Name:- Raj Khatri
Roll Number:- AC-1235
Subject:- Data Mining
Semester:- 6
Practical - 4

The dataset is groceries.csv

In [2]:

```python
import pandas as pd
import numpy as np
from mlxtend.frequent_patterns import apriori
```

In [3]:

```python
grocery_df = pd.read_csv("groceries.csv")
```

In [4]:

```python
grocery_df
```

Out[4]:

	Items
0	citrus fruit,semi-finished bread,margarine,rea...
1	tropical fruit,yogurt,coffee
2	whole milk
3	pip fruit,yogurt,cream cheese ,meat spreads
4	other vegetables,whole milk,condensed milk,lon...
...	...
695	pork,UHT-milk,bottled water,soda,canned beer
696	other vegetables,curd,yogurt,curd cheese,marga...
697	rolls/buns,soda,fruit/vegetable juice,canned b...
698	frankfurter,pip fruit,whole milk,rolls/buns,ro...
699	yogurt,hygiene articles,newspapers,shopping bags

700 rows × 1 columns

In [5]:

```python
grocery_df.shape
```

Out[5]:

```
(700, 1)
```

In [6]:

```python
items_list = grocery_df['Items'].str.split(',').values
```

In [7]:

```python
items_list.tolist()
```

Out[7]:

```
[['citrus fruit', 'semi-finished bread', 'margarine', 'ready soups'],
 ['tropical fruit', 'yogurt', 'coffee'],
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 ['pip fruit', 'yogurt', 'cream cheese ', 'meat spreads'],
 ['other vegetables',
  'whole milk',
  'condensed milk',
  'long life bakery product'],
 ['whole milk', 'butter', 'yogurt', 'rice', 'abrasive cleaner'],
 ['rolls/buns'],
 ['other vegetables',
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  'rolls/buns',
  'bottled beer',
  'liquor (appetizer)'],
 ['pot plants'],
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  'white bread',
  'bottled water',
  'chocolate'],
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  'curd',
  'yogurt',
  'flour',
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 ['chicken', 'tropical fruit'],
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 ['chocolate'],
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  'processed cheese',
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  'newspapers'],
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  'waffles',
  'candy',
  'bathroom cleaner'],
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 ['yogurt'],
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 ['other vegetables'],
 ['brown bread',
  'soda',
  'fruit/vegetable juice',
  'canned beer',
  'newspapers',
  'shopping bags'],
 ['yogurt', 'beverages', 'bottled water', 'specialty bar'],
 ['hamburger meat',
  'other vegetables',
  'rolls/buns',
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  'frozen vegetables',
  'canned vegetables',
  'misc. beverages'],
 ['meat',
  'beef',
  'herbs',
  'whole milk',
  'frozen dessert',
  'rolls/buns',
  'semi-finished bread',
  'flour',
  'oil',
  'coffee',
  'pot plants'],
 ['beverages', 'pastry', 'bottled water'],
 ['beef', 'citrus fruit', 'other vegetables', 'rolls/buns'],
 ['ham', 'whole milk', 'white bread', 'margarine', 'hair spray'],
 ['hamburger meat',
  'whole milk',
  'oil',
  'ketchup',
  'soups',
  'Instant food products',
  'canned fish',
  'coffee',
  'bottled beer',
  'hygiene articles',
  'newspapers'],
 ['beef',
  'citrus fruit',
  'other vegetables',
  'butter milk',
  'sliced cheese',
  'processed cheese',
  'rolls/buns',
  'margarine',
```

```
  'bottled water',
  'fruit/vegetable juice'],
 ['beef',
  'citrus fruit',
  'whole milk',
  'domestic eggs',
  'rolls/buns',
  'pastry',
  'roll products ',
  'tea',
  'fruit/vegetable juice'],
 ['root vegetables', 'whole milk', 'detergent'],
 ['citrus fruit',
  'tropical fruit',
  'grapes',
  'other vegetables',
  'frozen vegetables',
  'pickled vegetables',
  'fruit/vegetable juice',
  'liquor',
  'rum',
  'liquor (appetizer)',
  'candy',
  'cling film/bags'],
 ['yogurt', 'bottled water'],
 ['tropical fruit',
  'root vegetables',
  'other vegetables',
  'whipped/sour cream',
  'brown bread',
  'canned fish',
  'long life bakery product'],
 ['frankfurter', 'root vegetables', 'newspapers'],
 ['beef',
  'other vegetables',
  'whole milk',
  'brown bread',
  'pastry',
  'salty snack',
  'abrasive cleaner',
  'shopping bags'],
 ['shopping bags'],
 ['canned beer'],
 ['rolls/buns', 'canned beer'],
 ['other vegetables',
  'rolls/buns',
  'meat spreads',
  'bottled water',
  'soda',
  'misc. beverages',
  'waffles',
  'chocolate',
  'candy'],
 ['hamburger meat',
  'other vegetables',
  'yogurt',
  'rolls/buns',
  'bottled water'],
 ['hamburger meat',
  'citrus fruit',
  'root vegetables',
  'rolls/buns',
  'Instant food products',
  'canned fish',
  'bottled water',
  'soda',
  'fruit/vegetable juice',
  'napkins'],
 ['frankfurter',
  'sausage',
  'domestic eggs',
  'soda',
```

```
  'chewing gum',
  'shopping bags'],
 ['bottled beer'],
 ['tropical fruit', 'domestic eggs', 'rolls/buns', 'pastry'],
 ['soda'],
 ['frankfurter',
  'root vegetables',
  'onions',
  'other vegetables',
  'white bread',
  'canned beer'],
 ['chicken',
  'hamburger meat',
  'herbs',
  'whipped/sour cream',
  'soups',
  'soda',
  'canned beer',
  'dish cleaner',
  'napkins',
  'cling film/bags'],
 ['coffee', 'soda'],
 ['whole milk'],
 ['margarine'],
 ['tropical fruit', 'other vegetables'],
 ['meat', 'other vegetables'],
 ['cream cheese ', 'bottled water', 'canned beer'],
 ['newspapers'],
 ['rolls/buns', 'pastry', 'newspapers'],
 ['citrus fruit',
  'other vegetables',
  'whole milk',
  'curd',
  'yogurt',
  'potato products',
  'fruit/vegetable juice',
  'long life bakery product'],
 ['whole milk', 'rolls/buns', 'detergent'],
 ['frankfurter',
  'citrus fruit',
  'butter milk',
  'UHT-milk',
  'rolls/buns',
  'female sanitary products',
  'shopping bags'],
 ['ham', 'other vegetables', 'butter', 'whipped/sour cream', 'sugar', 'soda'],
 ['frankfurter', 'citrus fruit', 'bottled beer', 'salty snack'],
 ['sausage', 'onions', 'curd', 'yogurt', 'domestic eggs', 'coffee'],
 ['domestic eggs'],
 ['whole milk', 'domestic eggs', 'rolls/buns', 'soda'],
 ['rolls/buns', 'bottled beer', 'newspapers'],
 ['whole milk', 'hard cheese', 'chocolate marshmallow'],
 ['sausage', 'root vegetables', 'other vegetables', 'rolls/buns', 'soda'],
 ['curd', 'butter milk', 'yogurt', 'beverages'],
 ['bottled water'],
 ['beef'],
 ['frankfurter',
  'hamburger meat',
  'whole milk',
  'rolls/buns',
  'potato products',
  'mustard',
  'coffee',
  'waffles',
  'chocolate marshmallow',
  'soap',
  'newspapers'],
 ['chicken', 'butter', 'newspapers'],
 ['sausage',
  'meat',
  'tropical fruit',
  'pip fruit',
```

```
 'pastry',
 'sugar',
 'coffee',
 'candles',
 'pot plants'],
['pork', 'whole milk', 'whipped/sour cream', 'beverages'],
['yogurt', 'pastry', 'coffee'],
['whole milk',
 'sliced cheese',
 'margarine',
 'cat food',
 'detergent',
 'dishes',
 'shopping bags'],
['frankfurter',
 'ham',
 'whole milk',
 'yogurt',
 'rolls/buns',
 'pastry',
 'vinegar',
 'sugar',
 'soda',
 'fruit/vegetable juice',
 'napkins'],
['beef', 'whole milk', 'brown bread', 'specialty chocolate', 'newspapers'],
['pip fruit',
 'other vegetables',
 'butter milk',
 'cream cheese ',
 'rolls/buns'],
['sausage', 'whole milk', 'rolls/buns', 'coffee', 'chocolate'],
['pastry', 'coffee'],
['chicken', 'beef', 'specialty chocolate'],
['root vegetables',
 'other vegetables',
 'whole milk',
 'sliced cheese',
 'frozen vegetables',
 'frozen fish',
 'frozen dessert',
 'chocolate'],
['whole milk', 'frozen meals', 'rolls/buns'],
['detergent'],
['rolls/buns', 'canned fish'],
['house keeping products'],
['yogurt', 'salt', 'jam', 'sparkling wine', 'cleaner'],
['tropical fruit', 'curd', 'sliced cheese', 'rolls/buns', 'soda'],
['tropical fruit'],
['curd', 'UHT-milk', 'artif. sweetener', 'dental care'],
['beef', 'berries', 'onions', 'rolls/buns'],
['whole milk',
 'brown bread',
 'pasta',
 'margarine',
 'bottled water',
 'napkins',
 'newspapers'],
['pork', 'UHT-milk', 'bottled water', 'soda', 'canned beer'],
['other vegetables',
 'curd',
 'yogurt',
 'curd cheese',
 'margarine',
 'cleaner',
 'hygiene articles'],
['rolls/buns',
 'soda',
 'fruit/vegetable juice',
 'canned beer',
 'white wine',
 'long life bakery product',
```

```
  'shopping bags'],
 ['frankfurter', 'pip fruit', 'whole milk', 'rolls/buns', 'roll products '],
 ['yogurt', 'hygiene articles', 'newspapers', 'shopping bags']]
```

In [8]:

```python
from mlxtend.preprocessing import TransactionEncoder
encoded = TransactionEncoder()
encoded_array = encoded .fit_transform(items_list)
encoded_array
```

Out[8]:

```
array([[False, False, False, ..., False, False, False],
       [False, False, False, ..., False,  True, False],
       [False, False, False, ...,  True, False, False],
       ...,
       [False, False, False, ..., False, False, False],
       [False, False, False, ...,  True, False, False],
       [False, False, False, ..., False,  True, False]])
```

In [9]:

```python
arr_to_df = pd.DataFrame(encoded_array, columns=encoded.columns_)
```

Minimum support is taken as 1% and threshold as 75%

In [10]:

```python
frequent_itemsets = apriori(arr_to_df, min_support=0.01, use_colnames=True)
print(frequent_itemsets)
```

```
      support                                       itemsets
0     0.020000                                      (UHT-milk)
1     0.011429                                 (baking powder)
2     0.060000                                          (beef)
3     0.040000                                       (berries)
4     0.031429                                     (beverages)
..        ...                                             ...
309   0.012857   (tropical fruit, whole milk, root vegetables)
310   0.010000      (whole milk, yogurt, root vegetables)
311   0.011429            (sausage, whole milk, yogurt)
312   0.011429              (whole milk, soda, yogurt)
313   0.012857       (tropical fruit, whole milk, yogurt)

[314 rows x 2 columns]
```

In [11]:

```python
from mlxtend.frequent_patterns import association_rules
rules = association_rules(
    frequent_itemsets, metric="confidence", min_threshold=0.75)
rules
```

Out[11]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	conviction
0	(cereals)	(whole milk)	0.011429	0.251429	0.010000	0.875000	3.480114	0.007127	5.988571
1	(frozen dessert)	(whole milk)	0.014286	0.251429	0.011429	0.800000	3.181818	0.007837	3.742857
2	(fruit/vegetable juice, yogurt)	(whole milk)	0.017143	0.251429	0.014286	0.833333	3.314394	0.009976	4.491429
3	(margarine, rolls/buns)	(whole milk)	0.017143	0.251429	0.012857	0.750000	2.982955	0.008547	2.994286
4	(sausage, root vegetables)	(rolls/buns)	0.012857	0.218571	0.010000	0.777778	3.558460	0.007190	3.516429