

In [1]:

```
#importing the Libraries
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

In [3]:

```
#importing the mall dataset with pandas
dataset = pd.read_csv('Market_Basket_Optimisation.csv',header = None)
dataset.head()
```

Out[3]:

	0	1	2	3	4	5	6	7	8	
0	shrimp	almonds	avocado	vegetables mix	green grapes	whole weat flour	yams	cottage cheese	energy drink	ton juic
1	burgers	meatballs	eggs	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2	chutney	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
3	turkey	avocado	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
4	mineral water	milk	energy bar	whole wheat rice	green tea	NaN	NaN	NaN	NaN	NaN

In [4]:

```
# now convert the dataframe into list
transactions = []
for i in range(0,7501):
    transactions.append([str(dataset.values[i, j]) for j in range(0,20)])
```

In [5]:

```
len(transactions)
```

Out[5]:

7501

In [7]:

```
# training apriori on dataset
from apyori import apriori
rules = apriori(transactions, min_support = 0.003, min_confidence = 0.2, min_lift = 3,
min_length = 2)
```

In [8]:

```
#visualising the result
results = list(rules)
```

In [9]:

```
results
```

Out[9]:

```
[RelationRecord(items=frozenset({'light cream', 'chicken'}), support=0.004532728969470737, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light cream'}), items_add=frozenset({'chicken'}), confidence=0.29059829059829057, lift=4.84395061728395)]),
 RelationRecord(items=frozenset({'escalope', 'mushroom cream sauce'}), support=0.005732568990801226, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mushroom cream sauce'}), items_add=frozenset({'escalope'}), confidence=0.3006993006993007, lift=3.790832696715049)]),
 RelationRecord(items=frozenset({'escalope', 'pasta'}), support=0.005865884548726837, ordered_statistics=[OrderedStatistic(items_base=frozenset({'pasta'}), items_add=frozenset({'escalope'}), confidence=0.3728813559322034, lift=4.700811850163794)]),
 RelationRecord(items=frozenset({'honey', 'fromage blanc'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'fromage blanc'}), items_add=frozenset({'honey'}), confidence=0.2450980392156863, lift=5.164270764485569)]),
 RelationRecord(items=frozenset({'herb & pepper', 'ground beef'}), support=0.015997866951073192, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper'}), items_add=frozenset({'ground beef'}), confidence=0.3234501347708895, lift=3.2919938411349285)]),
 RelationRecord(items=frozenset({'tomato sauce', 'ground beef'}), support=0.005332622317024397, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomato sauce'}), items_add=frozenset({'ground beef'}), confidence=0.3773584905660377, lift=3.840659481324083)]),
 RelationRecord(items=frozenset({'light cream', 'olive oil'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light cream'}), items_add=frozenset({'olive oil'}), confidence=0.20512820512820515, lift=3.1147098515519573)]),
 RelationRecord(items=frozenset({'whole wheat pasta', 'olive oil'}), support=0.007998933475536596, ordered_statistics=[OrderedStatistic(items_base=frozenset({'whole wheat pasta'}), items_add=frozenset({'olive oil'}), confidence=0.2714932126696833, lift=4.122410097642296)]),
 RelationRecord(items=frozenset({'shrimp', 'pasta'}), support=0.005065991201173177, ordered_statistics=[OrderedStatistic(items_base=frozenset({'pasta'}), items_add=frozenset({'shrimp'}), confidence=0.3220338983050847, lift=4.506672147735896)]),
 RelationRecord(items=frozenset({'milk', 'spaghetti', 'avocado'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'avocado'}), items_add=frozenset({'milk'}), confidence=0.4166666666666663, lift=3.215449245541838)]),
 RelationRecord(items=frozenset({'milk', 'burgers', 'cake'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'cake'}), items_add=frozenset({'burgers'}), confidence=0.27999999999999997, lift=3.211437308868501)]),
 RelationRecord(items=frozenset({'chocolate', 'burgers', 'turkey'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'turkey'}), items_add=frozenset({'burgers'}), confidence=0.27058823529411763, lift=3.1034898363014927)]),
 RelationRecord(items=frozenset({'milk', 'burgers', 'turkey'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'turkey'}), items_add=frozenset({'burgers'}), confidence=0.2823529411764706, lift=3.2384241770102533)]),
 RelationRecord(items=frozenset({'tomatoes', 'frozen vegetables', 'cake'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'cake'}), items_add=frozenset({'tomatoes'}), confidence=0.2987012987012987, lift=4.367560314928736), OrderedStatistic(items_base=frozenset({'tomatoes', 'cake'}), items_add=frozenset({'frozen vegetables'}), confidence=0.36507936507936506, lift=3.8300144300144296)])]
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RelationRecord(items=frozenset({'cereals', 'spaghetti', 'ground beef'}), support=0.003062578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'cereals', 'ground beef'}), items_add=frozenset({'spaghetti'}), confidence=0.6764705882352942, lift=3.8853031258445188), OrderedStatistic(items_base=frozenset({'cereals', 'spaghetti'}), items_add=frozenset({'ground beef'}), confidence=0.4599999999999996, lift=4.681763907734057)]),
RelationRecord(items=frozenset({'milk', 'chicken', 'ground beef'}), support=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chicken', 'ground beef'}), items_add=frozenset({'milk'}), confidence=0.40845070422535207, lift=3.152046020981858)]),
RelationRecord(items=frozenset({'nan', 'light cream', 'chicken'}), support=0.004532728969470737, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light cream', 'nan'}), items_add=frozenset({'chicken'}), confidence=0.29059829059829057, lift=4.84395061728395)]),
RelationRecord(items=frozenset({'milk', 'chicken', 'olive oil'}), support=0.0035995200639914677, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'chicken'}), items_add=frozenset({'olive oil'}), confidence=0.24324324324324323, lift=3.693456614509246), OrderedStatistic(items_base=frozenset({'chicken', 'olive oil'}), items_add=frozenset({'milk'}), confidence=0.5, lift=3.858539094650206), OrderedStatistic(items_base=frozenset({'milk', 'olive oil'}), items_add=frozenset({'chicken'}), confidence=0.2109375, lift=3.51609375)]),
RelationRecord(items=frozenset({'spaghetti', 'chicken', 'olive oil'}), support=0.0034662045060658577, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'chicken'}), items_add=frozenset({'olive oil'}), confidence=0.20155038759689922, lift=3.0603835169318647)]),
RelationRecord(items=frozenset({'chocolate', 'frozen vegetables', 'shrimp'}), support=0.005332622317024397, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables'}), items_add=frozenset({'shrimp'}), confidence=0.23255813953488375, lift=3.2545123221103784), OrderedStatistic(items_base=frozenset({'chocolate', 'shrimp'}), items_add=frozenset({'frozen vegetables'}), confidence=0.29629629629629634, lift=3.1084175084175087)]),
RelationRecord(items=frozenset({'herb & pepper', 'chocolate', 'ground beef'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper', 'chocolate'}), items_add=frozenset({'ground beef'}), confidence=0.4411764705882354, lift=4.4901827759597746)]),
RelationRecord(items=frozenset({'chocolate', 'soup', 'milk'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'soup'}), items_add=frozenset({'milk'}), confidence=0.3947368421052632, lift=3.0462150747238472)]),
RelationRecord(items=frozenset({'cooking oil', 'spaghetti', 'ground beef'}), support=0.004799360085321957, ordered_statistics=[OrderedStatistic(items_base=frozenset({'cooking oil', 'ground beef'}), items_add=frozenset({'spaghetti'}), confidence=0.5714285714285714, lift=3.2819951870487856), OrderedStatistic(items_base=frozenset({'cooking oil', 'spaghetti'}), items_add=frozenset({'ground beef'}), confidence=0.3025210084033613, lift=3.0789824749438446)]),
RelationRecord(items=frozenset({'herb & pepper', 'eggs', 'ground beef'}), support=0.0041327822956939075, ordered_statistics=[OrderedStatistic(items_base=frozenset({'eggs', 'ground beef'}), items_add=frozenset({'herb & pepper'}), confidence=0.20666666666666667, lift=4.178454627133872), OrderedStatistic(items_base=frozenset({'herb & pepper', 'eggs'}), items_add=frozenset({'ground beef'}), confidence=0.3297872340425532, lift=3.3564912381997174)]),
RelationRecord(items=frozenset({'red wine', 'spaghetti', 'eggs'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'red wine', 'eggs'}), items_add=frozenset({'spaghetti'}), confidence=0.5283018867924528, lift=3.0342974370828397)]),

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RelationRecord(items=frozenset({'nan', 'escalope', 'mushroom cream sauce'}), support=0.005732568990801226, ordered_statistics=[OrderedStatistic(items_base=frozenset({'nan', 'mushroom cream sauce'}), items_add=frozenset({'escalope'}), confidence=0.3006993006993007, lift=3.790832696715049)],  
RelationRecord(items=frozenset({'escalope', 'nan', 'pasta'}), support=0.005865884548726837, ordered_statistics=[OrderedStatistic(items_base=frozenset({'nan', 'pasta'}), items_add=frozenset({'escalope'}), confidence=0.3728813559322034, lift=4.700811850163794)]),  
RelationRecord(items=frozenset({'herb & pepper', 'french fries', 'ground beef'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'french fries', 'ground beef'}), items_add=frozenset({'herb & pepper'}), confidence=0.23076923076923078, lift=4.665768194070081), OrderedStatistic(items_base=frozenset({'herb & pepper', 'french fries'}), items_add=frozenset({'ground beef'}), confidence=0.46153846153846156, lift=4.697421981004071)]),  
RelationRecord(items=frozenset({'honey', 'fromage blanc', 'nan'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'fromage blanc', 'nan'}), items_add=frozenset({'honey'}), confidence=0.2450980392156863, lift=5.164270764485569)]),  
RelationRecord(items=frozenset({'frozen vegetables', 'tomatoes', 'green tea'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'green tea'}), items_add=frozenset({'tomatoes'}), confidence=0.2314814814814815, lift=3.38468341635983)]),  
RelationRecord(items=frozenset({'frozen vegetables', 'spaghetti', 'ground beef'}), support=0.008665511265164644, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'spaghetti'}), items_add=frozenset({'ground beef'}), confidence=0.31100478468899523, lift=3.165328208890303)]),  
RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'olive oil'}), support=0.004799360085321957, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk'}), items_add=frozenset({'olive oil'}), confidence=0.20338983050847456, lift=3.088314005352364), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'olive oil'}), items_add=frozenset({'milk'}), confidence=0.4235294117647058, lift=3.2684095860566447)]),  
RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'soup'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'soup'}), items_add=frozenset({'milk'}), confidence=0.5, lift=3.858539094650206)]),  
RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'tomatoes'}), support=0.0041327822956939075, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'tomatoes'}), items_add=frozenset({'frozen vegetables'}), confidence=0.29523809523809524, lift=3.0973160173160172)]),  
RelationRecord(items=frozenset({'frozen vegetables', 'mineral water', 'shrimp'}), support=0.007199040127982935, ordered_statistics=[OrderedStatistic(items_base=frozenset({'shrimp', 'mineral water'}), items_add=frozenset({'frozen vegetables'}), confidence=0.30508474576271183, lift=3.200616332819722)]),  
RelationRecord(items=frozenset({'frozen vegetables', 'spaghetti', 'olive oil'}), support=0.005732568990801226, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'spaghetti'}), items_add=frozenset({'olive oil'}), confidence=0.20574162679425836, lift=3.1240241752707125)]),  
RelationRecord(items=frozenset({'frozen vegetables', 'shrimp', 'spaghetti'}), support=0.005999200106652446, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'spaghetti'}), items_add=frozenset({'shrimp'}), confidence=0.21531100478468898, lift=3.0131489680782684)]),
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RelationRecord(items=frozenset({'frozen vegetables', 'shrimp', 'tomato es'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'shrimp'}), items_add=frozenset({'tomatoes'}), confidence=0.2400000000000002, lift=3.5092397660818717), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'tomatoes'}), items_add=frozenset({'shrimp'}), confidence=0.2479338842975207, lift=3.4696866905143704), OrderedStatistic(items_base=frozenset({'shrimp', 'tomatoes'}), items_add=frozenset({'frozen vegetables'}), confidence=0.35714285714285715, lift=3.7467532467532467)],),
RelationRecord(items=frozenset({'frozen vegetables', 'spaghetti', 'tomatoes'}), support=0.006665777896280496, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'spaghetti'}), items_add=frozenset({'tomatoes'}), confidence=0.23923444976076558, lift=3.4980460188216425), OrderedStatistic(items_base=frozenset({'spaghetti', 'tomatoes'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3184713375796179, lift=3.341053850607991)],),
RelationRecord(items=frozenset({'spaghetti', 'grated cheese', 'ground beef'}), support=0.005332622317024397, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'grated cheese'}), items_add=frozenset({'ground beef'}), confidence=0.3225806451612903, lift=3.283144395325426)],),
RelationRecord(items=frozenset({'ground beef', 'tomatoes', 'green tea'}), support=0.003062578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'green tea'}), items_add=frozenset({'tomatoes'}), confidence=0.2072072072072072, lift=3.0297490472929067)],),
RelationRecord(items=frozenset({'herb & pepper', 'milk', 'ground beef'}), support=0.0035995200639914677, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper', 'milk'}), items_add=frozenset({'ground beef'}), confidence=0.3913043478260869, lift=3.982596896969382335)],),
RelationRecord(items=frozenset({'herb & pepper', 'mineral water', 'ground beef'}), support=0.006665777896280496, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper', 'mineral water'}), items_add=frozenset({'ground beef'}), confidence=0.3906250000000006, lift=3.975682666214383)],),
RelationRecord(items=frozenset({'herb & pepper', 'nan', 'ground beef'}), support=0.015997866951073192, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3234501347708895, lift=3.2919938411349285)],),
RelationRecord(items=frozenset({'herb & pepper', 'spaghetti', 'ground beef'}), support=0.006399146780429276, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper', 'spaghetti'}), items_add=frozenset({'ground beef'}), confidence=0.3934426229508197, lift=4.004359721511667)],),
RelationRecord(items=frozenset({'milk', 'ground beef', 'olive oil'}), support=0.004932675643247567, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'ground beef'}), items_add=frozenset({'olive oil'}), confidence=0.22424242424242427, lift=3.40494417862839)],),
RelationRecord(items=frozenset({'soup', 'milk', 'ground beef'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'soup', 'ground beef'}), items_add=frozenset({'milk'}), confidence=0.4109589041095891, lift=3.1714019956029094)],),
RelationRecord(items=frozenset({'tomato sauce', 'nan', 'ground beef'}), support=0.005332622317024397, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomato sauce', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3773584905660377, lift=3.840659481324083)],),
RelationRecord(items=frozenset({'pepper', 'spaghetti', 'ground beef'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'pepper', 'spaghetti'}), items_add=frozenset({'ground beef'}), confidence=0.35714285714285715, lift=3.7467532467532467)])

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c(items_base=frozenset({'spaghetti', 'pepper'}), items_add=frozenset({'ground beef'}), confidence=0.33783783783783, lift=3.4384282518610876]),
 RelationRecord(items=frozenset({'shrimp', 'spaghetti', 'ground beef'}), support=0.005999200106652446, ordered_statistics=[OrderedStatistic(items_base=frozenset({'shrimp', 'ground beef'}), items_add=frozenset({'spaghetti'}), confidence=0.5232558139534884, lift=3.005315360233627)]),
 RelationRecord(items=frozenset({'spaghetti', 'tomato sauce', 'ground beef'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomato sauce', 'ground beef'}), items_add=frozenset({'spaghetti'}), confidence=0.5750000000000001, lift=3.3025076569678413), OrderedStatistic(items_base=frozenset({'spaghetti', 'tomato sauce'}), items_add=frozenset({'ground beef'}), confidence=0.4893617021276596, lift=4.980599901844742)]),
 RelationRecord(items=frozenset({'light cream', 'nan', 'olive oil'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light cream', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.20512820512820515, lift=3.1147098515519573)]),
 RelationRecord(items=frozenset({'shrimp', 'milk', 'olive oil'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'shrimp', 'olive oil'}), items_add=frozenset({'milk'}), confidence=0.3934426229508197, lift=3.0362274843149164)]),
 RelationRecord(items=frozenset({'soup', 'milk', 'olive oil'}), support=0.0035995200639914677, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'olive oil'}), items_add=frozenset({'soup'}), confidence=0.2109375, lift=4.174781497361478), OrderedStatistic(items_base=frozenset({'soup', 'milk'}), items_add=frozenset({'olive oil'}), confidence=0.23684210526315788, lift=3.5962603878116344), OrderedStatistic(items_base=frozenset({'soup', 'olive oil'}), items_add=frozenset({'milk'}), confidence=0.4029850746268656, lift=3.1098673300165833)]),
 RelationRecord(items=frozenset({'milk', 'spaghetti', 'olive oil'}), support=0.007199040127982935, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'spaghetti'}), items_add=frozenset({'olive oil'}), confidence=0.20300751879699247, lift=3.0825089038385434)]),
 RelationRecord(items=frozenset({'soup', 'milk', 'tomatoes'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'tomatoes'}), items_add=frozenset({'soup'}), confidence=0.21904761904761905, lift=4.335293378565146), OrderedStatistic(items_base=frozenset({'soup', 'tomatoes'}), items_add=frozenset({'milk'}), confidence=0.44230769230769235, lift=3.4133230452674903)]),
 RelationRecord(items=frozenset({'milk', 'spaghetti', 'whole wheat pasta'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'whole wheat pasta'}), items_add=frozenset({'milk'}), confidence=0.4545454545454546, lift=3.5077628133183696)]),
 RelationRecord(items=frozenset({'soup', 'mineral water', 'olive oil'}), support=0.005199306759098787, ordered_statistics=[OrderedStatistic(items_base=frozenset({'soup', 'mineral water'}), items_add=frozenset({'olive oil'}), confidence=0.22543352601156072, lift=3.4230301186492245)]),
 RelationRecord(items=frozenset({'mineral water', 'whole wheat pasta', 'olive oil'}), support=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mineral water', 'whole wheat pasta'}), items_add=frozenset({'olive oil'}), confidence=0.4027777777777778, lift=6.115862573099416)]),
 RelationRecord(items=frozenset({'whole wheat pasta', 'nan', 'olive oil'}), support=0.007998933475536596, ordered_statistics=[OrderedStatistic(items_base=frozenset({'whole wheat pasta', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.2714932126696833, lift=4.122410097642296)]),
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RelationRecord(items=frozenset({'shrimp', 'nan', 'pasta'}), support=0.005065991201173177, ordered_statistics=[OrderedStatistic(items_base=frozenset({'nan', 'pasta'}), items_add=frozenset({'shrimp'}), confidence=0.3220338983050847, lift=4.506672147735896)]),
RelationRecord(items=frozenset({'spaghetti', 'pancakes', 'olive oil'}), support=0.005065991201173177, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'pancakes'}), items_add=frozenset({'olive oil'}), confidence=0.20105820105820105, lift=3.0529100529100526)]),
RelationRecord(items=frozenset({'spaghetti', 'tomatoes', 'olive oil'}), support=0.004399413411545127, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomatoes', 'olive oil'}), items_add=frozenset({'spaghetti'}), confidence=0.611111111111112, lift=3.5099115194827295), OrderedStatistic(items_base=frozenset({'spaghetti', 'tomatoes'}), items_add=frozenset({'olive oil'}), confidence=0.21019108280254778, lift=3.19158565202816)]),
RelationRecord(items=frozenset({'spaghetti', 'tomatoes', 'whole wheat rice'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'whole wheat rice'}), items_add=frozenset({'tomatoes'}), confidence=0.2169811320754717, lift=3.1726617382029496)]),
RelationRecord(items=frozenset({'milk', 'spaghetti', 'nan', 'avocado'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'nan', 'avocado'}), items_add=frozenset({'milk'}), confidence=0.41666666666666663, lift=3.215449245541838)]),
RelationRecord(items=frozenset({'milk', 'nan', 'burgers', 'cake'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'nan', 'milk', 'cake'}), items_add=frozenset({'burgers'}), confidence=0.27999999999999997, lift=3.211437308868501)]),
RelationRecord(items=frozenset({'chocolate', 'burgers', 'turkey', 'nan'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'turkey', 'nan'}), items_add=frozenset({'burgers'}), confidence=0.27058823529411763, lift=3.1034898363014927)]),
RelationRecord(items=frozenset({'milk', 'burgers', 'turkey', 'nan'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'turkey', 'nan'}), items_add=frozenset({'burgers'}), confidence=0.2823529411764706, lift=3.2384241770102533)]),
RelationRecord(items=frozenset({'nan', 'frozen vegetables', 'tomatoes', 'cake'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'nan', 'frozen vegetables', 'cake'}), items_add=frozenset({'tomatoes'}), confidence=0.2987012987012987, lift=4.367560314928736), OrderedStatistic(items_base=frozenset({'nan', 'tomatoes', 'cake'}), items_add=frozenset({'frozen vegetables'}), confidence=0.36507936507936506, lift=3.8300144300144296)]),
RelationRecord(items=frozenset({'cereals', 'spaghetti', 'nan', 'ground beef'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'cereals', 'nan', 'ground beef'}), items_add=frozenset({'spaghetti'}), confidence=0.6764705882352942, lift=3.8853031258445188), OrderedStatistic(items_base=frozenset({'cereals', 'spaghetti', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.45999999999999996, lift=4.681763907734057)]),
RelationRecord(items=frozenset({'nan', 'milk', 'chicken', 'ground beef'}), support=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset({'nan', 'chicken', 'ground beef'}), items_add=frozenset({'milk'}), confidence=0.40845070422535207, lift=3.152046020981858)]),
RelationRecord(items=frozenset({'nan', 'milk', 'chicken', 'olive oil'}), support=0.0035995200639914677, ordered_statistics=[OrderedStatistic(items_base=frozenset({'nan', 'milk', 'chicken'}), items_add=frozenset({})])

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t({'olive oil'}), confidence=0.24324324324324323, lift=3.69345661450924
6), OrderedStatistic(items_base=frozenset({'nan', 'chicken', 'olive oil'}), items_add=frozenset({'milk'}), confidence=0.5, lift=3.85853909465
0206), OrderedStatistic(items_base=frozenset({'milk', 'nan', 'olive oil'}), items_add=frozenset({'chicken'}), confidence=0.2109375, lift=3.51
609375)],
RelationRecord(items=frozenset({'nan', 'spaghetti', 'chicken', 'olive oil'}), support=0.0034662045060658577, ordered_statistics=[OrderedStatistic(items_base=frozenset({'nan', 'spaghetti', 'chicken'}), items_add=frozenset({'olive oil'}), confidence=0.20155038759689922, lift=3.0603835
169318647)]),
RelationRecord(items=frozenset({'chocolate', 'mineral water', 'eggs', 'ground beef'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'mineral water', 'eggs'}), items_add=frozenset({'ground beef'}), confidence=0.29702970297029
707, lift=3.023093354111531)]),
RelationRecord(items=frozenset({'chocolate', 'frozen vegetables', 'mineral water', 'ground beef'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'mineral water'}), items_add=frozenset({'ground beef'}), confidence=0.34246575342465757, lift=3.4855300087358976), OrderedStatistic(items_base=frozenset({'chocolate', 'mineral water', 'ground beef'}), items_add=frozenset({'frozen vegetables'}), confidence=0.304878048780487
85, lift=3.1984478935698455)]),
RelationRecord(items=frozenset({'chocolate', 'frozen vegetables', 'spaghetti', 'ground beef'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'ground beef'}), items_add=frozenset({'spaghetti'}), confidence=0.5348837209302326, lift=3.0721001460165964), OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'spaghetti'}), items_add=frozenset({'ground beef'}), confidence=0.3898305084745763, lift=3.96
7596531978015), OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'ground beef'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3333333333333337, lift=3.4969696969696975)]),
RelationRecord(items=frozenset({'chocolate', 'frozen vegetables', 'milk', 'mineral water'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'mineral water'}), items_add=frozenset({'milk'}), confidence=0.4109
589041095891, lift=3.1714019956029094)]),
RelationRecord(items=frozenset({'chocolate', 'frozen vegetables', 'milk', 'spaghetti'}), support=0.0034662045060658577, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'spaghetti'}), items_add=frozenset({'milk'}), confidence=0.440677966101
69485, lift=3.4007463207086555), OrderedStatistic(items_base=frozenset({'chocolate', 'milk', 'spaghetti'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3170731707317073, lift=3.3263858093126384)]),
RelationRecord(items=frozenset({'chocolate', 'frozen vegetables', 'mineral water', 'shrimp'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'mineral water'}), items_add=frozenset({'shrimp'}), confidence=0.32876712328767127, lift=4.600899611531385), OrderedStatistic(items_base=frozenset({'chocolate', 'shrimp', 'mineral water'}), items_add=frozenset({'frozen vegetables'}), confidence=0.4210526315789474, lift=4.417224
880382776)],
RelationRecord(items=frozenset({'chocolate', 'frozen vegetables', 'shrimp', 'nan'}), support=0.005332622317024397, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'nan'}), items_add=frozenset({'shrimp'}), confidence=0.23255813953488375, lift=3.2545123221103784), OrderedStatistic(items_base=frozenset({'chocolate', 'shrimp', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.29629629629629634, lift=3.1084175084175087)]),
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RelationRecord(items=frozenset({'herb & pepper', 'chocolate', 'nan',
'ground beef'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper', 'chocolate', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.4411764705882354, lift=4.4901827759597746)], RelationRecord(items=frozenset({'chocolate', 'soup', 'milk', 'nan'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'soup', 'nan'}), items_add=frozenset({'milk'}), confidence=0.3947368421052632, lift=3.0462150747238472)]), RelationRecord(items=frozenset({'chocolate', 'spaghetti', 'mineral water', 'olive oil'}), support=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'mineral water'}), items_add=frozenset({'olive oil'}), confidence=0.2436974789915966, lift=3.700353825740822)]), RelationRecord(items=frozenset({'chocolate', 'shrimp', 'mineral water', 'spaghetti'}), support=0.0034662045060658577, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'mineral water'}), items_add=frozenset({'shrimp'}), confidence=0.21848739495798317, lift=3.0576006522011783)]), RelationRecord(items=frozenset({'cooking oil', 'spaghetti', 'nan', 'ground beef'}), support=0.004799360085321957, ordered_statistics=[OrderedStatistic(items_base=frozenset({'cooking oil', 'nan', 'ground beef'}), items_add=frozenset({'spaghetti'}), confidence=0.5714285714285714, lift=3.2819951870487856), OrderedStatistic(items_base=frozenset({'cooking oil', 'spaghetti', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3025210084033613, lift=3.0789824749438446)]), RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'mineral water', 'eggs'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'mineral water', 'eggs'}), items_add=frozenset({'milk'}), confidence=0.411764705882353, lift=3.177620430888405)]), RelationRecord(items=frozenset({'herb & pepper', 'nan', 'eggs', 'ground beef'}), support=0.0041327822956939075, ordered_statistics=[OrderedStatistic(items_base=frozenset({'nan', 'eggs', 'ground beef'}), items_add=frozenset({'herb & pepper'}), confidence=0.2066666666666667, lift=4.178454627133872), OrderedStatistic(items_base=frozenset({'herb & pepper', 'nan', 'eggs'}), items_add=frozenset({'ground beef'}), confidence=0.3297872340425532, lift=3.3564912381997174)]), RelationRecord(items=frozenset({'nan', 'red wine', 'spaghetti', 'eggs'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'nan', 'red wine', 'eggs'}), items_add=frozenset({'spaghetti'}), confidence=0.5283018867924528, lift=3.0342974370828397)]), RelationRecord(items=frozenset({'herb & pepper', 'french fries', 'nan', 'ground beef'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'french fries', 'nan', 'ground beef'}), items_add=frozenset({'herb & pepper'}), confidence=0.23076923076923078, lift=4.665768194070081), OrderedStatistic(items_base=frozenset({'herb & pepper', 'french fries', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.46153846153846156, lift=4.697421981004071)]), RelationRecord(items=frozenset({'frozen smoothie', 'spaghetti', 'milk', 'mineral water'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen smoothie', 'spaghetti', 'mineral water'}), items_add=frozenset({'milk'}), confidence=0.4705882352941177, lift=3.631566206729606), OrderedStatistic(items_base=frozenset({'spaghetti', 'milk', 'mineral water'}), items_add=frozenset({'frozen smoothie'}), confidence=0.2033898305084746, lift=3.211846565566459)]), RelationRecord(items=frozenset({'tomatoes', 'frozen vegetables', 'nan', 'green tea'}), support=0.00333288948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'nan', 'green tea'}), items_add=frozenset({'tomatoes'}), confidence=0.4411764705882354, lift=4.4901827759597746)])

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tea'}), items_add=frozenset({'tomatoes'}), confidence=0.231481481481481
5, lift=3.38468341635983)],

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'mineral
water', 'ground beef'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'miner
al water', 'ground beef'}), items_add=frozenset({'milk'}), confidence=
0.40579710144927533, lift=3.1315679608755294), OrderedStatistic(items_b
ase=frozenset({'frozen vegetables', 'milk', 'mineral water'}), items_ad
d=frozenset({'ground beef'}), confidence=0.3373493975903614, lift=3.433
4570302921317), OrderedStatistic(items_base=frozenset({'milk', 'mineral
water', 'ground beef'}), items_add=frozenset({'frozen vegetables'}), co
nfidence=0.3373493975903614, lift=3.539101861993428)],

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'spaghett
i', 'ground beef'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk', 'g
round beef'}), items_add=frozenset({'spaghetti'}), confidence=0.5348837
209302326, lift=3.0721001460165964), OrderedStatistic(items_base=froze
n set({'frozen vegetables', 'milk', 'spaghetti'}), items_add=frozenset(
{'ground beef'}), confidence=0.3709677419354839, lift=3.77561605462423
97), OrderedStatistic(items_base=frozenset({'milk', 'spaghetti', 'grou
n d beef'}), items_add=frozenset({'frozen vegetables'}), confidence=0.315
0684931506849, lift=3.305354919053549)],

RelationRecord(items=frozenset({'frozen vegetables', 'mineral water',
'spaghetti', 'ground beef'}), support=0.004399413411545127, ordered_st
atistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'm
ineral water', 'spaghetti'}), items_add=frozenset({'ground beef'}), con
fidence=0.3666666666666667, lift=3.7318407960199007)],

RelationRecord(items=frozenset({'frozen vegetables', 'spaghetti', 'na
n', 'ground beef'}), support=0.008665511265164644, ordered_statistics=[O
rderedStatistic(items_base=frozenset({'frozen vegetables', 'spaghett
i', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3110047
8468899523, lift=3.165328208890303)],

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'mineral
water', 'olive oil'}), support=0.003332888948140248, ordered_statistics
=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk',
'mineral water'}), items_add=frozenset({'olive oil'}), confidence=0.301
20481927710846, lift=4.573557387444516), OrderedStatistic(items_base=fr
ozenset({'frozen vegetables', 'mineral water', 'olive oil'}), items_add
=frozenset({'milk'}), confidence=0.5102040816326531, lift=3.93728479045
9394), OrderedStatistic(items_base=frozenset({'milk', 'mineral water',
'olive oil'}), items_add=frozenset({'frozen vegetables'}), confidence=
0.3906250000000006, lift=4.098011363636364)],

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'mineral
water', 'soup'}), support=0.0030662578322890282, ordered_statistics=[Or
deredStatistic(items_base=frozenset({'frozen vegetables', 'milk', 'mine
ral water'}), items_add=frozenset({'soup'}), confidence=0.2771084337349
3976, lift=5.484407286136631), OrderedStatistic(items_base=frozenset(
{'frozen vegetables', 'milk', 'soup'}), items_add=frozenset({'mineral
water'}), confidence=0.7666666666666666, lift=3.21631245339299), Ordere
dStatistic(items_base=frozenset({'frozen vegetables', 'mineral water',
'soup'}), items_add=frozenset({'milk'}), confidence=0.6052631578947368,
lift=4.670863114576565), OrderedStatistic(items_base=frozenset({'soup',
'milk', 'mineral water'}), items_add=frozenset({'frozen vegetables'}),
confidence=0.3593750000000006, lift=3.77017045454553)],

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'mineral
water', 'spaghetti'}), support=0.004532728969470737, ordered_statistics
=[OrderedStatistic(items_base=frozenset({'spaghetti', 'milk', 'mineral
water'}), items_add=frozenset({'frozen vegetables'}), confidence=0.2881
3559322033894, lift=3.0228043143297376)],

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'nan', 'o
live oil'}), support=0.004799360085321957, ordered_statistics=[OrderedS

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statistic(items_base=frozenset({'frozen vegetables', 'milk', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.20338983050847456, lift=3.088314005352364), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'nan', 'olive oil'}), items_add=frozenset({'milk'}), confidence=0.4235294117647058, lift=3.2684095860566447]),
RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'nan', 'soup'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'nan', 'soup'}), items_add=frozenset({'milk'}), confidence=0.5, lift=3.858539094650206)],
RelationRecord(items=frozenset({'tomatoes', 'frozen vegetables', 'milk', 'nan'}), support=0.0041327822956939075, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomatoes', 'milk', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.29523809523809524, lift=3.0973160173160172)],
RelationRecord(items=frozenset({'frozen vegetables', 'mineral water', 'nan', 'shrimp'}), support=0.007199040127982935, ordered_statistics=[OrderedStatistic(items_base=frozenset({'shrimp', 'mineral water', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3068181818181818, lift=3.218801652892562)],
RelationRecord(items=frozenset({'frozen vegetables', 'mineral water', 'spaghetti', 'shrimp'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'mineral water', 'spaghetti'}), items_add=frozenset({'shrimp'}), confidence=0.277777777777778, lift=3.8873341625207294), OrderedStatistic(items_base=frozenset({'shrimp', 'mineral water', 'spaghetti'}), items_add=frozenset({'frozen vegetables'}), confidence=0.39062500000000006, lift=4.09801363636364)],
RelationRecord(items=frozenset({'tomatoes', 'frozen vegetables', 'mineral water', 'spaghetti'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'mineral water', 'spaghetti'}), items_add=frozenset({'tomatoes'}), confidence=0.255555555555556, lift=3.7366904916612524), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'mineral water', 'tomatoes'}), items_add=frozenset({'spaghetti'}), confidence=0.5227272727272727, lift=3.0022796881525826), OrderedStatistic(items_base=frozenset({'spaghetti', 'mineral water', 'tomatoes'}), items_add=frozenset({'frozen vegetables'}), confidence=0.32857142857142857, lift=3.447012987012987)],
RelationRecord(items=frozenset({'frozen vegetables', 'spaghetti', 'nan', 'olive oil'}), support=0.005732568990801226, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'spaghetti', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.20574162679425836, lift=3.1240241752707125)],
RelationRecord(items=frozenset({'spaghetti', 'frozen vegetables', 'shrimp', 'nan'}), support=0.005999200106652446, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'spaghetti', 'nan'}), items_add=frozenset({'shrimp'}), confidence=0.21531100478468898, lift=3.0131489680782684)],
RelationRecord(items=frozenset({'tomatoes', 'frozen vegetables', 'shrimp', 'nan'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'shrimp', 'nan'}), items_add=frozenset({'tomatoes'}), confidence=0.2400000000000002, lift=3.5092397660818717), OrderedStatistic(items_base=frozenset({'tomatoes', 'frozen vegetables', 'nan'}), items_add=frozenset({'shrimp'}), confidence=0.2479338842975207, lift=3.4696866905143704), OrderedStatistic(items_base=frozenset({'tomatoes', 'shrimp', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.35714285714285715, lift=3.7467532467532467]),
RelationRecord(items=frozenset({'tomatoes', 'frozen vegetables', 'spaghetti', 'nan'}), support=0.006665777896280496, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'spaghetti', 'nan'}), items_add=frozenset({'tomatoes'}), confidence=0.2392344497607655

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8, lift=3.4980460188216425), OrderedStatistic(items_base=frozenset({'to
matoes', 'spaghetti', 'nan'}), items_add=frozenset({'frozen vegetable
s'}), confidence=0.3184713375796179, lift=3.341053850607991)]),
RelationRecord(items=frozenset({'spaghetti', 'grated cheese', 'nan',
'ground beef'}), support=0.005332622317024397, ordered_statistics=[Orde
redStatistic(items_base=frozenset({'spaghetti', 'grated cheese', 'na
n'}), items_add=frozenset({'ground beef'}), confidence=0.32258064516129
03, lift=3.283144395325426)]),
RelationRecord(items=frozenset({'tomatoes', 'ground beef', 'nan', 'gre
en tea'}), support=0.0030662578322890282, ordered_statistics=[OrderedSt
atistic(items_base=frozenset({'ground beef', 'nan', 'green tea'}), item
s_add=frozenset({'tomatoes'}), confidence=0.2072072072072072, lift=3.02
97490472929067)]),
RelationRecord(items=frozenset({'herb & pepper', 'milk', 'nan', 'grou
n d beef'}), support=0.0035995200639914677, ordered_statistics=[OrderedSt
atistic(items_base=frozenset({'herb & pepper', 'milk', 'nan'}), item
s_add=frozenset({'ground beef'}), confidence=0.3913043478260869, lift=3.98
25968969382335)]),
RelationRecord(items=frozenset({'herb & pepper', 'mineral water', 'na
n', 'ground beef'}), support=0.006665777896280496, ordered_statistics=
[OrderedStatistic(items_base=frozenset({'herb & pepper', 'mineral wate
r', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3906250
000000006, lift=3.975682666214383)]),
RelationRecord(items=frozenset({'herb & pepper', 'spaghetti', 'nan',
'ground beef'}), support=0.006399146780429276, ordered_statistics=[Orde
redStatistic(items_base=frozenset({'herb & pepper', 'spaghetti', 'na
n'}), items_add=frozenset({'ground beef'}), confidence=0.39344262295081
97, lift=4.004359721511667)]),
RelationRecord(items=frozenset({'milk', 'nan', 'ground beef', 'olive o
il'}), support=0.004932675643247567, ordered_statistics=[OrderedStatist
ic(items_base=frozenset({'milk', 'nan', 'ground beef'}), items_add=froz
enset({'olive oil'}), confidence=0.22424242424242427, lift=3.4049441786
2839)]),
RelationRecord(items=frozenset({'soup', 'milk', 'nan', 'ground bee
f'}), support=0.003999466737768298, ordered_statistics=[OrderedStatisti
c(items_base=frozenset({'soup', 'nan', 'ground beef'}), items_add=froze
nset({'milk'}), confidence=0.4109589041095891, lift=3.171401995602909
4]),
RelationRecord(items=frozenset({'spaghetti', 'mineral water', 'ground
beef', 'olive oil'}), support=0.0030662578322890282, ordered_statistics
=[OrderedStatistic(items_base=frozenset({'spaghetti', 'mineral water',
'olive oil'}), items_add=frozenset({'ground beef'}), confidence=0.29870
12987012987, lift=3.0401064335935435)]),
RelationRecord(items=frozenset({'spaghetti', 'mineral water', 'tomatoe
s', 'ground beef'}), support=0.0030662578322890282, ordered_statistics=
[OrderedStatistic(items_base=frozenset({'mineral water', 'tomatoes', 'g
round beef'}), items_add=frozenset({'spaghetti'}), confidence=0.5609756
097560976, lift=3.221958689724723), OrderedStatistic(items_base=froz
enset({'spaghetti', 'mineral water', 'tomatoes'}), items_add=frozenset({'g
round beef'}), confidence=0.32857142857142857, lift=3.34411707695289
8]),
RelationRecord(items=frozenset({'pepper', 'spaghetti', 'nan', 'ground
beef'}), support=0.003332888948140248, ordered_statistics=[OrderedStati
stic(items_base=frozenset({'spaghetti', 'nan', 'pepper'}), items_add=fr
ozenset({'ground beef'}), confidence=0.33783783783783783, lift=3.438428
2518610876]),
RelationRecord(items=frozenset({'shrimp', 'spaghetti', 'nan', 'ground
beef'}), support=0.005999200106652446, ordered_statistics=[OrderedStati
stic(items_base=frozenset({'shrimp', 'nan', 'ground beef'}), items_add=
frozenset({'spaghetti'}), confidence=0.5232558139534884, lift=3.0053153
60233627)]),

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RelationRecord(items=frozenset({'spaghetti', 'nan', 'ground beef', 'tomato sauce'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomato sauce', 'nan', 'ground beef'}), items_add=frozenset({'spaghetti'}), confidence=0.5750000000000001, lift=3.3025076569678413), OrderedStatistic(items_base=frozenset({'spaghetti', 'nan', 'tomato sauce'}), items_add=frozenset({'ground beef'}), confidence=0.4893617021276596, lift=4.980599901844742)]),
RelationRecord(items=frozenset({'spaghetti', 'milk', 'mineral water', 'olive oil'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'milk', 'mineral water'}), items_add=frozenset({'olive oil'}), confidence=0.211864406779661, lift=3.216993755575379)]),
RelationRecord(items=frozenset({'spaghetti', 'milk', 'mineral water', 'tomatoes'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'milk', 'mineral water'}), items_add=frozenset({'tomatoes'}), confidence=0.211864406779661, lift=3.0978458387022165)]),
RelationRecord(items=frozenset({'shrimp', 'milk', 'nan', 'olive oil'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'shrimp', 'nan', 'olive oil'}), items_add=frozenset({'milk'}), confidence=0.3999999999999997, lift=3.0868312757201646]),
RelationRecord(items=frozenset({'soup', 'milk', 'nan', 'olive oil'}), support=0.0035995200639914677, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'nan', 'olive oil'}), items_add=frozenset({'soup'}), confidence=0.2109375, lift=4.174781497361478), OrderedStatistic(items_base=frozenset({'soup', 'milk', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.23684210526315788, lift=3.5962603878116344), OrderedStatistic(items_base=frozenset({'soup', 'nan', 'olive oil'}), items_add=frozenset({'milk'}), confidence=0.4029850746268656, lift=3.1098673300165833)],
RelationRecord(items=frozenset({'milk', 'spaghetti', 'nan', 'olive oil'}), support=0.007199040127982935, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'spaghetti', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.20300751879699247, lift=3.0825089038385434]),
RelationRecord(items=frozenset({'tomatoes', 'soup', 'milk', 'nan'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomatoes', 'milk', 'nan'}), items_add=frozenset({'soup'}), confidence=0.21904761904761905, lift=4.335293378565146), OrderedStatistic(items_base=frozenset({'tomatoes', 'soup', 'nan'}), items_add=frozenset({'milk'}), confidence=0.44230769230769235, lift=3.4133230452674903)],
RelationRecord(items=frozenset({'whole wheat pasta', 'milk', 'spaghetti', 'nan'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'whole wheat pasta', 'spaghetti', 'nan'}), items_add=frozenset({'milk'}), confidence=0.4545454545454546, lift=3.5077628133183696)],
RelationRecord(items=frozenset({'soup', 'mineral water', 'nan', 'olive oil'}), support=0.005199306759098787, ordered_statistics=[OrderedStatistic(items_base=frozenset({'soup', 'mineral water', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.22543352601156072, lift=3.4230301186492245]),
RelationRecord(items=frozenset({'whole wheat pasta', 'mineral water', 'nan', 'olive oil'}), support=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset({'whole wheat pasta', 'mineral water', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.40277777777778, lift=6.115862573099416)],
RelationRecord(items=frozenset({'pancakes', 'spaghetti', 'nan', 'olive oil'}), support=0.005065991201173177, ordered_statistics=[OrderedStatistic(items_base=frozenset({'pancakes', 'spaghetti', 'nan'}), items_add=frozenset({'olive oil'})]

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rozensest({'olive oil'}), confidence=0.20105820105820105, lift=3.0529100
529100526]),

RelationRecord(items=frozenset({'tomatoes', 'spaghetti', 'nan', 'olive
oil'}), support=0.004399413411545127, ordered_statistics=[OrderedStatis
tic(items_base=frozenset({'tomatoes', 'nan', 'olive oil'})), items_add=f
rozensest({'spaghetti'}), confidence=0.6111111111111112, lift=3.50991151
94827295], OrderedStatistic(items_base=frozenset({'tomatoes', 'spaghett
i', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.210191082
80254778, lift=3.19158565202816]),

RelationRecord(items=frozenset({'tomatoes', 'spaghetti', 'nan', 'whole
wheat rice'}), support=0.0030662578322890282, ordered_statistics=[Order
edStatistic(items_base=frozenset({'spaghetti', 'nan', 'whole wheat ric
e'}), items_add=frozenset({'tomatoes'}), confidence=0.2169811320754717,
lift=3.1726617382029496]),

RelationRecord(items=frozenset({'chocolate', 'ground beef', 'mineral w
ater', 'eggs', 'nan'}), support=0.003999466737768298, ordered_statistic
s=[OrderedStatistic(items_base=frozenset({'chocolate', 'nan', 'mineral
water', 'eggs'}), items_add=frozenset({'ground beef'}), confidence=0.29
702970297029707, lift=3.023093354111531]),

RelationRecord(items=frozenset({'frozen vegetables', 'chocolate', 'gro
und beef', 'mineral water', 'nan'}), support=0.003332888948140248, orde
red_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'fr
ozen vegetables', 'mineral water', 'nan'}), items_add=frozenset({'groun
d beef'}), confidence=0.34246575342465757, lift=3.4855300087358976], Or
deredStatistic(items_base=frozenset({'chocolate', 'mineral water', 'na
n', 'ground beef'}), items_add=frozenset({'frozen vegetables'}), confid
ence=0.30487804878048785, lift=3.1984478935698455]),

RelationRecord(items=frozenset({'frozen vegetables', 'spaghetti', 'cho
colate', 'ground beef', 'nan'}), support=0.0030662578322890282, ordered_
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n vegetables', 'nan', 'ground beef'}), items_add=frozenset({'spaghett
i'}), confidence=0.5348837209302326, lift=3.0721001460165964], Order
edStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'spagh
etti', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3898
305084745763, lift=3.967596531978015], OrderedStatistic(items_base=froz
ensest({'chocolate', 'spaghetti', 'nan', 'ground beef'}), items_add=froz
ensest({'frozen vegetables'}), confidence=0.3333333333333337, lift=3.49
69696969696975]),

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'chocolat
e', 'mineral water', 'nan'}), support=0.003999466737768298, ordered_st
atistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen ve
getables', 'mineral water', 'nan'}), items_add=frozenset({'milk'}), con
fidence=0.4109589041095891, lift=3.1714019956029094]),

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'spaghett
i', 'chocolate', 'nan'}), support=0.0034662045060658577, ordered_statis
tics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen veget
ables', 'spaghetti', 'nan'}), items_add=frozenset({'milk'}), confidence
=0.44067796610169485, lift=3.4007463207086555], OrderedStatistic(items_
base=frozenset({'chocolate', 'milk', 'spaghetti', 'nan'}), items_add=fr
ozensest({'frozen vegetables'}), confidence=0.3170731707317073, lift=3.3
263858093126384]),

RelationRecord(items=frozenset({'frozen vegetables', 'shrimp', 'chocol
ate', 'mineral water', 'nan'}), support=0.003199573390214638, ordered_s
tatistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen
vegetables', 'mineral water', 'nan'}), items_add=frozenset({'shrimp'}),
confidence=0.32876712328767127, lift=4.600899611531385], OrderedStatist
ic(items_base=frozenset({'chocolate', 'shrimp', 'mineral water', 'na
n'}), items_add=frozenset({'frozen vegetables'}), confidence=0.42105263
15789474, lift=4.417224880382776]),

RelationRecord(items=frozenset({'spaghetti', 'chocolate', 'olive oil',
'mineral water', 'nan'}), support=0.0038661511798426876, ordered_statis

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tics=[OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti',
'mineral water', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.2436974789915966, lift=3.700353825740822)],

RelationRecord(items=frozenset({'shrimp', 'spaghetti', 'chocolate', 'mineral water', 'nan'}), support=0.0034662045060658577, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'mineral water', 'nan'}), items_add=frozenset({'shrimp'}), confidence=0.21848739495798317, lift=3.0576006522011783)]),

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'mineral water', 'eggs', 'nan'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'nan', 'frozen vegetables', 'mineral water', 'eggs'}), items_add=frozenset({'milk'}), confidence=0.411764705882353, lift=3.177620430888405)]),

RelationRecord(items=frozenset({'milk', 'spaghetti', 'frozen smoothie', 'mineral water', 'nan'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen smoothie', 'spaghetti', 'mineral water', 'nan'}), items_add=frozenset({'milk'}), confidence=0.4705882352941177, lift=3.631566206729606), OrderedStatistic(items_base=frozenset({'spaghetti', 'milk', 'mineral water', 'nan'}), items_add=frozenset({'frozen smoothie'}), confidence=0.2033898305084746, lift=3.211846565566459)]),

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'ground beef', 'mineral water', 'nan'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'mineral water', 'nan', 'ground beef'}), items_add=frozenset({'milk'}), confidence=0.40579710144927533, lift=3.1315679608755294), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk', 'mineral water', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3373493975903614, lift=3.4334570302921317), OrderedStatistic(items_base=frozenset({'milk', 'mineral water', 'nan', 'ground beef'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3373493975903614, lift=3.539101861993428)]),

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'spaghetti', 'ground beef', 'nan'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk', 'nan', 'ground beef'}), items_add=frozenset({'spaghetti'}), confidence=0.5348837209302326, lift=3.0721001460165964), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk', 'spaghetti', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3709677419354839, lift=3.7756160546242397), OrderedStatistic(items_base=frozenset({'milk', 'spaghetti', 'nan', 'ground beef'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3150684931506849, lift=3.305354919053549)]),

RelationRecord(items=frozenset({'frozen vegetables', 'spaghetti', 'ground beef', 'mineral water', 'nan'}), support=0.004399413411545127, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables', 'mineral water', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3666666666666667, lift=3.7318407960199007)]),

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'olive oil', 'mineral water', 'nan'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk', 'mineral water', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.30120481927710846, lift=4.573557387444516), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'mineral water', 'nan', 'olive oil'}), items_add=frozenset({'milk'}), confidence=0.5102040816326531, lift=3.937284790459394), OrderedStatistic(items_base=frozenset({'milk', 'mineral water', 'nan', 'olive oil'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3906250000000006, lift=4.098011363636364)]),

RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'mineral water', 'soup', 'nan'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'mil

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k', 'mineral water', 'nan'})), items_add=frozenset({'soup'}), confidence
=0.27710843373493976, lift=5.484407286136631), OrderedStatistic(items_b
ase=frozenset({'frozen vegetables', 'milk', 'nan', 'soup'}), items_add=
frozenset({'mineral water'}), confidence=0.7666666666666666, lift=3.216
31245339299), OrderedStatistic(items_base=frozenset({'frozen vegetable
s', 'mineral water', 'nan', 'soup'}), items_add=frozenset({'milk'}), co
nfidence=0.6052631578947368, lift=4.670863114576565), OrderedStatistic
(items_base=frozenset({'soup', 'milk', 'mineral water', 'nan'}), items_
add=frozenset({'frozen vegetables'}), confidence=0.35937500000000006, l
ift=3.7701704545454553)]),
RelationRecord(items=frozenset({'frozen vegetables', 'milk', 'spaghett
i', 'mineral water', 'nan'}), support=0.004532728969470737, ordered_st
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ineral water', 'nan'}), items_add=frozenset({'frozen vegetables'}), con
fidence=0.28813559322033894, lift=3.0228043143297376)]),
RelationRecord(items=frozenset({'frozen vegetables', 'shrimp', 'spaghe
tti', 'mineral water', 'nan'}), support=0.003332888948140248, ordered_s
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vegetables', 'mineral water', 'nan'}), items_add=frozenset({'shrimp'}), c
onfidence=0.2777777777777778, lift=3.8873341625207294), OrderedStatist
ic(items_base=frozenset({'spaghetti', 'shrimp', 'mineral water', 'na
n'}), items_add=frozenset({'frozen vegetables'}), confidence=0.39062500
00000006, lift=4.098011363636364)]),
RelationRecord(items=frozenset({'frozen vegetables', 'spaghetti', 'tom
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d_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'froz
en vegetables', 'mineral water', 'nan'}), items_add=frozenset({'tomatoe
s'}), confidence=0.2555555555555556, lift=3.7366904916612524), Ordereds
tatistic(items_base=frozenset({'tomatoes', 'frozen vegetables', 'minera
l water', 'nan'}), items_add=frozenset({'spaghetti'}), confidence=0.522
7272727272727, lift=3.0022796881525826), OrderedStatistic(items_base=fr
ozenset({'tomatoes', 'spaghetti', 'mineral water', 'nan'}), items_add=f
rozenset({'frozen vegetables'}), confidence=0.32857142857142857, lift=
3.447012987012987)]),
RelationRecord(items=frozenset({'spaghetti', 'ground beef', 'olive oi
l', 'mineral water', 'nan'}), support=0.0030662578322890282, ordered_st
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water', 'nan', 'olive oil'}), items_add=frozenset({'ground beef'}), con
fidence=0.2987012987012987, lift=3.0401064335935435)]),
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f', 'mineral water', 'nan'}), support=0.0030662578322890282, ordered_st
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ater', 'nan', 'ground beef'}), items_add=frozenset({'spaghetti'}), conf
idence=0.5609756097560976, lift=3.221958689724723), OrderedStatistic(it
ems_base=frozenset({'tomatoes', 'spaghetti', 'mineral water', 'nan'}), it
ems_add=frozenset({'ground beef'}), confidence=0.32857142857142857, l
ift=3.344117076952898)]),
RelationRecord(items=frozenset({'milk', 'spaghetti', 'olive oil', 'min
eral water', 'nan'}), support=0.003332888948140248, ordered_statistics=
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ater', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.211864
406779661, lift=3.216993755575379)]),
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ral water', 'nan'}), support=0.003332888948140248, ordered_statistics=
[OrderedStatistic(items_base=frozenset({'spaghetti', 'milk', 'mineral w
ater', 'nan'}), items_add=frozenset({'tomatoes'}), confidence=0.2118644
06779661, lift=3.0978458387022165)])

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