In [1]:
```
get_ipython().system('pip install mlxtend ')
```

```
Collecting mlxtend
  Downloading mlxtend-0.23.1-py3-none-any.whl (1.4 MB)
     ---------------------------------------- 1.4/1.4 MB 2.9 MB/s eta 0:00:00
Requirement already satisfied: joblib>=0.13.2 in c:\users\rohit\anaconda3\lib\site-packa
ges (from mlxtend) (1.1.0)
Requirement already satisfied: scipy>=1.2.1 in c:\users\rohit\anaconda3\lib\site-package
s (from mlxtend) (1.9.1)
Requirement already satisfied: numpy>=1.16.2 in c:\users\rohit\anaconda3\lib\site-packag
es (from mlxtend) (1.21.5)
Requirement already satisfied: scikit-learn>=1.0.2 in c:\users\rohit\anaconda3\lib\site-
packages (from mlxtend) (1.0.2)
Requirement already satisfied: pandas>=0.24.2 in c:\users\rohit\anaconda3\lib\site-packa
ges (from mlxtend) (1.4.4)
Requirement already satisfied: matplotlib>=3.0.0 in c:\users\rohit\anaconda3\lib\site-pa
ckages (from mlxtend) (3.5.2)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\rohit\anaconda3\lib\site-pa
ckages (from matplotlib>=3.0.0->mlxtend) (1.4.2)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\rohit\anaconda3\lib\site
-packages (from matplotlib>=3.0.0->mlxtend) (2.8.2)
Requirement already satisfied: pyparsing>=2.2.1 in c:\users\rohit\anaconda3\lib\site-pac
kages (from matplotlib>=3.0.0->mlxtend) (3.0.9)
Requirement already satisfied: cycler>=0.10 in c:\users\rohit\anaconda3\lib\site-package
s (from matplotlib>=3.0.0->mlxtend) (0.11.0)
Requirement already satisfied: packaging>=20.0 in c:\users\rohit\anaconda3\lib\site-pack
ages (from matplotlib>=3.0.0->mlxtend) (21.3)
Requirement already satisfied: pillow>=6.2.0 in c:\users\rohit\anaconda3\lib\site-packag
es (from matplotlib>=3.0.0->mlxtend) (9.2.0)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\rohit\anaconda3\lib\site-pa
ckages (from matplotlib>=3.0.0->mlxtend) (4.25.0)
Requirement already satisfied: pytz>=2020.1 in c:\users\rohit\anaconda3\lib\site-package
s (from pandas>=0.24.2->mlxtend) (2022.1)
Requirement already satisfied: threadpoolctl>=2.0.0 in c:\users\rohit\anaconda3\lib\site
-packages (from scikit-learn>=1.0.2->mlxtend) (2.2.0)
Requirement already satisfied: six>=1.5 in c:\users\rohit\anaconda3\lib\site-packages (f
rom python-dateutil>=2.7->matplotlib>=3.0.0->mlxtend) (1.16.0)
Installing collected packages: mlxtend
Successfully installed mlxtend-0.23.1
```

In [2]:
```
import pandas as pd
from mlxtend.frequent_patterns import apriori,association_rules
import seaborn as sn
```

```
C:\Users\ROHIT\anaconda3\lib\site-packages\seaborn\rcmod.py:82: DeprecationWarning: dist
utils Version classes are deprecated. Use packaging.version instead.
  if LooseVersion(mpl.__version__) >= "3.0":
C:\Users\ROHIT\anaconda3\lib\site-packages\setuptools\_distutils\version.py:346: Depreca
tionWarning: distutils Version classes are deprecated. Use packaging.version instead.
  other = LooseVersion(other)
```

In [3]:
```
book=pd.read_csv('book.csv')
book
```

Out[3]:

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

2000 rows × 11 columns

In [4]:
```
frequent_itemsets = apriori(book, min_support=0.1, use_colnames=True)
frequent_itemsets
```

```
C:\Users\ROHIT\anaconda3\lib\site-packages\mlxtend\frequent_patterns\fpcommon.py:109: 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(
```

Out[4]:

	support	itemsets
0	0.4230	(ChildBks)
1	0.2475	(YouthBks)
2	0.4310	(CookBks)
3	0.2820	(DoItYBks)
4	0.2145	(RefBks)
5	0.2410	(ArtBks)
6	0.2760	(GeogBks)
7	0.1135	(ItalCook)
8	0.1085	(Florence)
9	0.1650	(ChildBks, YouthBks)
10	0.2560	(CookBks, ChildBks)
11	0.1840	(ChildBks, DoItYBks)
12	0.1515	(RefBks, ChildBks)
13	0.1625	(ChildBks, ArtBks)
14	0.1950	(ChildBks, GeogBks)
15	0.1620	(CookBks, YouthBks)
16	0.1155	(YouthBks, DoItYBks)
17	0.1010	(YouthBks, ArtBks)
18	0.1205	(GeogBks, YouthBks)
19	0.1875	(CookBks, DoItYBks)
20	0.1525	(RefBks, CookBks)
21	0.1670	(CookBks, ArtBks)
22	0.1925	(CookBks, GeogBks)
23	0.1135	(CookBks, ItalCook)
24	0.1055	(RefBks, DoItYBks)
25	0.1235	(DoItYBks, ArtBks)
26	0.1325	(GeogBks, DoItYBks)
27	0.1105	(RefBks, GeogBks)
28	0.1275	(GeogBks, ArtBks)
29	0.1290	(CookBks, ChildBks, YouthBks)
30	0.1460	(CookBks, ChildBks, DoItYBks)
31	0.1225	(CookBks, RefBks, ChildBks)
32	0.1265	(CookBks, ChildBks, ArtBks)
33	0.1495	(CookBks, ChildBks, GeogBks)
34	0.1045	(ChildBks, DoItYBks, GeogBks)
35	0.1020	(ChildBks, GeogBks, ArtBks)
36	0.1015	(CookBks, DoItYBks, ArtBks)
37	0.1085	(CookBks, DoItYBks, GeogBks)
38	0.1035	(CookBks, GeogBks, ArtBks)

In [5]:
```
rules = association_rules(frequent_itemsets, metric="lift", min_threshold=0.7)
rules
rules.sort_values('lift',ascending = False).head(10)
```

Out[5]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	conviction	zh
28	(CookBks)	(ItalCook)	0.4310	0.1135	0.1135	0.263341	2.320186	0.064582	1.203406	
29	(ItalCook)	(CookBks)	0.1135	0.4310	0.1135	1.000000	2.320186	0.064582	inf	
77	(ChildBks, ArtBks)	(GeogBks)	0.1625	0.2760	0.1020	0.627692	2.274247	0.057150	1.944628	
80	(GeogBks)	(ChildBks, ArtBks)	0.2760	0.1625	0.1020	0.369565	2.274247	0.057150	1.328448	
87	(ArtBks)	(CookBks, DoItYBks)	0.2410	0.1875	0.1015	0.421162	2.246196	0.056313	1.403674	
82	(CookBks, DoItYBks)	(ArtBks)	0.1875	0.2410	0.1015	0.541333	2.246196	0.056313	1.654797	
98	(GeogBks)	(CookBks, ArtBks)	0.2760	0.1670	0.1035	0.375000	2.245509	0.057408	1.332800	
95	(CookBks, ArtBks)	(GeogBks)	0.1670	0.2760	0.1035	0.619760	2.245509	0.057408	1.904063	
99	(ArtBks)	(CookBks, GeogBks)	0.2410	0.1925	0.1035	0.429461	2.230964	0.057107	1.415327	
94	(CookBks, GeogBks)	(ArtBks)	0.1925	0.2410	0.1035	0.537662	2.230964	0.057107	1.641657	

In [6]:
```
rules.sort_values('lift',ascending = False)[0:20]
```

Out[6]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	conviction	zh
28	(CookBks)	(ItalCook)	0.4310	0.1135	0.1135	0.263341	2.320186	0.064582	1.203406	
29	(ItalCook)	(CookBks)	0.1135	0.4310	0.1135	1.000000	2.320186	0.064582	inf	
77	(ChildBks, ArtBks)	(GeogBks)	0.1625	0.2760	0.1020	0.627692	2.274247	0.057150	1.944628	
80	(GeogBks)	(ChildBks, ArtBks)	0.2760	0.1625	0.1020	0.369565	2.274247	0.057150	1.328448	
87	(ArtBks)	(CookBks, DoItYBks)	0.2410	0.1875	0.1015	0.421162	2.246196	0.056313	1.403674	
82	(CookBks, DoItYBks)	(ArtBks)	0.1875	0.2410	0.1015	0.541333	2.246196	0.056313	1.654797	
98	(GeogBks)	(CookBks, ArtBks)	0.2760	0.1670	0.1035	0.375000	2.245509	0.057408	1.332800	
95	(CookBks, ArtBks)	(GeogBks)	0.1670	0.2760	0.1035	0.619760	2.245509	0.057408	1.904063	
99	(ArtBks)	(CookBks, GeogBks)	0.2410	0.1925	0.1035	0.429461	2.230964	0.057107	1.415327	
94	(CookBks, GeogBks)	(ArtBks)	0.1925	0.2410	0.1035	0.537662	2.230964	0.057107	1.641657	
53	(CookBks, ChildBks)	(RefBks)	0.2560	0.2145	0.1225	0.478516	2.230842	0.067588	1.506277	
56	(RefBks)	(CookBks, ChildBks)	0.2145	0.2560	0.1225	0.571096	2.230842	0.067588	1.734652	
81	(ArtBks)	(ChildBks, GeogBks)	0.2410	0.1950	0.1020	0.423237	2.170444	0.055005	1.395719	
76	(ChildBks, GeogBks)	(ArtBks)	0.1950	0.2410	0.1020	0.523077	2.170444	0.055005	1.591452	
86	(DoItYBks)	(CookBks, ArtBks)	0.2820	0.1670	0.1015	0.359929	2.155264	0.054406	1.301418	
83	(CookBks, ArtBks)	(DoItYBks)	0.1670	0.2820	0.1015	0.607784	2.155264	0.054406	1.830626	
64	(CookBks, ChildBks)	(GeogBks)	0.2560	0.2760	0.1495	0.583984	2.115885	0.078844	1.740319	
69	(GeogBks)	(CookBks, ChildBks)	0.2760	0.2560	0.1495	0.541667	2.115885	0.078844	1.623273	
88	(CookBks, DoItYBks)	(GeogBks)	0.1875	0.2760	0.1085	0.578667	2.096618	0.056750	1.718354	
93	(GeogBks)	(CookBks, DoItYBks)	0.2760	0.1875	0.1085	0.393116	2.096618	0.056750	1.338806	

In [7]:
```
rules[rules.lift>1]
```

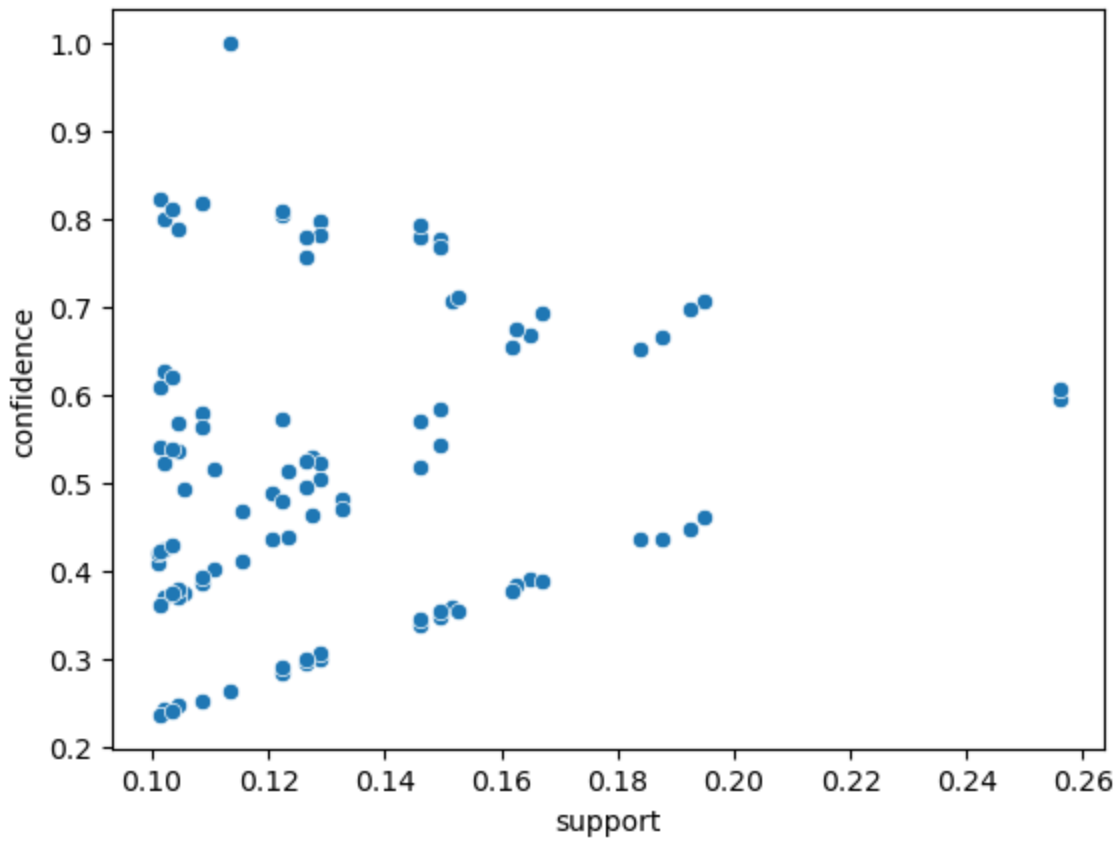
Out[7]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	conviction	zh
0	(ChildBks)	(YouthBks)	0.4230	0.2475	0.1650	0.390071	1.576044	0.060308	1.233750	
1	(YouthBks)	(ChildBks)	0.2475	0.4230	0.1650	0.666667	1.576044	0.060308	1.731000	
2	(CookBks)	(ChildBks)	0.4310	0.4230	0.2560	0.593968	1.404179	0.073687	1.421069	
3	(ChildBks)	(CookBks)	0.4230	0.4310	0.2560	0.605201	1.404179	0.073687	1.441240	
4	(ChildBks)	(DoItYBks)	0.4230	0.2820	0.1840	0.434988	1.542511	0.064714	1.270770	
...	...	...	...	...	...	...	...	...	...	
95	(CookBks, ArtBks)	(GeogBks)	0.1670	0.2760	0.1035	0.619760	2.245509	0.057408	1.904063	
96	(GeogBks, ArtBks)	(CookBks)	0.1275	0.4310	0.1035	0.811765	1.883445	0.048547	3.022812	
97	(CookBks)	(GeogBks, ArtBks)	0.4310	0.1275	0.1035	0.240139	1.883445	0.048547	1.148237	
98	(GeogBks)	(CookBks, ArtBks)	0.2760	0.1670	0.1035	0.375000	2.245509	0.057408	1.332800	
99	(ArtBks)	(CookBks, GeogBks)	0.2410	0.1925	0.1035	0.429461	2.230964	0.057107	1.415327	

100 rows × 10 columns

In [8]:
```
sn.scatterplot(x='support',y='confidence', data= rules)
```

Out[8]:
```
<AxesSubplot:xlabel='support', ylabel='confidence'>
```



In [9]:
```
frequent_itemsets = apriori(book, min_support=0.2, use_colnames=True)
frequent_itemsets
```

```
C:\Users\ROHIT\anaconda3\lib\site-packages\mlxtend\frequent_patterns\fpcommon.py:109: 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(
```

Out[9]:

	support	itemsets
0	0.4230	(ChildBks)
1	0.2475	(YouthBks)
2	0.4310	(CookBks)
3	0.2820	(DoItYBks)
4	0.2145	(RefBks)
5	0.2410	(ArtBks)
6	0.2760	(GeogBks)
7	0.2560	(CookBks, ChildBks)

In [10]:
```
rules1 = association_rules(frequent_itemsets, metric="lift", min_threshold=1)
rules1
rules1.sort_values('lift',ascending = False).head(10)
```

Out[10]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	conviction	zha
0	(CookBks)	(ChildBks)	0.431	0.423	0.256	0.593968	1.404179	0.073687	1.421069	
1	(ChildBks)	(CookBks)	0.423	0.431	0.256	0.605201	1.404179	0.073687	1.441240	

In [12]:
```
rules1.sort_values('lift',ascending = False)[0:20]
```

Out[12]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	conviction	zha
0	(CookBks)	(ChildBks)	0.431	0.423	0.256	0.593968	1.404179	0.073687	1.421069	
1	(ChildBks)	(CookBks)	0.423	0.431	0.256	0.605201	1.404179	0.073687	1.441240	

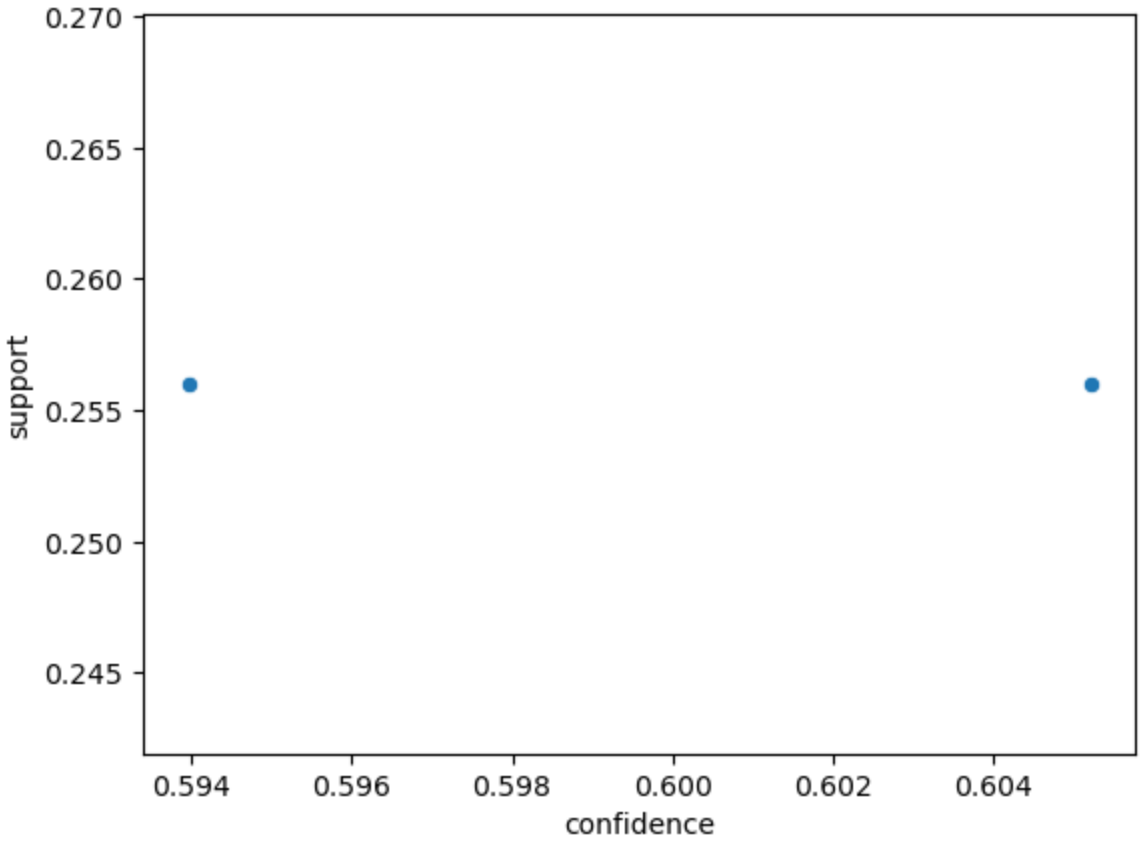
In [13]:
```
rules1[rules1.lift>1]
```

Out[13]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage	conviction	zha
0	(CookBks)	(ChildBks)	0.431	0.423	0.256	0.593968	1.404179	0.073687	1.421069	
1	(ChildBks)	(CookBks)	0.423	0.431	0.256	0.605201	1.404179	0.073687	1.441240	

In [14]:
```
sn.scatterplot(x='confidence',y='support',data=rules1)
```

Out[14]:
```
<AxesSubplot:xlabel='confidence', ylabel='support'>
```



In [ ]: