

```
In [3]: !pip install apyori
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Requirement already satisfied: apyori in c:\users\clyia\anaconda3\lib\site-packages (1.1.2)
```

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In [4]: import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

```
In [5]: dataset = pd.read_csv('Market_Basket_Optimisation.csv', header = None)
transactions = []
for i in range(0, 7501):
    transactions.append([str(dataset.values[i,j]) for j in range(0, 20)])
```

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In [6]: from apyori import apriori
rules = apriori(transactions, min_support = 0.003, min_confidence = 0.2, min_lift = 3, m
```

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In [7]: results = list(rules)
```

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In [8]: results
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Out[8]: [RelationRecord(items=frozenset({'light cream', 'chicken'}), support=0.00453272896947073
7, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light cream'}), items_add
=frozenset({'chicken'}), confidence=0.29059829059829057, lift=4.84395061728395)]),
RelationRecord(items=frozenset({'mushroom cream sauce', 'escalope'}), support=0.0057325
68990801226, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mushroom cream
sauce'}), items_add=frozenset({'escalope'}), confidence=0.3006993006993007, lift=3.79083
2696715049)]),
RelationRecord(items=frozenset({'pasta', 'escalope'}), support=0.005865884548726837, or
dered_statistics=[OrderedStatistic(items_base=frozenset({'pasta'}), items_add=frozenset
({'escalope'}), confidence=0.3728813559322034, lift=4.700811850163794)]),
RelationRecord(items=frozenset({'honey', 'fromage blanc'}), support=0.00333288894814024
8, ordered_statistics=[OrderedStatistic(items_base=frozenset({'fromage blanc'}), items_a
dd=frozenset({'honey'}), confidence=0.2450980392156863, lift=5.164270764485569)]),
RelationRecord(items=frozenset({'ground beef', 'herb & pepper'}), support=0.01599786695
1073192, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper'}), i
tems_add=frozenset({'ground beef'}), confidence=0.3234501347708895, lift=3.2919938411349
285)]),
RelationRecord(items=frozenset({'ground beef', 'tomato sauce'}), support=0.005332622317
024397, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomato sauce'}), ite
ms_add=frozenset({'ground beef'}), confidence=0.3773584905660377, lift=3.84065948132408
3)]),
RelationRecord(items=frozenset({'olive oil', 'light cream'}), support=0.003199573390214
638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light cream'}), items_a
dd=frozenset({'olive oil'}), confidence=0.20512820512820515, lift=3.1147098515519573)]),
RelationRecord(items=frozenset({'olive oil', 'whole wheat pasta'}), support=0.007998933
475536596, ordered_statistics=[OrderedStatistic(items_base=frozenset({'whole wheat past
a'}), items_add=frozenset({'olive oil'}), confidence=0.2714932126696833, lift=4.12241009
7642296)]),
RelationRecord(items=frozenset({'shrimp', 'pasta'}), support=0.005065991201173177, orde
red_statistics=[OrderedStatistic(items_base=frozenset({'pasta'}), items_add=frozenset
({'shrimp'}), confidence=0.3220338983050847, lift=4.506672147735896)]),
RelationRecord(items=frozenset({'spaghetti', 'avocado', 'milk'}), support=0.00333288894
8140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'avocad
o'}), items_add=frozenset({'milk'}), confidence=0.41666666666666663, lift=3.215449245541
838)]),
RelationRecord(items=frozenset({'cake', 'milk', 'burgers'}), support=0.0037328356219170
776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'cake', 'milk'}), items_
add=frozenset({'burgers'}), confidence=0.27999999999999997, lift=3.211437308868501)]),
RelationRecord(items=frozenset({'chocolate', 'turkey', 'burgers'}), support=0.003066257
8322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'tur
key'}), items_add=frozenset({'burgers'}), confidence=0.27058823529411763, lift=3.1034898
363014927)])]
```

RelationRecord(items=frozenset({'turkey', 'milk', 'burgers'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'turkey', 'milk'}), items_add=frozenset({'burgers'}), confidence=0.2823529411764706, lift=3.2384241770102533)]),
RelationRecord(items=frozenset({'cake', 'frozen vegetables', 'tomatoes'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'cake', 'frozen vegetables'}), items_add=frozenset({'tomatoes'}), confidence=0.2987012987012987, lift=4.367560314928736), OrderedStatistic(items_base=frozenset({'cake', 'tomatoes'}), items_add=frozenset({'frozen vegetables'}), confidence=0.36507936507936506, lift=3.8300144300144296)]),
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'cereals'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'cereals'}), items_add=frozenset({'spaghetti'}), confidence=0.6764705882352942, lift=3.8853031258445188), OrderedStatistic(items_base=frozenset({'spaghetti', 'cereals'}), items_add=frozenset({'ground beef'}), confidence=0.45999999999999996, lift=4.681763907734057)]),
RelationRecord(items=frozenset({'ground beef', 'milk', 'chicken'}), support=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'chicken'}), items_add=frozenset({'milk'}), confidence=0.40845070422535207, lift=3.152046020981858)]),
RelationRecord(items=frozenset({'light cream', 'nan', 'chicken'}), support=0.004532728969470737, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light cream'}), items_add=frozenset({'chicken', 'nan'}), confidence=0.29059829059829057, lift=4.84395061728395), OrderedStatistic(items_base=frozenset({'light cream', 'nan'}), items_add=frozenset({'chicken'}), confidence=0.29059829059829057, lift=4.84395061728395)]),
RelationRecord(items=frozenset({'olive oil', 'milk', 'chicken'}), 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({'olive oil', 'chicken'}), items_add=frozenset({'milk'}), confidence=0.5, lift=3.858539094650206), OrderedStatistic(items_base=frozenset({'olive oil', 'milk'}), items_add=frozenset({'chicken'}), confidence=0.2109375, lift=3.51609375)]),
RelationRecord(items=frozenset({'olive oil', 'spaghetti', 'chicken'}), 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({'chocolate', 'ground beef', 'herb & pepper'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'herb & pepper'}), items_add=frozenset({'ground beef'}), confidence=0.4411764705882354, lift=4.4901827759597746)]),
RelationRecord(items=frozenset({'chocolate', 'milk', 'soup'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'soup'}), items_add=frozenset({'milk'}), confidence=0.3947368421052632, lift=3.0462150747238472)]),
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'cooking oil'}), support=0.004799360085321957, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'cooking oil'}), items_add=frozenset({'spaghetti'}), confidence=0.5714285714285714, lift=3.2819951870487856), OrderedStatistic(items_base=frozenset({'spaghetti', 'cooking oil'}), items_add=frozenset({'ground beef'}), confidence=0.3025210084033613, lift=3.0789824749438446)]),
RelationRecord(items=frozenset({'ground beef', 'eggs', 'herb & pepper'}), support=0.0041327822956939075, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'eggs'}), 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({'spaghetti', 'eggs', 'red wine'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'eggs', 'red wine'}), items_add=frozenset({'spaghetti'}), confidence=0.5283018867924528, lift=3.0342974370828397)]),

RelationRecord(items=frozenset({'mushroom cream sauce', 'nan', 'escalope'}), support=0.005732568990801226, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mushroom cream sauce'}), items_add=frozenset({'nan', 'escalope'}), confidence=0.3006993006993007, lift=3.790832696715049), OrderedStatistic(items_base=frozenset({'mushroom cream sauce', 'nan'}), items_add=frozenset({'escalope'}), confidence=0.3006993006993007, lift=3.790832696715049)]),

RelationRecord(items=frozenset({'pasta', 'nan', 'escalope'}), support=0.005865884548726837, ordered_statistics=[OrderedStatistic(items_base=frozenset({'pasta'}), items_add=frozenset({'nan', 'escalope'}), confidence=0.3728813559322034, lift=4.700811850163794), OrderedStatistic(items_base=frozenset({'pasta', 'nan'}), items_add=frozenset({'escalope'}), confidence=0.3728813559322034, lift=4.700811850163794)]),

RelationRecord(items=frozenset({'ground beef', 'french fries', 'herb & pepper'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'french fries'}), 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({'nan', 'honey', 'fromage blanc'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'fromage blanc'}), items_add=frozenset({'honey', 'nan'}), confidence=0.2450980392156863, lift=5.1788180060756694), OrderedStatistic(items_base=frozenset({'nan', 'fromage blanc'}), items_add=frozenset({'honey'}), confidence=0.2450980392156863, lift=5.164270764485569)]),

RelationRecord(items=frozenset({'tomatoes', 'frozen vegetables', '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({'spaghetti', 'ground beef', 'frozen vegetables'}), support=0.008665511265164644, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables'}), items_add=frozenset({'ground beef'}), confidence=0.31100478468899523, lift=3.165328208890303)]),

RelationRecord(items=frozenset({'olive oil', 'frozen vegetables', 'milk'}), 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({'olive oil', 'frozen vegetables'}), 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({'tomatoes', 'frozen vegetables', 'milk'}), support=0.0041327822956939075, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomatoes', 'milk'}), items_add=frozenset({'frozen vegetables'}), confidence=0.29523809523809524, lift=3.0973160173160172)]),

RelationRecord(items=frozenset({'mineral water', 'frozen vegetables', 'shrimp'}), support=0.007199040127982935, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mineral water', 'shrimp'}), items_add=frozenset({'frozen vegetables'}), confidence=0.30508474576271183, lift=3.200616332819722)]),

RelationRecord(items=frozenset({'spaghetti', 'olive oil', 'frozen vegetables'}), support=0.005732568990801226, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables'}), items_add=frozenset({'olive oil'}), confidence=0.20574162679425836, lift=3.1240241752707125)]),

RelationRecord(items=frozenset({'spaghetti', 'frozen vegetables', 'shrimp'}), support=0.005999200106652446, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables'}), items_add=frozenset({'shrimp'}), confidence=0.21531100478468898, lift=3.0131489680782684)]),

RelationRecord(items=frozenset({'tomatoes', 'frozen vegetables', 'shrimp'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'shrimp'}), items_add=frozenset({'tomatoes'}), confidence=0.24000000000000002, lift=3.5092397660818717), OrderedStatistic(items_base=frozenset({'tomatoes', 'frozen vegetables'}), items_add=frozenset({'shrimp'}), confidence=0.2479338842975207, lift=3.4696866905143704), OrderedStatistic(items_base=frozenset({'tomatoes', 'shrimp'}), items_add=frozenset({'frozen vegetables'}), confidence=0.35714285714285715, lift=3.7467532467532467)]),

RelationRecord(items=frozenset({'spaghetti', 'tomatoes', 'frozen vegetables'}), support=0.006665777896280496, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spagh

etti', 'frozen vegetables'})), items_add=frozenset({'tomatoes'}), confidence=0.2392344497
6076558, lift=3.4980460188216425), OrderedStatistic(items_base=frozenset({'tomatoes', 's
paghetti'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3184713375796179,
lift=3.341053850607991)]),
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0.005332622317024397, ordered_statistics=[OrderedStatistic(items_base=frozenset({'grated
cheese', 'spaghetti'}), items_add=frozenset({'ground beef'}), confidence=0.3225806451612
903, lift=3.283144395325426)]),
RelationRecord(items=frozenset({'ground beef', 'green tea', 'tomatoes'}), support=0.003
0662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground bee
f', 'green tea'}), items_add=frozenset({'tomatoes'}), confidence=0.2072072072072072, lif
t=3.0297490472929067)]),
RelationRecord(items=frozenset({'ground beef', 'milk', 'herb & pepper'}), support=0.003
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per', 'milk'}), items_add=frozenset({'ground beef'}), confidence=0.3913043478260869, lif
t=3.9825968969382335)]),
RelationRecord(items=frozenset({'ground beef', 'mineral water', 'herb & pepper'}), supp
ort=0.006665777896280496, ordered_statistics=[OrderedStatistic(items_base=frozenset({'he
rb & pepper', 'mineral water'}), items_add=frozenset({'ground beef'}), confidence=0.3906
2500000000006, lift=3.975682666214383)]),
RelationRecord(items=frozenset({'ground beef', 'nan', 'herb & pepper'}), support=0.0159
97866951073192, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & peppe
r'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.3234501347708895, lift=
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ems_add=frozenset({'ground beef'}), confidence=0.3234501347708895, lift=3.29199384113492
85)]),
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'herb & pepper'}), support=
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pepper', 'spaghetti'}), items_add=frozenset({'ground beef'}), confidence=0.3934426229508
197, lift=4.004359721511667)]),
RelationRecord(items=frozenset({'ground beef', 'olive oil', 'milk'}), support=0.0049326
75643247567, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef',
'milk'}), items_add=frozenset({'olive oil'}), confidence=0.22424242424242427, lift=3.404
94417862839)]),
RelationRecord(items=frozenset({'ground beef', 'milk', 'soup'}), support=0.003999466737
768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'sou
p'}), items_add=frozenset({'milk'}), confidence=0.4109589041095891, lift=3.1714019956029
094)]),
RelationRecord(items=frozenset({'ground beef', 'tomato sauce', 'nan'}), support=0.00533
2622317024397, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomato sauc
e'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.3773584905660377, lift=
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s_add=frozenset({'ground beef'}), confidence=0.3773584905660377, lift=3.84065948132408
3)]),
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'pepper'}), support=0.00333
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'pepper'}), items_add=frozenset({'ground beef'}), confidence=0.33783783783783783, lift=
