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

```
df = pd.read_csv('Market_Basket_Optimisation.csv',header=None)
```

```
df
```

	0	1	2	3	4	5	6	7
0	shrimp	almonds	avocado	vegetables mix	green grapes	whole weat flour	yams	cottage cheese
1	burgers	meatballs	eggs	NaN	NaN	NaN	NaN	NaN
2	chutney	NaN	NaN	NaN	NaN	NaN	NaN	NaN
3	turkey	avocado	NaN	NaN	NaN	NaN	NaN	NaN
4	mineral water	milk	energy bar	whole wheat rice	green tea	NaN	NaN	NaN
...	...	...	...	...	...	...	...	...
7496	butter	light mayo	fresh bread	NaN	NaN	NaN	NaN	NaN
7497	burgers	frozen vegetables	eggs	french fries	magazines	green tea	NaN	NaN
7498	chicken	NaN	NaN	NaN	NaN	NaN	NaN	NaN
7499	escalope	green tea	NaN	NaN	NaN	NaN	NaN	NaN
7500	eggs	frozen smoothie	yogurt cake	low fat yogurt	NaN	NaN	NaN	NaN

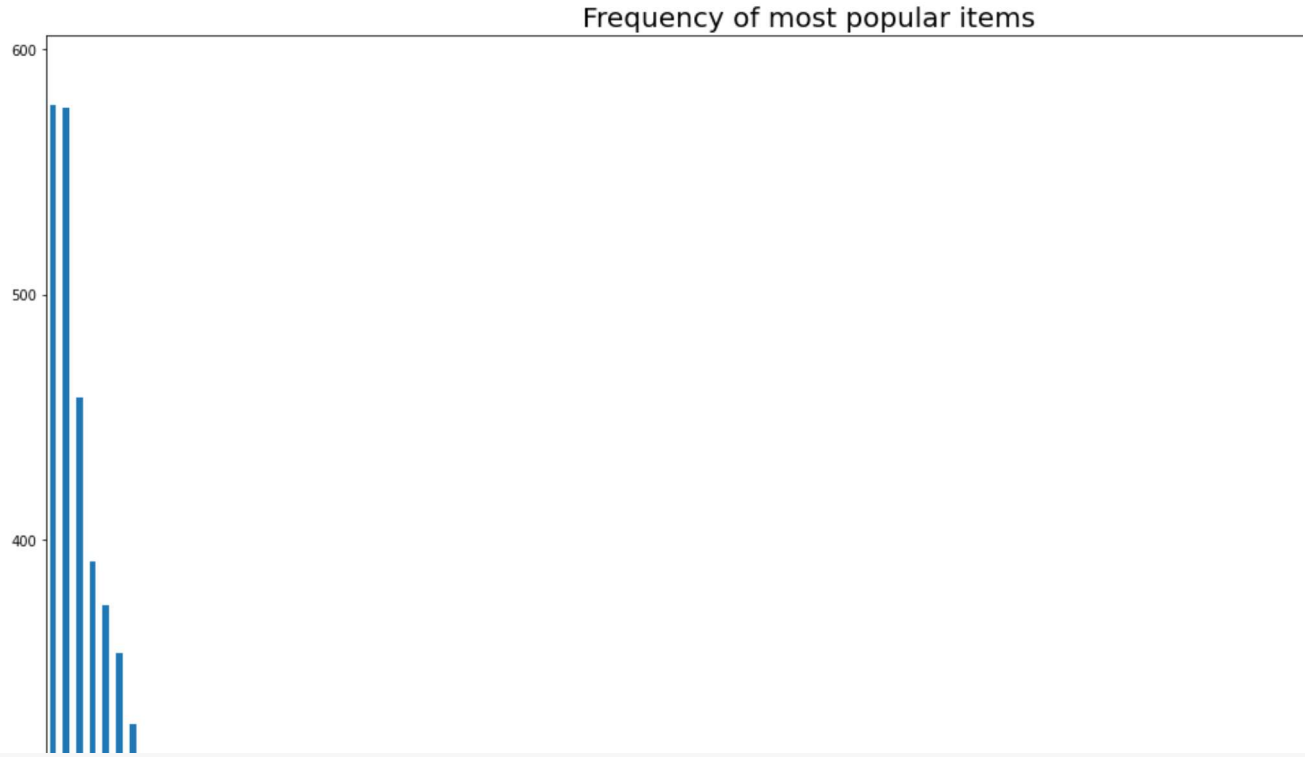
7501 rows × 20 columns

```
df[0].value_counts()
```

```
mineral water        577
burgers              576
turkey               458
chocolate            391
frozen vegetables    373
                    ...
cauliflower            1
ketchup                1
cream                  1
body spray             1
```

```
oatmeal                 1
Name: 0, Length: 115, dtype: int64
```

```
df[0].value_counts().plot.bar(figsize=(20,20))
plt.title('Frequency of most popular items',fontsize=20)
plt.show()
```




```
transactions = []
for i in range(len(df)):
    transactions.append([str(df.values[i,j]) for j in range(0, 20) if str(df.values[i,j])!
transactions
```

```
       'frozen vegetables',
       'ground beef',
       'mineral water',
       'milk',
       'eggs',
       'cake',
       'light mayo'],
      ['green tea', 'cottage cheese'],
      ['fresh tuna', 'eggs', 'champagne'],
      ['cookies'],
      ['cookies'],
      ['cookies'],
      ['tomatoes', 'mineral water', 'eggplant'],
      ['grated cheese',
       'tomatoes',
       'spaghetti',
       'mineral water',
       'soup',
       'honey',
       'chicken',
       'chocolate',
       'french fries'],
      ['protein bar'],
      ['herb & pepper',
       'red wine',
       'shrimp',
       'mineral water',
       'barbecue sauce',
       'protein bar'],
      ['burgers',
       'ham',
       'spaghetti',
       'mineral water',
```

```
 'milk',
 'eggs',
 'french fries',
 'escalope',
 'pancakes',
 'low fat yogurt'],
['french fries'],
['frozen vegetables',
 'soup',
 'milk',
 'eggs',
 'whole wheat rice',
 'chocolate',
 'escalope',
 'melons'],
['spaghetti'],
['herb & pepper',
 'shrimp',
 'soup',
 'eggs',
 'oil',
 'cooking oil',
 'energy drink',
 'protein bar',
 'low fat yogurt'],
['ham'
```

```
rules = apriori(transactions,min_support=0.003,min_confidence=0.01,min_lift=3,min_length=2
values = list(rules)
values
```

```
[RelationRecord(items=frozenset({'cottage cheese', 'brownies'}),
support=0.0034662045060658577, ordered_statistics=
[OrderedStatistic(items_base=frozenset({'brownies'}),
items_add=frozenset({'cottage cheese'}), confidence=0.10276679841897232,
lift=3.225329518580382), OrderedStatistic(items_base=frozenset({'cottage
cheese'}), items_add=frozenset({'brownies'}), confidence=0.10878661087866107,
lift=3.2253295185803816)]),
 RelationRecord(items=frozenset({'light cream', 'chicken'}),
support=0.004532728969470737, ordered_statistics=
[OrderedStatistic(items_base=frozenset({'chicken'}), items_add=frozenset({'light
cream'}), confidence=0.07555555555555556, lift=4.843950617283951),
OrderedStatistic(items_base=frozenset({'light cream'}),
items_add=frozenset({'chicken'}), confidence=0.29059829059829057,
lift=4.84395061728395)]),
 RelationRecord(items=frozenset({'escalope', 'mushroom cream sauce'}),
support=0.005732568990801226, ordered_statistics=
[OrderedStatistic(items_base=frozenset({'escalope'}),
items_add=frozenset({'mushroom cream sauce'}), confidence=0.0722689075630252,
lift=3.7908326967150496), OrderedStatistic(items_base=frozenset({'mushroom cream
sauce'}), items_add=frozenset({'escalope'}), confidence=0.3006993006993007,
lift=3.790832696715049)]),
 RelationRecord(items=frozenset({'escalope', 'pasta'}),
support=0.005865884548726837, ordered_statistics=
[OrderedStatistic(items_base=frozenset({'escalope'}),
items_add=frozenset({'pasta'}), confidence=0.07394957983193277,
lift=4.700811850163794), OrderedStatistic(items_base=frozenset({'pasta'}),
items_add=frozenset({'escalope'}), confidence=0.3728813559322034,
lift=4.700811850163794)]),
```

```
 RelationRecord(items=frozenset({'tomato juice', 'fresh bread'}),
support=0.004266097853619517, ordered_statistics=
[OrderedStatistic(items_base=frozenset({'fresh bread'}),
items_add=frozenset({'tomato juice'}), confidence=0.09907120743034055,
lift=3.2593558198902826), OrderedStatistic(items_base=frozenset({'tomato
juice'}), items_add=frozenset({'fresh bread'}), confidence=0.14035087719298245,
lift=3.2593558198902826)]),
 RelationRecord(items=frozenset({'fresh tuna', 'honey'}),
support=0.003999466737768298, ordered_statistics=
[OrderedStatistic(items_base=frozenset({'fresh tuna'}),
items_add=frozenset({'honey'}), confidence=0.17964071856287428,
lift=3.7850703088205613), OrderedStatistic(items_base=frozenset({'honey'}),
items_add=frozenset({'fresh tuna'}), confidence=0.08426966292134831,
lift=3.7850703088205613)]),
 RelationRecord(items=frozenset({'fromage blanc', 'honey'}),
support=0.003332888948140248, ordered_statistics=
[OrderedStatistic(items_base=frozenset({'fromage blanc'}),
items_add=frozenset({'honey'}), confidence=0.2450980392156863,
lift=5.164270764485569), OrderedStatistic(items_base=frozenset({'honey'}),
items_add=frozenset({'fromage blanc'}), confidence=0.0702247191011236,
lift=5.16427076448557)]),
 RelationRecord(items=frozenset({'ground beef', 'herb & pepper'}),
support=0.015997866951073192, ordered_statistics=
[OrderedStatistic(items_base=frozenset({'ground beef'}),
items_add=frozenset({'herb & pepper'}), confidence=0.1628222523744912,
lift=3.291993841134928), OrderedStatistic(items_base=frozenset({'herb &
pepper'}), items_add=frozenset({'ground beef'}), confidence=0.3234501347708895,
lift=3.2919938411349285)]),
 RelationRecord(items=frozenset({'ground beef', 'tomato sauce'}),
support=0.005332622317024397, ordered_statistics=
```

```
rules = []
for item in values:
    pair = item[0]
    items = [x for x in pair]
    rules.append([str(items[0]+" -> " + items[1]),str(item[1]),str(item[2][0][2]),str(item
rules
```

```
[['cottage cheese -> brownies',
  '0.0034662045060658577',
  '0.10276679841897232',
  '3.225329518580382'],
 ['light cream -> chicken',
  '0.004532728969470737',
  '0.07555555555555556',
  '4.843950617283951'],
 ['escalope -> mushroom cream sauce',
  '0.005732568990801226',
  '0.0722689075630252',
  '3.7908326967150496'],
 ['escalope -> pasta',
  '0.005865884548726837',
  '0.07394957983193277',
  '4.700811850163794'],
 ['tomato juice -> fresh bread',
  '0.004266097853619517',
  '0.09907120743034055',
  '3.2593558198902826'],
 ['fresh tuna -> honey',
```

```
 '0.003999466737768298',
 '0.17964071856287428',
 '3.7850703088205613'],
['fromage blanc -> honey',
 '0.003332888948140248',
 '0.2450980392156863',
 '5.164270764485569'],
['ground beef -> herb & pepper',
 '0.015997866951073192',
 '0.1628222523744912',
 '3.291993841134928'],
['ground beef -> tomato sauce',
 '0.005332622317024397',
 '0.054274084124830396',
 '3.840659481324083'],
['light cream -> olive oil',
 '0.003199573390214638',
 '0.20512820512820515',
 '3.1147098515519573'],
['whole wheat pasta -> olive oil',
 '0.007998933475536596',
 '0.12145748987854252',
 '4.1224100976422955'],
['shrimp -> pasta',
 '0.005065991201173177',
 '0.3220338983050847',
 '4.506672147735896'],
['spaghetti -> avocado',
 '0.003332888948140248',
 '0.025720164609053502',
 '3.2154492455418384'],
['burgers -> milk',
 '0.0037328356219170776',
 '0.04281345565749235',
 '3.211437308868501'],
['burgers -> turkey',
```

```
table = pd.DataFrame(rules,columns=['Rule','Support','Confidence','Lift'])
```

```
table
```

	Rule	Support	Confidence	
0	cottage cheese → brownies	0.0034662045060658577	0.10276679841897232	3
1	light cream → chicken	0.004532728969470737	0.0755555555555556	4
[illegible]	escalope → mushroom cream	[illegible]	[illegible]	[illegible]

```
table.sort_values(by=['Support'],ascending=False)
```

	Rule	Support	Confidence	
7	ground beef → herb & pepper	0.015997866951073192	0.1628222523744912	3
30	ground beef → frozen vegetables	0.008665511265164644	0.08819538670284939	3
51	soup → mineral water	0.008532195707239034	0.16886543535620052	3
10	whole wheat pasta → olive oil	0.007998933475536596	0.12145748987854252	4.
34	shrimp → frozen vegetables	0.007199040127982935	0.07552447552447553	3.
...	...	...	...	
41	ground beef → green tea	0.0030662578322890282	0.04483430799220273	3.
49	ground beef → tomato sauce	0.0030662578322890282	0.031207598371777748	4
55	soup → tomatoes	0.0030662578322890282	0.02366255144032922	3.
[illegible]	whole wheat rice → [illegible]	[illegible]	[illegible]	[illegible]

```
table.sort_values(by=['Confidence'],ascending=False)
```

	Rule	Support	Confidence	

```
table.sort_values(by=['Lift'],ascending=False)
```

	Rule	Support	Confidence	
58	whole wheat pasta → olive oil	0.0038661511798426876	0.058704453441295545	6
6	fromage blanc → honey	0.003332888948140248	0.2450980392156863	5
49	ground beef → tomato sauce	0.0030662578322890282	0.03120759837177748	4
1	light cream → chicken	0.004532728969470737	0.07555555555555556	4
3	escalope → pasta	0.005865884548726837	0.07394957983193277	4
...	...	...	...	
70	chocolate → frozen vegetables	0.0041327822956939075	0.1802325581395349	3.
92	mineral water → shrimp	0.0030662578322890282	0.0638888888888889	3
36	shrimp → frozen vegetables	0.005999200106652446	0.08395522388059701	3
71	ground beef → chocolate	0.003332888948140248	0.14450867052023122	3.

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