In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from mlxtend.frequent_patterns import apriori,association_rules
from mlxtend.preprocessing import TransactionEncoder
```

In [2]:
```
movie=pd.read_csv('my_movies.csv')
movie
```

Out[2]:

	V1	V2	V3	V4	V5	Sixth Sense	Gladiator	LOTR1	Harry Potter1	Patriot	LOTR2
0	Sixth Sense	LOTR1	Harry Potter1	Green Mile	LOTR2	1	0	1	1	0	1
1	Gladiator	Patriot	Braveheart	NaN	NaN	0	1	0	0	1	0
2	LOTR1	LOTR2	NaN	NaN	NaN	0	0	1	0	0	1
3	Gladiator	Patriot	Sixth Sense	NaN	NaN	1	1	0	0	1	0
4	Gladiator	Patriot	Sixth Sense	NaN	NaN	1	1	0	0	1	0
5	Gladiator	Patriot	Sixth Sense	NaN	NaN	1	1	0	0	1	0
6	Harry Potter1	Harry Potter2	NaN	NaN	NaN	0	0	0	1	0	0
7	Gladiator	Patriot	NaN	NaN	NaN	0	1	0	0	1	0
8	Gladiator	Patriot	Sixth Sense	NaN	NaN	1	1	0	0	1	0
9	Sixth Sense	LOTR	Gladiator	Green Mile	NaN	1	1	0	0	0	0

In [3]:
```
movie.shape
```

Out[3]:
```
(10, 15)
```

In [6]:
```
movie.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 15 columns):
 #   Column         Non-Null Count  Dtype 
---  ------         --------------  ----- 
 0   V1             10 non-null     object
 1   V2             10 non-null     object
 2   V3             7 non-null      object
 3   V4             2 non-null      object
 4   V5             1 non-null      object
 5   Sixth Sense    10 non-null     int64 
 6   Gladiator      10 non-null     int64 
 7   LOTR1          10 non-null     int64 
 8   Harry Potter1  10 non-null     int64 
 9   Patriot        10 non-null     int64 
 10  LOTR2          10 non-null     int64 
 11  Harry Potter2  10 non-null     int64 
 12  LOTR           10 non-null     int64 
 13  Braveheart     10 non-null     int64 
 14  Green Mile     10 non-null     int64 
dtypes: int64(10), object(5)
memory usage: 1.3+ KB
```

In [7]:
```
movie2=movie.iloc[:,5:]
movie2
```

Out[7]:

	Sixth Sense	Gladiator	LOTR1	Harry Potter1	Patriot	LOTR2	Harry Potter2	LOTR	Braveheart	Green Mile
0	1	0	1	1	0	1	0	0	0	1
1	0	1	0	0	1	0	0	0	1	0
2	0	0	1	0	0	1	0	0	0	0
3	1	1	0	0	1	0	0	0	0	0
4	1	1	0	0	1	0	0	0	0	0
5	1	1	0	0	1	0	0	0	0	0
6	0	0	0	1	0	0	1	0	0	0
7	0	1	0	0	1	0	0	0	0	0
8	1	1	0	0	1	0	0	0	0	0
9	1	1	0	0	0	0	0	1	0	1

Apriori Algorithm

1. Association rules with 10% Support and 70% confidence

In [8]:
```
# with 10% support
frequent_itemsets=apriori(movie2,min_support=0.1,use_colnames=True)
frequent_itemsets
```

Out[8]:

	support	itemsets
0	0.6	(Sixth Sense)
1	0.7	(Gladiator)
2	0.2	(LOTR1)
3	0.2	(Harry Potter1)
4	0.6	(Patriot)
5	0.2	(LOTR2)
6	0.1	(Harry Potter2)
7	0.1	(LOTR)
8	0.1	(Braveheart)
9	0.2	(Green Mile)
10	0.5	(Gladiator, Sixth Sense)
11	0.1	(LOTR1, Sixth Sense)
12	0.1	(Harry Potter1, Sixth Sense)
13	0.4	(Patriot, Sixth Sense)
14	0.1	(LOTR2, Sixth Sense)
15	0.1	(LOTR, Sixth Sense)
16	0.2	(Green Mile, Sixth Sense)
17	0.6	(Patriot, Gladiator)
18	0.1	(LOTR, Gladiator)
19	0.1	(Braveheart, Gladiator)
20	0.1	(Green Mile, Gladiator)
21	0.1	(LOTR1, Harry Potter1)
22	0.2	(LOTR2, LOTR1)
23	0.1	(Green Mile, LOTR1)
24	0.1	(LOTR2, Harry Potter1)
25	0.1	(Harry Potter2, Harry Potter1)
26	0.1	(Green Mile, Harry Potter1)
27	0.1	(Braveheart, Patriot)
28	0.1	(LOTR2, Green Mile)
29	0.1	(Green Mile, LOTR)
30	0.4	(Patriot, Gladiator, Sixth Sense)
31	0.1	(LOTR, Gladiator, Sixth Sense)

	support	itemsets
32	0.1	(Green Mile, Gladiator, Sixth Sense)
33	0.1	(Harry Potter1, LOTR1, Sixth Sense)
34	0.1	(LOTR2, LOTR1, Sixth Sense)
35	0.1	(Green Mile, LOTR1, Sixth Sense)
36	0.1	(LOTR2, Harry Potter1, Sixth Sense)
37	0.1	(Harry Potter1, Green Mile, Sixth Sense)
38	0.1	(LOTR2, Green Mile, Sixth Sense)
39	0.1	(Green Mile, LOTR, Sixth Sense)
40	0.1	(Braveheart, Patriot, Gladiator)
41	0.1	(Green Mile, LOTR, Gladiator)
42	0.1	(LOTR2, LOTR1, Harry Potter1)
43	0.1	(Green Mile, LOTR1, Harry Potter1)
44	0.1	(LOTR2, Green Mile, LOTR1)
45	0.1	(LOTR2, Green Mile, Harry Potter1)
46	0.1	(Green Mile, LOTR, Gladiator, Sixth Sense)
47	0.1	(LOTR2, Harry Potter1, LOTR1, Sixth Sense)
48	0.1	(Harry Potter1, Green Mile, LOTR1, Sixth Sense)
49	0.1	(LOTR2, Green Mile, LOTR1, Sixth Sense)
50	0.1	(Harry Potter1, Green Mile, LOTR2, Sixth Sense)
51	0.1	(LOTR2, Green Mile, LOTR1, Harry Potter1)
52	0.1	(LOTR2, Green Mile, Sixth Sense, Harry Potter1...

In [9]:
```
# 70% confidence
rules=association_rules(frequent_itemsets,metric='lift',min_threshold=0.7)
rules
```

Out[9]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage
0	(Gladiator)	(Sixth Sense)	0.7	0.6	0.5	0.714286	1.190476	0.08
1	(Sixth Sense)	(Gladiator)	0.6	0.7	0.5	0.833333	1.190476	0.08
2	(LOTR1)	(Sixth Sense)	0.2	0.6	0.1	0.500000	0.833333	-0.02
3	(Sixth Sense)	(LOTR1)	0.6	0.2	0.1	0.166667	0.833333	-0.02
4	(Harry Potter1)	(Sixth Sense)	0.2	0.6	0.1	0.500000	0.833333	-0.02
...	...	...	...	...	...	...	...	...
245	(LOTR2)	(Harry Potter1, Green Mile, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
246	(Green Mile)	(LOTR2, Harry Potter1, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
247	(Sixth Sense)	(LOTR2, Green Mile, LOTR1, Harry Potter1)	0.6	0.1	0.1	0.166667	1.666667	0.04
248	(Harry Potter1)	(LOTR2, Green Mile, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
249	(LOTR1)	(LOTR2, Green Mile, Harry Potter1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08

250 rows × 9 columns

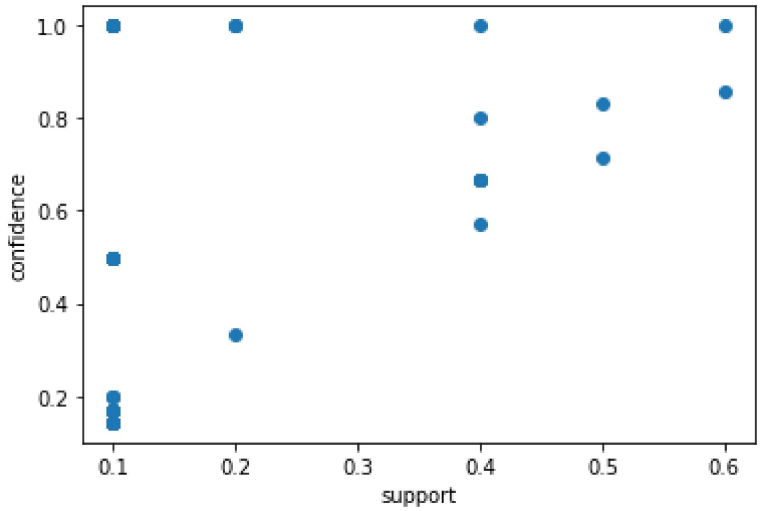
In [10]:
```
# Lift Ratio > 1 is a good influential rule in selecting the associated transacti
rules[rules.lift>1]
```

Out[10]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage
0	(Gladiator)	(Sixth Sense)	0.7	0.6	0.5	0.714286	1.190476	0.08
1	(Sixth Sense)	(Gladiator)	0.6	0.7	0.5	0.833333	1.190476	0.08
6	(Patriot)	(Sixth Sense)	0.6	0.6	0.4	0.666667	1.111111	0.04
7	(Sixth Sense)	(Patriot)	0.6	0.6	0.4	0.666667	1.111111	0.04
10	(LOTR)	(Sixth Sense)	0.1	0.6	0.1	1.000000	1.666667	0.04
...	...	...	...	...	...	...	...	...
245	(LOTR2)	(Harry Potter1, Green Mile, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
246	(Green Mile)	(LOTR2, Harry Potter1, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
247	(Sixth Sense)	(LOTR2, Green Mile, LOTR1, Harry Potter1)	0.6	0.1	0.1	0.166667	1.666667	0.04
248	(Harry Potter1)	(LOTR2, Green Mile, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
249	(LOTR1)	(LOTR2, Green Mile, Harry Potter1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08

236 rows × 9 columns

In [13]:
```
# visualization of obtained rule
plt.scatter(rules['support'],rules['confidence'])
plt.xlabel('support')
plt.ylabel('confidence')
plt.show()
```



2. Association rules with 5% Support and 90% confidence

In [14]:
```
# with 5% support
frequent_itemsets2=apriori(movie2,min_support=0.05,use_colnames=True)
frequent_itemsets2
```

Out[14]:

	support	itemsets
0	0.6	(Sixth Sense)
1	0.7	(Gladiator)
2	0.2	(LOTR1)
3	0.2	(Harry Potter1)
4	0.6	(Patriot)
5	0.2	(LOTR2)
6	0.1	(Harry Potter2)
7	0.1	(LOTR)
8	0.1	(Braveheart)
9	0.2	(Green Mile)
10	0.5	(Gladiator, Sixth Sense)
11	0.1	(LOTR1, Sixth Sense)
12	0.1	(Harry Potter1, Sixth Sense)
13	0.4	(Patriot, Sixth Sense)
14	0.1	(LOTR2, Sixth Sense)
15	0.1	(LOTR, Sixth Sense)
16	0.2	(Green Mile, Sixth Sense)
17	0.6	(Patriot, Gladiator)
18	0.1	(LOTR, Gladiator)
19	0.1	(Braveheart, Gladiator)
20	0.1	(Green Mile, Gladiator)
21	0.1	(LOTR1, Harry Potter1)
22	0.2	(LOTR2, LOTR1)
23	0.1	(Green Mile, LOTR1)
24	0.1	(LOTR2, Harry Potter1)
25	0.1	(Harry Potter2, Harry Potter1)
26	0.1	(Green Mile, Harry Potter1)
27	0.1	(Braveheart, Patriot)
28	0.1	(LOTR2, Green Mile)
29	0.1	(Green Mile, LOTR)
30	0.4	(Patriot, Gladiator, Sixth Sense)
31	0.1	(LOTR, Gladiator, Sixth Sense)
32	0.1	(Green Mile, Gladiator, Sixth Sense)

	support	itemsets
33	0.1	(Harry Potter1, LOTR1, Sixth Sense)
34	0.1	(LOTR2, LOTR1, Sixth Sense)
35	0.1	(Green Mile, LOTR1, Sixth Sense)
36	0.1	(LOTR2, Harry Potter1, Sixth Sense)
37	0.1	(Harry Potter1, Green Mile, Sixth Sense)
38	0.1	(LOTR2, Green Mile, Sixth Sense)
39	0.1	(Green Mile, LOTR, Sixth Sense)
40	0.1	(Braveheart, Patriot, Gladiator)
41	0.1	(Green Mile, LOTR, Gladiator)
42	0.1	(LOTR2, LOTR1, Harry Potter1)
43	0.1	(Green Mile, LOTR1, Harry Potter1)
44	0.1	(LOTR2, Green Mile, LOTR1)
45	0.1	(LOTR2, Green Mile, Harry Potter1)
46	0.1	(Green Mile, LOTR, Gladiator, Sixth Sense)
47	0.1	(LOTR2, Harry Potter1, LOTR1, Sixth Sense)
48	0.1	(Harry Potter1, Green Mile, LOTR1, Sixth Sense)
49	0.1	(LOTR2, Green Mile, LOTR1, Sixth Sense)
50	0.1	(Harry Potter1, Green Mile, LOTR2, Sixth Sense)
51	0.1	(LOTR2, Green Mile, LOTR1, Harry Potter1)
52	0.1	(LOTR2, Green Mile, Sixth Sense, Harry Potter1...

In [15]:
```
# 90% confidence
rules2=association_rules(frequent_itemsets2,metric='lift',min_threshold=0.9)
rules2
```

Out[15]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage
0	(Gladiator)	(Sixth Sense)	0.7	0.6	0.5	0.714286	1.190476	0.08
1	(Sixth Sense)	(Gladiator)	0.6	0.7	0.5	0.833333	1.190476	0.08
2	(Patriot)	(Sixth Sense)	0.6	0.6	0.4	0.666667	1.111111	0.04
3	(Sixth Sense)	(Patriot)	0.6	0.6	0.4	0.666667	1.111111	0.04
4	(LOTR)	(Sixth Sense)	0.1	0.6	0.1	1.000000	1.666667	0.04
...	...	...	...	...	...	...	...	...
233	(LOTR2)	(Harry Potter1, Green Mile, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
234	(Green Mile)	(LOTR2, Harry Potter1, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
235	(Sixth Sense)	(LOTR2, Green Mile, LOTR1, Harry Potter1)	0.6	0.1	0.1	0.166667	1.666667	0.04
236	(Harry Potter1)	(LOTR2, Green Mile, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
237	(LOTR1)	(LOTR2, Green Mile, Harry Potter1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08

238 rows × 9 columns

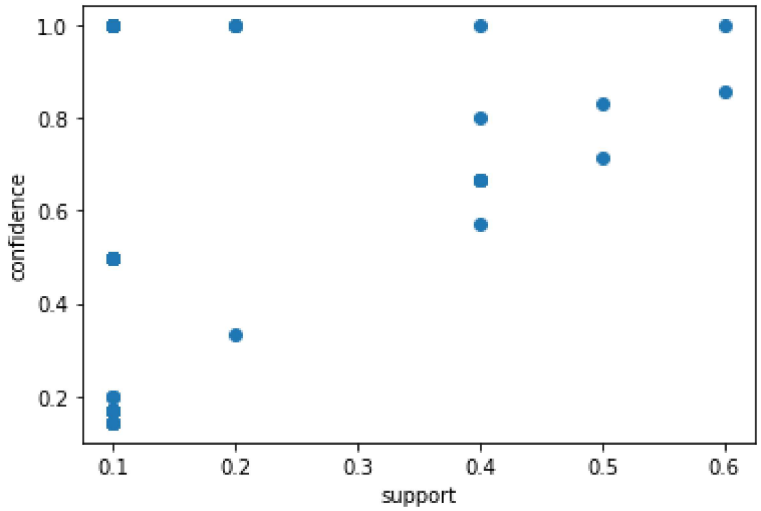
In [16]:
```
# Lift Ratio > 1 is a good influential rule in selecting the associated transacti
rules2[rules2.lift>1]
```

Out[16]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	leverage
0	(Gladiator)	(Sixth Sense)	0.7	0.6	0.5	0.714286	1.190476	0.08
1	(Sixth Sense)	(Gladiator)	0.6	0.7	0.5	0.833333	1.190476	0.08
2	(Patriot)	(Sixth Sense)	0.6	0.6	0.4	0.666667	1.111111	0.04
3	(Sixth Sense)	(Patriot)	0.6	0.6	0.4	0.666667	1.111111	0.04
4	(LOTR)	(Sixth Sense)	0.1	0.6	0.1	1.000000	1.666667	0.04
...	...	...	...	...	...	...	...	...
233	(LOTR2)	(Harry Potter1, Green Mile, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
234	(Green Mile)	(LOTR2, Harry Potter1, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
235	(Sixth Sense)	(LOTR2, Green Mile, LOTR1, Harry Potter1)	0.6	0.1	0.1	0.166667	1.666667	0.04
236	(Harry Potter1)	(LOTR2, Green Mile, LOTR1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08
237	(LOTR1)	(LOTR2, Green Mile, Harry Potter1, Sixth Sense)	0.2	0.1	0.1	0.500000	5.000000	0.08

236 rows × 9 columns

In [17]:
```
# visualization of obtained rule
plt.scatter(rules2['support'],rules2['confidence'])
plt.xlabel('support')
plt.ylabel('confidence')
plt.show()
```



In [ ]: