## TUGAS KONSEP APLIKASI DATA MAINING

# ASSOCIATION RULE (MENGHITUNG SUPPORT DAN CONFIDANCE) MENGGUNAKAN JUPYTER NETBOOK



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KEMENTRIAN RISET DAN TEKNOLOGI PENDIDIKAN TINGGI SEKOLAH TINGGI MANAJEMEN INFORMATIKA KOMPUTER PRADNYA PARAMITA MALANG 2020 Secara sederhana beberapa istilah yang akan sering di gunakan pada *Acossiation Rule* ini adalah:

- **Support** adalah indikasi seberapa sering itemset muncul di dataset.
- Confidence adalah indikasi seberapa sering aturan itu terbukti benar.
- Lift Ratio adalah rasio dari nilai pengamatan Support, diharapkan jika dua aturan itu independen
- 1. Yang pertama adalah melakukan import library, yang pertama adalah pandas nanti di sebut sebagai pd, matplotlib.pyplot nanti di sebut sebagai plt, Kemudian mlxtend melakukan import fungsi apriori dan association\_rules

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
from apyori import apriori
```

2. Pertama-tama adalah membaca file excel menggunakan library pandas. Dimana nama file excel yang di gunakan adalah 'data.xls' file ini di simpan 1 folder dengan lokasi script yang sedang kita jalankan, jika sudah berhasil maka akan muncul head tabel dari data tersebut.

```
df = pd.read_excel('data.xls')

df.head()
```

### Dengan output:

|   | Barang 1 | Barang 2 | Barang 3 | Barang 4 | Barang 5 | Barang 6 |
|---|----------|----------|----------|----------|----------|----------|
| 0 | Wine     | Chips    | Bread    | Butter   | Milk     | Apple    |
| 1 | Wine     | NaN      | Bread    | Butter   | Milk     | NaN      |
| 2 | NaN      | NaN      | Bread    | Butter   | Milk     | NaN      |
| 3 | NaN      | Chips    | NaN      | NaN      | NaN      | Apple    |
| 4 | Wine     | Chips    | Bread    | Butter   | Milk     | Apple    |
|   |          |          |          |          |          |          |

3. Selanjutnya yaitu menghapus Header yang ada. Dengan script berikut ini:

```
df = pd.read_excel('data.xls', header = None)
df.head()
```

#### Dengan output:

|   | 0        | 1        | 2        | 3        | 4        | 5        |
|---|----------|----------|----------|----------|----------|----------|
| 0 | Barang 1 | Barang 2 | Barang 3 | Barang 4 | Barang 5 | Barang 6 |
| 1 | Wine     | Chips    | Bread    | Butter   | Milk     | Apple    |
| 2 | Wine     | NaN      | Bread    | Butter   | Milk     | NaN      |
| 3 | NaN      | NaN      | Bread    | Butter   | Milk     | NaN      |
| 4 | NaN      | Chips    | NaN      | NaN      | NaN      | Apple    |

4. Selajutnya, Library Apriori yang akan kita gunakan membutuhkan dataset dalam bentuk list di dalam list, di mana seluruh dataset adalah daftar besar dan setiap transaksi dalam dataset adalah List dalam di dalam List yang besar luar. Saat ini kami memiliki dataset dalam bentuk dataset pandas. Untuk mengonversi dataset dalam pandas kami ke List di dalam list, jalankan skrip berikut:

```
records = []
for i in range(0, 22):
    records.append([str(df.values[i,j]) for j in range(0, 6)])
```

5. Langkah selanjutnya adalah menerapkan algoritma Apriori pada dataset. Untuk melakukannya, kita bisa menggunakan kelas apriori yang kita impor dari perpustakaan apyori. Jalankan skrip berikut:

```
association_rules = apriori(records, min_support=0.10, min_confidence=0.7, min_lift=1.2, min_length=2)
association_results = list(association_rules)
```

6. Pertama mari kita temukan jumlah total aturan yang diexcecute oleh Library apriori. Jalankan skrip berikut:

```
print(len(association_results))
24
```

7. Selanjutkan mari menampilkan item pertama di association\_rules untuk melihat apa aturan pertama. Jalankan skrip berikut:

```
association_results[0]
```

Dengan output:

8. Script untuk menampilkan support, confidence, dan lift, maka jalankan script dibawah ini:

```
results = []
for item in association_results:
    pair = item[0]
    items = [x for x in pair]

value0 = str(items[0])
value1 = str(items[1])
value2 = str(item[1])[:6]
value3 = str(item[2][0][2])[:6]
value4 = str(item[2][0][3])[:6]

rows = (value0, value1, value2, value3, value4)

results.append(rows)

label = ['title1'], ['title2'], ['support'], ['confidence'], ['lift']

store_suggestion = pd.DataFrame.from_records(results,columns=label)

print(store_suggestion)
```

#### Dengan output:

```
(title1,) (title2,) (support,) (confidence,) (lift,)
               Wine
                        0.4545
                                      0.625
     Bread
                                               1.25
  (title1,) (title2,) (support,) (confidence,) (lift,)
     Bread
              Wine
                       0.4545
                                      0.625
                                               1.25
    Butter
               Milk
                        0.4090
                                     0.6000 1.2000
  (title1,) (title2,) (support,) (confidence,) (lift,)
0
               Wine
                        0.4545
                                      0.625
     Bread
               Milk
                                     0.6000 1.2000
1
    Butter
                        0.4090
                        0.4090
     Chips
              Butter
                                     0.5625 1.2375
  (title1,) (title2,) (support,) (confidence,) (lift,)
0
               Wine
                       0.4545
                                      0.625
    Bread
                                             1.25
1
    Butter
               Milk
                        0.4090
                                     0.6000 1.2000
                        0.4090
2
                                     0.5625 1.2375
     Chips
            Butter
                                     0.7333 1.2410
3
    Butter
              Bread
                         0.5
  (title1,) (title2,) (support,) (confidence,) (lift,)
                                     0.625
\cap
             Wine
                        0.4545
                                             1.25
     Bread
               Milk
                        0.4090
                                     0.6000 1.2000
1
    Butter
2
                        0.4090
                                     0.5625 1.2375
     Chips
             Butter
3
                           0.5
                                     0.7333 1.2410
    Butter
             Bread
             Bread
                        0.4545
                                      0.625
                                             1.25
    Butter
  (title1,) (title2,) (support,) (confidence,) (lift,)
0
     Bread
               Wine
                        0.4545
                                      0.625
                                             1.25
1
    Butter
               Milk
                        0.4090
                                     0.6000 1.2000
2
    Chips
           Butter
                        0.4090
                                     0.5625 1.2375
3
                           0.5
                                     0.7333
    Butter
             Bread
                                            1.2410
4
                        0.4545
                                      0.625
                                             1.25
    Butter
              Bread
5
                                        0.5 1.2222
                        0.3181
     Chips
              Butter
  (title1,) (title2,) (support,) (confidence,) (lift,)
0
     Bread
               Wine
                        0.4545
                                     0.625
                                             1.25
1
               Milk
                        0.4090
                                     0.6000 1.2000
    Butter
2
     Chips Butter
                        0.4090
                                    0.5625 1.2375
3
                                     0.7333 1.2410
    Butter
             Bread
                         0.5
    Butter
             Bread 0.4545
                                     0.625
                                            1.25
```

| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |  |
|----|-----------|-----------|------------|---------------|---------|--|
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |  |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |  |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |  |
| 3  | Butter    | Bread     | 0.4050     | 0.7333        | 1.2410  |  |
|    |           |           |            |               |         |  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |  |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |  |
|    |           |           |            |               | (lift,) |  |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |  |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |  |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |  |
| 8  | Chips     | Bread     |            | 0.5454        | 1.2     |  |
| 0  |           |           |            |               | (lift,) |  |
| 0  |           |           |            |               |         |  |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |  |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |  |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |  |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |  |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |  |
| 0  | Bread     |           |            |               | 1.25    |  |
| 1  | Butter    |           |            |               |         |  |
| 2  | Chips     |           |            |               |         |  |
| 3  | Butter    |           |            |               |         |  |
| 4  | Butter    |           |            |               | 1.25    |  |
| 5  | Chips     |           |            | 0.023         | 1.2222  |  |
|    | -         |           |            |               |         |  |
| 6  | Butter    |           |            |               | 1.2031  |  |
| 7  | Chips     |           |            |               | 1.2     |  |
| 8  | Chips     |           |            |               | 1.2     |  |
| 9  | Wine      |           |            |               | 1.2222  |  |
| 10 | Chips     |           | 0.2727     |               | 1.2     |  |
|    | (title1,) |           | (support,) |               | (lift,) |  |
| 0  | Bread     |           |            |               | 1.25    |  |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |  |
| 4  | Butter    |           |            |               | 1.25    |  |
| 5  | Chips     |           |            |               |         |  |
| 6  | Butter    |           |            |               | 1.2031  |  |
| 7  | Chips     |           |            |               | 1.2     |  |
| 8  | Chips     |           |            |               | 1.2     |  |
| 9  | Wine      |           |            |               | 1.2222  |  |
| 10 |           |           |            |               | 1.2222  |  |
| 11 |           |           |            |               | 1.2222  |  |
| ΤТ | Curbs     | Butter    | 0.2212     | 0.0333        | 1.444   |  |
|    |           |           |            |               |         |  |

|   | /+i+1-1 \   | (+i+1-2 \   | (aummant )  | (confidence)   | (1:f+ )   |  |
|---|---|---|---|--|---|--|
| 0   | (title1,) Bread   | Wine  | 0.4545  | (confidence,)<br>0.625   |   |  |
|   |   | Milk  | 0.4090  | 0.6000   |   |  |
| 1<br>2  | Butter  | Butter  | 0.4090  | 0.5625   |   |  |
| 3   | Chips   |   |   |  |   |  |
|   | Butter  | Bread   | 0.5   | 0.7333   |   |  |
| 4   | Butter  | Bread   | 0.4545  | 0.625  | 1.25  |  |
| 5   | Chips   | Butter  | 0.3181  | 0.5  |   |  |
| 6   | Butter  | Bread   | 0.3181  | 0.875  |   |  |
| 7   | Chips   | Bread   | 0.2727  | 0.5454   | 1.2   |  |
| 8   | Chips   | Bread   | 0.2727  | 0.5454   | 1.2   |  |
| 9   | Wine  | Bread   | 0.3636  | 0.5  | 1.2222  |  |
| 10  | Chips   | Butter  | 0.2727  | 0.5454   | 1.2   |  |
| 11  | Chips   | Butter  | 0.2272  | 0.8333   |   |  |
| 12  | Wine  | Butter  |   | 0.6363   |   |  |
|   | (title1,)   | (title2,)   |   | (confidence,)  |   |  |
| 0   | Bread   | Wine  | 0.4545  | 0.625  |   |  |
| 1   | Butter  | Milk  | 0.4090  | 0.6000   |   |  |
| 2   | Chips   | Butter  | 0.4090  | 0.5625   |   |  |
| 3   | Butter  | Bread   | 0.5   | 0.7333   |   |  |
| 4   | Butter  | Bread   |   | 0.625  | 1.25  |  |
| 5   | Chips   | Butter  | 0.3181  | 0.5  | 1.2222  |  |
| 6   | Butter  | Bread   | 0.3181  | 0.875  | 1.2031  |  |
| 7   | Chips   | Bread   | 0.2727  | 0.5454   | 1.2   |  |
| 8   | Chips   | Bread   | 0.2727  | 0.5454   | 1.2   |  |
| 9   | Wine  | Bread   | 0.3636  | 0.5  | 1.2222  |  |
| 10  | Chips   | Butter  | 0.2727  | 0.5454   | 1.2   |  |
| 11  | Chips   | Butter  | 0.2272  | 0.8333   |   |  |
| 12  | Wine  | Butter  | 0.3181  | 0.6363   | 1.2727  |  |
| 13  | Chips   | Butter  | 0.3181  | 0.875  |   |  |
|   | (title1,)   |   |   | (confidence,)  |   |  |
| 0   | Bread   | Wine  | 0.4545  | 0.625  |   |  |
| 1   | Butter  | Milk  | 0.4090  | 0.6000   |   |  |
| 2   | Chips   | Butter  | 0.4090  | 0.5625   |   |  |
| 3   | Butter  | Bread   | 0.5   | 0.7333   |   |  |
| 4   | Butter  | Bread   | 0.4545  | 0.625  |   |  |
| 5   | Daccer  | Dicaa   |   |  |   |  |
| 6   | Chine   | Rutter  | 0 3181  | () 5   |   |  |
|   | Chips   | Butter  | 0.3181  | 0.5  |   |  |
|   | Butter  | Bread   | 0.3181  | 0.875  | 1.2031  |  |
| 7   | Butter<br>Chips   | Bread<br>Bread  | 0.3181<br>0.2727  | 0.875<br>0.5454  | 1.2031<br>1.2   |  |
| 7<br>8  | Butter<br>Chips<br>Chips  | Bread<br>Bread<br>Bread   | 0.3181<br>0.2727<br>0.2727  | 0.875<br>0.5454<br>0.5454  | 1.2031<br>1.2<br>1.2  |  |
| 7<br>8<br>9   | Butter<br>Chips<br>Chips<br>Wine  | Bread<br>Bread<br>Bread<br>Bread  | 0.3181<br>0.2727<br>0.2727<br>0.3636  | 0.875<br>0.5454<br>0.5454<br>0.5   | 1.2031<br>1.2<br>1.2<br>1.2222  |  |
| 7<br>8<br>9<br>10   | Butter<br>Chips<br>Chips<br>Wine<br>Chips   | Bread<br>Bread<br>Bread<br>Bread<br>Butter  | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727  | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454   | 1.2031<br>1.2<br>1.2<br>1.2222<br>1.2   |  |
| 7<br>8<br>9<br>10<br>11   | Butter<br>Chips<br>Chips<br>Wine<br>Chips<br>Chips  | Bread<br>Bread<br>Bread<br>Bread<br>Butter<br>Butter  | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272  | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333   | 1.2031<br>1.2<br>1.2<br>1.2222<br>1.2<br>1.2222   |  |
| 7<br>8<br>9<br>10<br>11<br>12   | Butter<br>Chips<br>Chips<br>Wine<br>Chips<br>Chips<br>Wine  | Bread<br>Bread<br>Bread<br>Butter<br>Butter<br>Butter   | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181  | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363   | 1.2031<br>1.2<br>1.2<br>1.2222<br>1.2<br>1.2222<br>1.2727   |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13   | Butter<br>Chips<br>Chips<br>Wine<br>Chips<br>Chips<br>Wine<br>Chips   | Bread<br>Bread<br>Bread<br>Butter<br>Butter<br>Butter<br>Butter   | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181  | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875  | 1.2031<br>1.2<br>1.2<br>1.2222<br>1.2<br>1.2222<br>1.2727<br>1.2833   |  |
| 7<br>8<br>9<br>10<br>11<br>12   | Butter Chips Chips Wine Chips Chips Wine Chips Chips Chips Chips  | Bread Bread Bread Butter Butter Butter Butter Butter Butter   | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181  | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000  | 1.2031<br>1.2<br>1.2<br>1.2222<br>1.2<br>1.2222<br>1.2727<br>1.2833<br>1.4000   |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14   | Butter Chips Chips Wine Chips Chips Wine Chips Chips Chips (title1,)  | Bread Bread Bread Butter Butter Butter Butter Butter (title2,)  | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>(support,)  | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)   | 1.2031<br>1.2<br>1.2<br>1.2222<br>1.2<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)  |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14   | Butter Chips Chips Wine Chips Chips Wine Chips Chips Chips (title1,) Bread  | Bread Bread Bread Butter Butter Butter Butter Butter (title2,) Wine   | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>(support,)<br>0.4545  | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)   | 1.2031<br>1.2<br>1.2<br>1.2222<br>1.2<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)<br>1.25  |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14   | Butter Chips Chips Wine Chips Chips Wine Chips Chips (title1,) Bread Butter   | Bread Bread Bread Butter Butter Butter Butter (title2,) Wine Milk   | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>(support,)<br>0.4545<br>0.4090  | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)<br>0.625<br>0.6000  | 1.2031<br>1.2<br>1.2<br>1.2222<br>1.2<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)<br>1.25<br>1.2000  |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>0<br>1   | Butter Chips Chips Wine Chips Chips Wine Chips Chips (title1,) Bread Butter Chips   | Bread Bread Bread Butter Butter Butter Butter (title2,) Wine Milk Butter  | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>(support,)<br>0.4545<br>0.4090<br>0.4090  | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)<br>0.625<br>0.6000<br>0.5625  | 1.2031<br>1.2<br>1.2222<br>1.2<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)<br>1.25<br>1.2000<br>1.2375   |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>0<br>1<br>2<br>3                               | Butter Chips Chips Wine Chips Chips Wine Chips Chips (title1,) Bread Butter Chips Butter  | Bread Bread Bread Butter Butter Butter Butter (title2,) Wine Milk Butter Bread  | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5   | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333  | 1.2031<br>1.2<br>1.2222<br>1.2<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410   |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>0<br>1<br>2<br>3<br>4                          | Butter Chips Chips Wine Chips Chips Wine Chips Chips (title1,) Bread Butter Chips Butter Butter   | Bread Bread Bread Bread Butter Butter Butter Butter (title2,) Wine Milk Butter Bread Bread                                      | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545   | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625                                     | 1.2031<br>1.2<br>1.2222<br>1.2<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25                                   |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>0<br>1<br>2<br>3<br>4<br>5                     | Butter Chips Chips Wine Chips Chips Wine Chips Chips (title1,) Bread Butter Chips Butter Chips Butter Chips   | Bread Bread Bread Bread Butter Butter Butter Butter (title2,) Wine Milk Butter Bread Bread Bread Butter                         | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181   | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5                              | 1.2031<br>1.2<br>1.2222<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222                                |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>0<br>1<br>2<br>3<br>4<br>5<br>6                | Butter Chips Chips Wine Chips Chips Wine Chips Chips (title1,) Bread Butter Chips Butter Butter Chips Butter Chips Butter                               | Bread Bread Bread Bread Butter Butter Butter Butter (title2,) Wine Milk Butter Bread Bread Butter Bread                         | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181                               | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5                              | 1.2031<br>1.2<br>1.2222<br>1.2<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.222<br>1.222<br>1.2031       |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7           | Butter Chips Chips Wine Chips Chips Wine Chips Chips (title1,) Bread Butter Chips Butter Chips Butter Chips Butter Chips Butter Chips                   | Bread Bread Bread Bread Butter Butter Butter Butter (title2,) Wine Milk Butter Bread Bread Bread Bread Bread Bread              | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>(support,)<br>0.4545<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181   | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.55<br>0.875                    | 1.2031<br>1.2<br>1.2222<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2               |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8      | Butter Chips Chips Wine Chips Chips Wine Chips Chips (title1,) Bread Butter Chips Butter Chips Butter Chips Butter Chips Chips Chips Chips Chips Chips  | Bread Bread Bread Bread Butter Butter Butter Butter (title2,) Wine Milk Butter Bread Bread Butter Bread                         | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181<br>0.3181<br>0.3181           | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.55<br>0.875                    | 1.2031<br>1.2<br>1.2222<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2               |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9 | Butter Chips Chips Wine Chips Chips Wine Chips Chips (title1,) Bread Butter Chips Butter Chips Butter Chips Butter Chips Butter Chips Butter Chips Wine | Bread Bread Bread Bread Butter Butter Butter Butter (title2,) Wine Milk Butter Bread Bread Bread Bread Bread Bread              | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181<br>0.3181<br>0.2727<br>0.2727 | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.7333<br>0.625<br>0.55<br>0.875 | 1.2031<br>1.2<br>1.2222<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2 |  |
| 7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8      | Butter Chips Chips Wine Chips Chips Wine Chips Chips (title1,) Bread Butter Chips Butter Chips Butter Chips Butter Chips Chips Chips Chips Chips Chips  | Bread Bread Bread Bread Butter Butter Butter Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Bread | 0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181<br>0.3181<br>0.3181           | 0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.55<br>0.875                    | 1.2031<br>1.2<br>1.2222<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2               |  |

| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
|----|-----------|-----------|------------|---------------|---------|
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  |           | Butter    |            |               |         |
|    | Chips     |           | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 10 | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  |           |           |            |               |         |
|    | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     |           | 0.4090     | 0.5625        | 1.2375  |
| 3  |           | Butter    |            | 0.7333        | 1.2410  |
|    | Butter    | Bread     | 0.5        |               |         |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
|    |           |           |            |               |         |

| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
|----|-----------|-----------|------------|---------------|---------|
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 10 | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  |           |           | 0.4545     | 0.625         | 1.25    |
| 0  | Bread     | Wine      |            |               |         |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 |           | Butter    | 0.2272     | 0.8333        | 1.2222  |
|    | Chips     |           |            |               |         |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine      | Butter    | 0.2272     | 0.5           | 1.375   |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     |           | 0.4090     | 0.5625        | 1.2375  |
| 3  |           | Butter    |            |               |         |
|    | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 |           |           |            |               | 1.4000  |
|    | Chips     | Butter    | 0.3181     | 0.7000        |         |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine      | Butter    | 0.2272     | 0.5           | 1.375   |
| 20 | Wine      | Milk      | 0.2727     | 0.5454        | 1.2     |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
|    |           |           |            |               |         |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
|    |           |           |            |               |         |

| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
|----|-----------|-----------|------------|---------------|---------|
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      |           | 0.3181     | 0.6363        | 1.2727  |
|    |           | Butter    |            |               |         |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine      | Butter    | 0.2272     | 0.5           | 1.375   |
| 20 | Wine      | Milk      | 0.2727     | 0.5454        | 1.2     |
| 21 | Wine      | Milk      | 0.2272     | 0.5           | 1.2222  |
| 21 |           |           |            | (confidence,) |         |
| ^  | (title1,) | (title2,) | (support,) |               | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
|    |           |           |            |               |         |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
| 18 | Milk      | Butter    | 0.2272     | 0.5           | 1.2222  |
| 19 | Wine      | Butter    | 0.2272     | 0.5           | 1.375   |
| 20 | Wine      | Milk      | 0.2727     | 0.5454        | 1.2     |
| 21 | Wine      | Milk      | 0.2272     |               | 1.2222  |
|    |           |           |            | 0.5           |         |
| 22 | Wine      | Apple     | 0.0909     | 1.0           | 1.375   |
|    | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
| 0  | Bread     | Wine      | 0.4545     | 0.625         | 1.25    |
| 1  | Butter    | Milk      | 0.4090     | 0.6000        | 1.2000  |
| 2  | Chips     | Butter    | 0.4090     | 0.5625        | 1.2375  |
| 3  | Butter    | Bread     | 0.5        | 0.7333        | 1.2410  |
| 4  | Butter    | Bread     | 0.4545     | 0.625         | 1.25    |
| 5  | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| 6  | Butter    | Bread     | 0.3181     | 0.875         | 1.2031  |
| 7  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 8  | Chips     | Bread     | 0.2727     | 0.5454        | 1.2     |
| 9  | Wine      | Bread     | 0.3636     | 0.5           | 1.2222  |
|    |           |           |            |               |         |
| 10 | Chips     | Butter    | 0.2727     | 0.5454        | 1.2     |
| 11 | Chips     | Butter    | 0.2272     | 0.8333        | 1.2222  |
| 12 | Wine      | Butter    | 0.3181     | 0.6363        | 1.2727  |
| 13 | Chips     | Butter    | 0.3181     | 0.875         | 1.2833  |
| 14 | Chips     | Butter    | 0.3181     | 0.7000        | 1.4000  |
| 15 | nan       | Chips     | 0.2272     | 0.8333        | 1.2222  |
| 16 | Butter    | Bread     | 0.4090     | 0.5625        | 1.2375  |
| 17 | Chips     | Bread     | 0.3181     | 0.875         | 1.2031  |
|    | _         |           |            |               |         |
|    |           |           |            |               |         |

| 18   | Milk   | Butter   | 0.2272  | 0.5   | 1.2222   |
|--|--|--|---|---|--|
| 19   | Wine   | Butter   | 0.2272  | 0.5   | 1.375  |
| 20   | Wine   | Milk   | 0.2727  | 0.5454  | 1.2  |
| 21   | Wine   | Milk   | 0.2272  | 0.5   | 1.2222   |
|  |  |  |   |   |  |
| 22   | Wine   | Apple  | 0.0909  | 1.0   | 1.375  |
| 23   | Milk   | Wine   | 0.2727  | 0.6   | 1.32   |
|  | (title1,)  | (title2,)  | (support,)  | (confidence,)   | (lift,)  |
| 0  | Bread  | Wine   | 0.4545  | 0.625   | 1.25   |
| 1  | Butter   | Milk   | 0.4090  | 0.6000  | 1.2000   |
| 2  | Chips  | Butter   | 0.4090  | 0.5625  | 1.2375   |
| 3  | Butter   | Bread  | 0.5   | 0.7333  | 1.2410   |
| 4  |  |  | 0.4545  | 0.625   | 1.25   |
|  | Butter   | Bread  |   |   |  |
| 5  | Chips  | Butter   | 0.3181  | 0.5   | 1.2222   |
| 6  | Butter   | Bread  | 0.3181  | 0.875   | 1.2031   |
| 7  | Chips  | Bread  | 0.2727  | 0.5454  | 1.2  |
| 8  | Chips  | Bread  | 0.2727  | 0.5454  | 1.2  |
| 9  | Wine   | Bread  | 0.3636  | 0.5   | 1.2222   |
| 10   | Chips  | Butter   | 0.2727  | 0.5454  | 1.2  |
| 11   | Chips  | Butter   | 0.2272  | 0.8333  | 1.2222   |
| 12   | Wine   | Butter   | 0.3181  | 0.6363  | 1.2727   |
|  |  |  |   |   |  |
| 13   | Chips  | Butter   | 0.3181  | 0.875   | 1.2833   |
| 14   | Chips  | Butter   | 0.3181  | 0.7000  | 1.4000   |
| 15   | nan  | Chips  | 0.2272  | 0.8333  | 1.2222   |
| 16   | Butter   | Bread  | 0.4090  | 0.5625  | 1.2375   |
| 17   | Chips  | Bread  | 0.3181  | 0.875   | 1.2031   |
| 18   | Milk   | Butter   | 0.2272  | 0.5   | 1.2222   |
| 19   | Wine   | Butter   | 0.2272  | 0.5   | 1.375  |
| 20   | Wine   | Milk   | 0.2727  | 0.5454  | 1.2  |
| 21   | Wine   | Milk   | 0.2272  | 0.5   | 1.2222   |
|  |  |  |   |   |  |
|  | Mino   | 7227   | 0.0000  | 1 0   | 1 275  |
| 22   | Wine   | Apple  | 0.0909  | 1.0   | 1.375  |
| 23   | Milk   | Wine   | 0.2727  | 0.6   | 1.32   |
|  | Milk<br>Wine   | Wine<br>Butter   | 0.2727<br>0.1363  | 0.6<br>1.0  | 1.32<br>1.375  |
| 23<br>24   | Milk   | Wine<br>Butter<br>(title2,)  | 0.2727<br>0.1363<br>(support,)  | 0.6<br>1.0<br>(confidence,)   | 1.32<br>1.375<br>(lift,)   |
| 23   | Milk<br>Wine   | Wine<br>Butter   | 0.2727<br>0.1363  | 0.6<br>1.0  | 1.32<br>1.375  |
| 23<br>24   | Milk<br>Wine<br>(title1,)  | Wine<br>Butter<br>(title2,)  | 0.2727<br>0.1363<br>(support,)  | 0.6<br>1.0<br>(confidence,)   | 1.32<br>1.375<br>(lift,)   |
| 23<br>24<br>0  | Milk<br>Wine<br>(title1,)<br>Bread   | Wine<br>Butter<br>(title2,)<br>Wine  | 0.2727<br>0.1363<br>(support,)<br>0.4545  | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000  | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000   |
| 23<br>24<br>0<br>1<br>2  | Milk<br>Wine<br>(title1,)<br>Bread<br>Butter<br>Chips  | Wine<br>Butter<br>(title2,)<br>Wine<br>Milk<br>Butter  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090  | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625  | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375   |
| 23<br>24<br>0<br>1<br>2<br>3   | Milk<br>Wine<br>(title1,)<br>Bread<br>Butter<br>Chips<br>Butter  | Wine<br>Butter<br>(title2,)<br>Wine<br>Milk<br>Butter<br>Bread   | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333  | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4  | Milk Wine (title1,) Bread Butter Chips Butter Butter   | Wine Butter (title2,) Wine Milk Butter Bread Bread   | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625   | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5   | Milk Wine (title1,) Bread Butter Chips Butter Butter Chips   | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5  | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6  | Milk Wine (title1,) Bread Butter Chips Butter Butter Chips Butter Chips Butter   | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875   | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7   | Milk Wine (title1,) Bread Butter Chips Butter Butter Chips Butter Chips Butter Chips   | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Bread Bread  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181<br>0.2727   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454   | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8  | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Butter Chips Chips Chips  | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181<br>0.2727<br>0.2727   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454   | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2  |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9   | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Butter Chips Chips Chips Wine   | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Bread Bread  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181<br>0.2727<br>0.2727   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454   | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8  | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Butter Chips Chips Chips  | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181<br>0.2727<br>0.2727   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454   | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2  |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9   | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Butter Chips Chips Chips Wine   | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Bread  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181<br>0.2727<br>0.2727   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454   | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10   | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Chips Chips Wine Chips  | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.5454<br>0.5454<br>0.5454  | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.2222   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12   | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Chips Chips Wine Chips Chips Chips  | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Butter Butter  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454  | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.222<br>1.2222  |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13   | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Chips Chips Wine Chips Chips Wine Chips   | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Butter Butter Butter Butter  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2727<br>0.2727   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.5454<br>0.5<br>0.5454   | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2<br>2<br>1.2222<br>1.2727<br>1.2833   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14   | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Chips Chips Chips Chips Chips Wine Chips Chips Chips Chips Chips Chips  | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Butter Butter Butter Butter Butter   | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.2727   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.55<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000  | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2<br>2<br>1.2222<br>1.2727<br>1.2833<br>1.4000   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15                                     | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Thips Chips Chips Thips Chips Thips T | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000  | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2<br>222<br>1.222<br>1.2727<br>1.2833<br>1.4000<br>1.2222  |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16                               | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Thips Chips Chips Chips Chips Thips Chips Chips Chips Thips Chips Thips T | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread  | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181                               | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333  | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2<br>222<br>1.2727<br>1.2833<br>1.4000<br>1.2222<br>1.2375   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17                         | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips   | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Butter Butter Butter Butter Butter Bread Bread Bread   | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875             | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>1.2222<br>1.2375<br>1.2031   |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18                   | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Mine Chips Chips Mine Chips Chips Mink  | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Butter | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875                | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.222<br>1.2727<br>1.2833<br>1.4000<br>1.2222<br>1.2375<br>1.2031<br>1.2031  |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19             | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Mine Chips Chips Chips Mine Chips Chips Mine Chips Chips Mine Chips Mine Chips Mine Chips Mine Chips Mine Chips Mine Chips Nan Butter Chips Milk Wine   | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Butter   | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272 | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875               | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.222<br>1.2727<br>1.2833<br>1.4000<br>1.2222<br>1.2375<br>1.2031<br>1.2031<br>1.2222<br>1.375                     |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18                   | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Mine Chips Chips Mine Chips Chips Mink  | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Butter                      | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181   | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875                | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.222<br>1.2727<br>1.2833<br>1.4000<br>1.2222<br>1.2375<br>1.2031<br>1.2031  |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19             | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Mine Chips Chips Chips Mine Chips Chips Mine Chips Chips Mine Chips Mine Chips Mine Chips Mine Chips Mine Chips Mine Chips Nan Butter Chips Milk Wine   | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Butter   | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272 | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875               | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.222<br>1.2727<br>1.2833<br>1.4000<br>1.2222<br>1.2375<br>1.2031<br>1.2031<br>1.2222<br>1.375                     |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20       | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Chips Wine Chips Chips Chips Chips Wine Chips Chips Mine Chips Chips Mine Chips Mine Chips Chips Mine Chips Mine Chips Mine Chips Mine Wine Wine  | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Bread Butter             | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2722<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272<br>0.2272           | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875<br>0.5 | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>1.2222<br>1.2375<br>1.2031<br>1.2222<br>1.375<br>1.2031                              |
| 23<br>24<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21 | Milk Wine (title1,) Bread Butter Chips Butter Chips Butter Chips Chips Wine Chips Chips Chips Chips Chips Chips Mine Chips Chips Mine Chips Chips Mine Chips Chips Mine Chips Mine Chips Mine Chips Mine Chips Mine Wine   | Wine Butter (title2,) Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Bread Bread Butter Milk   | 0.2727<br>0.1363<br>(support,)<br>0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272                     | 0.6<br>1.0<br>(confidence,)<br>0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.5454<br>0.5454<br>0.5<br>0.5454<br>0.5<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.5<br>0.5   | 1.32<br>1.375<br>(lift,)<br>1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>1.2222<br>1.2375<br>1.2031<br>1.2222<br>1.375<br>1.2031<br>1.2222<br>1.375<br>1.2222 |

| 24  | Wine   | Butter  | 0.1363  | 1.0  | 1.375  |
|---|--|---|---|--|--|
| 25  | Milk   | Wine  | 0.2272  | 0.7142   | 1.2087   |
|   | (title1,)  | (title2,)   | (support,)  | (confidence,)  | (lift,)  |
| 0   | Bread  | Wine  | 0.4545  | 0.625  | 1.25   |
|   |  |   |   |  |  |
| 1   | Butter   | Milk  | 0.4090  | 0.6000   | 1.2000   |
| 2   | Chips  | Butter  | 0.4090  | 0.5625   | 1.2375   |
| 3   | Butter   | Bread   | 0.5   | 0.7333   | 1.2410   |
| 4   | Butter   | Bread   | 0.4545  | 0.625  | 1.25   |
| 5   | Chips  | Butter  | 0.3181  | 0.5  | 1.2222   |
| 6   | Butter   | Bread   | 0.3181  | 0.875  | 1.2031   |
| 7   | Chips  | Bread   | 0.2727  | 0.5454   | 1.2  |
| 8   | Chips  | Bread   | 0.2727  | 0.5454   | 1.2  |
|   |  |   |   |  |  |
| 9   | Wine   | Bread   | 0.3636  | 0.5  | 1.2222   |
| 10  | Chips  | Butter  | 0.2727  | 0.5454   | 1.2  |
| 11  | Chips  | Butter  | 0.2272  | 0.8333   | 1.2222   |
| 12  | Wine   | Butter  | 0.3181  | 0.6363   | 1.2727   |
| 13  | Chips  | Butter  | 0.3181  | 0.875  | 1.2833   |
| 14  | Chips  | Butter  | 0.3181  | 0.7000   | 1.4000   |
| 15  | nan  | Chips   | 0.2272  | 0.8333   | 1.2222   |
| 16  | Butter   | Bread   | 0.4090  | 0.5625   | 1.2375   |
| 17  | Chips  | Bread   | 0.3181  | 0.875  | 1.2031   |
|   | _  |   |   |  | 1.2222   |
| 18  | Milk   | Butter  | 0.2272  | 0.5  |  |
| 19  | Wine   | Butter  | 0.2272  | 0.5  | 1.375  |
| 20  | Wine   | Milk  | 0.2727  | 0.5454   | 1.2  |
| 21  | Wine   | Milk  | 0.2272  | 0.5  | 1.2222   |
| 22  | Wine   | Apple   | 0.0909  | 1.0  | 1.375  |
| 23  | Milk   | Wine  | 0.2727  | 0.6  | 1.32   |
| 24  | Wine   | Butter  | 0.1363  | 1.0  | 1.375  |
| 25  | Milk   | Wine  | 0.2272  | 0.7142   | 1.2087   |
| 26  | Milk   | Wine  | 0.1818  | 0.5  | 1.375  |
| 20  |  |   |   | 0.5  |  |
|   | (+i+1~1 \  | (+i+1~2 \   | ( aumnort )   | (aonfidonao)   | /1:f+ \  |
| 0   | (title1,)  | (title2,)   | (support,)  | (confidence,)  | (lift,)  |
| 0   | Bread  | Wine  | 0.4545  | 0.625  | 1.25   |
| 1   | Bread<br>Butter  | Wine<br>Milk  | 0.4545<br>0.4090  | 0.625<br>0.6000  | 1.25<br>1.2000   |
| 1<br>2  | Bread<br>Butter<br>Chips   | Wine<br>Milk<br>Butter  | 0.4545<br>0.4090<br>0.4090  | 0.625<br>0.6000<br>0.5625  | 1.25<br>1.2000<br>1.2375   |
| 1<br>2<br>3   | Bread<br>Butter<br>Chips<br>Butter   | Wine<br>Milk  | 0.4545<br>0.4090  | 0.625<br>0.6000<br>0.5625<br>0.7333  | 1.25<br>1.2000   |
| 1<br>2  | Bread<br>Butter<br>Chips   | Wine<br>Milk<br>Butter  | 0.4545<br>0.4090<br>0.4090  | 0.625<br>0.6000<br>0.5625  | 1.25<br>1.2000<br>1.2375   |
| 1<br>2<br>3   | Bread<br>Butter<br>Chips<br>Butter   | Wine<br>Milk<br>Butter<br>Bread   | 0.4545<br>0.4090<br>0.4090<br>0.5   | 0.625<br>0.6000<br>0.5625<br>0.7333  | 1.25<br>1.2000<br>1.2375<br>1.2410   |
| 1<br>2<br>3<br>4<br>5   | Bread<br>Butter<br>Chips<br>Butter<br>Butter<br>Chips  | Wine<br>Milk<br>Butter<br>Bread<br>Bread  | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5  | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222   |
| 1<br>2<br>3<br>4<br>5<br>6  | Bread Butter Chips Butter Butter Chips Butter  | Wine<br>Milk<br>Butter<br>Bread<br>Bread<br>Butter<br>Bread   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5  | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031   |
| 1<br>2<br>3<br>4<br>5<br>6<br>7   | Bread Butter Chips Butter Butter Chips Butter Chips Chips  | Wine<br>Milk<br>Butter<br>Bread<br>Bread<br>Butter<br>Bread<br>Bread  | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454   | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031   |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8  | Bread Butter Chips Butter Butter Chips Butter Chips Chips Chips  | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181<br>0.2727   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454   | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2  |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8  | Bread Butter Chips Butter Butter Chips Butter Chips Chips Chips Wine   | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Bread   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.3181<br>0.2727<br>0.2727   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454   | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222   |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10   | Bread Butter Chips Butter Butter Chips Butter Chips Chips Chips Wine Chips   | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Bread Bread Bread   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.2727   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454   | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222   |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10   | Bread Butter Chips Butter Butter Chips Butter Chips Chips Chips Wine Chips Chips   | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Bread Butter Butter   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5  | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.2  |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11   | Bread Butter Chips Butter Chips Butter Chips Chips Chips Wine Chips Chips Wine   | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Bread Bread Bread   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2727<br>0.3636   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.55<br>0.5454<br>0.8333<br>0.6363   | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>2<br>1.2222<br>1.2<br>1.2222<br>1.2727                               |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13   | Bread Butter Chips Butter Chips Butter Chips   | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Bread Butter Butter Butter Butter   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875  | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.2222<br>1.2727<br>1.2833                                 |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11   | Bread Butter Chips Butter Chips Butter Chips Chips Chips Wine Chips Chips Wine   | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Bread Butter Butter Butter  | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2727<br>0.3636   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.55<br>0.5454<br>0.8333<br>0.6363   | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>2<br>1.2222<br>1.2<br>1.2222<br>1.2727                               |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13   | Bread Butter Chips Butter Chips Butter Chips   | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Bread Butter Butter Butter Butter   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875  | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2<br>1.2222<br>1.2222<br>1.2727<br>1.2833                                 |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15   | Bread Butter Chips Butter Chips Butter Chips   | Wine Milk Butter Bread Bread Bread Bread Bread Bread Bread Bread Butter Butter Butter Butter Butter Chips   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333  | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2222<br>1.2222<br>1.2727<br>1.2833<br>1.4000<br>1.2222                    |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16   | Bread Butter Chips Butter Chips Butter Chips Chips Chips Chips Chips Chips Chips Chips Chips Thips Chips Chips Chips Thips Chips Chips Thips Thi | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Butter Butter Butter Butter Butter  | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.4090   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.55<br>0.5454<br>0.6363<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625  | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2222<br>1.222<br>1.2727<br>1.2833<br>1.4000<br>1.2222<br>1.2375           |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17   | Bread Butter Chips Butter Chips Butter Chips Chips Chips Wine Chips  | Wine Milk Butter Bread Bread Bread Bread Bread Bread Bread Butter Butter Butter Butter Chips Bread Bread Bread  | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5455<br>0.5455<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875   | 1.25<br>1.2000<br>1.2375<br>1.2410<br>1.25<br>1.2222<br>1.2031<br>1.2<br>1.2222<br>1.222<br>1.2727<br>1.2833<br>1.4000<br>1.2222<br>1.2375<br>1.2031 |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18                                     | Bread Butter Chips Butter Chips Butter Chips Chips Chips Wine Chips Mine Chips Chips Mine Chips Chips Mine   | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Butter Butter Butter Butter Chips Bread Bread Bread   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5455<br>0.5455<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875   | 1.25 1.2000 1.2375 1.2410 1.25 1.2222 1.2031 1.2 1.2222 1.222 1.2727 1.2833 1.4000 1.2222 1.2375 1.2031 1.2222                                       |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19                               | Bread Butter Chips Butter Chips Butter Chips Chips Chips Wine Chips Chips Chips Chips Chips Mine Chips Chips Chips Mine Chips Chips Mine Chips Mine Chips Chips Mine Chips Mine Chips Mine Chips Nan Butter Chips Milk Wine  | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Butter Butter Butter Butter Chips Bread Bread Bread Butter  | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272   | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.5455<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555<br>0.555 | 1.25 1.2000 1.2375 1.2410 1.25 1.2222 1.2031 1.2 1.2222 1.222 1.2727 1.2833 1.4000 1.2222 1.2375 1.2031 1.2222 1.375                                 |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20                         | Bread Butter Chips Butter Chips Butter Chips Chips Chips Wine Chips Chips Chips Chips Mine Chips Chips Mine Chips Chips Mine Chips Mine Chips Mine Chips Mine Chips Mine Chips Mine Wine   | Wine Milk Butter Bread Bread Butter Bread Bread Bread Bread Butter Butter Butter Butter Chips Bread Bread Bread Butter Milk   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272                     | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875<br>0.5454   | 1.25 1.2000 1.2375 1.2410 1.25 1.2222 1.2031 1.2 1.2222 1.222 1.2727 1.2833 1.4000 1.2222 1.2375 1.2031 1.2222 1.375 1.2031 1.2222                   |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21                   | Bread Butter Chips Butter Chips Butter Chips Chips Wine Chips Chips Wine Chips Chips Mine Chips Chips Mine Chips Mine Chips Mine Chips Mine Chips Mine Wine Wine   | Wine Milk Butter Bread Bread Bread Bread Bread Bread Bread Bread Butter Butter Butter Butter Chips Bread Bread Bread Bread Bread Butter Milk Milk   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272           | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875<br>0.5454<br>0.55   | 1.25 1.2000 1.2375 1.2410 1.25 1.2222 1.2031 1.2 1.2222 1.222 1.222 1.2727 1.2833 1.4000 1.2222 1.2375 1.2031 1.2222 1.375 1.2031 1.2222 1.375 1.2   |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22             | Bread Butter Chips Butter Chips Butter Chips Chips Chips Chips Chips Chips Chips Chips Mine Chips Chips Mine Chips Chips Mine Chips Mine Chips Mine Chips Nan Butter Chips Milk Wine Wine Wine Wine  | Wine Milk Butter Bread Bread Bread Bread Bread Bread Bread Bread Butter Butter Butter Butter Chips Bread Bread Bread Butter Apple   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.2727<br>0.2272<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272<br>0.2272<br>0.2272<br>0.2272 | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.6363<br>0.875<br>0.5454<br>0.55   | 1.25 1.2000 1.2375 1.2410 1.25 1.2222 1.2031 1.2 1.2222 1.222 1.2727 1.2833 1.4000 1.2222 1.2375 1.2031 1.2222 1.375 1.21 1.2222 1.375               |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22<br>23       | Bread Butter Chips Butter Chips Butter Chips Chips Chips Wine Chips Chips Chips Mine Chips Chips Mine Chips Mine Chips Mine Chips Mine Chips Milk Wine Wine Wine Wine Milk   | Wine Milk Butter Bread Bread Bread Bread Bread Bread Bread Butter Butter Butter Butter Chips Bread Bread Bread Butter Milk Apple Wine   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272<br>0.2272<br>0.2272<br>0.2272                     | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875<br>0.55   | 1.25 1.2000 1.2375 1.2410 1.25 1.2222 1.2031 1.2 1.2222 1.222 1.2727 1.2833 1.4000 1.2222 1.2375 1.2031 1.2222 1.375 1.2 1.2222 1.375 1.32           |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22<br>23<br>24 | Bread Butter Chips Butter Chips Butter Chips Chips Chips Chips Chips Chips Chips Chips Chips Mine Chips Chips Mine Chips Chips Mine Chips Mine Chips Milk Wine Wine Wine Wine Wine Milk Wine   | Wine Milk Butter Bread Bread Bread Bread Bread Bread Bread Butter Butter Butter Butter Chips Bread Bread Bread Butter Butter Butter Chips Bread | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.2727<br>0.2272<br>0.3636<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272<br>0.2272<br>0.2272<br>0.2272 | 0.625 0.6000 0.5625 0.7333 0.625 0.5 0.875 0.5454 0.5454 0.5454 0.8333 0.6363 0.875 0.7000 0.8333 0.5625 0.875 0.5454 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5  | 1.25 1.2000 1.2375 1.2410 1.25 1.2222 1.2031 1.2 1.2222 1.222 1.2727 1.2833 1.4000 1.2222 1.2375 1.2031 1.2222 1.375 1.2 1.2222 1.375 1.32 1.375     |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10<br>11<br>12<br>13<br>14<br>15<br>16<br>17<br>18<br>19<br>20<br>21<br>22<br>23       | Bread Butter Chips Butter Chips Butter Chips Chips Chips Wine Chips Chips Chips Mine Chips Chips Mine Chips Mine Chips Mine Chips Mine Chips Milk Wine Wine Wine Wine Milk   | Wine Milk Butter Bread Bread Bread Bread Bread Bread Bread Butter Butter Butter Butter Chips Bread Bread Bread Butter Milk Apple Wine   | 0.4545<br>0.4090<br>0.4090<br>0.5<br>0.4545<br>0.3181<br>0.2727<br>0.2727<br>0.2727<br>0.2272<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.3181<br>0.2272<br>0.4090<br>0.3181<br>0.2272<br>0.2272<br>0.2272<br>0.2272                     | 0.625<br>0.6000<br>0.5625<br>0.7333<br>0.625<br>0.5<br>0.875<br>0.5454<br>0.5454<br>0.5454<br>0.5454<br>0.8333<br>0.6363<br>0.875<br>0.7000<br>0.8333<br>0.5625<br>0.875<br>0.55   | 1.25 1.2000 1.2375 1.2410 1.25 1.2222 1.2031 1.2 1.2222 1.222 1.2727 1.2833 1.4000 1.2222 1.2375 1.2031 1.2222 1.375 1.2 1.2222 1.375 1.32           |

26 Milk Wine 0.1818 0.5 1.375 27 Milk Wine 0.0909 1.0 1.375

9. Selanjutnya jalankan script berikut ini untuk menampilkan kesimpulan

#### Dengan Output:

|        | (title1,) | (title2,) | (support,) | (confidence,) | (lift,) |
|--------|-----------|-----------|------------|---------------|---------|
| count  | 28        | 28        | 28         | 28            | 28      |
| unique | 6         | 6         | 10         | 13            | 13      |
| top    | Chips     | Butter    | 0.3181     | 0.5           | 1.2222  |
| freq   | 9         | 10        | 6          | 6             | 6       |

10. Selanjutnya meneksport hasilnya ke bentuk excel dengan menggunakan script berikut ini :

```
store_suggestion.to_excel('C:/Users/Aminurachma Aisyah/outputs.xls')
```

# Kesimpulan

Algoritma Association rule mining seperti Apriori sangat berguna untuk menemukan asosiasi sederhana. Mereka mudah diimplementasikan dan memiliki kemampuan menjelaskan yang tinggi. Pada tugas ini saya mencoba (min\_support=0.09, min\_confidence=0.5, min\_lift=1.2, min\_length=2) dan mendapatkan 28 list dan yang tertinggi adalah Chips biasanya terbeli bersamaan dengan Butter dengan Support 0,3181 dan Confidence 0,5.