.00	0.71	0.00	51.29	2.80	0.00	tropical fruit, yogurt, other vegetables, root vegetables	whole milk
0.00	0.81	0.00	93.07	3.19	0.00	tropical fruit, yogurt, rolls/buns, root vegetables	whole milk
0.00	0.72	0.00	139.61	2.83	0.00	tropical fruit, yogurt, other vegetables, rolls/buns, root vegetables	whole milk
0.00	0.70	0.00	51.60	6.67	0.00	yogurt, other vegetables, bottled water, root vegetables	tropical fruit
0.00	0.79	0.00	73.71	7.49	0.00	yogurt, whole milk, other vegetables, bottled water, root vegetables	tropical fruit
0.00	0.79	0.00	179.50	3.08	0.00	tropical fruit, yogurt, other vegetables, bottled water, root vegetables	whole milk
0.00	0.73	0.00	126.87	3.79	0.00	tropical fruit, yogurt, whole milk, bottled water, root vegetables	other vegetables
0.00	0.92	0.00	209.42	3.59	0.00	tropical fruit, rolls/buns, bottled water, root vegetables	whole milk
0.00	0.89	0.00	114.67	8.47	0.00	yogurt, whole milk, rolls/buns, bottled water, root vegetables	tropical fruit
0.00	0.73	0.00	124.73	5.21	0.00	tropical fruit, whole milk, rolls/buns, bottled water, root vegetables	yogurt
0.00	1.00	0.00	314.12	3.91	0.00	tropical fruit, yogurt, rolls/buns, bottled water, root vegetables	whole milk
0.00	0.83	0.00	228.67	5.97	0.00	tropical fruit, other vegetables, rolls/buns, bottled water, root vegetables	yogurt
0.00	0.83	0.00	418.83	3.26	0.00	tropical fruit, other vegetables, rolls/buns, bottled water, root vegetables	whole milk
0.00	0.83	0.00	172.00	7.94	0.00	yogurt, whole milk, other vegetables, rolls/buns, bottled water, root vegetables	tropical fruit
0.00	1.00	0.00	274.40	7.17	0.00	tropical fruit, whole milk, other vegetables, rolls/buns, bottled water, root vegetables	yogurt
0.00	1.00	0.00	502.60	3.91	0.00	tropical fruit, yogurt, other vegetables, rolls/buns, bottled water, root vegetables	whole milk
0.00	0.83	0.00	91.83	14.87	0.00	tropical fruit, other vegetables, rolls/buns, bottled water, root vegetables	yogurt, whole milk
0.00	0.71	0.00	153.14	6.55	0.00	tropical fruit, yogurt, whole milk, other vegetables, rolls/buns, bottled water	root vegetables
0.00	0.75	0.00	158.58	3.88	0.00	tropical fruit, rolls/buns, soda, root vegetables	other vegetables
0.00	0.71	0.00	258.42	2.88	0.00	tropical fruit, yogurt, other vegetables, soda, root vegetables	rolls/buns

References and further reading

[1]: J. Han, J. Pei, Y. Yin, R. Mao. (2004) Mining Frequent Patterns without Candidate Generation: A Frequent-Pattern Tree Approach http://www.cs.sfu.ca/~jpei/publications/dami03_fpgrowth.pdf.
 [2]: R. Agrawal, C. Aggarwal, V. Prasad. (2000) Depth first generation of long patterns
 (<https://www.cs.bham.ac.uk/~fiat/dmsem03/Depth%20First%20Generation%20of%20Long%20Patterns%20-%202000.pdf>).

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