

Transaction Data and Association Rules

Example: Identifying Frequently-Purchased Groceries

```
library(arules)
```

```
## Loading required package: Matrix
```

```
##
```

```
## Attaching package: 'arules'
```

```
## The following objects are masked from 'package:base':
```

```
##
```

```
##      abbreviate, write
```

```
library(arulesViz)
```

```
## Loading required package: grid
```

```
library(DT)
```

Step 2: Exploring and preparing the data

Load the grocery data into a sparse matrix.

```
groceries <- read.transactions("groceries.csv", sep = ",")
summary(groceries)
```

```
## transactions as itemMatrix in sparse format with
```

```
## 9835 rows (elements/itemsets/transactions) and
```

```
## 169 columns (items) and a density of 0.02609146
```

```
##
```

```
## most frequent items:
```

```
##      whole milk other vegetables      rolls/buns      soda
```

```
##           2513           1903           1809           1715
```

```
##           yogurt      (Other)
```

```
##           1372           34055
```

```
##
```

```
## element (itemset/transaction) length distribution:
```

```
## sizes
```

```
##      1      2      3      4      5      6      7      8      9     10     11     12     13     14     15
```

```
## 2159 1643 1299 1005  855  645  545  438  350  246  182  117  78  77  55
```

```
##      16     17     18     19     20     21     22     23     24     26     27     28     29     32
```

```
##      46     29     14     14      9     11      4      6      1      1      1      1      3      1
```

```
##
```

```
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
```

```
##      1.000  2.000   3.000   4.409  6.000  32.000
```

```
##
```

```
## includes extended item information - examples:
```

```
##           labels
```

```
## 1 abrasive cleaner
```

```
## 2 artif. sweetener
```

```
## 3  baby cosmetics
```

Look at the first five transactions.

```
inspect(groceries[1:5])
```

```
##      items
## [1] {citrus fruit,
##      margarine,
##      ready soups,
##      semi-finished bread}
## [2] {coffee,
##      tropical fruit,
##      yogurt}
## [3] {whole milk}
## [4] {cream cheese,
##      meat spreads,
##      pip fruit,
##      yogurt}
## [5] {condensed milk,
##      long life bakery product,
##      other vegetables,
##      whole milk}
```

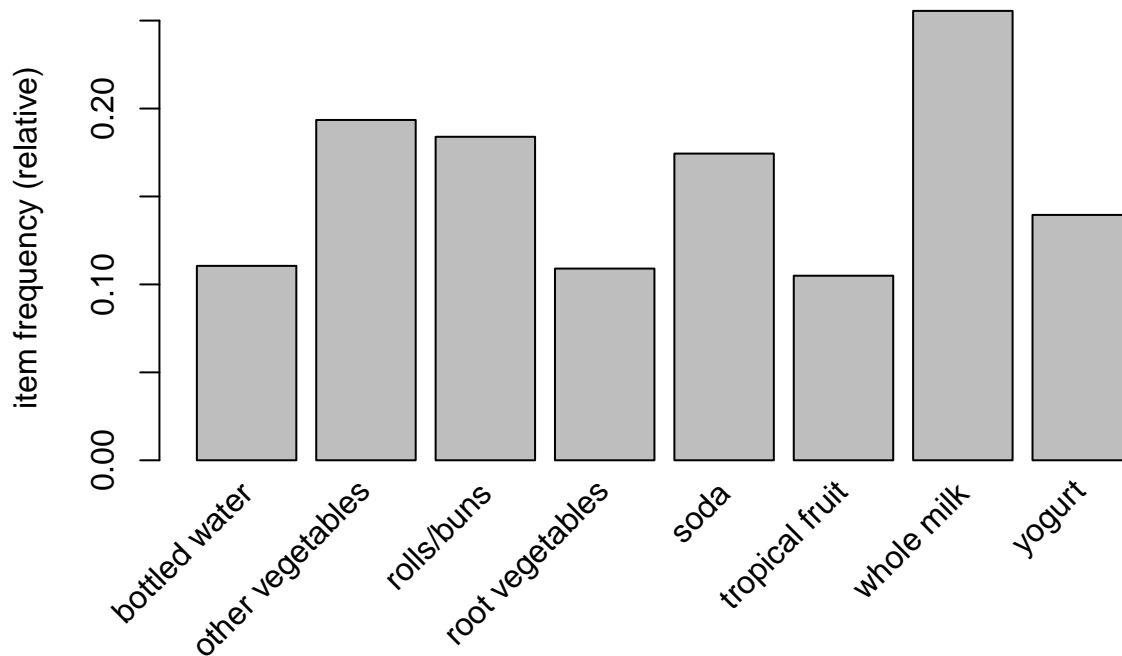
Examine the frequency of items.

```
itemFrequency(groceries[, 1:3])
```

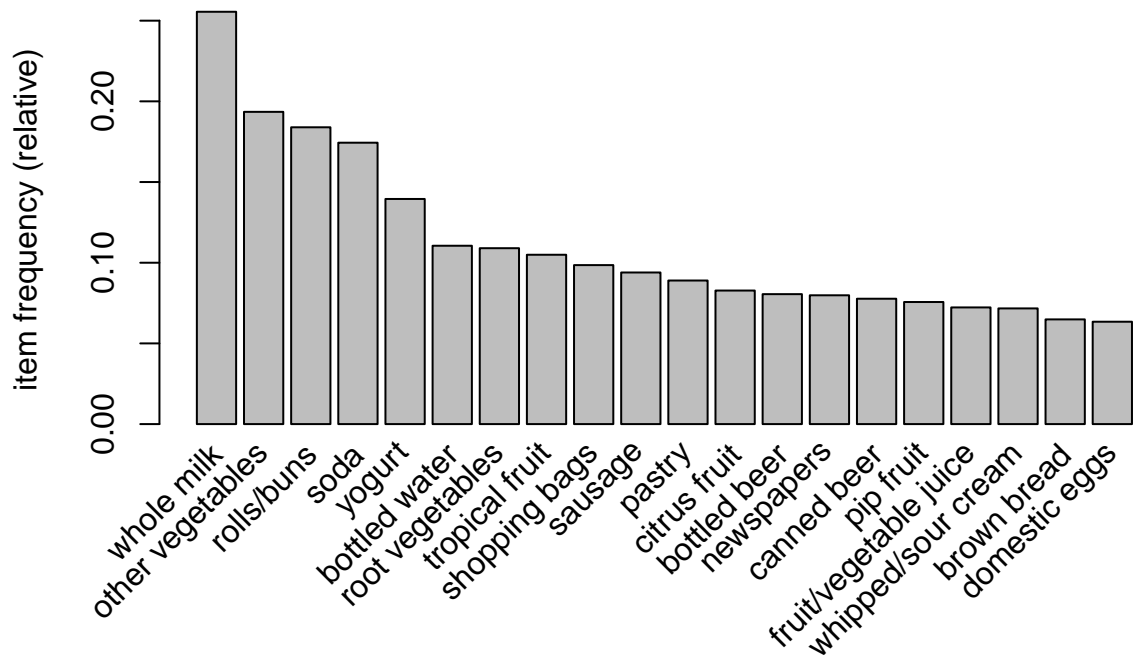
```
## abrasive cleaner artif. sweetener  baby cosmetics
##      0.0035587189      0.0032536858      0.0006100661
```

plot the frequency of items

```
itemFrequencyPlot(groceries, support = 0.1)
```

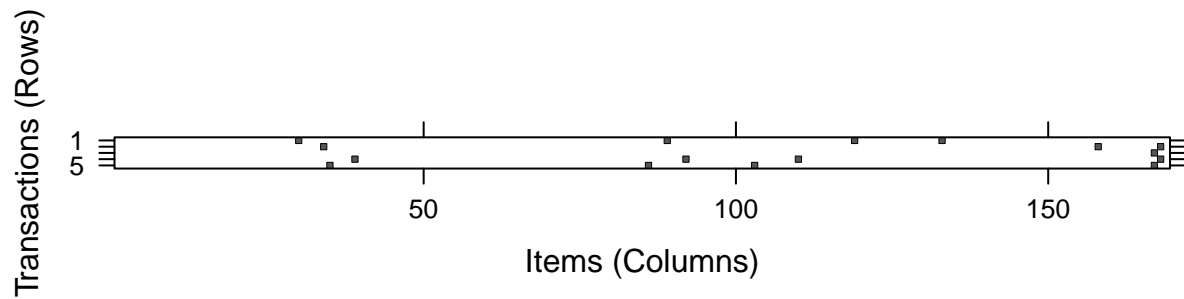


```
itemFrequencyPlot(groceries, topN = 20)
```



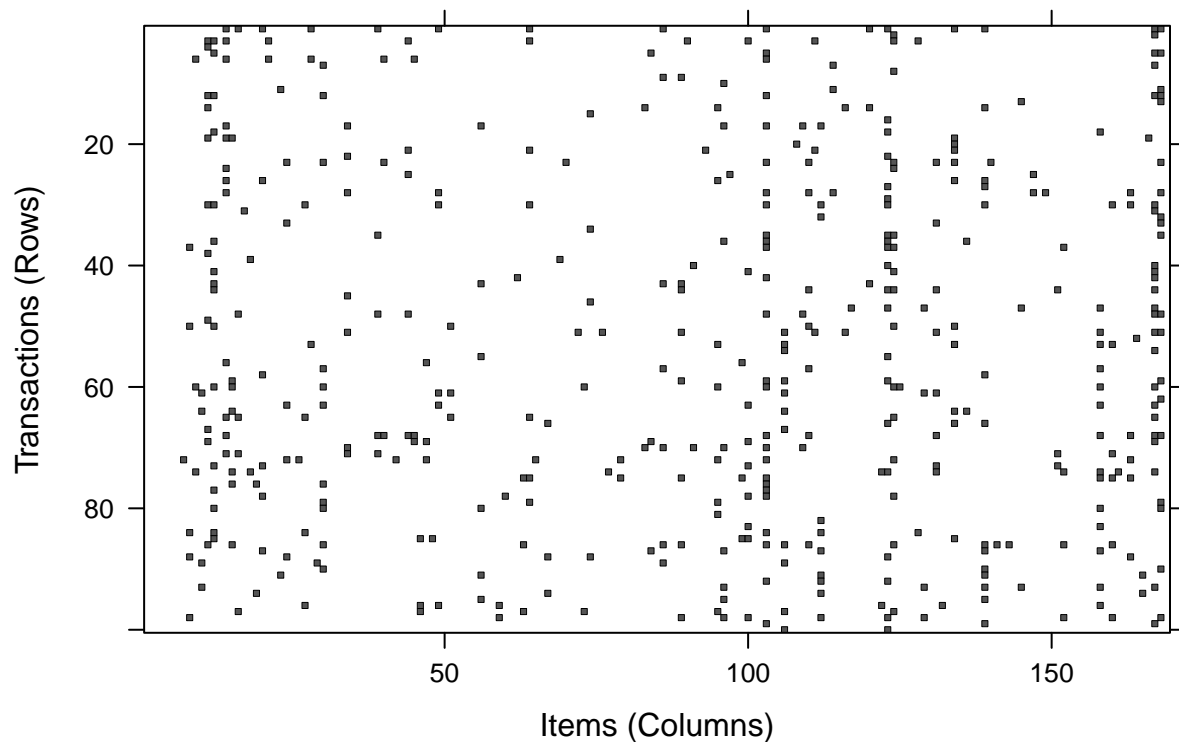
A visualization of the sparse matrix for the first five transactions.

```
image(groceries[1:5])
```



Visualization of a random sample of 100 transactions.

```
image(sample(groceries, 100))
```



Step 3: Training a model on the data

Default settings result in zero rules learned. See that no rules are produced.

```
apriori(groceries)
```

```
## Apriori
##
## Parameter specification:
## confidence minval smax arem aval originalSupport maxtime support minlen
##      0.8      0.1    1 none FALSE          TRUE      5      0.1      1
## maxlen target   ext
##      10  rules FALSE
##
## Algorithmic control:
## filter tree heap memopt load sort verbose
##    0.1 TRUE TRUE  FALSE TRUE    2    TRUE
##
## Absolute minimum support count: 983
##
## set item appearances ...[0 item(s)] done [0.00s].
## set transactions ...[169 item(s), 9835 transaction(s)] done [0.00s].
## sorting and recoding items ... [8 item(s)] done [0.00s].
## creating transaction tree ... done [0.00s].
## checking subsets of size 1 2 done [0.00s].
## writing ... [0 rule(s)] done [0.00s].
## creating S4 object ... done [0.00s].
##
## set of 0 rules
```

Set better support and confidence levels to learn more rules.

```
groceryrules <- apriori(groceries, parameter = list(support =
  0.006, confidence = 0.25, minlen = 2))

## Apriori
##
## Parameter specification:
## confidence minval smax arem aval originalSupport maxtime support minlen
##      0.25    0.1    1 none FALSE          TRUE      5  0.006      2
## maxlen target   ext
##      10 rules FALSE
##
## Algorithmic control:
## filter tree heap memopt load sort verbose
##    0.1 TRUE TRUE  FALSE TRUE    2    TRUE
##
## Absolute minimum support count: 59
##
## set item appearances ...[0 item(s)] done [0.00s].
## set transactions ...[169 item(s), 9835 transaction(s)] done [0.00s].
## sorting and recoding items ... [109 item(s)] done [0.00s].
## creating transaction tree ... done [0.00s].
## checking subsets of size 1 2 3 4 done [0.00s].
## writing ... [463 rule(s)] done [0.00s].
## creating S4 object ... done [0.00s].

groceryrules

## set of 463 rules
```

Step 4: Evaluating model performance

Summary of grocery association rules.

```
summary(groceryrules)

## set of 463 rules
##
## rule length distribution (lhs + rhs):sizes
##    2    3    4
## 150 297   16
##
##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    2.000   2.000   3.000   2.711   3.000   4.000
##
## summary of quality measures:
##      support      confidence      lift      count
##  Min.   :0.006101  Min.   :0.2500  Min.   :0.9932  Min.   : 60.0
## 1st Qu.:0.007117  1st Qu.:0.2971  1st Qu.:1.6229  1st Qu.: 70.0
##  Median :0.008744  Median :0.3554  Median :1.9332  Median : 86.0
##   Mean  :0.011539   Mean  :0.3786   Mean  :2.0351   Mean  :113.5
## 3rd Qu.:0.012303   3rd Qu.:0.4495   3rd Qu.:2.3565   3rd Qu.:121.0
##   Max.  :0.074835   Max.  :0.6600   Max.  :3.9565   Max.  :736.0
##
```

```
## mining info:
##      data ntransactions support confidence
## groceries      9835    0.006      0.25
```

Look at the first three rules.

```
inspect(groceryrules[1:10])
```

```
##      lhs                      rhs          support    confidence
## [1] {potted plants}          => {whole milk}      0.006914082 0.4000000
## [2] {pasta}                  => {whole milk}      0.006100661 0.4054054
## [3] {herbs}                  => {root vegetables} 0.007015760 0.4312500
## [4] {herbs}                  => {other vegetables} 0.007727504 0.4750000
## [5] {herbs}                  => {whole milk}      0.007727504 0.4750000
## [6] {processed cheese}       => {whole milk}      0.007015760 0.4233129
## [7] {semi-finished bread}    => {whole milk}      0.007117438 0.4022989
## [8] {beverages}              => {whole milk}      0.006812405 0.2617188
## [9] {detergent}              => {other vegetables} 0.006405694 0.3333333
## [10] {detergent}             => {whole milk}      0.008947636 0.4656085
##      lift      count
## [1] 1.565460 68
## [2] 1.586614 60
## [3] 3.956477 69
## [4] 2.454874 76
## [5] 1.858983 76
## [6] 1.656698 69
## [7] 1.574457 70
## [8] 1.024275 67
## [9] 1.722719 63
## [10] 1.822228 88
```

Sort rules by support.

```
top.support <- sort(groceryrules, decreasing = TRUE, na.last = NA, by = "support")
inspect(head(top.support, 10))
```

```
##      lhs                      rhs          support    confidence
## [1] {other vegetables} => {whole milk}      0.07483477 0.3867578
## [2] {whole milk}       => {other vegetables} 0.07483477 0.2928770
## [3] {rolls/buns}       => {whole milk}      0.05663447 0.3079049
## [4] {yogurt}            => {whole milk}      0.05602440 0.4016035
## [5] {root vegetables}   => {whole milk}      0.04890696 0.4486940
## [6] {root vegetables}   => {other vegetables} 0.04738180 0.4347015
## [7] {yogurt}            => {other vegetables} 0.04341637 0.3112245
## [8] {tropical fruit}    => {whole milk}      0.04229792 0.4031008
## [9] {tropical fruit}    => {other vegetables} 0.03589222 0.3420543
## [10] {bottled water}    => {whole milk}      0.03436706 0.3109476
##      lift      count
## [1] 1.513634 736
## [2] 1.513634 736
## [3] 1.205032 557
## [4] 1.571735 551
## [5] 1.756031 481
## [6] 2.246605 466
## [7] 1.608457 427
## [8] 1.577595 416
```

```
## [9] 1.767790 353
## [10] 1.216940 338
```

Sort rules by confidence.

```
top.confidence <- sort(groceryrules, decreasing = TRUE, na.last = NA, by = "confidence")
inspect(head(top.confidence, 10))
```

##	lhs	rhs	support	confidence	lift	count
## [1]	{butter,					
##	whipped/sour cream}	=> {whole milk}	0.006710727	0.6600000	2.583008	66
## [2]	{butter,					
##	yogurt}	=> {whole milk}	0.009354347	0.6388889	2.500387	92
## [3]	{butter,					
##	root vegetables}	=> {whole milk}	0.008235892	0.6377953	2.496107	81
## [4]	{curd,					
##	tropical fruit}	=> {whole milk}	0.006507372	0.6336634	2.479936	64
## [5]	{butter,					
##	tropical fruit}	=> {whole milk}	0.006202339	0.6224490	2.436047	61
## [6]	{other vegetables,					
##	tropical fruit,					
##	yogurt}	=> {whole milk}	0.007625826	0.6198347	2.425816	75
## [7]	{domestic eggs,					
##	tropical fruit}	=> {whole milk}	0.006914082	0.6071429	2.376144	68
## [8]	{other vegetables,					
##	root vegetables,					
##	yogurt}	=> {whole milk}	0.007829181	0.6062992	2.372842	77
## [9]	{domestic eggs,					
##	root vegetables}	=> {whole milk}	0.008540925	0.5957447	2.331536	84
## [10]	{citrus fruit,					
##	root vegetables}	=> {other vegetables}	0.010371124	0.5862069	3.029608	102

Sort rules by lift.

```
top.lift <- sort(groceryrules, decreasing = TRUE, na.last = NA, by = "lift")
inspect(head(top.lift, 10))
```

##	lhs	rhs	support	confidence	lift	count
## [1]	{herbs}	=> {root vegetables}	0.007015760	0.4312500	3.956477	69
## [2]	{berries}	=> {whipped/sour cream}	0.009049314	0.2721713	3.796886	89
## [3]	{other vegetables,					
##	tropical fruit,					
##	whole milk}	=> {root vegetables}	0.007015760	0.4107143	3.768074	69
## [4]	{beef,					
##	other vegetables}	=> {root vegetables}	0.007930859	0.4020619	3.688692	78
## [5]	{other vegetables,					
##	tropical fruit}	=> {pip fruit}	0.009456024	0.2634561	3.482649	93
## [6]	{beef,					
##	whole milk}	=> {root vegetables}	0.008032537	0.3779904	3.467851	79
## [7]	{other vegetables,					
##	pip fruit}	=> {tropical fruit}	0.009456024	0.3618677	3.448613	93
## [8]	{pip fruit,					
##	yogurt}	=> {tropical fruit}	0.006405694	0.3559322	3.392048	63
## [9]	{citrus fruit,					
##	other vegetables}	=> {root vegetables}	0.010371124	0.3591549	3.295045	102
## [10]	{other vegetables,					

```
##      whole milk,
##      yogurt}          => {tropical fruit}      0.007625826  0.3424658 3.263712      75
```

With a data.table

```
inspectDT(groceryrules)
```

save table as a html page.

```
p <- inspectDT(groceryrules)
```

```
htmlwidgets::saveWidget(p, "arules.html", selfcontained = FALSE)
```

```
browseURL("arules.html")
```

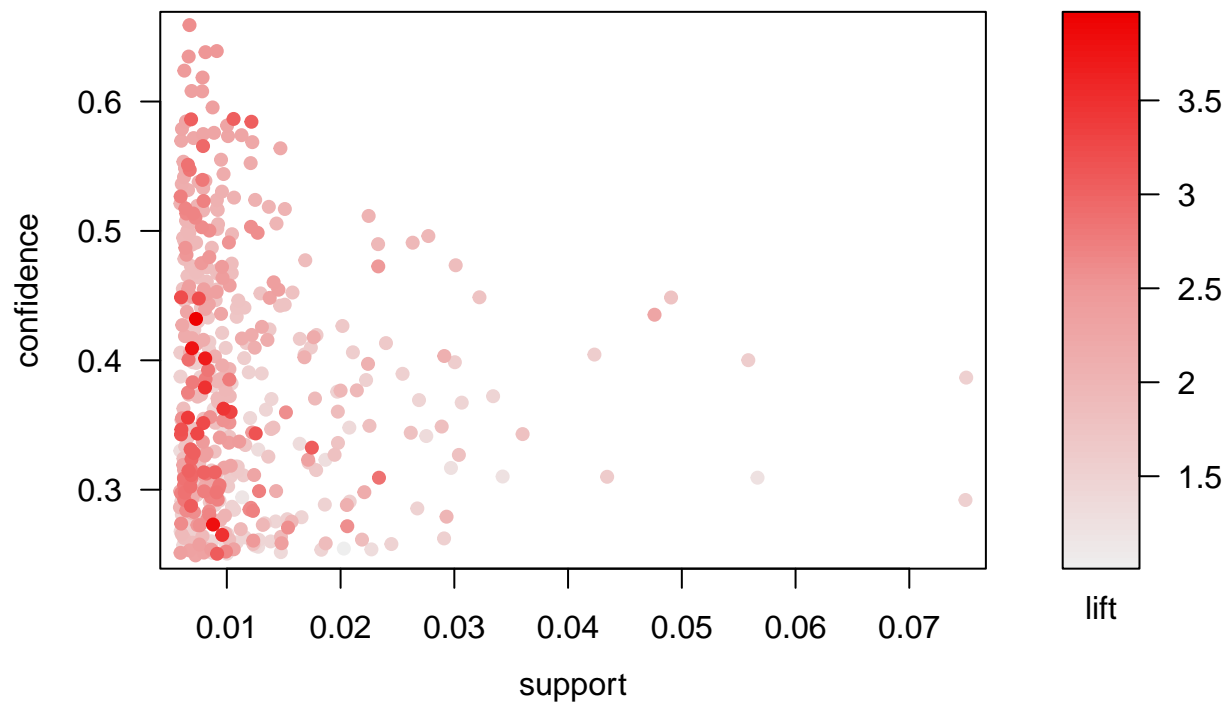
Read about the arulesViz package arulesViz.

Plot support and confidence and support and lift.

```
plot(groceryrules)
```

To reduce overplotting, jitter is added! Use jitter = 0 to prevent jitter.

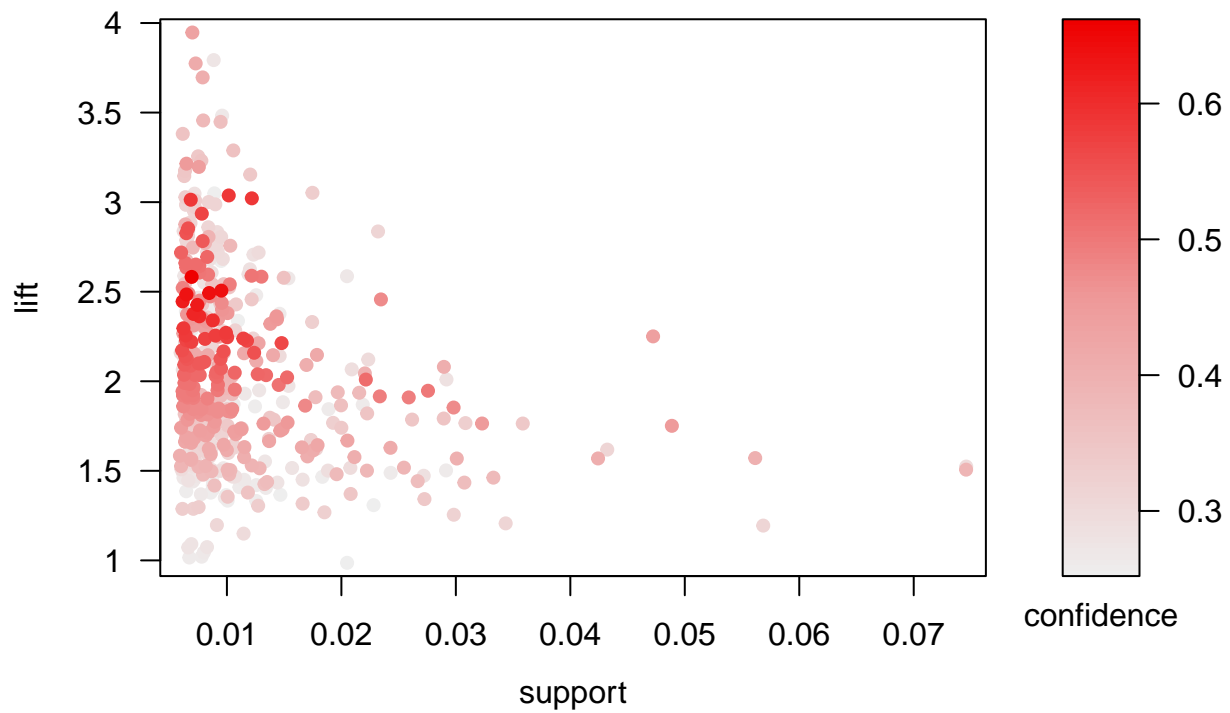
Scatter plot for 463 rules



```
plot(groceryrules, measure = c("support", "lift"), shading = "confidence")
```

To reduce overplotting, jitter is added! Use jitter = 0 to prevent jitter.

