association-rules-17-02

March 10, 2025

[ ]:
```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

[ ]:
```
import pandas as pd
from mlxtend.frequent_patterns import apriori
from mlxtend.frequent_patterns import association_rules
from mlxtend.preprocessing import TransactionEncoder
```

[ ]:
```
from google.colab import drive
drive.mount('/content/drive')
```

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
DeprecationWarning: `should_run_async` will not call `transform_cell`
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)

Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount("/content/drive", force_remount=True).
```

[ ]:
```
file_name ='/content/Titanic.csv'
```

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
DeprecationWarning: `should_run_async` will not call `transform_cell`
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

[ ]:
```
titanic = pd.read_csv(file_name)
```

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
DeprecationWarning: `should_run_async` will not call `transform_cell`
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
```

```
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

[ ]:
```
titanic
```

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
DeprecationWarning: `should_run_async` will not call `transform_cell`
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

[ ]:

	Class	Gender	Age	Survived
0	3rd	Male	Child	No
1	3rd	Male	Child	No
2	3rd	Male	Child	No
3	3rd	Male	Child	No
4	3rd	Male	Child	No
…	…	…	…	…
2196	Crew	Female	Adult	Yes
2197	Crew	Female	Adult	Yes
2198	Crew	Female	Adult	Yes
2199	Crew	Female	Adult	Yes
2200	Crew	Female	Adult	Yes

[2201 rows x 4 columns]

[ ]:
```
#pre processing

df=pd.get_dummies(titanic)
df.head()
```

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
DeprecationWarning: `should_run_async` will not call `transform_cell`
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

[ ]:

	Class_1st	Class_2nd	Class_3rd	Class_Crew	Gender_Female	Gender_Male	\
0	False	False	True	False	False	True	
1	False	False	True	False	False	True	
2	False	False	True	False	False	True	
3	False	False	True	False	False	True	
4	False	False	True	False	False	True	

	Age_Adult	Age_Child	Survived_No	Survived_Yes
0	False	True	True	False

```
1      False       True         True         False
2      False       True         True         False
3      False       True         True         False
4      False       True         True         False
```

[ ]:
```
df
```

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
DeprecationWarning: `should_run_async` will not call `transform_cell`
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

[ ]:
```
      Class_1st  Class_2nd  Class_3rd  Class_Crew  Gender_Female  Gender_Male  \
0         False      False       True       False          False         True
1         False      False       True       False          False         True
2         False      False       True       False          False         True
3         False      False       True       False          False         True
4         False      False       True       False          False         True
…           …          …          …           …              …            …
2196      False      False      False        True           True        False
2197      False      False      False        True           True        False
2198      False      False      False        True           True        False
2199      False      False      False        True           True        False
2200      False      False      False        True           True        False

      Age_Adult  Age_Child  Survived_No  Survived_Yes
0         False       True         True         False
1         False       True         True         False
2         False       True         True         False
3         False       True         True         False
4         False       True         True         False
…           …          …           …            …
2196       True      False        False         True
2197       True      False        False         True
2198       True      False        False         True
2199       True      False        False         True
2200       True      False        False         True

[2201 rows x 10 columns]
```

[ ]:
```
#Apriori Algorithm

frequent_itemsets = apriori(df, min_support=0.1, use_colnames=True)
frequent_itemsets
```

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
```

```
DeprecationWarning: `should_run_async` will not call `transform_cell`
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

[ ]:

