```
!pip install mlxtend
```

```
Requirement already satisfied: mlxtend in /usr/local/lib/python3.10/dist-packages (0.22.0)
Requirement already satisfied: scipy>=1.2.1 in /usr/local/lib/python3.10/dist-packages (from mlxtend) (1.11.3)
Requirement already satisfied: numpy>=1.16.2 in /usr/local/lib/python3.10/dist-packages (from mlxtend) (1.23.5)
Requirement already satisfied: pandas>=0.24.2 in /usr/local/lib/python3.10/dist-packages (from mlxtend) (1.5.3)
Requirement already satisfied: scikit-learn>=1.0.2 in /usr/local/lib/python3.10/dist-packages (from mlxtend) (1.2.2)
Requirement already satisfied: matplotlib>=3.0.0 in /usr/local/lib/python3.10/dist-packages (from mlxtend) (3.7.1)
Requirement already satisfied: joblib>=0.13.2 in /usr/local/lib/python3.10/dist-packages (from mlxtend) (1.3.2)
Requirement already satisfied: setuptools in /usr/local/lib/python3.10/dist-packages (from mlxtend) (67.7.2)
Requirement already satisfied: contourpy>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.0.0->mlxtend) (1.1.1)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.0.0->mlxtend) (0.12.0)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.0.0->mlxtend) (4.43.1)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.0.0->mlxtend) (1.4.5)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.0.0->mlxtend) (23.2)
Requirement already satisfied: pillow>=6.2.0 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.0.0->mlxtend) (9.4.0)
Requirement already satisfied: pyparsing>=2.3.1 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.0.0->mlxtend) (3.1.1)
Requirement already satisfied: python-dateutil>=2.7 in /usr/local/lib/python3.10/dist-packages (from matplotlib>=3.0.0->mlxtend) (2.8.2
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-packages (from pandas>=0.24.2->mlxtend) (2023.3.post1)
Requirement already satisfied: threadpoolctl>=2.0.0 in /usr/local/lib/python3.10/dist-packages (from scikit-learn>=1.0.2->mlxtend) (3.2
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-packages (from python-dateutil>=2.7->matplotlib>=3.0.0->mlxte
```

```
import csv
import pandas as pd
from mlxtend.preprocessing import TransactionEncoder
from mlxtend.frequent_patterns import apriori, association_rules



dataset = []
with open("Market_Basket_Optimisation.csv") as file:
 reader = csv.reader(file, delimiter=",")
 for row in reader:
    dataset.append(row)
```

```
/usr/local/lib/python3.10/dist-packages/ipykernel/ipkernel.py:283: DeprecationWarning: `should_run_async` will not call `transform_cell
  and should_run_async(code)
```

```
dataset
```

```
 'cottage cheese',
 'pancakes'],
['ground beef', 'mineral water', 'milk', 'eggs', 'mint'],
['shrimp', 'body spray', 'green tea'],
['frozen smoothie'],
['herb & pepper', 'frozen vegetables', 'mineral water', 'muffins', 'cereals'],
['turkey',
 'tomatoes',
 'spaghetti',
 'milk',
 'cider',
 'eggs',
 'honey',
 'cake',
 'green tea',
 'french fries',
 'brownies',
 'tomato juice'],
...]
```

```
te = TransactionEncoder()
```

```
/usr/local/lib/python3.10/dist-packages/ipykernel/ipkernel.py:283: DeprecationWarning: `should_run_async` will not call `transform_cell
  and should_run_async(code)
```

```
df = te.fit_transform(dataset)
```

```
/usr/local/lib/python3.10/dist-packages/ipykernel/ipkernel.py:283: DeprecationWarning: `should_run_async` will not call `transform_cell
  and should_run_async(code)
```

```
df = pd.DataFrame(df, columns=te.columns_)
df
```

```
/usr/local/lib/python3.10/dist-packages/ipykernel/ipkernel.py:283: DeprecationWarning: `should_run_async` will not call `transform_cell
  and should_run_async(code)
```

	asparagus	almonds	antioxydant juice	asparagus	avocado	babies food	bacon	barbecue sauce	black tea	blueberries	...	turkey	vegetables mix	water spray	w
0	False	True	True	False	True	False	False	False	False	False	...	False	True	False	
1	False	False	False	False	False	False	False	False	False	False	...	False	False	False	
2	False	False	False	False	False	False	False	False	False	False	...	False	False	False	
3	False	False	False	False	True	False	False	False	False	False	...	True	False	False	
4	False	False	False	False	False	False	False	False	False	False	...	False	False	False	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
7496	False	False	False	False	False	False	False	False	False	False	...	False	False	False	
7497	False	False	False	False	False	False	False	False	False	False	...	False	False	False	
7498	False	False	False	False	False	False	False	False	False	False	...	False	False	False	
7499	False	False	False	False	False	False	False	False	False	False	...	False	False	False	
7500	False	False	False	False	False	False	False	False	False	False	...	False	False	False	

7501 rows × 120 columns

```
item_set = apriori(df, min_support=0.01, use_colnames=True)
item_set
```

```
/usr/local/lib/python3.10/dist-packages/ipykernel/ipkernel.py:283: DeprecationWarning: `should_run_async` will not call `transform_cell
  and should_run_async(code)
```

	support	itemsets
0	0.020397	(almonds)
1	0.033329	(avocado)
2	0.010799	(barbecue sauce)
3	0.014265	(black tea)
4	0.011465	(body spray)
...	...	...
252	0.011065	(ground beef, milk, mineral water)

```
rules = association_rules(item_set, metric="confidence", min_threshold=0.25)
print(f" Confidence Level : 25%, No of rules : {len(rules)}")
rules
```

```
 Confidence Level : 25%, No of rules : 95
/usr/local/lib/python3.10/dist-packages/ipykernel/ipkernel.py:283: DeprecationWarning: `should_run_async` will not call `transform_cell
  and should_run_async(code)
```

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	conviction	zhangs_metric
0	(avocado)	(mineral water)	0.033329	0.238368	0.011598	0.348000	1.459926	0.003654	1.168147	0.325896
1	(burgers)	(eggs)	0.087188	0.179709	0.028796	0.330275	1.837830	0.013128	1.224818	0.499424
2	(burgers)	(french fries)	0.087188	0.170911	0.021997	0.252294	1.476173	0.007096	1.108844	0.353384
3	(burgers)	(mineral water)	0.087188	0.238368	0.024397	0.279817	1.173883	0.003614	1.057552	0.162275
4	(cake)	(mineral water)	0.081056	0.238368	0.027463	0.338816	1.421397	0.008142	1.151921	0.322617
...	...	...	...	...	...	...	...	...	...	...
90	(mineral water, spaghetti)	(milk)	0.059725	0.129583	0.015731	0.263393	2.032623	0.007992	1.181657	0.540294
91	(mineral water, olive oil)	(spaghetti)	0.027596	0.174110	0.010265	0.371981	2.136468	0.005460	1.315071	0.547034
92	(olive oil, spaghetti)	(mineral water)	0.022930	0.238368	0.010265	0.447674	1.878079	0.004799	1.378954	0.478514
93	(mineral water, pancakes)	(spaghetti)	0.033729	0.174110	0.011465	0.339921	1.952333	0.005593	1.251198	0.504819
94	(pancakes, spaghetti)	(mineral water)	0.025197	0.238368	0.011465	0.455026	1.908923	0.005459	1.397557	0.488452

95 rows × 10 columns

```
rules = association_rules(item_set, metric="confidence", min_threshold=0.20)
print(f" Confidence Level : 20%, No of rules : {len(rules)}")
rules
```

```
 Confidence Level : 20%, No of rules : 162
/usr/local/lib/python3.10/dist-packages/ipykernel/ipkernel.py:283: DeprecationWarning: `should_run_async` will not call `transform_cell
  and should_run_async(code)
```

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	conviction	zhangs_metric
0	(avocado)	(mineral water)	0.033329	0.238368	0.011598	0.348000	1.459926	0.003654	1.168147	0.325896
1	(burgers)	(eggs)	0.087188	0.179709	0.028796	0.330275	1.837830	0.013128	1.224818	0.499424
2	(burgers)	(french fries)	0.087188	0.170911	0.021997	0.252294	1.476173	0.007096	1.108844	0.353384
3	(burgers)	(green tea)	0.087188	0.132116	0.017464	0.200306	1.516139	0.005945	1.085270	0.372947
4	(burgers)	(milk)	0.087188	0.129583	0.017864	0.204893	1.581175	0.006566	1.094717	0.402667

```
rules = rules[["antecedents", "consequents", "support", "confidence"]]
rules
```

```
/usr/local/lib/python3.10/dist-packages/ipykernel/ipkernel.py:283: DeprecationWarning: `should_run_async` will not call `transform_cell
  and should_run_async(code)
```

	antecedents	consequents	support	confidence
0	(avocado)	(mineral water)	0.011598	0.348000
1	(burgers)	(eggs)	0.028796	0.330275
2	(burgers)	(french fries)	0.021997	0.252294
3	(burgers)	(green tea)	0.017464	0.200306
4	(burgers)	(milk)	0.017864	0.204893
...	...	...	...	...
157	(mineral water, spaghetti)	(milk)	0.015731	0.263393
158	(mineral water, olive oil)	(spaghetti)	0.010265	0.371981
159	(olive oil, spaghetti)	(mineral water)	0.010265	0.447674
160	(mineral water, pancakes)	(spaghetti)	0.011465	0.339921
161	(pancakes, spaghetti)	(mineral water)	0.011465	0.455026

162 rows × 4 columns

```
# Recommendation
ip = "milk"
# ip = input("Enter the item to purchase : ")
rules[rules["antecedents"] == {ip}]["consequents"]
```

```
/usr/local/lib/python3.10/dist-packages/ipykernel/ipkernel.py:283: DeprecationWarning: `should_run_async` will not call `transform_cell
  and should_run_async(code)
27        (chocolate)
49             (eggs)
86    (mineral water)
91        (spaghetti)
Name: consequents, dtype: object
```