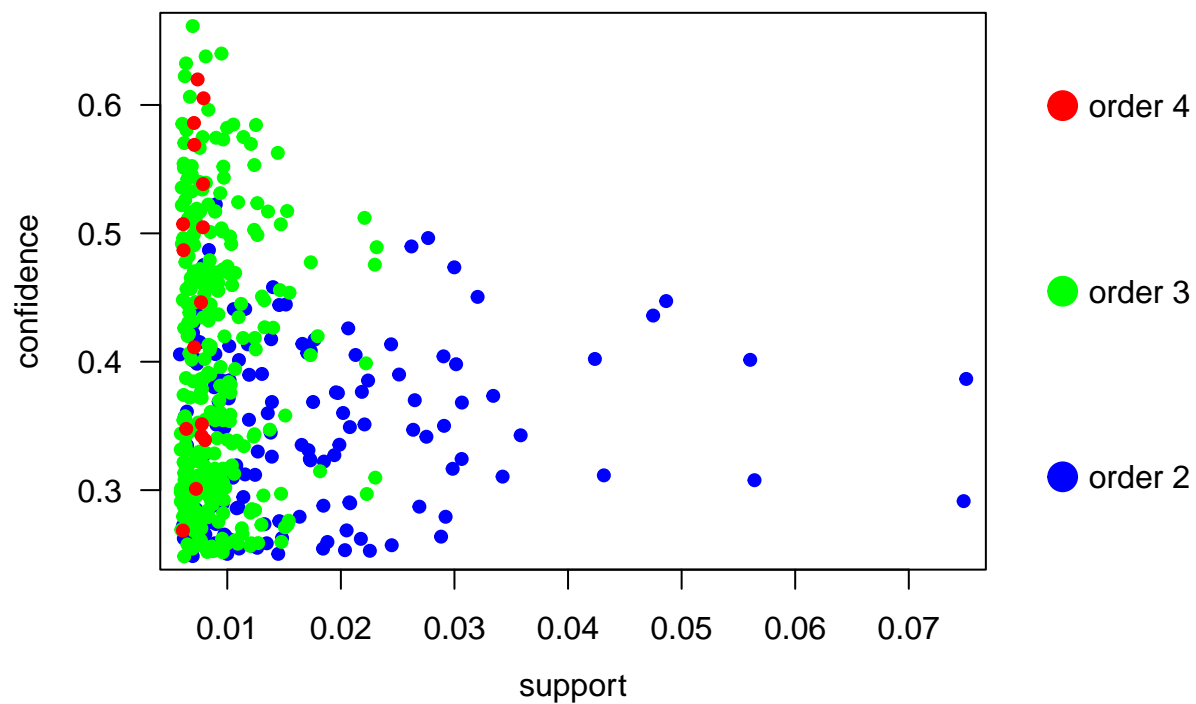
Scatter plot for 463 rules



```
plot(groceryrules, method = "two-key plot")
```

To reduce overplotting, jitter is added! Use jitter = 0 to prevent jitter.

Two-key plot



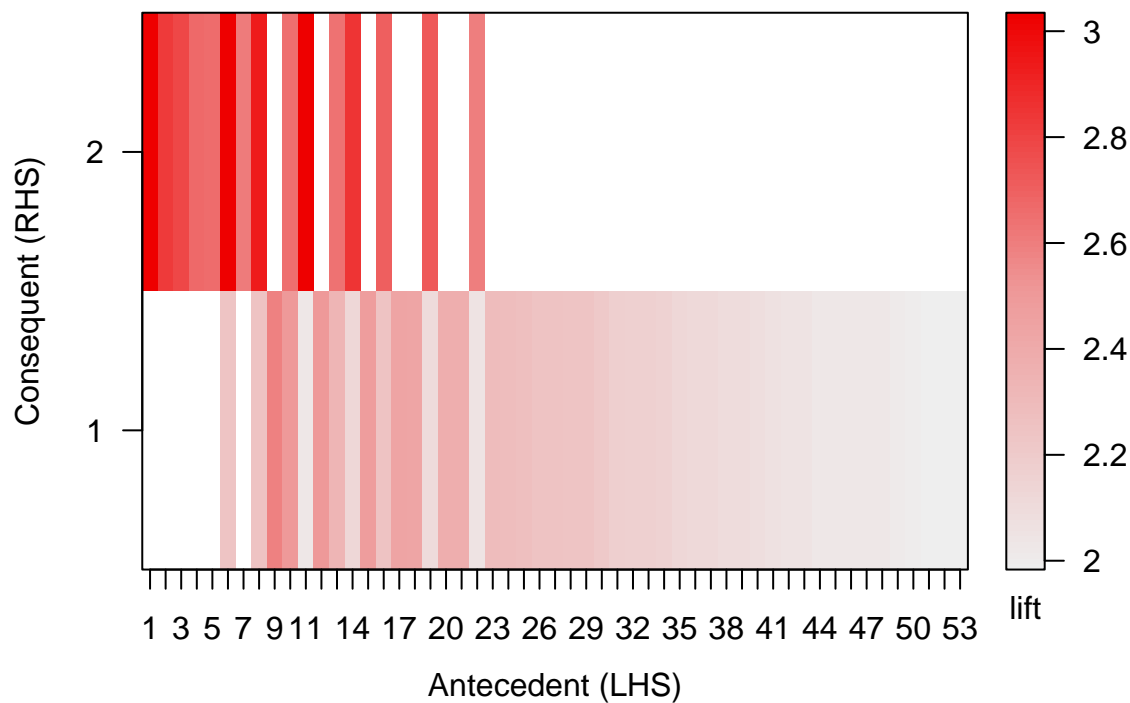
```
subrules <- groceryrules[quality(groceryrules)$confidence > 0.5]
```

```
plot(subrules, method = "matrix", measure = "lift")
```

```
## Itemsets in Antecedent (LHS)
## [1] "{root vegetables,tropical fruit,whole milk}"
## [2] "{onions,whole milk}"
## [3] "{root vegetables,whole milk,yogurt}"
## [4] "{root vegetables,shopping bags}"
## [5] "{pork,root vegetables}"
## [6] "{root vegetables,tropical fruit}"
## [7] "{tropical fruit,whole milk,yogurt}"
## [8] "{tropical fruit,whipped/sour cream}"
## [9] "{butter,whipped/sour cream}"
## [10] "{butter,root vegetables}"
## [11] "{citrus fruit,root vegetables}"
## [12] "{butter,yogurt}"
## [13] "{domestic eggs,root vegetables}"
## [14] "{fruit/vegetable juice,root vegetables}"
## [15] "{curd,tropical fruit}"
## [16] "{pip fruit,root vegetables}"
## [17] "{butter,tropical fruit}"
## [18] "{other vegetables,tropical fruit,yogurt}"
## [19] "{frozen vegetables,root vegetables}"
## [20] "{domestic eggs,tropical fruit}"
## [21] "{other vegetables,root vegetables,yogurt}"
## [22] "{rolls/buns,root vegetables}"
## [23] "{other vegetables,sugar}"
## [24] "{curd,yogurt}"
## [25] "{citrus fruit,whipped/sour cream}"
## [26] "{curd,other vegetables}"
## [27] "{butter,other vegetables}"
## [28] "{other vegetables,root vegetables,tropical fruit}"
## [29] "{curd,root vegetables}"
## [30] "{root vegetables,yogurt}"
## [31] "{frankfurter,yogurt}"
## [32] "{root vegetables,whipped/sour cream}"
## [33] "{domestic eggs,other vegetables}"
## [34] "{pork,rolls/buns}"
## [35] "{frozen vegetables,other vegetables}"
## [36] "{domestic eggs,yogurt}"
## [37] "{margarine,rolls/buns}"
## [38] "{rolls/buns,whipped/sour cream}"
## [39] "{cream cheese,yogurt}"
## [40] "{pip fruit,yogurt}"
## [41] "{whipped/sour cream,yogurt}"
## [42] "{baking powder}"
## [43] "{beef,yogurt}"
## [44] "{sausage,tropical fruit}"
## [45] "{other vegetables,pip fruit}"
## [46] "{tropical fruit,yogurt}"
## [47] "{pastry,yogurt}"
## [48] "{root vegetables,sausage}"
## [49] "{other vegetables,yogurt}"
```

```
## [50] "{other vegetables,rolls/buns,root vegetables}"
## [51] "{pastry,tropical fruit}"
## [52] "{other vegetables,whipped/sour cream}"
## [53] "{fruit/vegetable juice,yogurt}"
## Itemsets in Consequent (RHS)
## [1] "{whole milk}"      "{other vegetables}"
```

Matrix with 62 rules



```
plot(subrules, method = "matrix3D", measure = "lift")
```

```
## Warning in plot.rules(subrules, method = "matrix3D", measure = "lift"):  
## method 'matrix3D' is deprecated use method 'matrix' with engine '3d'
```

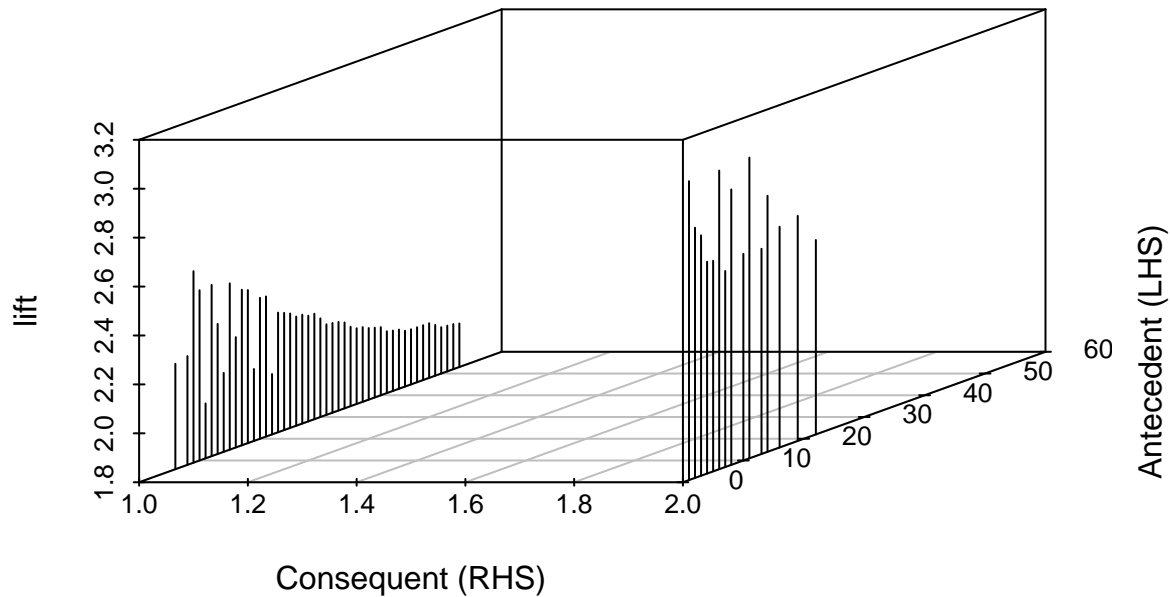
```
## Itemsets in Antecedent (LHS)
## [1] "{root vegetables,tropical fruit,whole milk}"
## [2] "{onions,whole milk}"
## [3] "{root vegetables,whole milk,yogurt}"
## [4] "{root vegetables,shopping bags}"
## [5] "{pork,root vegetables}"
## [6] "{root vegetables,tropical fruit}"
## [7] "{tropical fruit,whole milk,yogurt}"
## [8] "{tropical fruit,whipped/sour cream}"
## [9] "{butter,whipped/sour cream}"
## [10] "{butter,root vegetables}"
## [11] "{citrus fruit,root vegetables}"
## [12] "{butter,yogurt}"
## [13] "{domestic eggs,root vegetables}"
## [14] "{fruit/vegetable juice,root vegetables}"
## [15] "{curd,tropical fruit}"
## [16] "{pip fruit,root vegetables}"
## [17] "{butter,tropical fruit}"
```

```

## [18] "{other vegetables,tropical fruit,yogurt}"
## [19] "{frozen vegetables,root vegetables}"
## [20] "{domestic eggs,tropical fruit}"
## [21] "{other vegetables,root vegetables,yogurt}"
## [22] "{rolls/buns,root vegetables}"
## [23] "{other vegetables,sugar}"
## [24] "{curd,yogurt}"
## [25] "{citrus fruit,whipped/sour cream}"
## [26] "{curd,other vegetables}"
## [27] "{butter,other vegetables}"
## [28] "{other vegetables,root vegetables,tropical fruit}"
## [29] "{curd,root vegetables}"
## [30] "{root vegetables,yogurt}"
## [31] "{frankfurter,yogurt}"
## [32] "{root vegetables,whipped/sour cream}"
## [33] "{domestic eggs,other vegetables}"
## [34] "{pork,rolls/buns}"
## [35] "{frozen vegetables,other vegetables}"
## [36] "{domestic eggs,yogurt}"
## [37] "{margarine,rolls/buns}"
## [38] "{rolls/buns,whipped/sour cream}"
## [39] "{cream cheese,yogurt}"
## [40] "{pip fruit,yogurt}"
## [41] "{whipped/sour cream,yogurt}"
## [42] "{baking powder}"
## [43] "{beef,yogurt}"
## [44] "{sausage,tropical fruit}"
## [45] "{other vegetables,pip fruit}"
## [46] "{tropical fruit,yogurt}"
## [47] "{pastry,yogurt}"
## [48] "{root vegetables,sausage}"
## [49] "{other vegetables,yogurt}"
## [50] "{other vegetables,rolls/buns,root vegetables}"
## [51] "{pastry,tropical fruit}"
## [52] "{other vegetables,whipped/sour cream}"
## [53] "{fruit/vegetable juice,yogurt}"
## Itemsets in Consequent (RHS)
## [1] "{whole milk}"          "{other vegetables}"

```

Matrix with 62 rules



```
plot(groceryrules, method = "grouped")
```

Grouped Matrix for 463 Rules



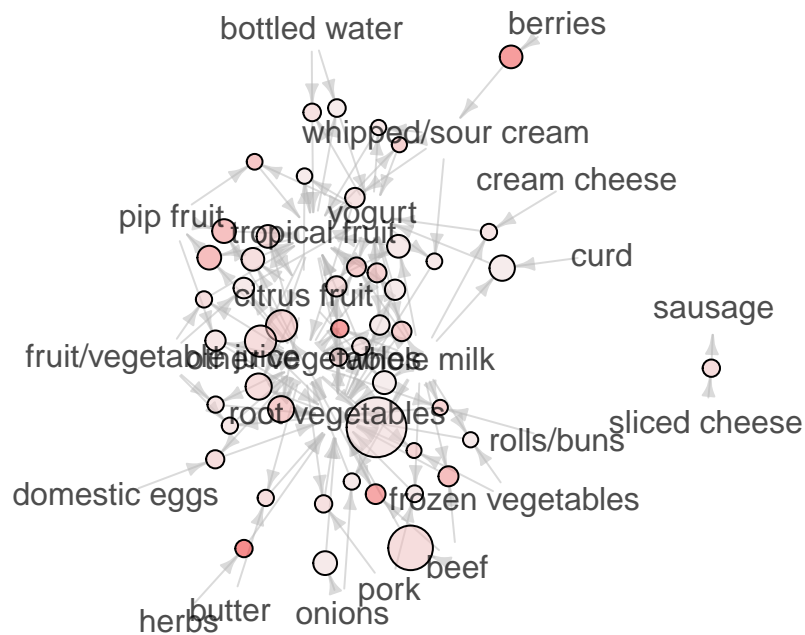
Network plot and Parallel Coordinates plot.

```
subrules2 <- head(groceryrules, n = 50, by = "lift")
```

```
plot(subrules2, method = "graph")
```

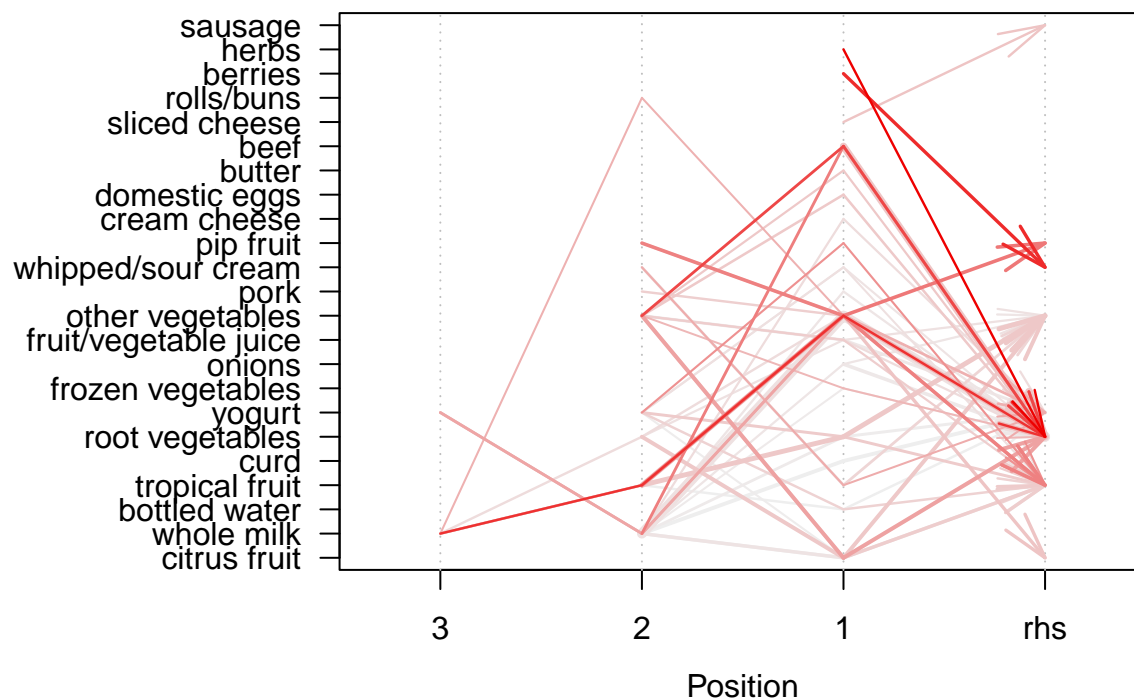
Graph for 50 rules

size: support (0.006 – 0.023)
color: lift (2.752 – 3.956)



```
plot(subrules2, method = "paracord")
```

Parallel coordinates plot for 50 rules

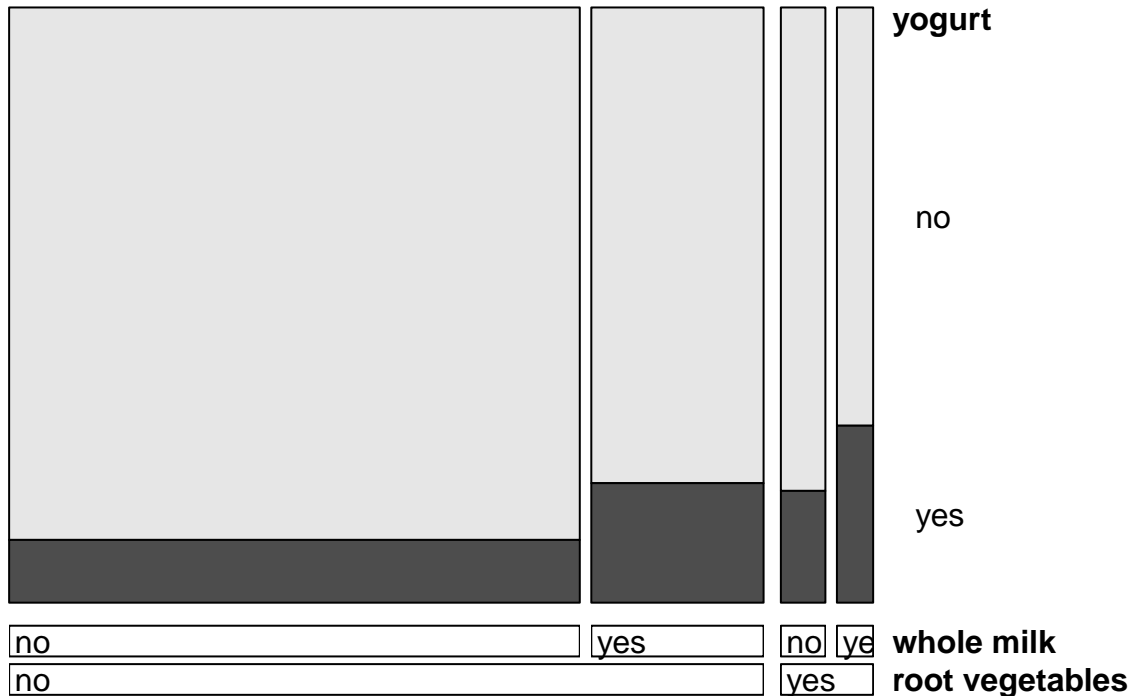


```
oneRule <- sample(groceryrules, 1)
inspect(oneRule)
```

```
##      lhs                                rhs      support   confidence
## [1] {root vegetables,whole milk} => {yogurt} 0.01453991 0.2972973
##      lift      count
## [1] 2.131136 143
```

```
plot(oneRule, method = "doubledecker", data = groceries)
```

Doubledecker plot for 1 rule



Step 5: Improving model performance

Sorting grocery rules by lift.

```
inspect(sort(groceryrules, by = "lift")[1:5])
```

```
##      lhs                                rhs      support confidence   lift count
## [1] {herbs}                            => {root vegetables} 0.007015760 0.4312500 3.956477    69
## [2] {berries}                          => {whipped/sour cream} 0.009049314 0.2721713 3.796886    89
## [3] {other vegetables,                  => {root vegetables} 0.007015760 0.4107143 3.768074    69
##      tropical fruit,
##      whole milk}
## [4] {beef,                             => {root vegetables} 0.007930859 0.4020619 3.688692    78
##      other vegetables}
## [5] {other vegetables,                  => {pip fruit} 0.009456024 0.2634561 3.482649    93
##      tropical fruit}
```

Finding subsets of rules containing any berry items.

```
berryrules <- subset(groceryrules, items %in% "berries")
```

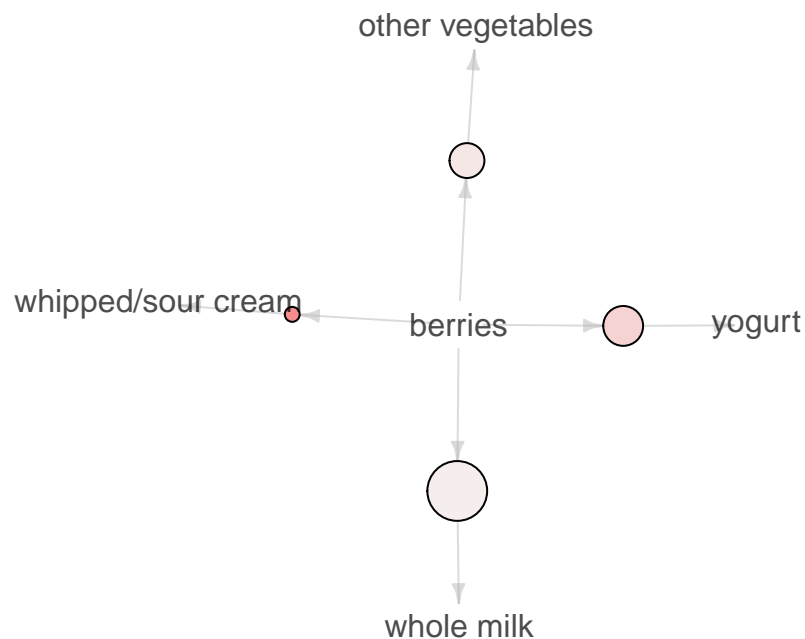
```
inspect(berryrules)
```

```
##      lhs      rhs      support    confidence lift
## [1] {berries} => {whipped/sour cream} 0.009049314 0.2721713 3.796886
## [2] {berries} => {yogurt}             0.010574479 0.3180428 2.279848
## [3] {berries} => {other vegetables}    0.010269446 0.3088685 1.596280
## [4] {berries} => {whole milk}         0.011794611 0.3547401 1.388328
##      count
## [1] 89
## [2] 104
## [3] 101
## [4] 116
```

```
plot(berryrules, method = "graph")
```

Graph for 4 rules

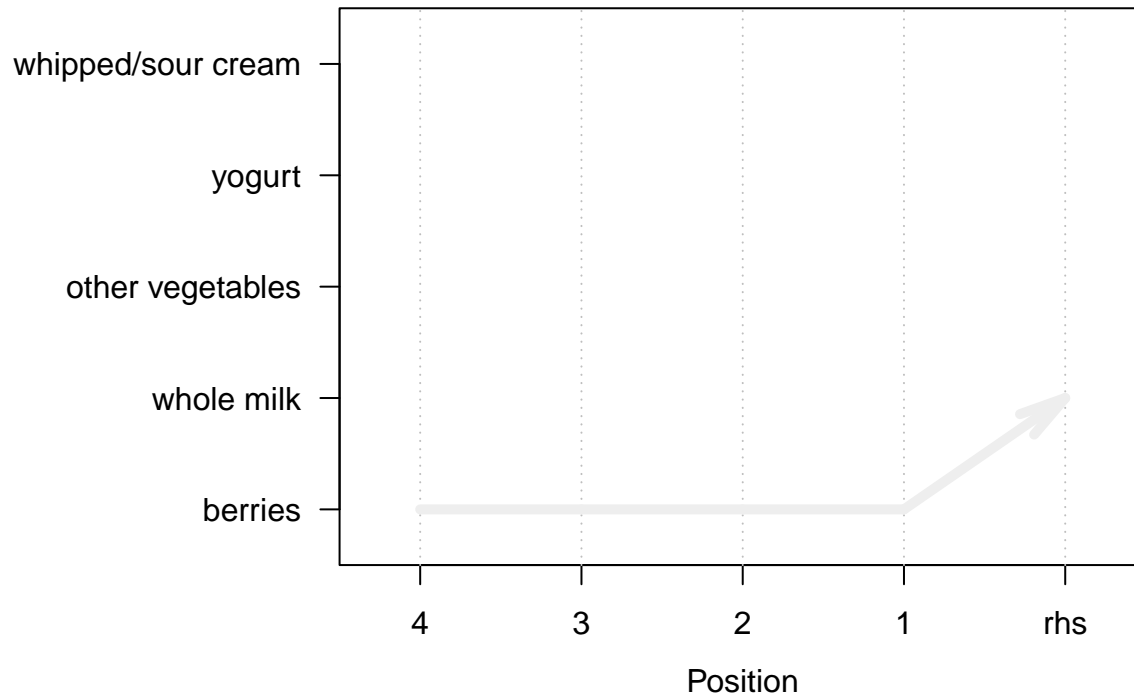
size: support (0.009 – 0.012)
color: lift (1.388 – 3.797)



```
plot(berryrules, method = "paracoord")
```

```
## Warning in cbind(pl, pr): number of rows of result is not a multiple of
## vector length (arg 2)
```

Parallel coordinates plot for 4 rules



Writing the rules to a CSV file.

```
write(groceryrules, file = "groceryrules.csv",
      sep = ",", quote = TRUE, row.names = FALSE)
```

Converting the rule set to a data frame.

```
groceryrules_df <- as(groceryrules, "data.frame")
```

```
groceryrules_df
```

```
##                                     rules
## 1                      {potted plants} => {whole milk}
## 2                      {pasta} => {whole milk}
## 3                      {herbs} => {root vegetables}
## 4                      {herbs} => {other vegetables}
## 5                      {herbs} => {whole milk}
## 6                      {processed cheese} => {whole milk}
## 7 {semi-finished bread} => {whole milk}
## 8                      {beverages} => {whole milk}
## 9                      {detergent} => {other vegetables}
## 10                     {detergent} => {whole milk}
## 11 {pickled vegetables} => {other vegetables}
## 12                     {pickled vegetables} => {whole milk}
## 13 {baking powder} => {other vegetables}
## 14                     {baking powder} => {whole milk}
## 15                     {flour} => {other vegetables}
## 16                     {flour} => {whole milk}
## 17 {soft cheese} => {other vegetables}
## 18                     {soft cheese} => {whole milk}
```

```

## 19         {specialty bar} => {soda}
## 20         {misc. beverages} => {soda}
## 21         {grapes} => {tropical fruit}
## 22         {grapes} => {other vegetables}
## 23         {grapes} => {whole milk}
## 24         {cat food} => {yogurt}
## 25         {cat food} => {other vegetables}
## 26         {cat food} => {whole milk}
## 27         {specialty chocolate} => {whole milk}
## 28         {meat} => {rolls/buns}
## 29         {meat} => {other vegetables}
## 30         {meat} => {whole milk}
## 31         {frozen meals} => {other vegetables}
## 32         {frozen meals} => {whole milk}
## 33         {hard cheese} => {yogurt}
## 34         {hard cheese} => {other vegetables}
## 35         {hard cheese} => {whole milk}
## 36         {butter milk} => {yogurt}
## 37         {butter milk} => {rolls/buns}
## 38         {butter milk} => {other vegetables}
## 39         {butter milk} => {whole milk}
## 40         {candy} => {soda}
## 41         {candy} => {whole milk}
## 42         {ham} => {yogurt}
## 43         {ham} => {rolls/buns}
## 44         {ham} => {other vegetables}
## 45         {ham} => {whole milk}
## 46         {sliced cheese} => {sausage}
## 47         {sliced cheese} => {yogurt}
## 48         {sliced cheese} => {rolls/buns}
## 49         {sliced cheese} => {other vegetables}
## 50         {sliced cheese} => {whole milk}
## 51         {oil} => {root vegetables}
## 52         {oil} => {other vegetables}
## 53         {oil} => {whole milk}
## 54         {onions} => {root vegetables}
## 55         {onions} => {other vegetables}
## 56         {onions} => {whole milk}
## 57         {berries} => {whipped/sour cream}
## 58         {berries} => {yogurt}
## 59         {berries} => {other vegetables}
## 60         {berries} => {whole milk}
## 61         {hamburger meat} => {rolls/buns}
## 62         {hamburger meat} => {other vegetables}
## 63         {hamburger meat} => {whole milk}
## 64         {hygiene articles} => {other vegetables}
## 65         {hygiene articles} => {whole milk}
## 66         {salty snack} => {other vegetables}
## 67         {salty snack} => {whole milk}
## 68         {sugar} => {other vegetables}
## 69         {sugar} => {whole milk}
## 70         {waffles} => {other vegetables}
## 71         {waffles} => {whole milk}
## 72         {long life bakery product} => {other vegetables}

```

```

## 73      {long life bakery product} => {whole milk}
## 74      {dessert} => {soda}
## 75      {dessert} => {yogurt}
## 76      {dessert} => {other vegetables}
## 77      {dessert} => {whole milk}
## 78      {cream cheese} => {yogurt}
## 79      {cream cheese} => {rolls/buns}
## 80      {cream cheese} => {other vegetables}
## 81      {cream cheese} => {whole milk}
## 82      {chicken} => {root vegetables}
## 83      {chicken} => {other vegetables}
## 84      {chicken} => {whole milk}
## 85      {white bread} => {other vegetables}
## 86      {white bread} => {whole milk}
## 87      {chocolate} => {soda}
## 88      {chocolate} => {other vegetables}
## 89      {chocolate} => {whole milk}
## 90      {coffee} => {whole milk}
## 91      {frozen vegetables} => {yogurt}
## 92      {frozen vegetables} => {other vegetables}
## 93      {frozen vegetables} => {whole milk}
## 94      {beef} => {root vegetables}
## 95      {beef} => {rolls/buns}
## 96      {beef} => {other vegetables}
## 97      {beef} => {whole milk}
## 98      {curd} => {yogurt}
## 99      {curd} => {other vegetables}
## 100     {curd} => {whole milk}
## 101     {napkins} => {other vegetables}
## 102     {napkins} => {whole milk}
## 103     {pork} => {other vegetables}
## 104     {pork} => {whole milk}
## 105     {frankfurter} => {rolls/buns}
## 106     {frankfurter} => {other vegetables}
## 107     {frankfurter} => {whole milk}
## 108     {bottled beer} => {whole milk}
## 109     {brown bread} => {other vegetables}
## 110     {brown bread} => {whole milk}
## 111     {margarine} => {rolls/buns}
## 112     {margarine} => {other vegetables}
## 113     {margarine} => {whole milk}
## 114     {butter} => {yogurt}
## 115     {butter} => {other vegetables}
## 116     {butter} => {whole milk}
## 117     {newspapers} => {whole milk}
## 118     {domestic eggs} => {other vegetables}
## 119     {domestic eggs} => {whole milk}
## 120     {fruit/vegetable juice} => {soda}
## 121     {fruit/vegetable juice} => {yogurt}
## 122     {fruit/vegetable juice} => {other vegetables}
## 123     {fruit/vegetable juice} => {whole milk}
## 124     {whipped/sour cream} => {yogurt}
## 125     {whipped/sour cream} => {other vegetables}
## 126     {whipped/sour cream} => {whole milk}

```

```

## 127         {pip fruit} => {tropical fruit}
## 128         {pip fruit} => {other vegetables}
## 129         {pip fruit} => {whole milk}
## 130         {pastry} => {other vegetables}
## 131         {pastry} => {whole milk}
## 132         {citrus fruit} => {yogurt}
## 133         {citrus fruit} => {other vegetables}
## 134         {citrus fruit} => {whole milk}
## 135         {sausage} => {soda}
## 136         {sausage} => {rolls/buns}
## 137         {sausage} => {other vegetables}
## 138         {sausage} => {whole milk}
## 139         {bottled water} => {soda}
## 140         {bottled water} => {whole milk}
## 141         {tropical fruit} => {yogurt}
## 142         {tropical fruit} => {other vegetables}
## 143         {tropical fruit} => {whole milk}
## 144         {root vegetables} => {other vegetables}
## 145         {root vegetables} => {whole milk}
## 146         {yogurt} => {other vegetables}
## 147         {yogurt} => {whole milk}
## 148         {rolls/buns} => {whole milk}
## 149         {other vegetables} => {whole milk}
## 150         {whole milk} => {other vegetables}
## 151         {onions,other vegetables} => {whole milk}
## 152         {onions,whole milk} => {other vegetables}
## 153         {hamburger meat,other vegetables} => {whole milk}
## 154         {hamburger meat,whole milk} => {other vegetables}
## 155         {other vegetables,sugar} => {whole milk}
## 156         {sugar,whole milk} => {other vegetables}
## 157         {cream cheese,yogurt} => {whole milk}
## 158         {cream cheese,whole milk} => {yogurt}
## 159         {cream cheese,other vegetables} => {whole milk}
## 160         {cream cheese,whole milk} => {other vegetables}
## 161         {chicken,other vegetables} => {whole milk}
## 162         {chicken,whole milk} => {other vegetables}
## 163         {coffee,other vegetables} => {whole milk}
## 164         {coffee,whole milk} => {other vegetables}
## 165         {frozen vegetables,root vegetables} => {other vegetables}
## 166         {frozen vegetables,other vegetables} => {root vegetables}
## 167         {frozen vegetables,root vegetables} => {whole milk}
## 168         {frozen vegetables,whole milk} => {root vegetables}
## 169         {frozen vegetables,yogurt} => {whole milk}
## 170         {frozen vegetables,whole milk} => {yogurt}
## 171         {frozen vegetables,other vegetables} => {whole milk}
## 172         {frozen vegetables,whole milk} => {other vegetables}
## 173         {beef,root vegetables} => {other vegetables}
## 174         {beef,other vegetables} => {root vegetables}
## 175         {beef,root vegetables} => {whole milk}
## 176         {beef,whole milk} => {root vegetables}
## 177         {beef,yogurt} => {whole milk}
## 178         {beef,whole milk} => {yogurt}
## 179         {beef,rolls/buns} => {whole milk}
## 180         {beef,whole milk} => {rolls/buns}

```

```

## 181      {beef,other vegetables} => {whole milk}
## 182      {beef,whole milk} => {other vegetables}
## 183      {curd,tropical fruit} => {whole milk}
## 184      {curd,root vegetables} => {whole milk}
## 185      {curd,yogurt} => {other vegetables}
## 186      {curd,other vegetables} => {yogurt}
## 187      {curd,yogurt} => {whole milk}
## 188      {curd,whole milk} => {yogurt}
## 189      {curd,other vegetables} => {whole milk}
## 190      {curd,whole milk} => {other vegetables}
## 191      {napkins,yogurt} => {whole milk}
## 192      {napkins,whole milk} => {yogurt}
## 193      {napkins,other vegetables} => {whole milk}
## 194      {napkins,whole milk} => {other vegetables}
## 195      {pork,root vegetables} => {other vegetables}
## 196      {other vegetables,pork} => {root vegetables}
## 197      {pork,root vegetables} => {whole milk}
## 198      {pork,whole milk} => {root vegetables}
## 199      {pork,rolls/buns} => {whole milk}
## 200      {pork,whole milk} => {rolls/buns}
## 201      {other vegetables,pork} => {whole milk}
## 202      {pork,whole milk} => {other vegetables}
## 203      {frankfurter,yogurt} => {whole milk}
## 204      {frankfurter,whole milk} => {yogurt}
## 205      {frankfurter,other vegetables} => {whole milk}
## 206      {frankfurter,whole milk} => {other vegetables}
## 207      {bottled beer,bottled water} => {whole milk}
## 208      {bottled beer,whole milk} => {bottled water}
## 209      {bottled beer,other vegetables} => {whole milk}
## 210      {bottled beer,whole milk} => {other vegetables}
## 211      {brown bread,yogurt} => {whole milk}
## 212      {brown bread,whole milk} => {yogurt}
## 213      {brown bread,other vegetables} => {whole milk}
## 214      {brown bread,whole milk} => {other vegetables}
## 215      {margarine,yogurt} => {whole milk}
## 216      {margarine,whole milk} => {yogurt}
## 217      {margarine,rolls/buns} => {whole milk}
## 218      {margarine,whole milk} => {rolls/buns}
## 219      {margarine,other vegetables} => {whole milk}
## 220      {margarine,whole milk} => {other vegetables}
## 221      {butter,whipped/sour cream} => {whole milk}
## 222      {butter,tropical fruit} => {whole milk}
## 223      {butter,root vegetables} => {other vegetables}
## 224      {butter,other vegetables} => {root vegetables}
## 225      {butter,root vegetables} => {whole milk}
## 226      {butter,whole milk} => {root vegetables}
## 227      {butter,yogurt} => {other vegetables}
## 228      {butter,other vegetables} => {yogurt}
## 229      {butter,yogurt} => {whole milk}
## 230      {butter,whole milk} => {yogurt}
## 231      {butter,rolls/buns} => {whole milk}
## 232      {butter,other vegetables} => {whole milk}
## 233      {butter,whole milk} => {other vegetables}
## 234      {newspapers,yogurt} => {whole milk}

```

```

## 235             {newspapers,rolls/buns} => {whole milk}
## 236             {newspapers,whole milk} => {rolls/buns}
## 237             {newspapers,other vegetables} => {whole milk}
## 238             {newspapers,whole milk} => {other vegetables}
## 239             {domestic eggs,tropical fruit} => {whole milk}
## 240             {domestic eggs,root vegetables} => {other vegetables}
## 241             {domestic eggs,other vegetables} => {root vegetables}
## 242             {domestic eggs,root vegetables} => {whole milk}
## 243             {domestic eggs,whole milk} => {root vegetables}
## 244             {domestic eggs,yogurt} => {whole milk}
## 245             {domestic eggs,whole milk} => {yogurt}
## 246             {domestic eggs,rolls/buns} => {whole milk}
## 247             {domestic eggs,other vegetables} => {whole milk}
## 248             {domestic eggs,whole milk} => {other vegetables}
## 249             {fruit/vegetable juice,tropical fruit} => {other vegetables}
## 250             {fruit/vegetable juice,other vegetables} => {tropical fruit}
## 251             {fruit/vegetable juice,root vegetables} => {other vegetables}
## 252             {fruit/vegetable juice,other vegetables} => {root vegetables}
## 253             {fruit/vegetable juice,root vegetables} => {whole milk}
## 254             {fruit/vegetable juice,soda} => {whole milk}
## 255             {fruit/vegetable juice,yogurt} => {other vegetables}
## 256             {fruit/vegetable juice,other vegetables} => {yogurt}
## 257             {fruit/vegetable juice,yogurt} => {whole milk}
## 258             {fruit/vegetable juice,whole milk} => {yogurt}
## 259             {fruit/vegetable juice,other vegetables} => {whole milk}
## 260             {fruit/vegetable juice,whole milk} => {other vegetables}
## 261             {citrus fruit,whipped/sour cream} => {whole milk}
## 262             {tropical fruit,whipped/sour cream} => {yogurt}
## 263             {whipped/sour cream,yogurt} => {tropical fruit}
## 264             {tropical fruit,whipped/sour cream} => {other vegetables}
## 265             {other vegetables,whipped/sour cream} => {tropical fruit}
## 266             {tropical fruit,whipped/sour cream} => {whole milk}
## 267             {root vegetables,whipped/sour cream} => {yogurt}
## 268             {whipped/sour cream,yogurt} => {root vegetables}
## 269             {root vegetables,whipped/sour cream} => {other vegetables}
## 270             {other vegetables,whipped/sour cream} => {root vegetables}
## 271             {root vegetables,whipped/sour cream} => {whole milk}
## 272             {whipped/sour cream,whole milk} => {root vegetables}
## 273             {whipped/sour cream,yogurt} => {other vegetables}
## 274             {other vegetables,whipped/sour cream} => {yogurt}
## 275             {whipped/sour cream,yogurt} => {whole milk}
## 276             {whipped/sour cream,whole milk} => {yogurt}
## 277             {rolls/buns,whipped/sour cream} => {other vegetables}
## 278             {rolls/buns,whipped/sour cream} => {whole milk}
## 279             {other vegetables,whipped/sour cream} => {whole milk}
## 280             {whipped/sour cream,whole milk} => {other vegetables}
## 281             {pip fruit,tropical fruit} => {yogurt}
## 282             {pip fruit,yogurt} => {tropical fruit}
## 283             {pip fruit,tropical fruit} => {other vegetables}
## 284             {other vegetables,pip fruit} => {tropical fruit}
## 285             {other vegetables,tropical fruit} => {pip fruit}
## 286             {pip fruit,tropical fruit} => {whole milk}
## 287             {pip fruit,whole milk} => {tropical fruit}
## 288             {pip fruit,root vegetables} => {other vegetables}

```

```

## 289      {other vegetables,pip fruit} => {root vegetables}
## 290      {pip fruit,root vegetables} => {whole milk}
## 291      {pip fruit,whole milk} => {root vegetables}
## 292      {pip fruit,yogurt} => {other vegetables}
## 293      {other vegetables,pip fruit} => {yogurt}
## 294      {pip fruit,yogurt} => {whole milk}
## 295      {pip fruit,whole milk} => {yogurt}
## 296      {pip fruit,rolls/buns} => {whole milk}
## 297      {other vegetables,pip fruit} => {whole milk}
## 298      {pip fruit,whole milk} => {other vegetables}
## 299      {pastry,tropical fruit} => {whole milk}
## 300      {pastry,soda} => {whole milk}
## 301      {pastry,yogurt} => {other vegetables}
## 302      {other vegetables,pastry} => {yogurt}
## 303      {pastry,yogurt} => {whole milk}
## 304      {pastry,whole milk} => {yogurt}
## 305      {pastry,rolls/buns} => {other vegetables}
## 306      {other vegetables,pastry} => {rolls/buns}
## 307      {pastry,rolls/buns} => {whole milk}
## 308      {pastry,whole milk} => {rolls/buns}
## 309      {other vegetables,pastry} => {whole milk}
## 310      {pastry,whole milk} => {other vegetables}
## 311      {citrus fruit,tropical fruit} => {yogurt}
## 312      {citrus fruit,yogurt} => {tropical fruit}
## 313      {citrus fruit,tropical fruit} => {other vegetables}
## 314      {citrus fruit,other vegetables} => {tropical fruit}
## 315      {other vegetables,tropical fruit} => {citrus fruit}
## 316      {citrus fruit,tropical fruit} => {whole milk}
## 317      {citrus fruit,whole milk} => {tropical fruit}
## 318      {citrus fruit,root vegetables} => {other vegetables}
## 319      {citrus fruit,other vegetables} => {root vegetables}
## 320      {citrus fruit,root vegetables} => {whole milk}
## 321      {citrus fruit,whole milk} => {root vegetables}
## 322      {citrus fruit,yogurt} => {other vegetables}
## 323      {citrus fruit,other vegetables} => {yogurt}
## 324      {citrus fruit,yogurt} => {whole milk}
## 325      {citrus fruit,whole milk} => {yogurt}
## 326      {citrus fruit,rolls/buns} => {whole milk}
## 327      {citrus fruit,other vegetables} => {whole milk}
## 328      {citrus fruit,whole milk} => {other vegetables}
## 329      {root vegetables,shopping bags} => {other vegetables}
## 330      {other vegetables,shopping bags} => {root vegetables}
## 331      {shopping bags,soda} => {rolls/buns}
## 332      {rolls/buns,shopping bags} => {soda}
## 333      {shopping bags,soda} => {whole milk}
## 334      {shopping bags,whole milk} => {soda}
## 335      {other vegetables,shopping bags} => {whole milk}
## 336      {shopping bags,whole milk} => {other vegetables}
## 337      {sausage,tropical fruit} => {whole milk}
## 338      {root vegetables,sausage} => {other vegetables}
## 339      {other vegetables,sausage} => {root vegetables}
## 340      {root vegetables,sausage} => {whole milk}
## 341      {sausage,whole milk} => {root vegetables}
## 342      {sausage,soda} => {rolls/buns}

```

```

## 343             {rolls/buns,sausage} => {soda}
## 344             {rolls/buns,soda} => {sausage}
## 345             {sausage,soda} => {other vegetables}
## 346             {other vegetables,sausage} => {soda}
## 347             {sausage,soda} => {whole milk}
## 348             {sausage,yogurt} => {other vegetables}
## 349             {other vegetables,sausage} => {yogurt}
## 350             {sausage,yogurt} => {whole milk}
## 351             {sausage,whole milk} => {yogurt}
## 352             {rolls/buns,sausage} => {other vegetables}
## 353             {other vegetables,sausage} => {rolls/buns}
## 354             {rolls/buns,sausage} => {whole milk}
## 355             {sausage,whole milk} => {rolls/buns}
## 356             {other vegetables,sausage} => {whole milk}
## 357             {sausage,whole milk} => {other vegetables}
## 358             {bottled water,tropical fruit} => {yogurt}
## 359             {bottled water,yogurt} => {tropical fruit}
## 360             {bottled water,tropical fruit} => {other vegetables}
## 361             {bottled water,other vegetables} => {tropical fruit}
## 362             {bottled water,tropical fruit} => {whole milk}
## 363             {bottled water,root vegetables} => {other vegetables}
## 364             {bottled water,other vegetables} => {root vegetables}
## 365             {bottled water,root vegetables} => {whole milk}
## 366             {bottled water,soda} => {yogurt}
## 367             {bottled water,yogurt} => {soda}
## 368             {soda,yogurt} => {bottled water}
## 369             {bottled water,rolls/buns} => {soda}
## 370             {bottled water,soda} => {whole milk}
## 371             {bottled water,yogurt} => {rolls/buns}
## 372             {bottled water,rolls/buns} => {yogurt}
## 373             {bottled water,yogurt} => {other vegetables}
## 374             {bottled water,other vegetables} => {yogurt}
## 375             {bottled water,yogurt} => {whole milk}
## 376             {bottled water,whole milk} => {yogurt}
## 377             {bottled water,rolls/buns} => {other vegetables}
## 378             {bottled water,other vegetables} => {rolls/buns}
## 379             {bottled water,rolls/buns} => {whole milk}
## 380             {bottled water,whole milk} => {rolls/buns}
## 381             {bottled water,other vegetables} => {whole milk}
## 382             {bottled water,whole milk} => {other vegetables}
## 383             {root vegetables,tropical fruit} => {yogurt}
## 384             {tropical fruit,yogurt} => {root vegetables}
## 385             {root vegetables,yogurt} => {tropical fruit}
## 386             {root vegetables,tropical fruit} => {other vegetables}
## 387             {other vegetables,tropical fruit} => {root vegetables}
## 388             {other vegetables,root vegetables} => {tropical fruit}
## 389             {root vegetables,tropical fruit} => {whole milk}
## 390             {tropical fruit,whole milk} => {root vegetables}
## 391             {soda,tropical fruit} => {yogurt}
## 392             {soda,tropical fruit} => {other vegetables}
## 393             {soda,tropical fruit} => {whole milk}
## 394             {tropical fruit,yogurt} => {rolls/buns}
## 395             {rolls/buns,tropical fruit} => {yogurt}
## 396             {rolls/buns,yogurt} => {tropical fruit}

```

```

## 397         {tropical fruit,yogurt} => {other vegetables}
## 398         {other vegetables,tropical fruit} => {yogurt}
## 399         {other vegetables,yogurt} => {tropical fruit}
## 400         {tropical fruit,yogurt} => {whole milk}
## 401         {tropical fruit,whole milk} => {yogurt}
## 402         {whole milk,yogurt} => {tropical fruit}
## 403     {rolls/buns,tropical fruit} => {other vegetables}
## 404         {rolls/buns,tropical fruit} => {whole milk}
## 405         {tropical fruit,whole milk} => {rolls/buns}
## 406     {other vegetables,tropical fruit} => {whole milk}
## 407     {tropical fruit,whole milk} => {other vegetables}
## 408         {root vegetables,soda} => {other vegetables}
## 409         {other vegetables,soda} => {root vegetables}
## 410         {root vegetables,soda} => {whole milk}
## 411         {root vegetables,yogurt} => {rolls/buns}
## 412         {rolls/buns,root vegetables} => {yogurt}
## 413     {root vegetables,yogurt} => {other vegetables}
## 414     {other vegetables,root vegetables} => {yogurt}
## 415     {other vegetables,yogurt} => {root vegetables}
## 416         {root vegetables,yogurt} => {whole milk}
## 417         {root vegetables,whole milk} => {yogurt}
## 418         {whole milk,yogurt} => {root vegetables}
## 419     {rolls/buns,root vegetables} => {other vegetables}
## 420     {other vegetables,root vegetables} => {rolls/buns}
## 421     {other vegetables,rolls/buns} => {root vegetables}
## 422         {rolls/buns,root vegetables} => {whole milk}
## 423         {root vegetables,whole milk} => {rolls/buns}
## 424     {other vegetables,root vegetables} => {whole milk}
## 425     {root vegetables,whole milk} => {other vegetables}
## 426     {other vegetables,whole milk} => {root vegetables}
## 427         {soda,yogurt} => {rolls/buns}
## 428         {rolls/buns,yogurt} => {soda}
## 429         {soda,yogurt} => {other vegetables}
## 430         {other vegetables,soda} => {yogurt}
## 431         {soda,yogurt} => {whole milk}
## 432         {soda,whole milk} => {yogurt}
## 433         {rolls/buns,soda} => {other vegetables}
## 434         {other vegetables,soda} => {rolls/buns}
## 435         {other vegetables,soda} => {whole milk}
## 436         {soda,whole milk} => {other vegetables}
## 437     {rolls/buns,yogurt} => {other vegetables}
## 438     {other vegetables,yogurt} => {rolls/buns}
## 439     {other vegetables,rolls/buns} => {yogurt}
## 440         {rolls/buns,yogurt} => {whole milk}
## 441         {whole milk,yogurt} => {rolls/buns}
## 442         {rolls/buns,whole milk} => {yogurt}
## 443         {other vegetables,yogurt} => {whole milk}
## 444         {whole milk,yogurt} => {other vegetables}
## 445         {other vegetables,whole milk} => {yogurt}
## 446         {other vegetables,rolls/buns} => {whole milk}
## 447         {rolls/buns,whole milk} => {other vegetables}
## 448 {other vegetables,root vegetables,tropical fruit} => {whole milk}
## 449 {root vegetables,tropical fruit,whole milk} => {other vegetables}
## 450 {other vegetables,tropical fruit,whole milk} => {root vegetables}

```

```

## 451 {other vegetables,root vegetables,whole milk} => {tropical fruit}
## 452      {other vegetables,tropical fruit,yogurt} => {whole milk}
## 453      {tropical fruit,whole milk,yogurt} => {other vegetables}
## 454      {other vegetables,tropical fruit,whole milk} => {yogurt}
## 455      {other vegetables,whole milk,yogurt} => {tropical fruit}
## 456      {other vegetables,root vegetables,yogurt} => {whole milk}
## 457      {root vegetables,whole milk,yogurt} => {other vegetables}
## 458      {other vegetables,root vegetables,whole milk} => {yogurt}
## 459      {other vegetables,whole milk,yogurt} => {root vegetables}
## 460      {other vegetables,rolls/buns,root vegetables} => {whole milk}
## 461      {rolls/buns,root vegetables,whole milk} => {other vegetables}
## 462      {other vegetables,root vegetables,whole milk} => {rolls/buns}
## 463      {other vegetables,rolls/buns,whole milk} => {root vegetables}
##      support confidence      lift count
## 1  0.006914082  0.4000000 1.5654596   68
## 2  0.006100661  0.4054054 1.5866145   60
## 3  0.007015760  0.4312500 3.9564774   69
## 4  0.007727504  0.4750000 2.4548739   76
## 5  0.007727504  0.4750000 1.8589833   76
## 6  0.007015760  0.4233129 1.6566981   69
## 7  0.007117438  0.4022989 1.5744565   70
## 8  0.006812405  0.2617188 1.0242753   67
## 9  0.006405694  0.3333333 1.7227185   63
## 10 0.008947636  0.4656085 1.8222281   88
## 11 0.006405694  0.3579545 1.8499648   63
## 12 0.007117438  0.3977273 1.5565650   70
## 13 0.007320793  0.4137931 2.1385471   72
## 14 0.009252669  0.5229885 2.0467935   91
## 15 0.006304016  0.3625731 1.8738342   62
## 16 0.008439248  0.4853801 1.8996074   83
## 17 0.007117438  0.4166667 2.1533981   70
## 18 0.007524148  0.4404762 1.7238692   74
## 19 0.007219115  0.2639405 1.5136181   71
## 20 0.007320793  0.2580645 1.4799210   72
## 21 0.006100661  0.2727273 2.5991015   60
## 22 0.009049314  0.4045455 2.0907538   89
## 23 0.007320793  0.3272727 1.2808306   72
## 24 0.006202339  0.2663755 1.9094778   61
## 25 0.006507372  0.2794760 1.4443753   64
## 26 0.008845958  0.3799127 1.4868448   87
## 27 0.008032537  0.2642140 1.0340410   79
## 28 0.006914082  0.2677165 1.4554959   68
## 29 0.009964413  0.3858268 1.9940128   98
## 30 0.009964413  0.3858268 1.5099906   98
## 31 0.007524148  0.2652330 1.3707653   74
## 32 0.009862735  0.3476703 1.3606593   97
## 33 0.006405694  0.2614108 1.8738886   63
## 34 0.009456024  0.3858921 1.9943505   93
## 35 0.010066090  0.4107884 1.6076815   99
## 36 0.008540925  0.3054545 2.1896104   84
## 37 0.007625826  0.2727273 1.4827378   75
## 38 0.010371124  0.3709091 1.9169159  102
## 39 0.011591256  0.4145455 1.6223854  114
## 40 0.008642603  0.2891156 1.6579897   85

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## 41	0.008235892	0.2755102	1.0782502	81
## 42	0.006710727	0.2578125	1.8480947	66
## 43	0.006914082	0.2656250	1.4441249	68
## 44	0.009150991	0.3515625	1.8169297	90
## 45	0.011489578	0.4414062	1.7275091	113
## 46	0.007015760	0.2863071	3.0474349	69
## 47	0.008032537	0.3278008	2.3497968	79
## 48	0.007625826	0.3112033	1.6919208	75
## 49	0.009049314	0.3692946	1.9085720	89
## 50	0.010777834	0.4398340	1.7213560	106
## 51	0.007015760	0.2500000	2.2936101	69
## 52	0.009964413	0.3550725	1.8350697	98
## 53	0.011286223	0.4021739	1.5739675	111
## 54	0.009456024	0.3049180	2.7974523	93
## 55	0.014234875	0.4590164	2.3722681	140
## 56	0.012099644	0.3901639	1.5269647	119
## 57	0.009049314	0.2721713	3.7968855	89
## 58	0.010574479	0.3180428	2.2798477	104
## 59	0.010269446	0.3088685	1.5962805	101
## 60	0.011794611	0.3547401	1.3883281	116
## 61	0.008642603	0.2599388	1.4132109	85
## 62	0.013828165	0.4159021	2.1494470	136
## 63	0.014743264	0.4434251	1.7354101	145
## 64	0.009557702	0.2901235	1.4994032	94
## 65	0.012811388	0.3888889	1.5219746	126
## 66	0.010777834	0.2849462	1.4726465	106
## 67	0.011184545	0.2956989	1.1572618	110
## 68	0.010777834	0.3183183	1.6451186	106
## 69	0.015048297	0.4444444	1.7393996	148
## 70	0.010066090	0.2619048	1.3535645	99
## 71	0.012709710	0.3306878	1.2941961	125
## 72	0.010676157	0.2853261	1.4746096	105
## 73	0.013523132	0.3614130	1.4144438	133
## 74	0.009862735	0.2657534	1.5240145	97
## 75	0.009862735	0.2657534	1.9050182	97
## 76	0.011591256	0.3123288	1.6141636	114
## 77	0.013726487	0.3698630	1.4475140	135
## 78	0.012404677	0.3128205	2.2424123	122
## 79	0.009964413	0.2512821	1.3661465	98
## 80	0.013726487	0.3461538	1.7889769	135
## 81	0.016471784	0.4153846	1.6256696	162
## 82	0.010879512	0.2535545	2.3262206	107
## 83	0.017895272	0.4170616	2.1554393	176
## 84	0.017590239	0.4099526	1.6044106	173
## 85	0.013726487	0.3260870	1.6852681	135
## 86	0.017081851	0.4057971	1.5881474	168
## 87	0.013523132	0.2725410	1.5629391	133
## 88	0.012709710	0.2561475	1.3238103	125
## 89	0.016675140	0.3360656	1.3152427	164
## 90	0.018708693	0.3222417	1.2611408	184
## 91	0.012404677	0.2579281	1.8489235	122
## 92	0.017793594	0.3699789	1.9121083	175
## 93	0.020437214	0.4249471	1.6630940	201
## 94	0.017386884	0.3313953	3.0403668	171

## 95	0.013624809	0.2596899	1.4118576	134
## 96	0.019725470	0.3759690	1.9430662	194
## 97	0.021250635	0.4050388	1.5851795	209
## 98	0.017285206	0.3244275	2.3256154	170
## 99	0.017183528	0.3225191	1.6668288	169
## 100	0.026131164	0.4904580	1.9194805	257
## 101	0.014438231	0.2757282	1.4250060	142
## 102	0.019725470	0.3766990	1.4742678	194
## 103	0.021657346	0.3756614	1.9414764	213
## 104	0.022165735	0.3844797	1.5047187	218
## 105	0.019217082	0.3258621	1.7716161	189
## 106	0.016471784	0.2793103	1.4435193	162
## 107	0.020538892	0.3482759	1.3630295	202
## 108	0.020437214	0.2537879	0.9932367	201
## 109	0.018708693	0.2884013	1.4905025	184
## 110	0.025216065	0.3887147	1.5212930	248
## 111	0.014743264	0.2517361	1.3686151	145
## 112	0.019725470	0.3368056	1.7406635	194
## 113	0.024199288	0.4131944	1.6170980	238
## 114	0.014641586	0.2642202	1.8940273	144
## 115	0.020030503	0.3614679	1.8681223	197
## 116	0.027554652	0.4972477	1.9460530	271
## 117	0.027351296	0.3426752	1.3411103	269
## 118	0.022267412	0.3509615	1.8138238	219
## 119	0.029994916	0.4727564	1.8502027	295
## 120	0.018403660	0.2545710	1.4598869	181
## 121	0.018708693	0.2587904	1.8551049	184
## 122	0.021047280	0.2911392	1.5046529	207
## 123	0.026639553	0.3684951	1.4421604	262
## 124	0.020742247	0.2893617	2.0742510	204
## 125	0.028876462	0.4028369	2.0819237	284
## 126	0.032231825	0.4496454	1.7597542	317
## 127	0.020437214	0.2701613	2.5746476	201
## 128	0.026131164	0.3454301	1.7852365	257
## 129	0.030096594	0.3978495	1.5570432	296
## 130	0.022572445	0.2537143	1.3112349	222
## 131	0.033248602	0.3737143	1.4625865	327
## 132	0.021657346	0.2616708	1.8757521	213
## 133	0.028876462	0.3488943	1.8031403	284
## 134	0.030503305	0.3685504	1.4423768	300
## 135	0.024300966	0.2586580	1.4833245	239
## 136	0.030604982	0.3257576	1.7710480	301
## 137	0.026944586	0.2867965	1.4822091	265
## 138	0.029893238	0.3181818	1.2452520	294
## 139	0.028978139	0.2621895	1.5035766	285
## 140	0.034367056	0.3109476	1.2169396	338
## 141	0.029283172	0.2790698	2.0004746	288
## 142	0.035892222	0.3420543	1.7677896	353
## 143	0.042297916	0.4031008	1.5775950	416
## 144	0.047381800	0.4347015	2.2466049	466
## 145	0.048906965	0.4486940	1.7560310	481
## 146	0.043416370	0.3112245	1.6084566	427
## 147	0.056024403	0.4016035	1.5717351	551
## 148	0.056634469	0.3079049	1.2050318	557

## 149	0.074834774	0.3867578	1.5136341	736
## 150	0.074834774	0.2928770	1.5136341	736
## 151	0.006609049	0.4642857	1.8170513	65
## 152	0.006609049	0.5462185	2.8229421	65
## 153	0.006304016	0.4558824	1.7841635	62
## 154	0.006304016	0.4275862	2.2098320	62
## 155	0.006304016	0.5849057	2.2891155	62
## 156	0.006304016	0.4189189	2.1650381	62
## 157	0.006609049	0.5327869	2.0851409	65
## 158	0.006609049	0.4012346	2.8761968	65
## 159	0.006710727	0.4888889	1.9133395	66
## 160	0.006710727	0.4074074	2.1055449	66
## 161	0.008439248	0.4715909	1.8456413	83
## 162	0.008439248	0.4797688	2.4795197	83
## 163	0.006405694	0.4772727	1.8678779	63
## 164	0.006405694	0.3423913	1.7695315	63
## 165	0.006100661	0.5263158	2.7200819	60
## 166	0.006100661	0.3428571	3.1455224	60
## 167	0.006202339	0.5350877	2.0941455	61
## 168	0.006202339	0.3034826	2.7842829	61
## 169	0.006100661	0.4918033	1.9247454	60
## 170	0.006100661	0.2985075	2.1398111	60
## 171	0.009659380	0.5428571	2.1245523	95
## 172	0.009659380	0.4726368	2.4426606	95
## 173	0.007930859	0.4561404	2.3574043	78
## 174	0.007930859	0.4020619	3.6886925	78
## 175	0.008032537	0.4619883	1.8080601	79
## 176	0.008032537	0.3779904	3.4678506	79
## 177	0.006100661	0.5217391	2.0419038	60
## 178	0.006100661	0.2870813	2.0579045	60
## 179	0.006812405	0.5000000	1.9568245	67
## 180	0.006812405	0.3205742	1.7428673	67
## 181	0.009252669	0.4690722	1.8357838	91
## 182	0.009252669	0.4354067	2.2502495	91
## 183	0.006507372	0.6336634	2.4799360	64
## 184	0.006202339	0.5700935	2.2311457	61
## 185	0.006100661	0.3529412	1.8240549	60
## 186	0.006100661	0.3550296	2.5449825	60
## 187	0.010066090	0.5823529	2.2791250	99
## 188	0.010066090	0.3852140	2.7613555	99
## 189	0.009862735	0.5739645	2.2462956	97
## 190	0.009862735	0.3774319	1.9506268	97
## 191	0.006100661	0.4958678	1.9406524	60
## 192	0.006100661	0.3092784	2.2170208	60
## 193	0.006812405	0.4718310	1.8465809	67
## 194	0.006812405	0.3453608	1.7848785	67
## 195	0.007015760	0.5149254	2.6612144	69
## 196	0.007015760	0.3239437	2.9720018	69
## 197	0.006812405	0.5000000	1.9568245	67
## 198	0.006812405	0.3073394	2.8196674	67
## 199	0.006202339	0.5495495	2.1507441	61
## 200	0.006202339	0.2798165	1.5212799	61
## 201	0.010167768	0.4694836	1.8373939	100
## 202	0.010167768	0.4587156	2.3707136	100

##	203	0.006202339	0.5545455	2.1702963	61
##	204	0.006202339	0.3019802	2.1647050	61
##	205	0.007625826	0.4629630	1.8118745	75
##	206	0.007625826	0.3712871	1.9188696	75
##	207	0.006100661	0.3870968	1.5149609	60
##	208	0.006100661	0.2985075	2.7008472	60
##	209	0.007625826	0.4716981	1.8460609	75
##	210	0.007625826	0.3731343	1.9284162	75
##	211	0.007117438	0.4895105	1.9157723	70
##	212	0.007117438	0.2822581	2.0233295	70
##	213	0.009354347	0.5000000	1.9568245	92
##	214	0.009354347	0.3709677	1.9172190	92
##	215	0.007015760	0.4928571	1.9288699	69
##	216	0.007015760	0.2899160	2.0782241	69
##	217	0.007930859	0.5379310	2.1052733	78
##	218	0.007930859	0.3277311	1.7817774	78
##	219	0.009252669	0.4690722	1.8357838	91
##	220	0.009252669	0.3823529	1.9760595	91
##	221	0.006710727	0.6600000	2.5830084	66
##	222	0.006202339	0.6224490	2.4360468	61
##	223	0.006609049	0.5118110	2.6451190	65
##	224	0.006609049	0.3299492	3.0270996	65
##	225	0.008235892	0.6377953	2.4961069	81
##	226	0.008235892	0.2988930	2.7421759	81
##	227	0.006405694	0.4375000	2.2610681	63
##	228	0.006405694	0.3197970	2.2924220	63
##	229	0.009354347	0.6388889	2.5003869	92
##	230	0.009354347	0.3394834	2.4335417	92
##	231	0.006609049	0.4924242	1.9271757	65
##	232	0.011489578	0.5736041	2.2448850	113
##	233	0.011489578	0.4169742	2.1549874	113
##	234	0.006609049	0.4304636	1.6846834	65
##	235	0.007625826	0.3865979	1.5130086	75
##	236	0.007625826	0.2788104	1.5158100	75
##	237	0.008337570	0.4315789	1.6890485	82
##	238	0.008337570	0.3048327	1.5754229	82
##	239	0.006914082	0.6071429	2.3761441	68
##	240	0.007320793	0.5106383	2.6390582	72
##	241	0.007320793	0.3287671	3.0162543	72
##	242	0.008540925	0.5957447	2.3315356	84
##	243	0.008540925	0.2847458	2.6123830	84
##	244	0.007727504	0.5390071	2.1094846	76
##	245	0.007727504	0.2576271	1.8467658	76
##	246	0.006609049	0.4220779	1.6518648	65
##	247	0.012302999	0.5525114	2.1623358	121
##	248	0.012302999	0.4101695	2.1198197	121
##	249	0.006609049	0.4814815	2.4883712	65
##	250	0.006609049	0.3140097	2.9925242	65
##	251	0.006609049	0.5508475	2.8468653	65
##	252	0.006609049	0.3140097	2.8808629	65
##	253	0.006507372	0.5423729	2.1226571	64
##	254	0.006100661	0.3314917	1.2973422	60
##	255	0.008235892	0.4402174	2.2751120	81
##	256	0.008235892	0.3913043	2.8050133	81

##	257	0.009456024	0.5054348	1.9780943	93
##	258	0.009456024	0.3549618	2.5444968	93
##	259	0.010472801	0.4975845	1.9473713	103
##	260	0.010472801	0.3931298	2.0317558	103
##	261	0.006304016	0.5794393	2.2677219	62
##	262	0.006202339	0.4485294	3.2152236	61
##	263	0.006202339	0.2990196	2.8496685	61
##	264	0.007829181	0.5661765	2.9260881	77
##	265	0.007829181	0.2711268	2.5838485	77
##	266	0.007930859	0.5735294	2.2445928	78
##	267	0.006405694	0.3750000	2.6881378	63
##	268	0.006405694	0.3088235	2.8332830	63
##	269	0.008540925	0.5000000	2.5840778	84
##	270	0.008540925	0.2957746	2.7135668	84
##	271	0.009456024	0.5535714	2.1664843	93
##	272	0.009456024	0.2933754	2.6915550	93
##	273	0.010167768	0.4901961	2.5334096	100
##	274	0.010167768	0.3521127	2.5240730	100
##	275	0.010879512	0.5245098	2.0527473	107
##	276	0.010879512	0.3375394	2.4196066	107
##	277	0.006710727	0.4583333	2.3687380	66
##	278	0.007829181	0.5347222	2.0927151	77
##	279	0.014641586	0.5070423	1.9843854	144
##	280	0.014641586	0.4542587	2.3476795	144
##	281	0.006405694	0.3134328	2.2468017	63
##	282	0.006405694	0.3559322	3.3920477	63
##	283	0.009456024	0.4626866	2.3912361	93
##	284	0.009456024	0.3618677	3.4486132	93
##	285	0.009456024	0.2634561	3.4826487	93
##	286	0.008439248	0.4129353	1.6160839	83
##	287	0.008439248	0.2804054	2.6722744	83
##	288	0.008134215	0.5228758	2.7023036	80
##	289	0.008134215	0.3112840	2.8558569	80
##	290	0.008947636	0.5751634	2.2509877	88
##	291	0.008947636	0.2972973	2.7275363	88
##	292	0.008134215	0.4519774	2.3358895	80
##	293	0.008134215	0.3112840	2.2313984	80
##	294	0.009557702	0.5310734	2.0784351	94
##	295	0.009557702	0.3175676	2.2764410	94
##	296	0.006202339	0.4452555	1.7425737	61
##	297	0.013523132	0.5175097	2.0253514	133
##	298	0.013523132	0.4493243	2.3221780	133
##	299	0.006710727	0.5076923	1.9869295	66
##	300	0.008235892	0.3913043	1.5314279	81
##	301	0.006609049	0.3735632	1.9306328	65
##	302	0.006609049	0.2927928	2.0988463	65
##	303	0.009150991	0.5172414	2.0243012	90
##	304	0.009150991	0.2752294	1.9729451	90
##	305	0.006100661	0.2912621	1.5052880	60
##	306	0.006100661	0.2702703	1.4693798	60
##	307	0.008540925	0.4077670	1.5958569	84
##	308	0.008540925	0.2568807	1.3965849	84
##	309	0.010574479	0.4684685	1.8334212	104
##	310	0.010574479	0.3180428	1.6436947	104

##	311	0.006304016	0.3163265	2.2675448	62
##	312	0.006304016	0.2910798	2.7740019	62
##	313	0.009049314	0.4540816	2.3467645	89
##	314	0.009049314	0.3133803	2.9865262	89
##	315	0.009049314	0.2521246	3.0462480	89
##	316	0.009049314	0.4540816	1.7771161	89
##	317	0.009049314	0.2966667	2.8272448	89
##	318	0.010371124	0.5862069	3.0296084	102
##	319	0.010371124	0.3591549	3.2950455	102
##	320	0.009150991	0.5172414	2.0243012	90
##	321	0.009150991	0.3000000	2.7523321	90
##	322	0.007625826	0.3521127	1.8197731	75
##	323	0.007625826	0.2640845	1.8930548	75
##	324	0.010269446	0.4741784	1.8557678	101
##	325	0.010269446	0.3366667	2.4133503	101
##	326	0.007219115	0.4303030	1.6840550	71
##	327	0.013014743	0.4507042	1.7638982	128
##	328	0.013014743	0.4266667	2.2050797	128
##	329	0.006609049	0.5158730	2.6661120	65
##	330	0.006609049	0.2850877	2.6155203	65
##	331	0.006304016	0.2561983	1.3928749	62
##	332	0.006304016	0.3229167	1.8518282	62
##	333	0.006812405	0.2768595	1.0835309	67
##	334	0.006812405	0.2780083	1.5942925	67
##	335	0.007625826	0.3289474	1.2873845	75
##	336	0.007625826	0.3112033	1.6083472	75
##	337	0.007219115	0.5182482	2.0282415	71
##	338	0.006812405	0.4557823	2.3555539	67
##	339	0.006812405	0.2528302	2.3195755	67
##	340	0.007727504	0.5170068	2.0233832	76
##	341	0.007727504	0.2585034	2.3716240	76
##	342	0.009659380	0.3974895	2.1610335	95
##	343	0.009659380	0.3156146	1.8099532	95
##	344	0.009659380	0.2519894	2.6821598	95
##	345	0.007219115	0.2970711	1.5353098	71
##	346	0.007219115	0.2679245	1.5364652	71
##	347	0.006710727	0.2761506	1.0807566	66
##	348	0.008134215	0.4145078	2.1422406	80
##	349	0.008134215	0.3018868	2.1640354	80
##	350	0.008744281	0.4455959	1.7439058	86
##	351	0.008744281	0.2925170	2.0968694	86
##	352	0.008845958	0.2890365	1.4937858	87
##	353	0.008845958	0.3283019	1.7848806	87
##	354	0.009354347	0.3056478	1.1961984	92
##	355	0.009354347	0.3129252	1.7012820	92
##	356	0.010167768	0.3773585	1.4768487	100
##	357	0.010167768	0.3401361	1.7578760	100
##	358	0.007117438	0.3846154	2.7570644	70
##	359	0.007117438	0.3097345	2.9517819	70
##	360	0.006202339	0.3351648	1.7321840	61
##	361	0.006202339	0.2500000	2.3825097	61
##	362	0.008032537	0.4340659	1.6987817	79
##	363	0.007015760	0.4480519	2.3156022	69
##	364	0.007015760	0.2827869	2.5944114	69

##	365	0.007320793	0.4675325	1.8297580	72
##	366	0.007422471	0.2561404	1.8361081	73
##	367	0.007422471	0.3230088	1.8523569	73
##	368	0.007422471	0.2713755	2.4553613	73
##	369	0.006812405	0.2815126	1.6143886	67
##	370	0.007524148	0.2596491	1.0161755	74
##	371	0.007117438	0.3097345	1.6839353	70
##	372	0.007117438	0.2941176	2.1083433	70
##	373	0.008134215	0.3539823	1.8294356	80
##	374	0.008134215	0.3278689	2.3502844	80
##	375	0.009659380	0.4203540	1.6451180	95
##	376	0.009659380	0.2810651	2.0147778	95
##	377	0.007320793	0.3025210	1.5634756	72
##	378	0.007320793	0.2950820	1.6042737	72
##	379	0.008744281	0.3613445	1.4141757	86
##	380	0.008744281	0.2544379	1.3833037	86
##	381	0.010777834	0.4344262	1.7001918	106
##	382	0.010777834	0.3136095	1.6207825	106
##	383	0.008134215	0.3864734	2.7703835	80
##	384	0.008134215	0.2777778	2.5484556	80
##	385	0.008134215	0.3149606	3.0015870	80
##	386	0.012302999	0.5845411	3.0209991	121
##	387	0.012302999	0.3427762	3.1447798	121
##	388	0.012302999	0.2596567	2.4745380	121
##	389	0.011997966	0.5700483	2.2309690	118
##	390	0.011997966	0.2836538	2.6023653	118
##	391	0.006609049	0.3170732	2.2728970	65
##	392	0.007219115	0.3463415	1.7899466	71
##	393	0.007829181	0.3756098	1.4700048	77
##	394	0.008744281	0.2986111	1.6234606	86
##	395	0.008744281	0.3553719	2.5474363	86
##	396	0.008744281	0.2544379	2.4248028	86
##	397	0.012302999	0.4201389	2.1713431	121
##	398	0.012302999	0.3427762	2.4571457	121
##	399	0.012302999	0.2833724	2.7005496	121
##	400	0.015149975	0.5173611	2.0247698	149
##	401	0.015149975	0.3581731	2.5675162	149
##	402	0.015149975	0.2704174	2.5770885	149
##	403	0.007829181	0.3181818	1.6444131	77
##	404	0.010981190	0.4462810	1.7465872	108
##	405	0.010981190	0.2596154	1.4114524	108
##	406	0.017081851	0.4759207	1.8625865	168
##	407	0.017081851	0.4038462	2.0871397	168
##	408	0.008235892	0.4426230	2.2875443	81
##	409	0.008235892	0.2515528	2.3078561	81
##	410	0.008134215	0.4371585	1.7108848	80
##	411	0.007219115	0.2795276	1.5197090	71
##	412	0.007219115	0.2970711	2.1295150	71
##	413	0.012913066	0.5000000	2.5840778	127
##	414	0.012913066	0.2725322	1.9536108	127
##	415	0.012913066	0.2974239	2.7286977	127
##	416	0.014539908	0.5629921	2.2033536	143
##	417	0.014539908	0.2972973	2.1311362	143
##	418	0.014539908	0.2595281	2.3810253	143

```
## 419 0.012201322 0.5020921 2.5948898 120
## 420 0.012201322 0.2575107 1.4000100 120
## 421 0.012201322 0.2863962 2.6275247 120
## 422 0.012709710 0.5230126 2.0468876 125
## 423 0.012709710 0.2598753 1.4128652 125
## 424 0.023182511 0.4892704 1.9148326 228
## 425 0.023182511 0.4740125 2.4497702 228
## 426 0.023182511 0.3097826 2.8420820 228
## 427 0.008642603 0.3159851 1.7179181 85
## 428 0.008642603 0.2514793 1.4421567 85
## 429 0.008337570 0.3048327 1.5754229 82
## 430 0.008337570 0.2546584 1.8254849 82
## 431 0.010472801 0.3828996 1.4985348 103
## 432 0.010472801 0.2614213 1.8739641 103
## 433 0.009862735 0.2572944 1.3297376 97
## 434 0.009862735 0.3012422 1.6377653 97
## 435 0.013929842 0.4254658 1.6651240 137
## 436 0.013929842 0.3477157 1.7970490 137
## 437 0.011489578 0.3343195 1.7278153 113
## 438 0.011489578 0.2646370 1.4387534 113
## 439 0.011489578 0.2696897 1.9332351 113
## 440 0.015556685 0.4526627 1.7715630 153
## 441 0.015556685 0.2776770 1.5096478 153
## 442 0.015556685 0.2746858 1.9690488 153
## 443 0.022267412 0.5128806 2.0072345 219
## 444 0.022267412 0.3974592 2.0541308 219
## 445 0.022267412 0.2975543 2.1329789 219
## 446 0.017895272 0.4200477 1.6439194 176
## 447 0.017895272 0.3159785 1.6330258 176
## 448 0.007015760 0.5702479 2.2317503 69
## 449 0.007015760 0.5847458 3.0220571 69
## 450 0.007015760 0.4107143 3.7680737 69
## 451 0.007015760 0.3026316 2.8840907 69
## 452 0.007625826 0.6198347 2.4258155 75
## 453 0.007625826 0.5033557 2.6014206 75
## 454 0.007625826 0.4464286 3.2001640 75
## 455 0.007625826 0.3424658 3.2637119 75
## 456 0.007829181 0.6062992 2.3728423 77
## 457 0.007829181 0.5384615 2.7828530 77
## 458 0.007829181 0.3377193 2.4208960 77
## 459 0.007829181 0.3515982 3.2257165 77
## 460 0.006202339 0.5083333 1.9894383 61
## 461 0.006202339 0.4880000 2.5220599 61
## 462 0.006202339 0.2675439 1.4545571 61
## 463 0.006202339 0.3465909 3.1797776 61
```

```
str(groceryrules_df)
```

```
## 'data.frame': 463 obs. of 5 variables:
## $ rules : Factor w/ 463 levels "{baking powder} => {other vegetables}",...: 340 302 207 206 208 ...
## $ support : num 0.00691 0.0061 0.00702 0.00773 0.00773 ...
## $ confidence: num 0.4 0.405 0.431 0.475 0.475 ...
## $ lift : num 1.57 1.59 3.96 2.45 1.86 ...
## $ count : num 68 60 69 76 76 69 70 67 63 88 ...
```