```
!pip install apyori

Requirement already satisfied: apyori in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (1.1.2)

[notice] A new release of pip is available: 23.1.2 -> 23.2.1
[notice] To update, run: pip install --upgrade pip

pip install mlxtend

Collecting mlxtend
  Downloading mlxtend-0.22.0-py2.py3-none-any.whl (1.4 MB)
━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.4/1.4 MB 747.8 kB/s eta
0:00:0000:0100:01
ent already satisfied: scipy>=1.2.1 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from mlxtend)
(1.10.0)
Requirement already satisfied: numpy>=1.16.2 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from mlxtend)
(1.23.5)
Requirement already satisfied: pandas>=0.24.2 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from mlxtend)
(1.5.3)
Requirement already satisfied: scikit-learn>=1.0.2 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from mlxtend)
(1.2.1)
Requirement already satisfied: matplotlib>=3.0.0 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from mlxtend)
(3.7.0)
Requirement already satisfied: joblib>=0.13.2 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from mlxtend)
(1.1.1)
Requirement already satisfied: setuptools in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from mlxtend)
(65.6.3)
Requirement already satisfied: contourpy>=1.0.1 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (1.0.5)
Requirement already satisfied: cycler>=0.10 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (4.25.0)
Requirement already satisfied: kiwisolver>=1.0.1 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (1.4.4)
Requirement already satisfied: packaging>=20.0 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (22.0)
```

```
Requirement already satisfied: pillow>=6.2.0 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (9.4.0)
Requirement already satisfied: pyparsing>=2.3.1 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (3.0.9)
Requirement already satisfied: python-dateutil>=2.7 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from
pandas>=0.24.2->mlxtend) (2022.7)
Requirement already satisfied: threadpoolctl>=2.0.0 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from scikit-
learn>=1.0.2->mlxtend) (2.2.0)
Requirement already satisfied: six>=1.5 in
/Users/aalokh/anaconda3/lib/python3.10/site-packages (from python-
dateutil>=2.7->matplotlib>=3.0.0->mlxtend) (1.16.0)
Installing collected packages: mlxtend
Successfully installed mlxtend-0.22.0

[notice] A new release of pip is available: 23.1.2 -> 23.2.1
[notice] To update, run: pip install --upgrade pip
Note: you may need to restart the kernel to use updated packages.
```

```
import pandas as pd
from mlxtend.frequent_patterns import apriori
from mlxtend.frequent_patterns import association_rules

d1 = pd.read_csv("BreadBasket.csv")

d1['value'] = d1.apply(lambda x: 1, axis = 1)

d1
```

	Tx	Products	value
0	0	Milk	1
1	0	Bread	1
2	0	Biscuit	1
3	1	Milk	1
4	1	Bread	1
..	..	...	...
61	18	Sugar	1
62	19	Milk	1
63	19	Cornflakes	1
64	19	Tea	1
65	19	Coffee	1

```
[66 rows x 3 columns]
```

```
d2 = pd.pivot_table(d1, index = 'Tx', columns = 'Products', values =
'value')

d2
```

Products	Biscuit	Bournvita	Bread	Coffee	Coke	Cornflakes	Jam	Maggie
Tx								
0	1.0	NaN	1.0	NaN	NaN	NaN	NaN	NaN
1	1.0	NaN	1.0	NaN	NaN	1.0	NaN	NaN
2	NaN	1.0	1.0	NaN	NaN	NaN	NaN	NaN
3	NaN	NaN	1.0	NaN	NaN	NaN	1.0	1.0
4	1.0	NaN	NaN	NaN	NaN	NaN	NaN	1.0
5	NaN	1.0	1.0	NaN	NaN	NaN	NaN	NaN
6	NaN	NaN	NaN	NaN	NaN	1.0	NaN	1.0
7	1.0	NaN	1.0	NaN	NaN	NaN	NaN	1.0
8	NaN	NaN	1.0	NaN	NaN	NaN	1.0	1.0
9	NaN	NaN	1.0	NaN	NaN	NaN	NaN	NaN
10	1.0	NaN	NaN	1.0	1.0	1.0	NaN	NaN
11	1.0	NaN	NaN	1.0	1.0	1.0	NaN	NaN
12	NaN	1.0	NaN	1.0	NaN	NaN	NaN	NaN
13	NaN	NaN	1.0	1.0	1.0	NaN	NaN	NaN
14	1.0	NaN	1.0	NaN	NaN	NaN	NaN	NaN
15	NaN	NaN	NaN	1.0	NaN	1.0	NaN	NaN
16	NaN	1.0	1.0	NaN	NaN	NaN	NaN	NaN
17	NaN	NaN	1.0	1.0	NaN	NaN	NaN	NaN
18	NaN	NaN	1.0	1.0	NaN	NaN	NaN	NaN
19	NaN	NaN	NaN	1.0	NaN	1.0	NaN	NaN

```
Products  Milk  Sugar  Tea
Tx
0          1.0    NaN  NaN
1          1.0    NaN  NaN
2          NaN    NaN  1.0
3          1.0    NaN  NaN
4          NaN    NaN  1.0
5          NaN    NaN  1.0
6          NaN    NaN  1.0
7          NaN    NaN  1.0
8          NaN    NaN  1.0
9          1.0    NaN  NaN
10         NaN    NaN  NaN
11         NaN    NaN  NaN
12         NaN    1.0  NaN
13         NaN    NaN  NaN
14         NaN    1.0  NaN
15         NaN    1.0  NaN
16         NaN    1.0  NaN
17         NaN    1.0  NaN
18         NaN    1.0  NaN
19         1.0    NaN  1.0
```

```
d3 = d2.fillna(0)
```

```
d3
```

```
Products  Biscuit  Bournvita  Bread  Coffee  Coke  Cornflakes  Jam
Maggie  \
Tx

0              1.0        0.0    1.0     0.0   0.0         0.0  0.0
0.0
1              1.0        0.0    1.0     0.0   0.0         1.0  0.0
0.0
2              0.0        1.0    1.0     0.0   0.0         0.0  0.0
0.0
3              0.0        0.0    1.0     0.0   0.0         0.0  1.0
1.0
4              1.0        0.0    0.0     0.0   0.0         0.0  0.0
1.0
5              0.0        1.0    1.0     0.0   0.0         0.0  0.0
0.0
6              0.0        0.0    0.0     0.0   0.0         1.0  0.0
1.0
7              1.0        0.0    1.0     0.0   0.0         0.0  0.0
1.0
8              0.0        0.0    1.0     0.0   0.0         0.0  1.0
1.0
9              0.0        0.0    1.0     0.0   0.0         0.0  0.0
```

```
0.0
10             1.0         0.0    0.0      1.0   1.0          1.0  0.0
0.0
11             1.0         0.0    0.0      1.0   1.0          1.0  0.0
0.0
12             0.0         1.0    0.0      1.0   0.0          0.0  0.0
0.0
13             0.0         0.0    1.0      1.0   1.0          0.0  0.0
0.0
14             1.0         0.0    1.0      0.0   0.0          0.0  0.0
0.0
15             0.0         0.0    0.0      1.0   0.0          1.0  0.0
0.0
16             0.0         1.0    1.0      0.0   0.0          0.0  0.0
0.0
17             0.0         0.0    1.0      1.0   0.0          0.0  0.0
0.0
18             0.0         0.0    1.0      1.0   0.0          0.0  0.0
0.0
19             0.0         0.0    0.0      1.0   0.0          1.0  0.0
0.0

Products  Milk  Sugar  Tea
Tx
0          1.0    0.0  0.0
1          1.0    0.0  0.0
2          0.0    0.0  1.0
3          1.0    0.0  0.0
4          0.0    0.0  1.0
5          0.0    0.0  1.0
6          0.0    0.0  1.0
7          0.0    0.0  1.0
8          0.0    0.0  1.0
9          1.0    0.0  0.0
10         0.0    0.0  0.0
11         0.0    0.0  0.0
12         0.0    1.0  0.0
13         0.0    0.0  0.0
14         0.0    1.0  0.0
15         0.0    1.0  0.0
16         0.0    1.0  0.0
17         0.0    1.0  0.0
18         0.0    1.0  0.0
19         1.0    0.0  1.0

frequent_itemsets = apriori(d3, min_support = 0.2, use_colnames =
True)
rules = association_rules(frequent_itemsets, metric = "lift",
min_threshold = 1)
```

```
/Users/aalokh/anaconda3/lib/python3.10/site-packages/mlxtend/
frequent_patterns/fpcommon.py:110: DeprecationWarning: DataFrames with
non-bool types result in worse computationalperformance and their
support might be discontinued in the future.Please use a DataFrame
with bool type
  warnings.warn(

rules

    antecedents   consequents  antecedent support  consequent support
\
0        (Milk)       (Bread)                0.25                0.65

1       (Bread)        (Milk)                0.65                0.25

2       (Bread)       (Sugar)                0.65                0.30

3       (Sugar)       (Bread)                0.30                0.65

4      (Coffee)  (Cornflakes)                0.40                0.30

5  (Cornflakes)      (Coffee)                0.30                0.40

6      (Coffee)       (Sugar)                0.40                0.30

7       (Sugar)      (Coffee)                0.30                0.40

8         (Tea)      (Maggie)                0.35                0.25

9      (Maggie)         (Tea)                0.25                0.35


   support  confidence      lift  leverage  conviction  zhangs_metric

0      0.2    0.800000  1.230769    0.0375    1.750000       0.250000

1      0.2    0.307692  1.230769    0.0375    1.083333       0.535714

2      0.2    0.307692  1.025641    0.0050    1.011111       0.071429

3      0.2    0.666667  1.025641    0.0050    1.050000       0.035714

4      0.2    0.500000  1.666667    0.0800    1.400000       0.666667

5      0.2    0.666667  1.666667    0.0800    1.800000       0.571429

6      0.2    0.500000  1.666667    0.0800    1.400000       0.666667

7      0.2    0.666667  1.666667    0.0800    1.800000       0.571429

8      0.2    0.571429  2.285714    0.1125    1.750000       0.865385
```

```
9      0.2    0.800000  2.285714    0.1125    3.250000       0.750000
```

There are two parts antecedents consequents. As per our results if a purchase is made for Milk (antecedents) then at then same time within same transaction Milk (consequents) may also be purchased

Confidence values tell you how many times items bought together with respect to bought single time. So if item bought together combined is less compared to single times then occurrence may be insignificant . So higher value of Confidence means higher chances of buying together as compared to single item

```

```