In [23]:
```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
from mlxtend.frequent_patterns import apriori,association_rules
```

In [24]:
```
data = pd.read_csv("book (1).csv")
data
```

Out[24]:

	ChildBks	YouthBks	CookBks	DoItYBks	RefBks	ArtBks	GeogBks	ItalCook	ItalAtlas	ItalA
0	0	1	0	1	0	0	1	0	0	
1	1	0	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	0	0	
3	1	1	1	0	1	0	1	0	0	
4	0	0	1	0	0	0	1	0	0	
...	...	...	...	...	...	...	...	...	...	
1995	0	0	1	0	0	1	1	1	0	
1996	0	0	0	0	0	0	0	0	0	
1997	0	0	0	0	0	0	0	0	0	
1998	0	0	1	0	0	0	0	0	0	
1999	0	0	0	0	0	0	0	0	0	

2000 rows × 11 columns

In [25]:
```
data.shape
```

Out[25]:
```
(2000, 11)
```

In [26]:
```
data.isna().sum()
```

Out[26]:
```
ChildBks     0
YouthBks     0
CookBks      0
DoItYBks     0
RefBks       0
ArtBks       0
GeogBks      0
ItalCook     0
ItalAtlas    0
ItalArt      0
Florence     0
dtype: int64
```

In [27]:
```
data.dtypes
```

Out[27]:
```
ChildBks     int64
YouthBks     int64
CookBks      int64
DoItYBks     int64
RefBks       int64
ArtBks       int64
GeogBks      int64
ItalCook     int64
ItalAtlas    int64
ItalArt      int64
Florence     int64
dtype: object
```

In [28]:
```
data.describe(include='all')
```

Out[28]:

	ChildBks	YouthBks	CookBks	DoItYBks	RefBks	ArtBks	GeogBks
count	2000.000000	2000.000000	2000.00000	2000.000000	2000.000000	2000.000000	2000.000000
mean	0.423000	0.247500	0.43100	0.282000	0.214500	0.241000	0.276000
std	0.494159	0.431668	0.49534	0.450086	0.410578	0.427797	0.447129
min	0.000000	0.000000	0.00000	0.000000	0.000000	0.000000	0.000000
25%	0.000000	0.000000	0.00000	0.000000	0.000000	0.000000	0.000000
50%	0.000000	0.000000	0.00000	0.000000	0.000000	0.000000	0.000000
75%	1.000000	0.000000	1.00000	1.000000	0.000000	0.000000	1.000000
max	1.000000	1.000000	1.00000	1.000000	1.000000	1.000000	1.000000

In [29]:
```
freq_items = apriori(data,min_support=0.005,use_colnames=True)
freq_items
```

Out[29]:

	support	itemsets
0	0.4230	(ChildBks)
1	0.2475	(YouthBks)
2	0.4310	(CookBks)
3	0.2820	(DoItYBks)
4	0.2145	(RefBks)
...	...	...
1057	0.0060	(YouthBks, RefBks, ItalAtlas, ItalArt, ArtBks,...
1058	0.0050	(RefBks, DoItYBks, ItalArt, ArtBks, ChildBks, ...
1059	0.0065	(RefBks, DoItYBks, ItalAtlas, ItalArt, ArtBks,...
1060	0.0080	(RefBks, ItalAtlas, ItalArt, ArtBks, ChildBks,...
1061	0.0050	(RefBks, DoItYBks, ItalAtlas, ItalArt, ArtBks,...

1062 rows × 2 columns

In [30]:
```
rules = association_rules(freq_items,metric='lift',min_threshold=1)
rules
```

Out[30]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverag
0	(YouthBks)	(ChildBks)	0.2475	0.4230	0.165	0.666667	1.576044	0.0603
1	(ChildBks)	(YouthBks)	0.4230	0.2475	0.165	0.390071	1.576044	0.0603
2	(CookBks)	(ChildBks)	0.4310	0.4230	0.256	0.593968	1.404179	0.0736
3	(ChildBks)	(CookBks)	0.4230	0.4310	0.256	0.605201	1.404179	0.0736
4	(ChildBks)	(DoItYBks)	0.4230	0.2820	0.184	0.434988	1.542511	0.0647
...	...	...	...	...	...	...	...	
35293	(ItalArt)	(RefBks, DoItYBks, ItalAtlas, ArtBks, ItalCook...	0.0485	0.0050	0.005	0.103093	20.618557	0.0047
35294	(ArtBks)	(RefBks, DoItYBks, ItalAtlas, ItalArt, ItalCoo...	0.2410	0.0050	0.005	0.020747	4.149378	0.0037
35295	(ItalCook)	(RefBks, DoItYBks, ItalAtlas, ItalArt, ArtBks,...	0.1135	0.0050	0.005	0.044053	8.810573	0.0044
35296	(GeogBks)	(RefBks, DoItYBks, ItalAtlas, ItalArt, ArtBks,...	0.2760	0.0075	0.005	0.018116	2.415459	0.0029
35297	(CookBks)	(RefBks, DoItYBks, ItalAtlas, ItalArt, ArtBks,...	0.4310	0.0050	0.005	0.011601	2.320186	0.0028

35298 rows × 9 columns

In [31]:
```
rules[(rules['lift']>=6) & (rules['confidence'] >=.8)]
```

Out[31]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverag
562	(YouthBks, ItalArt)	(ItalCook)	0.0230	0.1135	0.0190	0.826087	7.278299	0.0163
719	(CookBks, ItalAtlas)	(ItalCook)	0.0285	0.1135	0.0230	0.807018	7.110287	0.0197
724	(CookBks, ItalArt)	(ItalCook)	0.0410	0.1135	0.0375	0.914634	8.058451	0.0328
846	(ItalArt, DoItYBks)	(ItalCook)	0.0300	0.1135	0.0250	0.833333	7.342144	0.0215
930	(RefBks, ItalArt)	(ItalCook)	0.0200	0.1135	0.0160	0.800000	7.048458	0.0137
...	...	...	...	...	...	...	...	
35121	(DoItYBks, ItalAtlas, ArtBks, GeogBks, ItalCook)	(CookBks, RefBks, ItalArt)	0.0050	0.0165	0.0050	1.000000	60.606061	0.0049
35123	(DoItYBks, ItalAtlas, ArtBks, GeogBks, CookBks)	(ItalCook, RefBks, ItalArt)	0.0050	0.0160	0.0050	1.000000	62.500000	0.0049
35143	(GeogBks, RefBks, ItalArt, DoItYBks)	(ItalCook, CookBks, ArtBks, ItalAtlas)	0.0060	0.0130	0.0050	0.833333	64.102564	0.0049
35173	(GeogBks, ItalArt, DoItYBks, ItalAtlas)	(ItalCook, CookBks, RefBks, ArtBks)	0.0055	0.0235	0.0050	0.909091	38.684720	0.0048
35176	(GeogBks, ArtBks, DoItYBks, ItalAtlas)	(ItalCook, CookBks, RefBks, ItalArt)	0.0055	0.0160	0.0050	0.909091	56.818182	0.0049

1198 rows × 9 columns

In [32]:
```
freq_items_1 = apriori(data,min_support=0.01,use_colnames=True)
freq_items_1
```

Out[32]:

	support	itemsets
0	0.4230	(ChildBks)
1	0.2475	(YouthBks)
2	0.4310	(CookBks)
3	0.2820	(DoItYBks)
4	0.2145	(RefBks)
...	...	...
589	0.0125	(RefBks, ItalAtlas, ItalArt, ArtBks, ItalCook,...
590	0.0145	(YouthBks, RefBks, DoItYBks, ChildBks, ArtBks,...
591	0.0105	(DoItYBks, ItalArt, ArtBks, ChildBks, ItalCook...
592	0.0100	(RefBks, ItalArt, ArtBks, ChildBks, ItalCook, ...
593	0.0110	(RefBks, ItalAtlas, ItalArt, ArtBks, ChildBks,...

594 rows × 2 columns

In [33]:
```
rules[(rules['lift']>=6) & (rules['confidence'] >=.8)]
```

Out[33]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverag
562	(YouthBks, ItalArt)	(ItalCook)	0.0230	0.1135	0.0190	0.826087	7.278299	0.0163
719	(CookBks, ItalAtlas)	(ItalCook)	0.0285	0.1135	0.0230	0.807018	7.110287	0.0197
724	(CookBks, ItalArt)	(ItalCook)	0.0410	0.1135	0.0375	0.914634	8.058451	0.0328
846	(ItalArt, DoItYBks)	(ItalCook)	0.0300	0.1135	0.0250	0.833333	7.342144	0.0215
930	(RefBks, ItalArt)	(ItalCook)	0.0200	0.1135	0.0160	0.800000	7.048458	0.0137
...	...	...	...	...	...	...	...	
35121	(DoItYBks, ItalAtlas, ArtBks, GeogBks, ItalCook)	(CookBks, RefBks, ItalArt)	0.0050	0.0165	0.0050	1.000000	60.606061	0.0049
35123	(DoItYBks, ItalAtlas, ArtBks, GeogBks, CookBks)	(ItalCook, RefBks, ItalArt)	0.0050	0.0160	0.0050	1.000000	62.500000	0.0049
35143	(GeogBks, RefBks, ItalArt, DoItYBks)	(ItalCook, CookBks, ArtBks, ItalAtlas)	0.0060	0.0130	0.0050	0.833333	64.102564	0.0049
35173	(GeogBks, ItalArt, DoItYBks, ItalAtlas)	(ItalCook, CookBks, RefBks, ArtBks)	0.0055	0.0235	0.0050	0.909091	38.684720	0.0048
35176	(GeogBks, ArtBks, DoItYBks, ItalAtlas)	(ItalCook, CookBks, RefBks, ItalArt)	0.0055	0.0160	0.0050	0.909091	56.818182	0.0049

1198 rows × 9 columns

In [ ]:
```

```