	support	itemsets
0	0.147660	(Class_1st)
1	0.129487	(Class_2nd)
2	0.320763	(Class_3rd)
3	0.402090	(Class_Crew)
4	0.213539	(Gender_Female)
5	0.786461	(Gender_Male)
6	0.950477	(Age_Adult)
7	0.676965	(Survived_No)
8	0.323035	(Survived_Yes)
9	0.144934	(Class_1st, Age_Adult)
10	0.118582	(Class_2nd, Age_Adult)
11	0.231713	(Class_3rd, Gender_Male)
12	0.284871	(Class_3rd, Age_Adult)
13	0.239891	(Class_3rd, Survived_No)
14	0.391640	(Class_Crew, Gender_Male)
15	0.402090	(Class_Crew, Age_Adult)
16	0.305770	(Class_Crew, Survived_No)
17	0.193094	(Age_Adult, Gender_Female)
18	0.156293	(Gender_Female, Survived_Yes)
19	0.757383	(Gender_Male, Age_Adult)
20	0.619718	(Survived_No, Gender_Male)
21	0.166742	(Gender_Male, Survived_Yes)
22	0.653339	(Survived_No, Age_Adult)
23	0.297138	(Age_Adult, Survived_Yes)
24	0.209905	(Class_3rd, Gender_Male, Age_Adult)
25	0.191731	(Class_3rd, Survived_No, Gender_Male)
26	0.216265	(Class_3rd, Survived_No, Age_Adult)
27	0.391640	(Class_Crew, Gender_Male, Age_Adult)
28	0.304407	(Class_Crew, Survived_No, Gender_Male)
29	0.305770	(Class_Crew, Survived_No, Age_Adult)
30	0.143571	(Age_Adult, Gender_Female, Survived_Yes)
31	0.603816	(Survived_No, Gender_Male, Age_Adult)
32	0.153567	(Age_Adult, Gender_Male, Survived_Yes)
33	0.175829	(Class_3rd, Survived_No, Gender_Male, Age_Adult)
34	0.304407	(Class_Crew, Survived_No, Gender_Male, Age_Adult)

[ ]:
```
rules = association_rules(frequent_itemsets, metric="lift", min_threshold=0.7)
rules
```

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
DeprecationWarning: `should_run_async` will not call `transform_cell`
```

```
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

[ ]:

	antecedents	consequents	\
0	(Class_1st)	(Age_Adult)	
1	(Age_Adult)	(Class_1st)	
2	(Class_2nd)	(Age_Adult)	
3	(Age_Adult)	(Class_2nd)	
4	(Class_3rd)	(Gender_Male)	
..	…	…	
101	(Gender_Male, Age_Adult)	(Class_Crew, Survived_No)	
102	(Class_Crew)	(Survived_No, Gender_Male, Age_Adult)	
103	(Survived_No)	(Class_Crew, Gender_Male, Age_Adult)	
104	(Gender_Male)	(Class_Crew, Survived_No, Age_Adult)	
105	(Age_Adult)	(Class_Crew, Survived_No, Gender_Male)	

	antecedent support	consequent support	support	confidence	lift	\
0	0.147660	0.950477	0.144934	0.981538	1.032680	
1	0.950477	0.147660	0.144934	0.152486	1.032680	
2	0.129487	0.950477	0.118582	0.915789	0.963505	
3	0.950477	0.129487	0.118582	0.124761	0.963505	
4	0.320763	0.786461	0.231713	0.722380	0.918520	
..	…	…	…	…	…	
101	0.757383	0.305770	0.304407	0.401920	1.314450	
102	0.402090	0.603816	0.304407	0.757062	1.253795	
103	0.676965	0.391640	0.304407	0.449664	1.148157	
104	0.786461	0.305770	0.304407	0.387060	1.265851	
105	0.950477	0.304407	0.304407	0.320268	1.052103	

	representativity	leverage	conviction	zhangs_metric	jaccard	\
0	1.0	0.004587	2.682493	0.037128	0.152050	
1	1.0	0.004587	1.005694	0.639010	0.152050	
2	1.0	-0.004492	0.588085	-0.041697	0.123346	
3	1.0	-0.004492	0.994601	-0.433377	0.123346	
4	1.0	-0.020555	0.769177	-0.115514	0.264660	
..	…	…	…	…	…	
101	1.0	0.072822	1.160764	0.986022	0.401198	
102	1.0	0.061619	1.630802	0.338549	0.433938	
103	1.0	0.039280	1.105434	0.399458	0.398335	
104	1.0	0.063931	1.132622	0.983509	0.386390	
105	1.0	0.015075	1.023334	1.000000	0.320268	

	certainty	kulczynski
0	0.627212	0.567012
1	0.005661	0.567012

```
2    -0.700435    0.520275
3    -0.005429    0.520275
4    -0.300090    0.508503
..         …          …
101   0.138498    0.698731
102   0.386805    0.630600
103   0.095378    0.613463
104   0.117093    0.691301
105   0.022802    0.660134

[106 rows x 14 columns]
```

[ ]:
```
rules = association_rules(frequent_itemsets, metric="lift", min_threshold=1)
rules
```

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
DeprecationWarning: `should_run_async` will not call `transform_cell`
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

[ ]:
```
                 antecedents                          consequents  \
0                (Class_1st)                          (Age_Adult)
1                (Age_Adult)                          (Class_1st)
2                (Class_3rd)                        (Survived_No)
3              (Survived_No)                          (Class_3rd)
4               (Class_Crew)                        (Gender_Male)
..                       …                                   …
69  (Gender_Male, Age_Adult)              (Class_Crew, Survived_No)
70              (Class_Crew)   (Survived_No, Gender_Male, Age_Adult)
71             (Survived_No)    (Class_Crew, Gender_Male, Age_Adult)
72             (Gender_Male)    (Class_Crew, Survived_No, Age_Adult)
73               (Age_Adult)  (Class_Crew, Survived_No, Gender_Male)

    antecedent support  consequent support   support  confidence      lift  \
0             0.147660            0.950477  0.144934    0.981538  1.032680
1             0.950477            0.147660  0.144934    0.152486  1.032680
2             0.320763            0.676965  0.239891    0.747875  1.104747
3             0.676965            0.320763  0.239891    0.354362  1.104747
4             0.402090            0.786461  0.391640    0.974011  1.238474
..                 …                   …         …           …         …
69            0.757383            0.305770  0.304407    0.401920  1.314450
70            0.402090            0.603816  0.304407    0.757062  1.253795
71            0.676965            0.391640  0.304407    0.449664  1.148157
72            0.786461            0.305770  0.304407    0.387060  1.265851
73            0.950477            0.304407  0.304407    0.320268  1.052103
```

```
    representativity  leverage  conviction  zhangs_metric   jaccard  \
0                1.0  0.004587    2.682493       0.037128  0.152050
1                1.0  0.004587    1.005694       0.639010  0.152050
2                1.0  0.022745    1.281251       0.139592  0.316547
3                1.0  0.022745    1.052040       0.293515  0.316547
4                1.0  0.075412    8.216621       0.322047  0.491448
..               …       …          …              …       …
69               1.0  0.072822    1.160764       0.986022  0.401198
70               1.0  0.061619    1.630802       0.338549  0.433938
71               1.0  0.039280    1.105434       0.399458  0.398335
72               1.0  0.063931    1.132622       0.983509  0.386390
73               1.0  0.015075    1.023334       1.000000  0.320268

    certainty  kulczynski
0    0.627212    0.567012
1    0.005661    0.567012
2    0.219513    0.551119
3    0.049466    0.551119
4    0.878295    0.735995
..        …          …
69   0.138498    0.698731
70   0.386805    0.630600
71   0.095378    0.613463
72   0.117093    0.691301
73   0.022802    0.660134

[74 rows x 14 columns]
```

[ ]:
```
rules = association_rules(frequent_itemsets, metric="confidence",␣
  ↪min_threshold=0.7)
rules
```

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
DeprecationWarning: `should_run_async` will not call `transform_cell`
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

[ ]:
```
                          antecedents  \
0                          (Class_1st)
1                          (Class_2nd)
2                          (Class_3rd)
3                          (Class_3rd)
4                          (Class_3rd)
5                         (Class_Crew)
```

```
6                            (Class_Crew)
7                            (Class_Crew)
8                         (Gender_Female)
9                         (Gender_Female)
10                          (Gender_Male)
11                            (Age_Adult)
12                          (Survived_No)
13                          (Gender_Male)
14                          (Survived_No)
15                         (Survived_Yes)
16                (Class_3rd, Gender_Male)
17                  (Class_3rd, Age_Adult)
18                (Class_3rd, Survived_No)
19                (Class_3rd, Gender_Male)
20                (Class_3rd, Survived_No)
21                  (Class_3rd, Age_Adult)
22               (Class_Crew, Gender_Male)
23                 (Class_Crew, Age_Adult)
24                           (Class_Crew)
25               (Class_Crew, Survived_No)
26               (Class_Crew, Gender_Male)
27                           (Class_Crew)
28               (Class_Crew, Survived_No)
29                 (Class_Crew, Age_Adult)
30                           (Class_Crew)
31              (Gender_Female, Age_Adult)
32           (Gender_Female, Survived_Yes)
33              (Survived_No, Gender_Male)
34                (Survived_No, Age_Adult)
35                (Gender_Male, Age_Adult)
36                           (Survived_No)
37                           (Gender_Male)
38              (Gender_Male, Survived_Yes)
39   (Class_3rd, Survived_No, Gender_Male)
40     (Class_3rd, Survived_No, Age_Adult)
41     (Class_3rd, Gender_Male, Age_Adult)
42                (Class_3rd, Survived_No)
43                (Class_3rd, Gender_Male)
44  (Class_Crew, Survived_No, Gender_Male)
45    (Class_Crew, Survived_No, Age_Adult)
46    (Class_Crew, Gender_Male, Age_Adult)
47                (Class_Crew, Survived_No)
48                (Class_Crew, Gender_Male)
49                  (Class_Crew, Age_Adult)
50                           (Class_Crew)

                             consequents  antecedent support  \
```

0	(Age_Adult)	0.147660
1	(Age_Adult)	0.129487
2	(Gender_Male)	0.320763
3	(Age_Adult)	0.320763
4	(Survived_No)	0.320763
5	(Gender_Male)	0.402090
6	(Age_Adult)	0.402090
7	(Survived_No)	0.402090
8	(Age_Adult)	0.213539
9	(Survived_Yes)	0.213539
10	(Age_Adult)	0.786461
11	(Gender_Male)	0.950477
12	(Gender_Male)	0.676965
13	(Survived_No)	0.786461
14	(Age_Adult)	0.676965
15	(Age_Adult)	0.323035
16	(Age_Adult)	0.231713
17	(Gender_Male)	0.284871
18	(Gender_Male)	0.239891
19	(Survived_No)	0.231713
20	(Age_Adult)	0.239891
21	(Survived_No)	0.284871
22	(Age_Adult)	0.391640
23	(Gender_Male)	0.402090
24	(Gender_Male, Age_Adult)	0.402090
25	(Gender_Male)	0.305770
26	(Survived_No)	0.391640
27	(Survived_No, Gender_Male)	0.402090
28	(Age_Adult)	0.305770
29	(Survived_No)	0.402090
30	(Survived_No, Age_Adult)	0.402090
31	(Survived_Yes)	0.193094
32	(Age_Adult)	0.156293
33	(Age_Adult)	0.619718
34	(Gender_Male)	0.653339
35	(Survived_No)	0.757383
36	(Gender_Male, Age_Adult)	0.676965
37	(Survived_No, Age_Adult)	0.786461
38	(Age_Adult)	0.166742
39	(Age_Adult)	0.191731
40	(Gender_Male)	0.216265
41	(Survived_No)	0.209905
42	(Gender_Male, Age_Adult)	0.239891
43	(Survived_No, Age_Adult)	0.231713
44	(Age_Adult)	0.304407
45	(Gender_Male)	0.305770
46	(Survived_No)	0.391640

```
47                (Gender_Male, Age_Adult)            0.305770
48                (Survived_No, Age_Adult)            0.391640
49              (Survived_No, Gender_Male)            0.402090
50  (Survived_No, Gender_Male, Age_Adult)             0.402090

    consequent support   support  confidence      lift  representativity  \
0             0.950477  0.144934    0.981538  1.032680               1.0
1             0.950477  0.118582    0.915789  0.963505               1.0
2             0.786461  0.231713    0.722380  0.918520               1.0
3             0.950477  0.284871    0.888102  0.934375               1.0
4             0.676965  0.239891    0.747875  1.104747               1.0
5             0.786461  0.391640    0.974011  1.238474               1.0
6             0.950477  0.402090    1.000000  1.052103               1.0
7             0.676965  0.305770    0.760452  1.123325               1.0
8             0.950477  0.193094    0.904255  0.951370               1.0
9             0.323035  0.156293    0.731915  2.265745               1.0
10            0.950477  0.757383    0.963027  1.013204               1.0
11            0.786461  0.757383    0.796845  1.013204               1.0
12            0.786461  0.619718    0.915436  1.163995               1.0
13            0.676965  0.619718    0.787984  1.163995               1.0
14            0.950477  0.653339    0.965101  1.015386               1.0
15            0.950477  0.297138    0.919831  0.967757               1.0
16            0.950477  0.209905    0.905882  0.953082               1.0
17            0.786461  0.209905    0.736842  0.936909               1.0
18            0.786461  0.191731    0.799242  1.016252               1.0
19            0.676965  0.191731    0.827451  1.222295               1.0
20            0.950477  0.216265    0.901515  0.948487               1.0
21            0.676965  0.216265    0.759171  1.121433               1.0
22            0.950477  0.391640    1.000000  1.052103               1.0
23            0.786461  0.391640    0.974011  1.238474               1.0
24            0.757383  0.391640    0.974011  1.286022               1.0
25            0.786461  0.304407    0.995542  1.265851               1.0
26            0.676965  0.304407    0.777262  1.148157               1.0
27            0.619718  0.304407    0.757062  1.221623               1.0
28            0.950477  0.305770    1.000000  1.052103               1.0
29            0.676965  0.305770    0.760452  1.123325               1.0
30            0.653339  0.305770    0.760452  1.163946               1.0
31            0.323035  0.143571    0.743529  2.301699               1.0
32            0.950477  0.143571    0.918605  0.966467               1.0
33            0.950477  0.603816    0.974340  1.025106               1.0
34            0.786461  0.603816    0.924200  1.175139               1.0
35            0.676965  0.603816    0.797241  1.177669               1.0
36            0.757383  0.603816    0.891946  1.177669               1.0
37            0.653339  0.603816    0.767764  1.175139               1.0
38            0.950477  0.153567    0.920981  0.968967               1.0
39            0.950477  0.175829    0.917062  0.964844               1.0
40            0.786461  0.175829    0.813025  1.033777               1.0
```