3.4384282518610876)]),
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'shrimp'}), support=0.00599
9200106652446, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef',
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5315360233627)]),
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'tomato sauce'}), support=
0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomat
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4717, lift=5.535970992170453), OrderedStatistic(items_base=frozenset({'ground beef', 'to
mato sauce'}), items_add=frozenset({'spaghetti'}), confidence=0.5750000000000001, lift=
3.3025076569678413), OrderedStatistic(items_base=frozenset({'spaghetti', 'tomato sauc
e'}), items_add=frozenset({'ground beef'}), confidence=0.4893617021276596, lift=4.980599
901844742)]),
RelationRecord(items=frozenset({'spaghetti', 'mineral water', 'light cream'}), support=
0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light
cream'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.205128205128
20515, lift=3.4345238095238098)]),
RelationRecord(items=frozenset({'olive oil', 'light cream', 'nan'}), support=0.00319957
3390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light cream'}),

items_add=frozenset({'olive oil', 'nan'}), confidence=0.20512820512820515, lift=3.121027721433401), OrderedStatistic(items_base=frozenset({'light cream', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.20512820512820515, lift=3.1147098515519573)]),
RelationRecord(items=frozenset({'olive oil', 'shrimp', 'milk'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'olive oil', 'shrimp'}), items_add=frozenset({'milk'}), confidence=0.3934426229508197, lift=3.0362274843149164)]),
RelationRecord(items=frozenset({'olive oil', 'milk', 'soup'}), support=0.0035995200639914677, ordered_statistics=[OrderedStatistic(items_base=frozenset({'olive oil', 'milk'}), items_add=frozenset({'soup'}), confidence=0.2109375, lift=4.174781497361478), OrderedStatistic(items_base=frozenset({'milk', 'soup'}), items_add=frozenset({'olive oil'}), confidence=0.23684210526315788, lift=3.5962603878116344), OrderedStatistic(items_base=frozenset({'olive oil', 'soup'}), items_add=frozenset({'milk'}), confidence=0.4029850746268656, lift=3.1098673300165833)]),
RelationRecord(items=frozenset({'olive oil', 'spaghetti', 'milk'}), support=0.007199040127982935, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'milk'}), items_add=frozenset({'olive oil'}), confidence=0.20300751879699247, lift=3.0825089038385434)]),
RelationRecord(items=frozenset({'tomatoes', 'milk', 'soup'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomatoes', 'milk'}), items_add=frozenset({'soup'}), confidence=0.21904761904761905, lift=4.335293378565146), OrderedStatistic(items_base=frozenset({'tomatoes', 'soup'}), items_add=frozenset({'milk'}), confidence=0.44230769230769235, lift=3.4133230452674903)]),
RelationRecord(items=frozenset({'spaghetti', 'milk', '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({'mineral water', 'olive oil', 'soup'}), support=0.005199306759098787, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mineral water', 'soup'}), items_add=frozenset({'olive oil'}), confidence=0.22543352601156072, lift=3.4230301186492245)]),
RelationRecord(items=frozenset({'mineral water', 'olive oil', 'whole wheat pasta'}), 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({'olive oil', 'whole wheat pasta', 'nan'}), support=0.007998933475536596, ordered_statistics=[OrderedStatistic(items_base=frozenset({'whole wheat pasta'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.2714932126696833, lift=4.13077198425009), OrderedStatistic(items_base=frozenset({'whole wheat pasta', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.2714932126696833, lift=4.122410097642296)]),
RelationRecord(items=frozenset({'pasta', 'shrimp', 'nan'}), support=0.005065991201173177, ordered_statistics=[OrderedStatistic(items_base=frozenset({'pasta'}), items_add=frozenset({'shrimp', 'nan'}), confidence=0.3220338983050847, lift=4.515095833993347), OrderedStatistic(items_base=frozenset({'pasta', 'nan'}), items_add=frozenset({'shrimp'}), confidence=0.3220338983050847, lift=4.506672147735896)]),
RelationRecord(items=frozenset({'olive oil', 'spaghetti', 'pancakes'}), 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({'olive oil', 'spaghetti', 'tomatoes'}), support=0.004399413411545127, ordered_statistics=[OrderedStatistic(items_base=frozenset({'olive oil', 'tomatoes'}), items_add=frozenset({'spaghetti'}), confidence=0.6111111111111112, lift=3.5099115194827295), OrderedStatistic(items_base=frozenset({'tomatoes', 'spaghetti'}), items_add=frozenset({'olive oil'}), confidence=0.21019108280254778, lift=3.19158565202816)]),
RelationRecord(items=frozenset({'tomatoes', 'spaghetti', '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({'spaghetti', 'avocado', 'milk', 'nan'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'avocado'}), items_add=frozenset({'milk', 'nan'}), confidence=0.41666666666666663, lift=3.215449245541838), OrderedStatistic(items_base=frozenset({'spaghetti', 'avocado', 'nan'}), items_add=frozenset({'milk'}), confidence=0.41666666666666663, lift=3.215449245541838)]),

RelationRecord(items=frozenset({'cake', 'milk', 'nan', 'burgers'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'cake', 'milk'}), items_add=frozenset({'nan', 'burgers'}), confidence=0.27999999999999997, lift=3.211437308868501), OrderedStatistic(items_base=frozenset({'cake', 'milk', 'nan'}), items_add=frozenset({'burgers'}), confidence=0.27999999999999997, lift=3.211437308868501)]),
RelationRecord(items=frozenset({'chocolate', 'turkey', 'nan', 'burgers'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'turkey'}), items_add=frozenset({'nan', 'burgers'}), confidence=0.27058823529411763, lift=3.1034898363014927), OrderedStatistic(items_base=frozenset({'chocolate', 'turkey', 'nan'}), items_add=frozenset({'burgers'}), confidence=0.27058823529411763, lift=3.1034898363014927)]),
RelationRecord(items=frozenset({'turkey', 'milk', 'nan', 'burgers'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'turkey', 'milk'}), items_add=frozenset({'nan', 'burgers'}), confidence=0.2823529411764706, lift=3.2384241770102533), OrderedStatistic(items_base=frozenset({'turkey', 'milk', 'nan'}), items_add=frozenset({'burgers'}), confidence=0.2823529411764706, lift=3.2384241770102533)]),
RelationRecord(items=frozenset({'cake', 'frozen vegetables', 'nan', 'tomatoes'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'cake', 'frozen vegetables'}), items_add=frozenset({'tomatoes', 'nan'}), confidence=0.2987012987012987, lift=4.367560314928736), OrderedStatistic(items_base=frozenset({'cake', 'tomatoes'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.36507936507936506, lift=3.8300144300144296), OrderedStatistic(items_base=frozenset({'cake', 'frozen vegetables', 'nan'}), items_add=frozenset({'tomatoes'}), confidence=0.2987012987012987, lift=4.367560314928736), OrderedStatistic(items_base=frozenset({'cake', 'nan', 'tomatoes'}), items_add=frozenset({'frozen vegetables'}), confidence=0.36507936507936506, lift=3.8300144300144296)]),
RelationRecord(items=frozenset({'spaghetti', 'ground beef', 'nan', 'cereals'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'cereals'}), items_add=frozenset({'spaghetti', 'nan'}), confidence=0.6764705882352942, lift=3.8853031258445188), OrderedStatistic(items_base=frozenset({'spaghetti', 'cereals'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.45999999999999996, lift=4.681763907734057), OrderedStatistic(items_base=frozenset({'ground beef', 'nan', 'cereals'}), items_add=frozenset({'spaghetti'}), confidence=0.6764705882352942, lift=3.8853031258445188), OrderedStatistic(items_base=frozenset({'spaghetti', 'nan', 'cereals'}), items_add=frozenset({'ground beef'}), confidence=0.45999999999999996, lift=4.681763907734057)]),
RelationRecord(items=frozenset({'ground beef', 'nan', 'milk', 'chicken'}), support=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'chicken'}), items_add=frozenset({'milk', 'nan'}), confidence=0.40845070422535207, lift=3.152046020981858), OrderedStatistic(items_base=frozenset({'ground beef', 'nan', 'chicken'}), items_add=frozenset({'milk'}), confidence=0.40845070422535207, lift=3.152046020981858)]),
RelationRecord(items=frozenset({'olive oil', 'nan', 'milk', 'chicken'}), support=0.0035995200639914677, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'chicken'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.24324324324324323, lift=3.700948412915958), OrderedStatistic(items_base=frozenset({'olive oil', 'chicken'}), items_add=frozenset({'milk', 'nan'}), confidence=0.5, lift=3.858539094650206), OrderedStatistic(items_base=frozenset({'olive oil', 'milk'}), items_add=frozenset({'chicken', 'nan'}), confidence=0.2109375, lift=3.51609375), OrderedStatistic(items_base=frozenset({'nan', 'milk', 'chicken'}), items_add=frozenset({'olive oil'}), confidence=0.24324324324324323, lift=3.693456614509246), OrderedStatistic(items_base=frozenset({'olive oil', 'nan', 'chicken'}), items_add=frozenset({'milk'}), confidence=0.5, lift=3.858539094650206), OrderedStatistic(items_base=frozenset({'olive oil', 'milk', 'nan'}), items_add=frozenset({'chicken'}), confidence=0.2109375, lift=3.51609375)]),
RelationRecord(items=frozenset({'spaghetti', 'olive oil', 'nan', 'chicken'}), support=0.0034662045060658577, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'chicken'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.20155038759689922, lift=3.0665911914083996), OrderedStatistic(items_base=frozenset({'spaghetti', 'nan', 'chicken'}), items_add=frozenset({'olive oil'}), confidence=0.20155038759689922, lift=3.0603835169318647)]),
RelationRecord(items=frozenset({'chocolate', 'eggs', 'mineral water', 'ground beef'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'eggs'}), items_add=frozenset({'chocolate', 'mineral water'}), confidence=0.20000000000000004, lift=3.7979746835443047), OrderedStatistic(items_base=frozenset({'chocolate', 'eggs', 'mineral water'}), items_add=frozenset({'ground beef'}), confidence=0.29702970297029707, lift=3.023093354111531)]),

RelationRecord(items=frozenset({'chocolate', 'frozen vegetables', 'ground beef', 'mineral water'}), 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', 'ground beef', 'mineral water'}), items_add=frozenset({'frozen vegetables'}), confidence=0.30487804878048785, lift=3.1984478935698455)]),

RelationRecord(items=frozenset({'spaghetti', 'chocolate', 'frozen vegetables', '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({'spaghetti', 'chocolate', 'frozen vegetables'}), items_add=frozenset({'ground beef'}), confidence=0.3898305084745763, lift=3.967596531978015), OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'ground beef'}), items_add=frozenset({'frozen vegetables'}), confidence=0.33333333333333337, lift=3.49696969696975)]),

RelationRecord(items=frozenset({'chocolate', 'frozen vegetables', 'mineral water', 'milk'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'mineral water'}), items_add=frozenset({'milk'}), confidence=0.4109589041095891, lift=3.1714019956029094)]),

RelationRecord(items=frozenset({'spaghetti', 'chocolate', 'frozen vegetables', 'milk'}), support=0.0034662045060658577, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'chocolate', 'frozen vegetables'}), items_add=frozenset({'milk'}), confidence=0.44067796610169485, lift=3.4007463207086555), OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'milk'}), 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', 'mineral water', 'shrimp'}), items_add=frozenset({'frozen vegetables'}), confidence=0.4210526315789474, lift=4.417224880382776)]),

RelationRecord(items=frozenset({'chocolate', 'frozen vegetables', 'shrimp', 'nan'}), support=0.005332622317024397, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables'}), items_add=frozenset({'shrimp', 'nan'}), confidence=0.23255813953488375, lift=3.260595522712454), OrderedStatistic(items_base=frozenset({'chocolate', 'shrimp'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.29629629629629634, lift=3.1084175084175087), 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)]),

RelationRecord(items=frozenset({'chocolate', 'ground beef', 'nan', 'herb & pepper'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'herb & pepper'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.4411764705882354, lift=4.4901827759597746), OrderedStatistic(items_base=frozenset({'chocolate', 'nan', 'herb & pepper'}), items_add=frozenset({'ground beef'}), confidence=0.4411764705882354, lift=4.4901827759597746)]),

RelationRecord(items=frozenset({'chocolate', 'milk', 'nan', 'soup'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'soup'}), items_add=frozenset({'milk', 'nan'}), confidence=0.3947368421052632, lift=3.0462150747238472), OrderedStatistic(items_base=frozenset({'chocolate', 'nan', 'soup'}), items_add=frozenset({'milk'}), confidence=0.3947368421052632, lift=3.0462150747238472)]),

RelationRecord(items=frozenset({'chocolate', 'spaghetti', 'olive oil', 'mineral water'}), support=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'olive oil'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.23577235772357724, lift=3.947608159117306), OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'mineral water'}), items_add=frozenset({'olive oil'}), confidence=0.2436974789915966, lift=3.700353825740822)]),

RelationRecord(items=frozenset({'chocolate', 'spaghetti', 'mineral water', 'shrimp'}), 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({'ground beef', 'spaghetti', 'cooking oil', 'nan'}), support=0.004799360085321957, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'cooking oil'}), items_add=frozenset({'spaghetti', 'nan'}), confidence=0.5714285714285714, lift=3.2819951870487856), OrderedStatistic(items_base=frozenset({'spaghe

tti', 'cooking oil'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.302521084033613, lift=3.0789824749438446), OrderedStatistic(items_base=frozenset({'ground beef', 'cooking oil', 'nan'}), items_add=frozenset({'spaghetti'}), confidence=0.5714285714285714, lift=3.2819951870487856), OrderedStatistic(items_base=frozenset({'spaghetti', 'cooking oil', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3025210084033613, lift=3.0789824749438446)]),
RelationRecord(items=frozenset({'mineral water', 'frozen vegetables', 'eggs', 'milk'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'eggs'}), items_add=frozenset({'milk'}), confidence=0.411764705882353, lift=3.177620430888405)]),
RelationRecord(items=frozenset({'ground beef', 'eggs', 'nan', 'herb & pepper'}), support=0.0041327822956939075, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'eggs'}), items_add=frozenset({'herb & pepper', 'nan'}), confidence=0.20666666666666667, lift=4.178454627133872), OrderedStatistic(items_base=frozenset({'herb & pepper', 'eggs'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.3297872340425532, lift=3.3564912381997174), OrderedStatistic(items_base=frozenset({'ground beef', 'eggs', 'nan'}), items_add=frozenset({'herb & pepper'}), confidence=0.20666666666666667, lift=4.178454627133872), OrderedStatistic(items_base=frozenset({'herb & pepper', 'eggs', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3297872340425532, lift=3.3564912381997174)]),
RelationRecord(items=frozenset({'spaghetti', 'eggs', 'red wine', 'nan'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'eggs', 'red wine'}), items_add=frozenset({'spaghetti', 'nan'}), confidence=0.5283018867924528, lift=3.0342974370828397), OrderedStatistic(items_base=frozenset({'eggs', 'red wine', 'nan'}), items_add=frozenset({'spaghetti'}), confidence=0.5283018867924528, lift=3.0342974370828397)]),
RelationRecord(items=frozenset({'ground beef', 'french fries', 'nan', 'herb & pepper'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'french fries'}), items_add=frozenset({'herb & pepper', 'nan'}), confidence=0.23076923076923078, lift=4.665768194070081), OrderedStatistic(items_base=frozenset({'herb & pepper', 'french fries'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.46153846153846156, lift=4.697421981004071), OrderedStatistic(items_base=frozenset({'ground beef', 'french fries', 'nan'}), 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', 'mineral water', 'milk'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen smoothie', 'milk'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.22429906542056074, lift=3.7555073431241657), OrderedStatistic(items_base=frozenset({'frozen smoothie', 'spaghetti'}), items_add=frozenset({'mineral water', 'milk'}), confidence=0.20512820512820515, lift=4.274074074074075), OrderedStatistic(items_base=frozenset({'frozen smoothie', 'spaghetti', 'mineral water'}), items_add=frozenset({'milk'}), confidence=0.4705882352941177, lift=3.631566206729606), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'milk'}), items_add=frozenset({'frozen smoothie'}), confidence=0.2033898305084746, lift=3.211846565566459)]),
RelationRecord(items=frozenset({'tomatoes', 'frozen vegetables', 'nan', 'green tea'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'green tea'}), items_add=frozenset({'tomatoes', 'nan'}), confidence=0.2314814814814815, lift=3.38468341635983), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'nan', 'green tea'}), items_add=frozenset({'tomatoes'}), confidence=0.2314814814814815, lift=3.38468341635983)]),
RelationRecord(items=frozenset({'ground beef', 'frozen vegetables', 'mineral water', 'milk'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables'}), items_add=frozenset({'mineral water', 'milk'}), confidence=0.22047244094488186, lift=4.593788276465442), OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables', 'mineral water'}), items_add=frozenset({'milk'}), confidence=0.40579710144927533, lift=3.1315679608755294), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'milk'}), items_add=frozenset({'ground beef'}), confidence=0.3373493975903614, lift=3.4334570302921317), OrderedStatistic(items_base=frozenset({'ground beef', 'mineral water', 'milk'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3373493975903614, lift=3.539101861993428)]),
RelationRecord(items=frozenset({'spaghetti', 'ground beef', 'frozen vegetables', 'milk'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables', 'milk'}), items_add=frozenset({'spaghetti'}), confidence=0.5348837209302326, lift=3.0721001460165964), OrderedStatistic(items_base=

se=frozenset({'spaghetti', 'frozen vegetables', 'milk'}), items_add=frozenset({'ground beef'}), confidence=0.3709677419354839, lift=3.7756160546242397), OrderedStatistic(items_base=frozenset({'ground beef', 'spaghetti', 'milk'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3150684931506849, lift=3.305354919053549)]),
RelationRecord(items=frozenset({'spaghetti', 'ground beef', 'frozen vegetables', 'mineral water'}), support=0.004399413411545127, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.25984251968503935, lift=4.350622187851519), OrderedStatistic(items_base=frozenset({'spaghetti', 'mineral water', 'frozen vegetables'}), items_add=frozenset({'ground beef'}), confidence=0.3666666666666667, lift=3.7318407960199007)]),
RelationRecord(items=frozenset({'spaghetti', 'ground beef', 'frozen vegetables', 'nan'}), support=0.008665511265164644, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.31100478468899523, lift=3.165328208890303), OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.31100478468899523, lift=3.165328208890303)]),
RelationRecord(items=frozenset({'mineral water', 'frozen vegetables', 'olive oil', 'milk'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'olive oil', 'frozen vegetables'}), items_add=frozenset({'mineral water', 'milk'}), confidence=0.29411764705882354, lift=6.12826797385621), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'milk'}), items_add=frozenset({'olive oil'}), confidence=0.30120481927710846, lift=4.573557387444516), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'olive oil'}), items_add=frozenset({'milk'}), confidence=0.5102040816326531, lift=3.937284790459394), OrderedStatistic(items_base=frozenset({'mineral water', 'olive oil', 'milk'}), items_add=frozenset({'frozen vegetables'}), confidence=0.39062500000000006, lift=4.098011363636364)]),
RelationRecord(items=frozenset({'mineral water', 'frozen vegetables', 'milk', 'soup'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'soup'}), items_add=frozenset({'mineral water', 'milk'}), confidence=0.3833333333333333, lift=7.987175925925926), OrderedStatistic(items_base=frozenset({'milk', 'soup'}), items_add=frozenset({'mineral water', 'frozen vegetables'}), confidence=0.20175438596491227, lift=5.646864362398533), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'milk'}), items_add=frozenset({'soup'}), confidence=0.27710843373493976, lift=5.484407286136631), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk', 'soup'}), items_add=frozenset({'mineral water'}), confidence=0.7666666666666666, lift=3.21631245339299), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'soup'}), items_add=frozenset({'milk'}), confidence=0.6052631578947368, lift=4.670863114576565), OrderedStatistic(items_base=frozenset({'mineral water', 'milk', 'soup'}), items_add=frozenset({'frozen vegetables'}), confidence=0.35937500000000006, lift=3.7701704545454553)]),
RelationRecord(items=frozenset({'spaghetti', 'mineral water', 'frozen vegetables', 'milk'}), support=0.004532728969470737, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'milk'}), items_add=frozenset({'frozen vegetables'}), confidence=0.28813559322033894, lift=3.0228043143297376)]),
RelationRecord(items=frozenset({'olive oil', 'frozen vegetables', 'milk', 'nan'}), support=0.004799360085321957, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.20338983050847456, lift=3.094578333963626), OrderedStatistic(items_base=frozenset({'olive oil', 'frozen vegetables'}), items_add=frozenset({'milk', 'nan'}), confidence=0.4235294117647058, lift=3.2684095860566447), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.20338983050847456, lift=3.088314005352364), OrderedStatistic(items_base=frozenset({'olive oil', 'frozen vegetables', 'nan'}), 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', 'soup'}), items_add=frozenset({'milk', 'nan'}), confidence=0.5, lift=3.858539094650206), 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'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.29523809523809524, lift=3.0973160173160172), OrderedStatistic(items_base=frozenset({'tomatoes', 'milk', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.29523809523809524, lift=3.0973160173160172)]),
RelationRecord(items=frozenset({'mineral water', 'frozen vegetables', 'shrimp', 'na

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n'))), support=0.007199040127982935, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mineral water', 'shrimp'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.30508474576271183, lift=3.200616332819722), OrderedStatistic(items_base=frozenset({'mineral water', 'shrimp', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3068181818181818, lift=3.218801652892562)]),  
RelationRecord(items=frozenset({'spaghetti', 'mineral water', 'frozen vegetables', 'shrimp'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'shrimp'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.2, lift=3.3486607142857148), OrderedStatistic(items_base=frozenset({'spaghetti', 'mineral water', 'frozen vegetables'}), items_add=frozenset({'shrimp'}), confidence=0.2777777777777778, lift=3.8873341625207294), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'shrimp'}), items_add=frozenset({'frozen vegetable s'}), confidence=0.39062500000000006, lift=4.098011363636364)]),  
RelationRecord(items=frozenset({'spaghetti', 'mineral water', 'frozen vegetables', 'tomatoes'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'mineral water', 'frozen vegetables'}), items_add=frozenset({'tomatoes'}), confidence=0.2555555555555556, lift=3.7366904916612524), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'tomatoes'}), items_add=frozenset({'spaghetti'}), confidence=0.5227272727272727, lift=3.0022796881525826), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'tomatoes'}), items_add=frozenset({'frozen vegetables'}), confidence=0.32857142857142857, lift=3.447012987012987)]),  
RelationRecord(items=frozenset({'spaghetti', 'olive oil', 'frozen vegetables', 'nan'}), support=0.005732568990801226, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.20574162679425836, lift=3.1303609383037156), OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables', '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({'spaghetti', 'frozen vegetables'}), items_add=frozenset({'shrimp', 'nan'}), confidence=0.21531100478468898, lift=3.018781022242093), OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables', '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'}), items_add=frozenset({'tomatoes', 'nan'}), confidence=0.24000000000000002, lift=3.5092397660818717), OrderedStatistic(items_base=frozenset({'tomatoes', 'frozen vegetables'}), items_add=frozenset({'shrimp', 'nan'}), confidence=0.2479338842975207, lift=3.4761720861975753), OrderedStatistic(items_base=frozenset({'tomatoes', 'shrimp'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.35714285714285715, lift=3.7467532467532467), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'shrimp', 'nan'}), items_add=frozenset({'tomatoes'}), confidence=0.24000000000000002, 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({'spaghetti', 'tomatoes', 'frozen vegetables', 'nan'}), support=0.006665777896280496, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables'}), items_add=frozenset({'tomatoes', 'nan'}), confidence=0.23923444976076558, lift=3.4980460188216425), OrderedStatistic(items_base=frozenset({'tomatoes', 'spaghetti'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.3184713375796179, lift=3.341053850607991), OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables', 'nan'}), items_add=frozenset({'tomatoes'}), confidence=0.23923444976076558, lift=3.4980460188216425), OrderedStatistic(items_base=frozenset({'tomatoes', 'spaghetti', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3184713375796179, lift=3.341053850607991)]),  
RelationRecord(items=frozenset({'grated cheese', 'ground beef', 'spaghetti', 'nan'}), support=0.005332622317024397, ordered_statistics=[OrderedStatistic(items_base=frozenset({'grated cheese', 'spaghetti'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.3225806451612903, lift=3.283144395325426), OrderedStatistic(items_base=frozenset({'grated cheese', 'spaghetti', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3225806451612903, lift=3.283144395325426)]),  
RelationRecord(items=frozenset({'ground beef', 'nan', 'green tea', 'tomatoes'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'green tea'}), items_add=frozenset({'tomatoes', 'nan'}), confidence=0.2072072
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072072072072, lift=3.0297490472929067), OrderedStatistic(items_base=frozenset({'ground beef', 'nan', 'green tea'}), items_add=frozenset({'tomatoes'}), confidence=0.2072072072072072, lift=3.0297490472929067)]],
RelationRecord(items=frozenset({'ground beef', 'milk', 'nan', 'herb & pepper'}), support=0.0035995200639914677, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper', 'milk'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.3913043478260869, lift=3.9825968969382335), OrderedStatistic(items_base=frozenset({'herb & pepper', 'milk', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3913043478260869, lift=3.9825968969382335)]],
RelationRecord(items=frozenset({'ground beef', 'mineral water', 'nan', 'herb & pepper'}), support=0.006665777896280496, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper', 'mineral water'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.39062500000000006, lift=3.975682666214383), OrderedStatistic(items_base=frozenset({'herb & pepper', 'mineral water', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.39062500000000006, lift=3.975682666214383)]],
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'nan', 'herb & pepper'}), support=0.006399146780429276, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper', 'spaghetti'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.3934426229508197, lift=4.004359721511667), OrderedStatistic(items_base=frozenset({'herb & pepper', 'spaghetti', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3934426229508197, lift=4.004359721511667)]],
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'mineral water', 'milk'}), support=0.004399413411545127, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'milk'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.2, lift=3.3486607142857148)]],
RelationRecord(items=frozenset({'ground beef', 'olive oil', 'milk', 'nan'}), support=0.004932675643247567, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'milk'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.22424242424242427, lift=3.4118507591124225), OrderedStatistic(items_base=frozenset({'ground beef', 'milk', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.22424242424242427, lift=3.40494417862839)]],
RelationRecord(items=frozenset({'ground beef', 'milk', 'nan', 'soup'}), support=0.00399466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'soup'}), items_add=frozenset({'milk', 'nan'}), confidence=0.4109589041095891, lift=3.1714019956029094), OrderedStatistic(items_base=frozenset({'ground beef', 'nan', 'soup'}), items_add=frozenset({'milk'}), confidence=0.4109589041095891, lift=3.1714019956029094)]],
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'olive oil', 'mineral water'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'olive oil'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.2169811320754717, lift=3.63298096361186), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'olive oil'}), items_add=frozenset({'ground beef'}), confidence=0.2987012987012987, lift=3.0401064335935435)]],
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'mineral water', 'pancake s'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'pancakes'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.21100917431192662, lift=3.532990661861075)]],
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'mineral water', 'tomatoe s'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'tomatoes'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.26136363636363635, lift=4.3760907061688314), OrderedStatistic(items_base=frozenset({'ground beef', 'mineral water', 'tomatoes'}), items_add=frozenset({'spaghetti'}), confidence=0.5609756097560976, lift=3.221958689724723), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'tomatoes'}), items_add=frozenset({'ground beef'}), confidence=0.32857142857142857, lift=3.344117076952898)]],
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'pepper', 'nan'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'pepper'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.33783783783783783, lift=3.4384282518610876), OrderedStatistic(items_base=frozenset({'spaghetti', 'pepper', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.33783783783783783, lift=3.4384282518610876)]],
RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'shrimp', 'nan'}), support=0.005999200106652446, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'shrimp'}), items_add=frozenset({'spaghetti', 'nan'}), confidence=0.5232558139534884, lift=3.005315360233627), OrderedStatistic(items_base=frozenset({'ground beef', 'shrimp', 'nan'}), items_add=frozenset({'spaghetti'}), confidence=0.5232558139534884, lift=

3.005315360233627]]),

RelationRecord(items=frozenset({'ground beef', 'spaghetti', 'tomato sauce', 'nan'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomato sauce'}), items_add=frozenset({'ground beef', 'spaghetti', 'nan'}), confidence=0.2169811320754717, lift=5.535970992170453), OrderedStatistic(items_base=frozenset({'ground beef', 'tomato sauce'}), items_add=frozenset({'spaghetti', 'nan'}), confidence=0.5750000000000001, lift=3.3025076569678413), OrderedStatistic(items_base=frozenset({'tomato sauce', 'nan'}), items_add=frozenset({'ground beef', 'spaghetti'}), confidence=0.2169811320754717, lift=5.535970992170453), OrderedStatistic(items_base=frozenset({'spaghetti', 'tomato sauce'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.4893617021276596, lift=4.980599901844742), OrderedStatistic(items_base=frozenset({'ground beef', 'tomato sauce', 'nan'}), items_add=frozenset({'spaghetti'}), confidence=0.5750000000000001, lift=3.3025076569678413), OrderedStatistic(items_base=frozenset({'spaghetti', 'tomato sauce', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.4893617021276596, lift=4.980599901844742)]),

RelationRecord(items=frozenset({'spaghetti', 'mineral water', 'light cream', 'nan'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light cream'}), items_add=frozenset({'mineral water', 'spaghetti', 'nan'}), confidence=0.20512820512820515, lift=3.4345238095238098), OrderedStatistic(items_base=frozenset({'light cream', 'nan'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.20512820512820515, lift=3.4345238095238098)]),

RelationRecord(items=frozenset({'mineral water', 'spaghetti', 'olive oil', 'milk'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'milk'}), items_add=frozenset({'olive oil'}), confidence=0.211864406779661, lift=3.216993755575379)]),

RelationRecord(items=frozenset({'mineral water', 'spaghetti', 'milk', 'tomatoes'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomatoes', 'milk'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.2380952380952381, lift=3.9865008503401365), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'milk'}), items_add=frozenset({'tomatoes'}), confidence=0.211864406779661, lift=3.0978458387022165)]),

RelationRecord(items=frozenset({'olive oil', 'shrimp', 'milk', 'nan'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'olive oil', 'shrimp'}), items_add=frozenset({'milk', 'nan'}), confidence=0.3934426229508197, lift=3.0362274843149164), OrderedStatistic(items_base=frozenset({'olive oil', 'shrimp', 'nan'}), items_add=frozenset({'milk'}), confidence=0.39999999999999997, lift=3.0868312757201646)]),

RelationRecord(items=frozenset({'olive oil', 'milk', 'nan', 'soup'}), support=0.0035995200639914677, ordered_statistics=[OrderedStatistic(items_base=frozenset({'olive oil', 'milk'}), items_add=frozenset({'nan', 'soup'}), confidence=0.2109375, lift=4.174781497361478), OrderedStatistic(items_base=frozenset({'milk', 'soup'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.23684210526315788, lift=3.603555033628696), OrderedStatistic(items_base=frozenset({'olive oil', 'soup'}), items_add=frozenset({'milk', 'nan'}), confidence=0.4029850746268656, lift=3.1098673300165833), OrderedStatistic(items_base=frozenset({'olive oil', 'milk', 'nan'}), items_add=frozenset({'soup'}), confidence=0.2109375, lift=4.174781497361478), OrderedStatistic(items_base=frozenset({'milk', 'nan', 'soup'}), items_add=frozenset({'olive oil'}), confidence=0.23684210526315788, lift=3.5962603878116344), OrderedStatistic(items_base=frozenset({'olive oil', 'nan', 'soup'}), items_add=frozenset({'milk'}), confidence=0.4029850746268656, lift=3.1098673300165833)]),

RelationRecord(items=frozenset({'olive oil', 'spaghetti', 'milk', 'nan'}), support=0.007199040127982935, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'milk'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.20300751879699247, lift=3.088761457396025), OrderedStatistic(items_base=frozenset({'spaghetti', 'milk', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.20300751879699247, lift=3.0825089038385434)]),

RelationRecord(items=frozenset({'tomatoes', 'milk', 'nan', 'soup'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomatoes', 'milk'}), items_add=frozenset({'nan', 'soup'}), confidence=0.21904761904761905, lift=4.335293378565146), OrderedStatistic(items_base=frozenset({'tomatoes', 'soup'}), items_add=frozenset({'milk', 'nan'}), confidence=0.44230769230769235, lift=3.4133230452674903), OrderedStatistic(items_base=frozenset({'tomatoes', 'milk', 'nan'}), items_add=frozenset({'soup'}), confidence=0.21904761904761905, lift=4.335293378565146), OrderedStatistic(items_base=frozenset({'tomatoes', 'nan', 'soup'}), items_add=frozenset({'milk'}), confidence=0.44230769230769235, lift=3.4133230452674903)]),

RelationRecord(items=frozenset({'spaghetti', 'whole wheat pasta', 'milk', 'nan'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'whole wheat pasta', 'milk'}), items_add=frozenset({'nan'}), confidence=0.21904761904761905, lift=4.335293378565146), OrderedStatistic(items_base=frozenset({'spaghetti', 'whole wheat pasta', 'nan'}), items_add=frozenset({'milk'}), confidence=0.21904761904761905, lift=4.335293378565146), OrderedStatistic(items_base=frozenset({'spaghetti', 'milk', 'nan'}), items_add=frozenset({'whole wheat pasta'}), confidence=0.21904761904761905, lift=4.335293378565146), OrderedStatistic(items_base=frozenset({'whole wheat pasta', 'milk', 'nan'}), items_add=frozenset({'spaghetti'}), confidence=0.21904761904761905, lift=4.335293378565146)]),

aggetti', 'whole wheat pasta')), items_add=frozenset({'milk', 'nan'}), confidence=0.4545454545454546, lift=3.5077628133183696), OrderedStatistic(items_base=frozenset({'spaghetti', 'whole wheat pasta', 'nan'}), items_add=frozenset({'milk'}), confidence=0.4545454545454546, lift=3.5077628133183696)]),

RelationRecord(items=frozenset({'mineral water', 'olive oil', 'nan', 'soup'}), support=0.005199306759098787, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mineral water', 'soup'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.22543352601156072, lift=3.429973384609973), OrderedStatistic(items_base=frozenset({'mineral water', 'nan', 'soup'}), items_add=frozenset({'olive oil'}), confidence=0.22543352601156072, lift=3.4230301186492245)]),

RelationRecord(items=frozenset({'mineral water', 'olive oil', 'whole wheat pasta', 'nan'}), support=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mineral water', 'whole wheat pasta'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.4027777777777778, lift=6.128267973856209), OrderedStatistic(items_base=frozenset({'mineral water', 'whole wheat pasta', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.4027777777777778, lift=6.115862573099416)]),

RelationRecord(items=frozenset({'olive oil', 'spaghetti', 'nan', 'pancakes'}), support=0.005065991201173177, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'pancakes'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.20105820105820105, lift=3.0591025682303568), OrderedStatistic(items_base=frozenset({'spaghetti', 'nan', 'pancakes'}), items_add=frozenset({'olive oil'}), confidence=0.20105820105820105, lift=3.0529100529100526)]),

RelationRecord(items=frozenset({'olive oil', 'spaghetti', 'nan', 'tomatoes'}), support=0.004399413411545127, ordered_statistics=[OrderedStatistic(items_base=frozenset({'olive oil', 'tomatoes'}), items_add=frozenset({'spaghetti', 'nan'}), confidence=0.6111111111111112, lift=3.5099115194827295), OrderedStatistic(items_base=frozenset({'tomatoes', 'spaghetti'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.21019108280254778, lift=3.1980594565961677), OrderedStatistic(items_base=frozenset({'olive oil', 'nan', 'tomatoes'}), items_add=frozenset({'spaghetti'}), confidence=0.6111111111111112, lift=3.5099115194827295), OrderedStatistic(items_base=frozenset({'tomatoes', 'spaghetti', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.21019108280254778, lift=3.19158565202816)]),

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

RelationRecord(items=frozenset({'eggs', 'mineral water', 'ground beef', 'chocolate', 'nan'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'eggs'}), items_add=frozenset({'mineral water', 'chocolate', 'nan'}), confidence=0.20000000000000004, lift=3.7979746835443047), OrderedStatistic(items_base=frozenset({'chocolate', 'eggs', 'mineral water'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.29702970297029707, lift=3.023093354111531), OrderedStatistic(items_base=frozenset({'ground beef', 'eggs', 'nan'}), items_add=frozenset({'mineral water', 'chocolate'}), confidence=0.20000000000000004, lift=3.7979746835443047), OrderedStatistic(items_base=frozenset({'chocolate', 'eggs', 'mineral water', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.29702970297029707, lift=3.023093354111531)]),

RelationRecord(items=frozenset({'mineral water', 'ground beef', 'chocolate', 'frozen vegetables', 'nan'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'mineral water'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.34246575342465757, lift=3.4855300087358976), OrderedStatistic(items_base=frozenset({'chocolate', 'ground beef', 'mineral water'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.30487804878048785, lift=3.1984478935698455), OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'mineral water', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.34246575342465757, lift=3.4855300087358976), OrderedStatistic(items_base=frozenset({'chocolate', 'ground beef', 'mineral water', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.30487804878048785, lift=3.1984478935698455)]),

RelationRecord(items=frozenset({'spaghetti', 'ground beef', 'chocolate', 'frozen vegetables', 'nan'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'ground beef'}), items_add=frozenset({'spaghetti', 'nan'}), confidence=0.5348837209302326, lift=3.0721001460165964), OrderedStatistic(items_base=frozenset({'spaghetti', 'chocolate', 'frozen vegetables'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.3898305084745763, lift=3.967596531978015), OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'ground beef'}),

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items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.3333333333333337, lift=3.4969696969696975), OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'ground beef', 'nan'}), items_add=frozenset({'spaghetti'}), confidence=0.5348837209302326, lift=3.0721001460165964), OrderedStatistic(items_base=frozenset({'spaghetti', 'chocolate', 'frozen vegetables', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3898305084745763, lift=3.967596531978015), OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'ground beef', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3333333333333337, lift=3.4969696969696975))),  
RelationRecord(items=frozenset({'mineral water', 'milk', 'chocolate', 'frozen vegetables', 'nan'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'mineral water'}), items_add=frozenset({'milk', 'nan'}), confidence=0.4109589041095891, lift=3.1714019956029094), OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'mineral water', 'nan'}), items_add=frozenset({'milk'}), confidence=0.4109589041095891, lift=3.1714019956029094)]),  
RelationRecord(items=frozenset({'spaghetti', 'milk', 'chocolate', 'frozen vegetables', 'nan'}), support=0.0034662045060658577, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'chocolate', 'frozen vegetables'}), items_add=frozenset({'milk', 'nan'}), confidence=0.44067796610169485, lift=3.4007463207086555), OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'milk'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.3170731707317073, lift=3.3263858093126384), OrderedStatistic(items_base=frozenset({'spaghetti', 'chocolate', 'frozen vegetables', 'nan'}), items_add=frozenset({'milk'}), confidence=0.44067796610169485, lift=3.4007463207086555), OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'milk', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3170731707317073, lift=3.3263858093126384)]),  
RelationRecord(items=frozenset({'mineral water', 'chocolate', 'frozen vegetables', 'shrimp', 'nan'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'mineral water'}), items_add=frozenset({'shrimp', 'nan'}), confidence=0.32876712328767127, lift=4.609499423889387), OrderedStatistic(items_base=frozenset({'chocolate', 'mineral water', 'shrimp'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.4210526315789474, lift=4.417224880382776), OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetables', 'mineral water', 'nan'}), items_add=frozenset({'shrimp'}), confidence=0.32876712328767127, lift=4.600899611531385), OrderedStatistic(items_base=frozenset({'chocolate', 'mineral water', 'shrimp', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.4210526315789474, lift=4.417224880382776)]),  
RelationRecord(items=frozenset({'spaghetti', 'mineral water', 'olive oil', 'chocolate', 'nan'}), support=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'olive oil'}), items_add=frozenset({'mineral water', 'spaghetti', 'nan'}), confidence=0.23577235772357724, lift=3.947608159117306), OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'mineral water'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.2436974789915966, lift=3.707859614434008), OrderedStatistic(items_base=frozenset({'chocolate', 'olive oil', 'nan'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.23577235772357724, lift=3.947608159117306), OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'mineral water', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.2436974789915966, lift=3.700353825740822)]),  
RelationRecord(items=frozenset({'spaghetti', 'mineral water', 'chocolate', 'shrimp', 'nan'}), support=0.0034662045060658577, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'mineral water'}), items_add=frozenset({'shrimp', 'nan'}), confidence=0.21848739495798317, lift=3.063315793607162), OrderedStatistic(items_base=frozenset({'chocolate', 'spaghetti', 'mineral water', 'nan'}), items_add=frozenset({'shrimp'}), confidence=0.21848739495798317, lift=3.0576006522011783)]),  
RelationRecord(items=frozenset({'eggs', 'milk', 'mineral water', 'frozen vegetables', 'nan'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'eggs'}), items_add=frozenset({'milk', 'nan'}), confidence=0.411764705882353, lift=3.177620430888405), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'eggs', 'nan'}), items_add=frozenset({'milk'}), confidence=0.411764705882353, lift=3.177620430888405)]),  
RelationRecord(items=frozenset({'spaghetti', 'frozen smoothie', 'milk', 'mineral water', 'nan'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen smoothie', 'milk'}), items_add=frozenset({'mineral water', 'spaghetti', 'nan'}), confidence=0.22429906542056074, lift=3.7555073431241657), OrderedStatistic(items_base=frozenset({'frozen smoothie', 'spaghetti'}), items_add=frozenset({'mineral water', 'milk', 'nan'}), confidence=0.20512820512820515, lift=4.274074074074075), OrderedStatistic(items_base=frozenset({'frozen smoothie', 'milk', 'nan'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.20512820512820515, lift=4.274074074074075)]),
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t({'mineral water', 'spaghetti'}), confidence=0.22429906542056074, lift=3.7555073431241657), OrderedStatistic(items_base=frozenset({'frozen smoothie', 'spaghetti', 'mineral water'}), items_add=frozenset({'milk', 'nan'}), confidence=0.4705882352941177, lift=3.631566206729606), OrderedStatistic(items_base=frozenset({'frozen smoothie', 'spaghetti', 'nan'}), items_add=frozenset({'mineral water', 'milk'}), confidence=0.20512820512820515, lift=4.274074074074075), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'milk'}), items_add=frozenset({'frozen smoothie', 'nan'}), confidence=0.2033898305084746, lift=3.218622613173139), OrderedStatistic(items_base=frozenset({'frozen smoothie', 'spaghetti', 'mineral water', 'nan'}), items_add=frozenset({'milk'}), confidence=0.4705882352941177, lift=3.631566206729606), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'milk', 'nan'}), items_add=frozenset({'frozen smoothie'}), confidence=0.2033898305084746, lift=3.211846565566459)],
RelationRecord(items=frozenset({'ground beef', 'milk', 'mineral water', 'frozen vegetables', 'nan'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables'}), items_add=frozenset({'mineral water', 'milk', 'nan'}), confidence=0.22047244094488186, lift=4.593788276465442), OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables', 'mineral water'}), items_add=frozenset({'milk', 'nan'}), confidence=0.40579710144927533, lift=3.1315679608755294), OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables', 'nan'}), items_add=frozenset({'mineral water', 'milk'}), confidence=0.22047244094488186, lift=4.593788276465442), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'milk'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.3373493975903614, lift=3.4334570302921317), OrderedStatistic(items_base=frozenset({'ground beef', 'mineral water', 'milk'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.3373493975903614, lift=3.539101861993428), OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables', 'mineral water', 'nan'}), items_add=frozenset({'milk'}), confidence=0.40579710144927533, lift=3.1315679608755294), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'milk', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3373493975903614, lift=3.4334570302921317), OrderedStatistic(items_base=frozenset({'ground beef', 'mineral water', 'milk', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3373493975903614, lift=3.539101861993428)]),
RelationRecord(items=frozenset({'spaghetti', 'ground beef', 'milk', 'frozen vegetables', 'nan'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables', 'milk'}), items_add=frozenset({'spaghetti', 'nan'}), confidence=0.5348837209302326, lift=3.0721001460165964), OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables', 'milk'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.3709677419354839, lift=3.7756160546242397), OrderedStatistic(items_base=frozenset({'ground beef', 'spaghetti', 'milk'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.3150684931506849, lift=3.305354919053549), OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables', 'milk', 'nan'}), items_add=frozenset({'spaghetti'}), confidence=0.5348837209302326, lift=3.0721001460165964), OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables', 'milk', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3709677419354839, lift=3.7756160546242397), OrderedStatistic(items_base=frozenset({'ground beef', 'spaghetti', 'milk', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.3150684931506849, lift=3.305354919053549)]),
RelationRecord(items=frozenset({'spaghetti', 'ground beef', 'mineral water', 'frozen vegetables', 'nan'}), support=0.004399413411545127, ordered_statistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables'}), items_add=frozenset({'mineral water', 'spaghetti', 'nan'}), confidence=0.25984251968503935, lift=4.350622187851519), OrderedStatistic(items_base=frozenset({'ground beef', 'frozen vegetables', 'nan'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.25984251968503935, lift=4.350622187851519), OrderedStatistic(items_base=frozenset({'spaghetti', 'mineral water', 'frozen vegetables'}), items_add=frozenset({'ground beef', 'nan'}), confidence=0.3666666666666667, lift=3.7318407960199007), OrderedStatistic(items_base=frozenset({'spaghetti', 'mineral water', 'frozen vegetables', 'nan'}), items_add=frozenset({'ground beef'}), confidence=0.3666666666666667, lift=3.7318407960199007)]),
RelationRecord(items=frozenset({'olive oil', 'milk', 'mineral water', 'frozen vegetables', 'nan'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'olive oil', 'frozen vegetables'}), items_add=frozenset({'mineral water', 'milk', 'nan'}), confidence=0.29411764705882354, lift=6.12826797385621), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'milk'}), items_add=frozenset({'olive oil', 'nan'}), confidence=0.30120481927710846, lift=4.582834380116816), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'olive oil'}), items_add=frozenset({'milk', 'nan'}), confidence=0.5102040816326531, lift=3.937284790459394), OrderedStatistic(items_base=frozenset({'olive oil', 'frozen vegetables', 'nan'}),

items_add=frozenset({'mineral water', 'milk'}), confidence=0.29411764705882354, lift=6.12826797385621), OrderedStatistic(items_base=frozenset({'mineral water', 'olive oil', 'milk'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.39062500000000006, lift=4.098011363636364), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'milk', 'nan'}), items_add=frozenset({'olive oil'}), confidence=0.30120481927710846, lift=4.573557387444516), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'olive oil', 'nan'}), items_add=frozenset({'milk'}), confidence=0.5102040816326531, lift=3.937284790459394), OrderedStatistic(items_base=frozenset({'mineral water', 'olive oil', 'milk', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.39062500000000006, lift=4.098011363636364))),

RelationRecord(items=frozenset({'milk', 'soup', 'mineral water', 'frozen vegetables', 'nan'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'soup'}), items_add=frozenset({'mineral water', 'milk', 'nan'}), confidence=0.3833333333333333, lift=7.987175925925926), OrderedStatistic(items_base=frozenset({'milk', 'soup'}), items_add=frozenset({'mineral water', 'frozen vegetables', 'nan'}), confidence=0.20175438596491227, lift=5.646864362398533), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'milk'}), items_add=frozenset({'nan', 'soup'}), confidence=0.27710843373493976, lift=5.484407286136631), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk', 'soup'}), items_add=frozenset({'mineral water', 'nan'}), confidence=0.7666666666666666, lift=3.218112292482745), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'soup'}), items_add=frozenset({'milk', 'nan'}), confidence=0.6052631578947368, lift=4.670863114576565), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'nan', 'soup'}), items_add=frozenset({'mineral water', 'milk'}), confidence=0.3833333333333333, lift=7.987175925925926), OrderedStatistic(items_base=frozenset({'mineral water', 'milk', 'soup'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.35937500000000006, lift=3.7701704545454553), OrderedStatistic(items_base=frozenset({'milk', 'nan', 'soup'}), items_add=frozenset({'mineral water', 'frozen vegetables'}), confidence=0.20175438596491227, lift=5.646864362398533), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'milk', 'nan'}), items_add=frozenset({'soup'}), confidence=0.27710843373493976, lift=5.484407286136631), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'milk', 'nan', 'soup'}), items_add=frozenset({'mineral water'}), confidence=0.7666666666666666, lift=3.21631245339299), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'nan', 'soup'}), items_add=frozenset({'milk'}), confidence=0.6052631578947368, lift=4.670863114576565), OrderedStatistic(items_base=frozenset({'mineral water', 'milk', 'nan', 'soup'}), items_add=frozenset({'frozen vegetables'}), confidence=0.35937500000000006, lift=3.7701704545454553)]),

RelationRecord(items=frozenset({'spaghetti', 'milk', 'mineral water', 'frozen vegetables', 'nan'}), support=0.004532728969470737, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'milk'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.28813559322033894, lift=3.0228043143297376), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'milk', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.28813559322033894, lift=3.0228043143297376)]),

RelationRecord(items=frozenset({'spaghetti', 'mineral water', 'frozen vegetables', 'shrimp', 'nan'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'shrimp'}), items_add=frozenset({'mineral water', 'spaghetti', 'nan'}), confidence=0.2, lift=3.3486607142857148), OrderedStatistic(items_base=frozenset({'spaghetti', 'mineral water', 'frozen vegetables'}), items_add=frozenset({'shrimp', 'nan'}), confidence=0.2777777777777778, lift=3.89460020768432), OrderedStatistic(items_base=frozenset({'frozen vegetables', 'shrimp', 'nan'}), items_add=frozenset({'mineral water', 'spaghetti'}), confidence=0.2, lift=3.3486607142857148), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'shrimp'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.39062500000000006, lift=4.098011363636364), OrderedStatistic(items_base=frozenset({'spaghetti', 'mineral water', 'frozen vegetables', 'shrimp', 'nan'}), items_add=frozenset({'shrimp'}), confidence=0.2777777777777778, lift=3.8873341625207294), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'shrimp', 'nan'}), items_add=frozenset({'frozen vegetables'}), confidence=0.39062500000000006, lift=4.098011363636364)]),

RelationRecord(items=frozenset({'spaghetti', 'tomatoes', 'mineral water', 'frozen vegetables', 'nan'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'mineral water', 'frozen vegetables'}), items_add=frozenset({'tomatoes', 'nan'}), confidence=0.2555555555555556, lift=3.7366904916612524), OrderedStatistic(items_base=frozenset({'mineral water', 'frozen vegetables', 'tomatoes'}), items_add=frozenset({'spaghetti', 'nan'}), confidence=0.5227272727272727, lift=3.0022796881525826), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'tomatoes', 'nan'}), items_add=frozenset({'frozen vegetables', 'nan'}), confidence=0.32857142857142857,


```

lift=3.447012987012987), OrderedStatistic(items_base=frozenset({'spaghetti', 'mineral w
ater', 'frozen vegetables', 'nan'}), items_add=frozenset({'tomatoes'}), confidence=0.255
5555555555556, lift=3.7366904916612524), OrderedStatistic(items_base=frozenset({'mineral
water', 'frozen vegetables', 'nan', 'tomatoes'}), items_add=frozenset({'spaghetti'}), c
onfidence=0.5227272727272727, lift=3.0022796881525826), OrderedStatistic(items_base=froz
enset({'mineral water', 'spaghetti', 'nan', 'tomatoes'}), items_add=frozenset({'frozen v
egetables'}), confidence=0.32857142857142857, lift=3.447012987012987)]),
RelationRecord(items=frozenset({'spaghetti', 'ground beef', 'milk', 'mineral water', 'na
n'}), support=0.004399413411545127, ordered_statistics=[OrderedStatistic(items_base=fro
zenset({'ground beef', 'milk'}), items_add=frozenset({'mineral water', 'spaghetti', 'na
n'}), confidence=0.2, lift=3.3486607142857148), OrderedStatistic(items_base=frozenset
({'ground beef', 'milk', 'nan'}), items_add=frozenset({'mineral water', 'spaghetti'}), c
onfidence=0.2, lift=3.3486607142857148)]),
RelationRecord(items=frozenset({'spaghetti', 'olive oil', 'ground beef', 'mineral wate
r', 'nan'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_b
ase=frozenset({'ground beef', 'olive oil'}), items_add=frozenset({'mineral water', 'spag
hetti', 'nan'}), confidence=0.2169811320754717, lift=3.63298096361186), OrderedStatistic
(items_base=frozenset({'ground beef', 'olive oil', 'nan'}), items_add=frozenset({'minera
l water', 'spaghetti'}), confidence=0.2169811320754717, lift=3.63298096361186), Ordereds
tatistic(items_base=frozenset({'mineral water', 'spaghetti', 'olive oil'}), items_add=fr
ozenset({'ground beef', 'nan'}), confidence=0.2987012987012987, lift=3.040106433593543
5), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'olive oil', 'n
an'}), items_add=frozenset({'ground beef'}), confidence=0.2987012987012987, lift=3.04010
64335935435)]),
RelationRecord(items=frozenset({'spaghetti', 'ground beef', 'mineral water', 'nan', 'pa
ncakes'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_bas
e=frozenset({'ground beef', 'pancakes'}), items_add=frozenset({'mineral water', 'spaghet
ti', 'nan'}), confidence=0.21100917431192662, lift=3.532990661861075), OrderedStatistic
(items_base=frozenset({'ground beef', 'nan', 'pancakes'}), items_add=frozenset({'mineral
water', 'spaghetti'}), confidence=0.21100917431192662, lift=3.532990661861075)]),
RelationRecord(items=frozenset({'spaghetti', 'tomatoes', 'ground beef', 'mineral wate
r', 'nan'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_b
ase=frozenset({'ground beef', 'tomatoes'}), items_add=frozenset({'mineral water', 'spagh
etti', 'nan'}), confidence=0.26136363636363635, lift=4.3760907061688314), OrderedStatist
ic(items_base=frozenset({'ground beef', 'mineral water', 'tomatoes'}), items_add=frozens
et({'spaghetti', 'nan'}), confidence=0.5609756097560976, lift=3.221958689724723), Ordereds
tatistic(items_base=frozenset({'ground beef', 'nan', 'tomatoes'}), items_add=frozenset
({'mineral water', 'spaghetti'}), confidence=0.26136363636363635, lift=4.376090706168831
4), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghetti', 'tomatoes'}), i
tems_add=frozenset({'ground beef', 'nan'}), confidence=0.32857142857142857, lift=3.34411
7076952898), OrderedStatistic(items_base=frozenset({'ground beef', 'mineral water', 'na
n', 'tomatoes'}), items_add=frozenset({'spaghetti'}), confidence=0.5609756097560976, lif
t=3.221958689724723), OrderedStatistic(items_base=frozenset({'mineral water', 'spaghet
ti', 'nan', 'tomatoes'}), items_add=frozenset({'ground beef'}), confidence=0.328571428571
42857, lift=3.344117076952898)]),
RelationRecord(items=frozenset({'spaghetti', 'olive oil', 'milk', 'mineral water', 'na
n'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=froz
enset({'mineral water', 'spaghetti', 'milk'}), items_add=frozenset({'olive oil', 'na
n'}), confidence=0.211864406779661, lift=3.223519097878777), OrderedStatistic(items_base
=frozenset({'mineral water', 'spaghetti', 'milk', 'nan'}), items_add=frozenset({'olive o
il'}), confidence=0.211864406779661, lift=3.216993755575379)]),
RelationRecord(items=frozenset({'spaghetti', 'tomatoes', 'milk', 'mineral water', 'na
n'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=froz
enset({'tomatoes', 'milk'}), items_add=frozenset({'mineral water', 'spaghetti', 'nan'}),
confidence=0.2380952380952381, lift=3.9865008503401365), OrderedStatistic(items_base=fr
ozenset({'mineral water', 'spaghetti', 'milk'}), items_add=frozenset({'tomatoes', 'na
n'}), confidence=0.211864406779661, lift=3.0978458387022165), OrderedStatistic(items_bas
e=frozenset({'tomatoes', 'milk', 'nan'}), items_add=frozenset({'mineral water', 'spaghet
ti'}), confidence=0.2380952380952381, lift=3.9865008503401365), OrderedStatistic(items_b
ase=frozenset({'mineral water', 'spaghetti', 'milk', 'nan'}), items_add=frozenset({'toma
atoes'}), confidence=0.211864406779661, lift=3.0978458387022165)]))

```

```

In [9]: def inspect(results):
        lhs = [tuple(result[2][0][0])[0] for result in results]
        rhs = [tuple(result[2][0][1])[0] for result in results]

```

```

supports = [result[1] for result in results]
confidences = [result[2][0][2] for result in results]
lifts = [result[2][0][3] for result in results]
return list(zip(lhs, rhs, supports, confidences, lifts))
resultsinDataFrame = pd.DataFrame(inspect(results), columns = ['Left Hand Side', 'Right

```

```
In [15]: pd.set_option('display.max_rows', None)
```

```
In [16]: resultsinDataFrame
```

Out[16]:

	Left Hand Side	Right Hand Side	Support	Confidence	Lift
0	light cream	chicken	0.004533	0.290598	4.843951
1	mushroom cream sauce	escalope	0.005733	0.300699	3.790833
2	pasta	escalope	0.005866	0.372881	4.700812
3	fromage blanc	honey	0.003333	0.245098	5.164271
4	herb & pepper	ground beef	0.015998	0.323450	3.291994
5	tomato sauce	ground beef	0.005333	0.377358	3.840659
6	light cream	olive oil	0.003200	0.205128	3.114710
7	whole wheat pasta	olive oil	0.007999	0.271493	4.122410
8	pasta	shrimp	0.005066	0.322034	4.506672
9	spaghetti	milk	0.003333	0.416667	3.215449
10	cake	burgers	0.003733	0.280000	3.211437
11	chocolate	burgers	0.003066	0.270588	3.103490
12	turkey	burgers	0.003200	0.282353	3.238424
13	cake	tomatoes	0.003066	0.298701	4.367560
14	ground beef	spaghetti	0.003066	0.676471	3.885303
15	ground beef	milk	0.003866	0.408451	3.152046
16	light cream	chicken	0.004533	0.290598	4.843951
17	milk	olive oil	0.003600	0.243243	3.693457
18	spaghetti	olive oil	0.003466	0.201550	3.060384
19	chocolate	shrimp	0.005333	0.232558	3.254512
20	chocolate	ground beef	0.003999	0.441176	4.490183
21	chocolate	milk	0.003999	0.394737	3.046215
22	ground beef	spaghetti	0.004799	0.571429	3.281995
23	ground beef	herb & pepper	0.004133	0.206667	4.178455
24	eggs	spaghetti	0.003733	0.528302	3.034297
25	mushroom cream sauce	nan	0.005733	0.300699	3.790833
26	pasta	nan	0.005866	0.372881	4.700812
27	ground beef	herb & pepper	0.003200	0.230769	4.665768
28	fromage blanc	honey	0.003333	0.245098	5.178818
29	frozen vegetables	tomatoes	0.003333	0.231481	3.384683

30	spaghetti	ground beef	0.008666	0.311005	3.165328
31	frozen vegetables	olive oil	0.004799	0.203390	3.088314
32	frozen vegetables	milk	0.003999	0.500000	3.858539
33	tomatoes	frozen vegetables	0.004133	0.295238	3.097316
34	mineral water	frozen vegetables	0.007199	0.305085	3.200616
35	spaghetti	olive oil	0.005733	0.205742	3.124024
36	spaghetti	shrimp	0.005999	0.215311	3.013149
37	frozen vegetables	tomatoes	0.003999	0.240000	3.509240
38	spaghetti	tomatoes	0.006666	0.239234	3.498046
39	grated cheese	ground beef	0.005333	0.322581	3.283144
40	ground beef	tomatoes	0.003066	0.207207	3.029749
41	herb & pepper	ground beef	0.003600	0.391304	3.982597
42	herb & pepper	ground beef	0.006666	0.390625	3.975683
43	herb & pepper	ground beef	0.015998	0.323450	3.291994
44	herb & pepper	ground beef	0.006399	0.393443	4.004360
45	ground beef	olive oil	0.004933	0.224242	3.404944
46	ground beef	milk	0.003999	0.410959	3.171402
47	tomato sauce	ground beef	0.005333	0.377358	3.840659
48	spaghetti	ground beef	0.003333	0.337838	3.438428
49	ground beef	spaghetti	0.005999	0.523256	3.005315
50	tomato sauce	ground beef	0.003066	0.216981	5.535971
51	light cream	mineral water	0.003200	0.205128	3.434524
52	light cream	olive oil	0.003200	0.205128	3.121028
53	olive oil	milk	0.003200	0.393443	3.036227
54	olive oil	soup	0.003600	0.210938	4.174781
55	spaghetti	olive oil	0.007199	0.203008	3.082509
56	tomatoes	soup	0.003066	0.219048	4.335293
57	spaghetti	milk	0.003999	0.454545	3.507763
58	mineral water	olive oil	0.005199	0.225434	3.423030
59	mineral water	olive oil	0.003866	0.402778	6.115863
60	whole wheat pasta	olive oil	0.007999	0.271493	4.130772
61	pasta	shrimp	0.005066	0.322034	4.515096
62	spaghetti	olive oil	0.005066	0.201058	3.052910
63	olive oil	spaghetti	0.004399	0.611111	3.509912
64	spaghetti	tomatoes	0.003066	0.216981	3.172662
65	spaghetti	milk	0.003333	0.416667	3.215449
66	cake	nan	0.003733	0.280000	3.211437
67	chocolate	nan	0.003066	0.270588	3.103490

68	turkey	nan	0.003200	0.282353	3.238424
69	cake	tomatoes	0.003066	0.298701	4.367560
70	ground beef	spaghetti	0.003066	0.676471	3.885303
71	ground beef	milk	0.003866	0.408451	3.152046
72	milk	olive oil	0.003600	0.243243	3.700948
73	spaghetti	olive oil	0.003466	0.201550	3.066591
74	ground beef	chocolate	0.003999	0.200000	3.797975
75	chocolate	ground beef	0.003333	0.342466	3.485530
76	chocolate	spaghetti	0.003066	0.534884	3.072100
77	chocolate	milk	0.003999	0.410959	3.171402
78	spaghetti	milk	0.003466	0.440678	3.400746
79	chocolate	shrimp	0.003200	0.328767	4.600900
80	chocolate	shrimp	0.005333	0.232558	3.260596
81	chocolate	ground beef	0.003999	0.441176	4.490183
82	chocolate	milk	0.003999	0.394737	3.046215
83	chocolate	mineral water	0.003866	0.235772	3.947608
84	chocolate	shrimp	0.003466	0.218487	3.057601
85	ground beef	spaghetti	0.004799	0.571429	3.281995
86	mineral water	milk	0.003733	0.411765	3.177620
87	ground beef	herb & pepper	0.004133	0.206667	4.178455
88	eggs	spaghetti	0.003733	0.528302	3.034297
89	ground beef	herb & pepper	0.003200	0.230769	4.665768
90	frozen smoothie	mineral water	0.003200	0.224299	3.755507
91	frozen vegetables	tomatoes	0.003333	0.231481	3.384683
92	ground beef	mineral water	0.003733	0.220472	4.593788
93	ground beef	spaghetti	0.003066	0.534884	3.072100
94	ground beef	mineral water	0.004399	0.259843	4.350622
95	spaghetti	ground beef	0.008666	0.311005	3.165328
96	olive oil	mineral water	0.003333	0.294118	6.128268
97	frozen vegetables	mineral water	0.003066	0.383333	7.987176
98	mineral water	frozen vegetables	0.004533	0.288136	3.022804
99	frozen vegetables	olive oil	0.004799	0.203390	3.094578
100	frozen vegetables	milk	0.003999	0.500000	3.858539
101	tomatoes	frozen vegetables	0.004133	0.295238	3.097316
102	mineral water	frozen vegetables	0.007199	0.305085	3.200616
103	frozen vegetables	mineral water	0.003333	0.200000	3.348661
104	spaghetti	tomatoes	0.003066	0.255556	3.736690

105	spaghetti	olive oil	0.005733	0.205742	3.130361
106	spaghetti	shrimp	0.005999	0.215311	3.018781
107	frozen vegetables	tomatoes	0.003999	0.240000	3.509240
108	spaghetti	tomatoes	0.006666	0.239234	3.498046
109	grated cheese	ground beef	0.005333	0.322581	3.283144
110	ground beef	tomatoes	0.003066	0.207207	3.029749
111	herb & pepper	ground beef	0.003600	0.391304	3.982597
112	herb & pepper	ground beef	0.006666	0.390625	3.975683
113	herb & pepper	ground beef	0.006399	0.393443	4.004360
114	ground beef	mineral water	0.004399	0.200000	3.348661
115	ground beef	olive oil	0.004933	0.224242	3.411851
116	ground beef	milk	0.003999	0.410959	3.171402
117	ground beef	mineral water	0.003066	0.216981	3.632981
118	ground beef	mineral water	0.003066	0.211009	3.532991
119	ground beef	mineral water	0.003066	0.261364	4.376091
120	spaghetti	ground beef	0.003333	0.337838	3.438428
121	ground beef	spaghetti	0.005999	0.523256	3.005315
122	tomato sauce	ground beef	0.003066	0.216981	5.535971
123	light cream	mineral water	0.003200	0.205128	3.434524
124	mineral water	olive oil	0.003333	0.211864	3.216994
125	tomatoes	mineral water	0.003333	0.238095	3.986501
126	olive oil	milk	0.003200	0.393443	3.036227
127	olive oil	nan	0.003600	0.210938	4.174781
128	spaghetti	olive oil	0.007199	0.203008	3.088761
129	tomatoes	nan	0.003066	0.219048	4.335293
130	spaghetti	milk	0.003999	0.454545	3.507763
131	mineral water	olive oil	0.005199	0.225434	3.429973
132	mineral water	olive oil	0.003866	0.402778	6.128268
133	spaghetti	olive oil	0.005066	0.201058	3.059103
134	olive oil	spaghetti	0.004399	0.611111	3.509912
135	spaghetti	tomatoes	0.003066	0.216981	3.172662
136	ground beef	mineral water	0.003999	0.200000	3.797975
137	chocolate	ground beef	0.003333	0.342466	3.485530
138	chocolate	spaghetti	0.003066	0.534884	3.072100
139	chocolate	milk	0.003999	0.410959	3.171402
140	spaghetti	milk	0.003466	0.440678	3.400746
141	chocolate	shrimp	0.003200	0.328767	4.609499
142	chocolate	mineral water	0.003866	0.235772	3.947608

143	chocolate	shrimp	0.003466	0.218487	3.063316
144	mineral water	milk	0.003733	0.411765	3.177620
145	frozen smoothie	mineral water	0.003200	0.224299	3.755507
146	ground beef	mineral water	0.003733	0.220472	4.593788
147	ground beef	spaghetti	0.003066	0.534884	3.072100
148	ground beef	mineral water	0.004399	0.259843	4.350622
149	olive oil	mineral water	0.003333	0.294118	6.128268
150	frozen vegetables	mineral water	0.003066	0.383333	7.987176
151	mineral water	frozen vegetables	0.004533	0.288136	3.022804
152	frozen vegetables	mineral water	0.003333	0.200000	3.348661
153	spaghetti	tomatoes	0.003066	0.255556	3.736690
154	ground beef	mineral water	0.004399	0.200000	3.348661
155	ground beef	mineral water	0.003066	0.216981	3.632981
156	ground beef	mineral water	0.003066	0.211009	3.532991
157	ground beef	mineral water	0.003066	0.261364	4.376091
158	mineral water	olive oil	0.003333	0.211864	3.223519
159	tomatoes	mineral water	0.003333	0.238095	3.986501

```
In [11]: resultsinDataFrame.nlargest(n= 10, columns = 'Lift')
```

	Left Hand Side	Right Hand Side	Support	Confidence	Lift
97	frozen vegetables	mineral water	0.003066	0.383333	7.987176
150	frozen vegetables	mineral water	0.003066	0.383333	7.987176
96	olive oil	mineral water	0.003333	0.294118	6.128268
149	olive oil	mineral water	0.003333	0.294118	6.128268
132	mineral water	olive oil	0.003866	0.402778	6.128268
59	mineral water	olive oil	0.003866	0.402778	6.115863
50	tomato sauce	ground beef	0.003066	0.216981	5.535971
122	tomato sauce	ground beef	0.003066	0.216981	5.535971
28	fromage blanc	honey	0.003333	0.245098	5.178818
3	fromage blanc	honey	0.003333	0.245098	5.164271

```
In [12]: import matplotlib.pyplot as plt

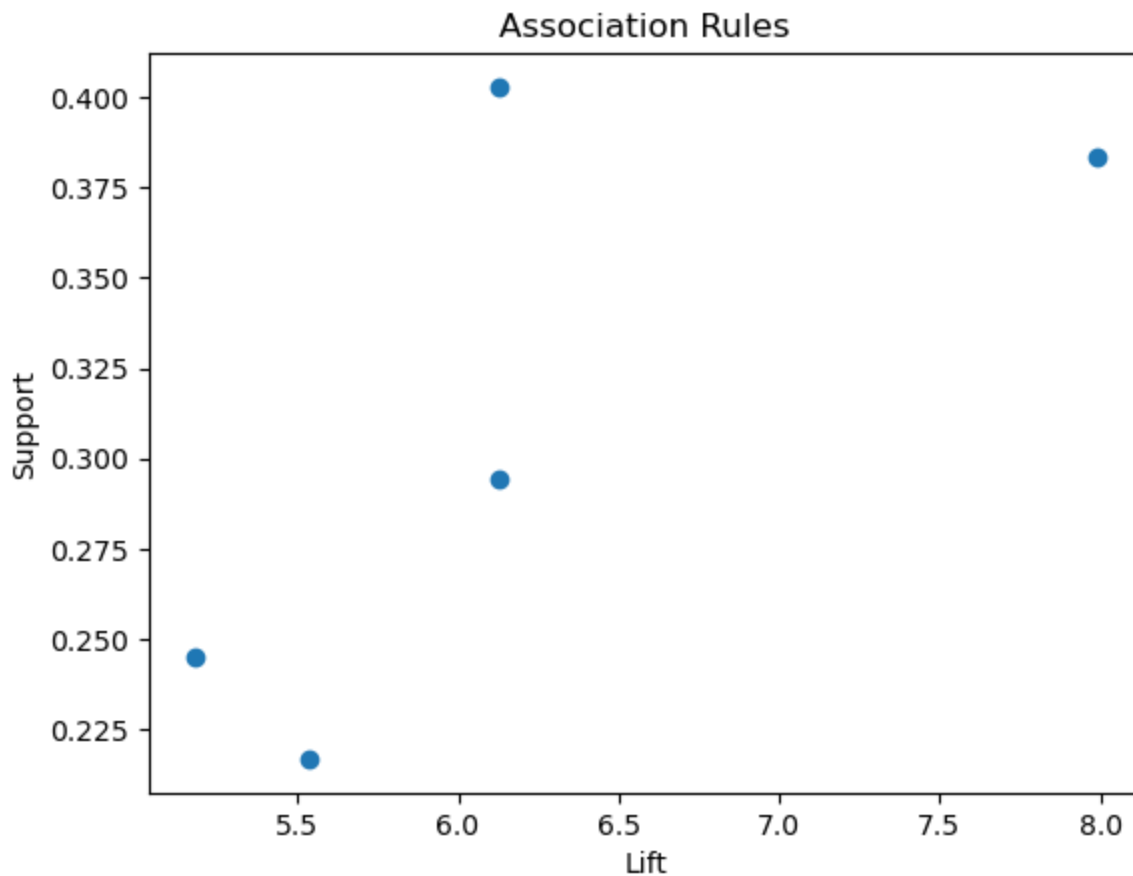
# Sample data
rules_data = [
    ("frozen vegetables", "mineral water", 0.003066, 0.383333, 7.987176),
    ("olive oil", "mineral water", 0.003333, 0.294118, 6.128268),
    ("mineral water", "olive oil", 0.003866, 0.402778, 6.128268),
    ("tomato sauce", "ground beef", 0.003066, 0.216981, 5.535971),
    ("fromage blanc", "honey", 0.003333, 0.245098, 5.178818)
]
```

```

# Extracting lift and support values
lift_values = [rule[4] for rule in rules_data]
support_values = [rule[3] for rule in rules_data]

# Creating scatter plot
plt.scatter(lift_values, support_values)
plt.xlabel("Lift")
plt.ylabel("Support")
plt.title("Association Rules")
plt.show()

```



```

In [13]: import networkx as nx
import matplotlib.pyplot as plt

# Sample data
correlated_products = [
    ("frozen vegetables", "mineral water"),
    ("olive oil", "mineral water"),
    ("mineral water", "olive oil"),
    ("tomato sauce", "ground beef"),
    ("fromage blanc", "honey")
]

# Create a new graph
G = nx.Graph()

# Add edges (product correlations) to the graph
for products in correlated_products:
    G.add_edge(products[0], products[1])

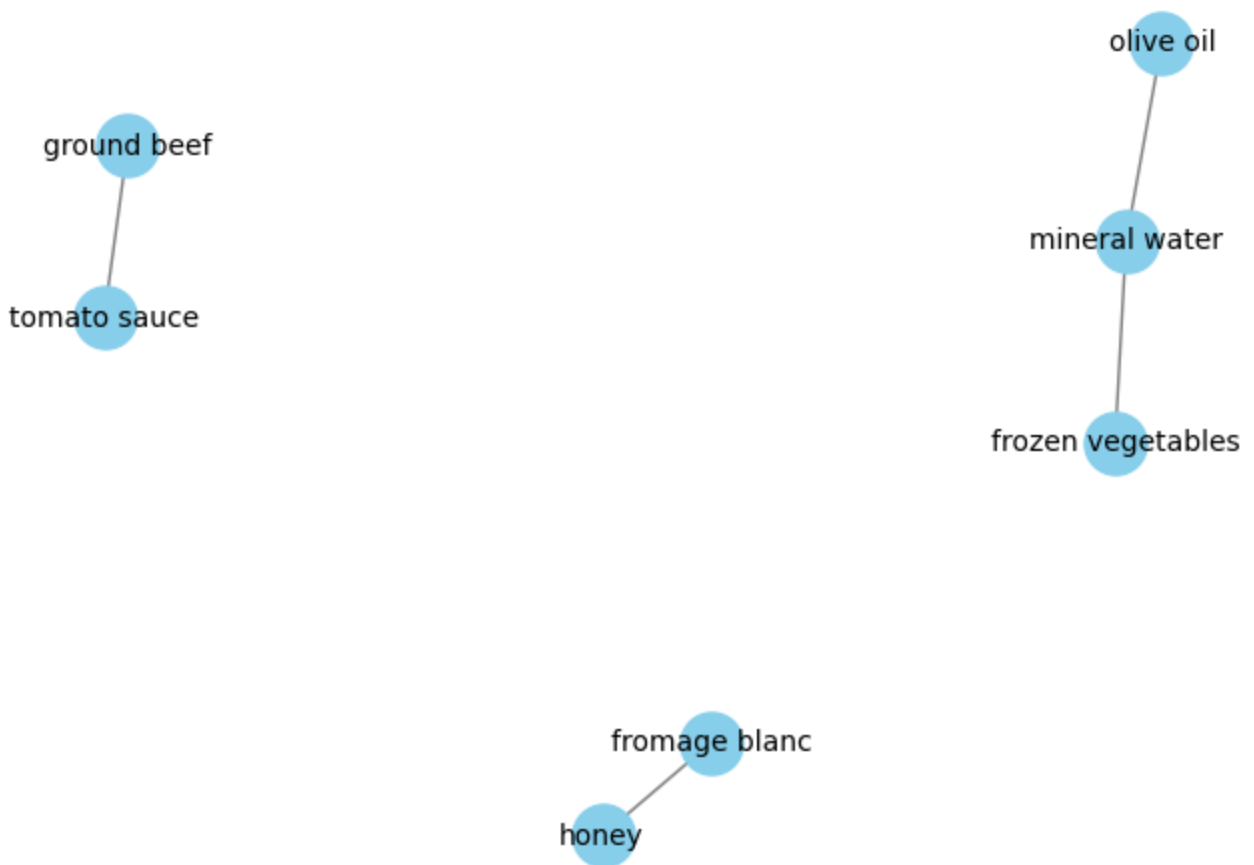
# Draw the network graph
pos = nx.spring_layout(G)
nx.draw(G, pos, with_labels=True, node_size=500, font_size=10, node_color='skyblue', edge_color='black')

# Set plot title
plt.title("Correlated Products Network")

```

```
# Show the graph
plt.show()
```

Correlated Products Network



```
In [17]: import matplotlib.pyplot as plt
```

```
# Data for the chart
association_rules = [
    ('(ground beef) -> (spaghetti)', 0.004799, 0.571429),
    ('(chocolate) -> (ground beef)', 0.003999, 0.441176),
    ('(chocolate) -> (milk)', 0.003999, 0.394737),
    ('(eggs) -> (spaghetti)', 0.003733, 0.528302),
    ('(mushroom cream sauce) -> (escalope)', 0.005733, 0.300699),
    ('(pasta) -> (escalope)', 0.005866, 0.372881),
    ('(tomato sauce) -> (ground beef)', 0.005333, 0.377358),
    ('(whole wheat pasta) -> (olive oil)', 0.007999, 0.271493),
    ('(pasta) -> (shrimp)', 0.005066, 0.322034),
    ('(light cream) -> (chicken)', 0.004533, 0.290598)
]

# Extracting data for plotting
association_labels = [rule[0] for rule in association_rules]
support_values = [rule[1] for rule in association_rules]
confidence_values = [rule[2] for rule in association_rules]

# Creating the bar chart
plt.figure(figsize=(10, 6))
plt.barh(range(len(association_rules)), support_values, align='center', alpha=0.8, color='red')
plt.barh(range(len(association_rules)), confidence_values, align='center', alpha=0.6, color='green')

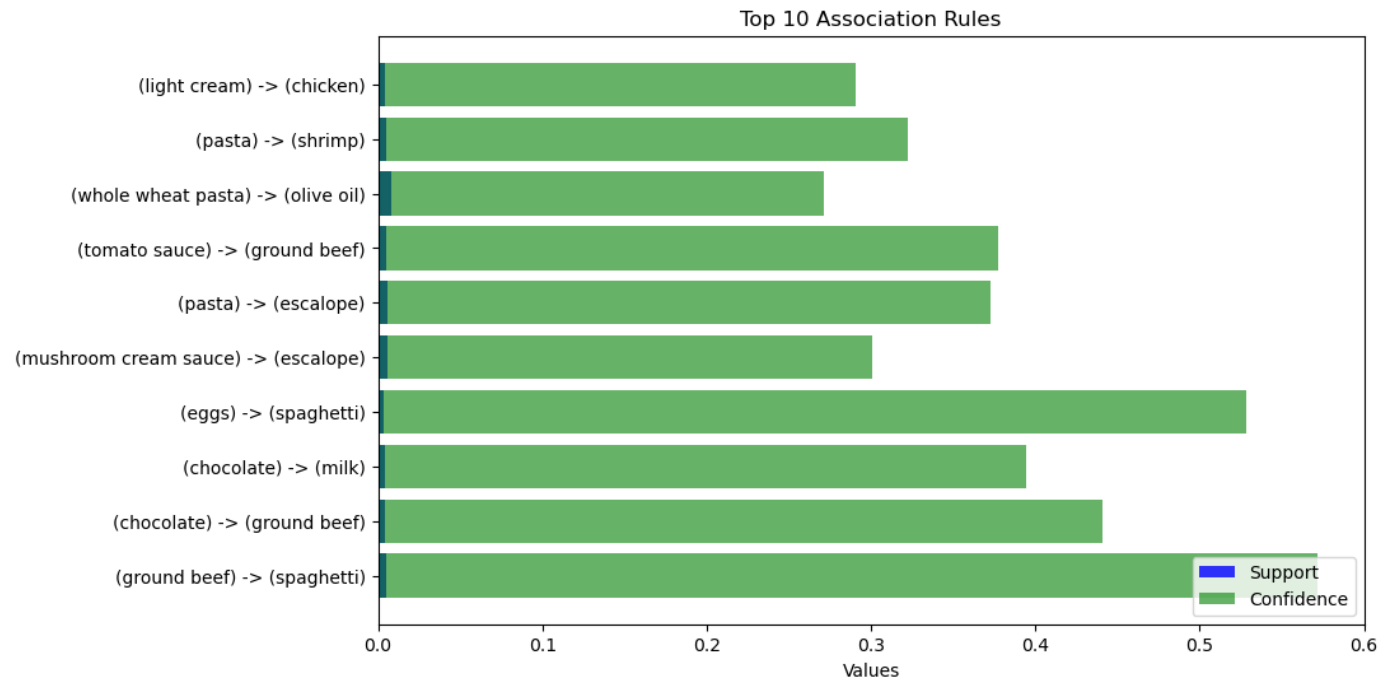
# Customizing the chart
plt.yticks(range(len(association_rules)), association_labels)
```



```
plt.xlabel('Values')
plt.title('Top 10 Association Rules')

# Adding a legend
plt.legend(loc='lower right')

# Displaying the chart
plt.show()
```



In []: