```
!pip install apyori

Requirement already satisfied: apyori in
/Users/sravya/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/sravya/anaconda3/lib/python3.10/site-packages (from mlxtend)
(1.10.0)
Requirement already satisfied: numpy>=1.16.2 in
/Users/sravya/anaconda3/lib/python3.10/site-packages (from mlxtend)
(1.23.5)
Requirement already satisfied: pandas>=0.24.2 in
/Users/sravya/anaconda3/lib/python3.10/site-packages (from mlxtend)
(1.5.3)
Requirement already satisfied: scikit-learn>=1.0.2 in
/Users/sravya/anaconda3/lib/python3.10/site-packages (from mlxtend)
(1.2.1)
Requirement already satisfied: matplotlib>=3.0.0 in
/Users/sravya/anaconda3/lib/python3.10/site-packages (from mlxtend)
(3.7.0)
Requirement already satisfied: joblib>=0.13.2 in
/Users/sravya/anaconda3/lib/python3.10/site-packages (from mlxtend)
(1.1.1)
Requirement already satisfied: setuptools in
/Users/sravya/anaconda3/lib/python3.10/site-packages (from mlxtend)
(65.6.3)
Requirement already satisfied: contourpy>=1.0.1 in
/Users/sravya/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (1.0.5)
Requirement already satisfied: cycler>=0.10 in
/Users/sravya/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in
/Users/sravya/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (4.25.0)
Requirement already satisfied: kiwisolver>=1.0.1 in
/Users/sravya/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (1.4.4)
Requirement already satisfied: packaging>=20.0 in
/Users/sravya/anaconda3/lib/python3.10/site-packages (from
matplotlib>=3.0.0->mlxtend) (22.0)
```

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

```python
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]
```

```python
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
```

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

```
/Users/sravya/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