41	0.676965	0.175829	0.837662	1.237379	1.0
42	0.757383	0.175829	0.732955	0.967746	1.0
43	0.653339	0.175829	0.758824	1.161454	1.0
44	0.950477	0.304407	1.000000	1.052103	1.0
45	0.786461	0.304407	0.995542	1.265851	1.0
46	0.676965	0.304407	0.777262	1.148157	1.0
47	0.757383	0.304407	0.995542	1.314450	1.0
48	0.653339	0.304407	0.777262	1.189676	1.0
49	0.619718	0.304407	0.757062	1.221623	1.0
50	0.603816	0.304407	0.757062	1.253795	1.0

	leverage	conviction	zhangs_metric	jaccard	certainty	kulczynski
0	0.004587	2.682493	0.037128	0.152050	0.627212	0.567012
1	-0.004492	0.588085	-0.041697	0.123346	-0.700435	0.520275
2	-0.020555	0.769177	-0.115514	0.264660	-0.300090	0.508503
3	-0.020008	0.442572	-0.093712	0.288807	-1.259519	0.593908
4	0.022745	1.281251	0.139592	0.316547	0.219513	0.551119
5	0.075412	8.216621	0.322047	0.491448	0.878295	0.735995
6	0.019913	inf	0.082827	0.423040	1.000000	0.711520
7	0.033569	1.348519	0.183616	0.395417	0.258446	0.606065
8	-0.009870	0.517240	-0.061028	0.198877	-0.933340	0.553705
9	0.087312	2.525187	0.710327	0.410992	0.603990	0.607870
10	0.009870	1.339441	0.061028	0.773191	0.253420	0.879936
11	0.009870	1.051116	0.263149	0.773191	0.048630	0.879936
12	0.087312	2.525187	0.436144	0.734518	0.603990	0.851710
13	0.087312	1.523634	0.659783	0.734518	0.343674	0.851710
14	0.009900	1.419023	0.046906	0.670709	0.295290	0.826241
15	-0.009900	0.617734	-0.046906	0.304328	-0.618821	0.616225
16	-0.010333	0.526181	-0.060217	0.215888	-0.900486	0.563362
17	-0.014135	0.811449	-0.086060	0.243671	-0.232363	0.501870
18	0.003066	1.063667	0.021039	0.229722	0.059857	0.521516
19	0.034870	1.872135	0.236717	0.267427	0.465850	0.555336
20	-0.011746	0.502848	-0.066686	0.222015	-0.988671	0.564524
21	0.023418	1.341344	0.151418	0.290067	0.254479	0.539317
22	0.019395	inf	0.081404	0.412046	1.000000	0.706023
23	0.075412	8.216621	0.322047	0.491448	0.878295	0.735995
24	0.087104	9.335480	0.371976	0.510059	0.892882	0.745554
25	0.063931	47.903983	0.302519	0.386390	0.979125	0.691301
26	0.039280	1.450292	0.212110	0.398335	0.310484	0.613463
27	0.055225	1.565346	0.303418	0.424319	0.361163	0.624132
28	0.015143	inf	0.071335	0.321702	1.000000	0.660851
29	0.033569	1.348519	0.183616	0.395417	0.258446	0.606065
30	0.043069	1.447145	0.235577	0.407879	0.308984	0.614232
31	0.081195	2.639542	0.700873	0.385366	0.621146	0.593987
32	-0.004981	0.608425	-0.039500	0.149057	-0.643589	0.534828
33	0.014788	1.929980	0.064404	0.624824	0.481860	0.804809
34	0.089991	2.817152	0.429921	0.722283	0.645032	0.845982

35	0.091095	1.593193	0.621823	0.727024	0.372330	0.844593
36	0.091095	2.245337	0.467023	0.727024	0.554633	0.844593
37	0.089991	1.492710	0.697935	0.722283	0.330078	0.845982
38	-0.004918	0.626721	-0.037013	0.159359	-0.595605	0.541274
39	-0.006407	0.597105	-0.043136	0.181946	-0.674747	0.551026
40	0.005745	1.142075	0.041690	0.212637	0.124401	0.518298
41	0.033731	1.989896	0.242806	0.247284	0.497461	0.548697
42	-0.005860	0.908523	-0.042006	0.214049	-0.100687	0.482554
43	0.024442	1.437373	0.180935	0.247918	0.304286	0.513974
44	0.015075	inf	0.071195	0.320268	1.000000	0.660134
45	0.063931	47.903983	0.302519	0.386390	0.979125	0.691301
46	0.039280	1.450292	0.212110	0.398335	0.310484	0.613463
47	0.072822	54.427079	0.344592	0.401198	0.981627	0.698731
48	0.048533	1.556362	0.262074	0.411043	0.357476	0.621594
49	0.055225	1.565346	0.303418	0.424319	0.361163	0.624132
50	0.061619	1.630802	0.338549	0.433938	0.386805	0.630600

[ ]:
```
rules = association_rules(frequent_itemsets, metric="confidence",␣
 ↪min_threshold=1)
rules
```

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
DeprecationWarning: `should_run_async` will not call `transform_cell`
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

[ ]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	representativity	leverage	conviction	zhangs_metric	jaccard	certainty	kulczynski
0	(Class_Crew)	(Age_Adult)	0.402090	0.950477	0.402090	1.0	1.052103	1.0	0.019913	inf	0.082827	0.423040	1.0	0.711520
1	(Class_Crew, Gender_Male)	(Age_Adult)	0.391640	0.950477	0.391640	1.0	1.052103	1.0	0.019395	inf	0.081404	0.412046	1.0	0.706023
2	(Class_Crew, Survived_No)	(Age_Adult)	0.305770	0.950477	0.305770	1.0	1.052103	1.0	0.015143	inf	0.071335	0.321702	1.0	0.660851
3	(Class_Crew, Survived_No, Gender_Male)	(Age_Adult)	0.304407	0.950477	0.304407	1.0	1.052103	1.0	0.015075	inf	0.071195	0.320268	1.0	0.660134

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

```
/usr/local/lib/python3.11/dist-packages/ipykernel/ipkernel.py:283:
DeprecationWarning: `should_run_async` will not call `transform_cell`
automatically in the future. Please pass the result to `transformed_cell`
argument and any exception that happen during thetransform in
`preprocessing_exc_tuple` in IPython 7.17 and above.
  and should_run_async(code)
```

[ ]:

	antecedents	consequents	antecedent support
31	(Gender_Female, Age_Adult)	(Survived_Yes)	0.193094
9	(Gender_Female)	(Survived_Yes)	0.213539
47	(Class_Crew, Survived_No)	(Gender_Male, Age_Adult)	0.305770
24	(Class_Crew)	(Gender_Male, Age_Adult)	0.402090
25	(Class_Crew, Survived_No)	(Gender_Male)	0.305770
45	(Class_Crew, Survived_No, Age_Adult)	(Gender_Male)	0.305770
50	(Class_Crew)	(Survived_No, Gender_Male, Age_Adult)	0.402090
5	(Class_Crew)	(Gender_Male)	0.402090
23	(Class_Crew, Age_Adult)	(Gender_Male)	0.402090
41	(Class_3rd, Gender_Male, Age_Adult)	(Survived_No)	0.209905
19	(Class_3rd, Gender_Male)	(Survived_No)	0.231713
49	(Class_Crew, Age_Adult)	(Survived_No, Gender_Male)	0.402090
27	(Class_Crew)	(Survived_No, Gender_Male)	0.402090
48	(Class_Crew, Gender_Male)	(Survived_No, Age_Adult)	0.391640
36	(Survived_No)	(Gender_Male, Age_Adult)	0.676965
35	(Gender_Male, Age_Adult)	(Survived_No)	0.757383
34	(Survived_No, Age_Adult)	(Gender_Male)	0.653339
37	(Gender_Male)		
13	(Gender_Male)		
12	(Survived_No)		

```
37                (Survived_No, Age_Adult)            0.786461
13                           (Survived_No)            0.786461
12                           (Gender_Male)            0.676965

    consequent support   support  confidence      lift  representativity  \
31            0.323035  0.143571    0.743529  2.301699               1.0
9             0.323035  0.156293    0.731915  2.265745               1.0
47            0.757383  0.304407    0.995542  1.314450               1.0
24            0.757383  0.391640    0.974011  1.286022               1.0
25            0.786461  0.304407    0.995542  1.265851               1.0
45            0.786461  0.304407    0.995542  1.265851               1.0
50            0.603816  0.304407    0.757062  1.253795               1.0
5             0.786461  0.391640    0.974011  1.238474               1.0
23            0.786461  0.391640    0.974011  1.238474               1.0
41            0.676965  0.175829    0.837662  1.237379               1.0
19            0.676965  0.191731    0.827451  1.222295               1.0
49            0.619718  0.304407    0.757062  1.221623               1.0
27            0.619718  0.304407    0.757062  1.221623               1.0
48            0.653339  0.304407    0.777262  1.189676               1.0
36            0.757383  0.603816    0.891946  1.177669               1.0
35            0.676965  0.603816    0.797241  1.177669               1.0
34            0.786461  0.603816    0.924200  1.175139               1.0
37            0.653339  0.603816    0.767764  1.175139               1.0
13            0.676965  0.619718    0.787984  1.163995               1.0
12            0.786461  0.619718    0.915436  1.163995               1.0

    leverage  conviction  zhangs_metric   jaccard  certainty  kulczynski
31  0.081195    2.639542       0.700873  0.385366   0.621146    0.593987
9   0.087312    2.525187       0.710327  0.410992   0.603990    0.607870
47  0.072822   54.427079       0.344592  0.401198   0.981627    0.698731
24  0.087104    9.335480       0.371976  0.510059   0.892882    0.745554
25  0.063931   47.903983       0.302519  0.386390   0.979125    0.691301
45  0.063931   47.903983       0.302519  0.386390   0.979125    0.691301
50  0.061619    1.630802       0.338549  0.433938   0.386805    0.630600
5   0.075412    8.216621       0.322047  0.491448   0.878295    0.735995
23  0.075412    8.216621       0.322047  0.491448   0.878295    0.735995
41  0.033731    1.989896       0.242806  0.247284   0.497461    0.548697
19  0.034870    1.872135       0.236717  0.267427   0.465850    0.555336
49  0.055225    1.565346       0.303418  0.424319   0.361163    0.624132
27  0.055225    1.565346       0.303418  0.424319   0.361163    0.624132
48  0.048533    1.556362       0.262074  0.411043   0.357476    0.621594
36  0.091095    2.245337       0.467023  0.727024   0.554633    0.844593
35  0.091095    1.593193       0.621823  0.727024   0.372330    0.844593
34  0.089991    2.817152       0.429921  0.722283   0.645032    0.845982
37  0.089991    1.492710       0.697935  0.722283   0.330078    0.845982
13  0.087312    1.523634       0.659783  0.734518   0.343674    0.851710
12  0.087312    2.525187       0.436144  0.734518   0.603990    0.851710
```

[ ]:

[ ]:

[ ]:

[ ]:

[ ]:

[ ]:

[ ]:

[ ]: