6주차 과제

Association Rule Mining



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과목명: Data Analytics

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학번: 201611145

전공: 산업공학과

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Objective: ARM분석에 DVD 대여 데이터를 활용해서 DVD의 추천에 활용하려고 한다.

계산 Tool은 파이썬을 활용했다.

```
🏓 201611145_박민성_week6.py 🗡
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     import pandas as pd
      from mlxtend.preprocessing import TransactionEncoder
     from mlxtend.frequent_patterns import apriori
    dataset=[]
     import csv
      f = open('data_week6.txt','r',encoding="utf-8-sig")
      rdr = csv.reader(f)
      for i in rdr:
         dataset.append(i)
    te = TransactionEncoder()
 te_ary = te.fit(dataset).transform(dataset)
     df = pd.DataFrame(te_ary, columns=te.columns_)
     frequent_itemsets = apriori(df, min_support=0.1, use_colnames=True)
      from mlxtend.frequent_patterns import association_rules
      association_rules(frequent_itemsets, metric="confidence", min_threshold=0.3).to_csv("./결과데이터.csv", encoding='ms949')
```

Import Apriori를 이용해서 분석을 진행했다.

data_wee6.txt를 list로 가져온 다음 분석을 진행했다.

support의 threshold는 0.1로 두고 confidence의 threshold는 0.3으로 두고 분석을 진행했다.그 결과값을 csv파일로 저장해서 엑셀로 데이터를 확인했다.

1 antecedents(X)		Α	В	С	D	Е	F	G	Н	1	J
1 frozenset([변지의제왕2]) frozenset([변지의제왕1]) 0.20 0.32 0.20 1.00 3.125 0.136 inf 4 2 frozenset([변지의제왕1]) frozenset([변지의제왕1]) 0.32 0.36 0.16 0.50 1.389 0.045 1.28 1.28 1 frozenset([변지의제왕1]) frozenset([변지의제왕1]) 0.32 0.36 0.16 0.44 1.389 0.045 1.28 1.28 1 frozenset([변지의제왕1]) 0.36 0.32 0.16 0.44 1.389 0.045 1.28 1.28 1 frozenset([변지의제왕1]) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 1.22 1 0.60 1.875 0.056 1.70 1.22 1 0.22 0.20 0.12 0.375 1.875 0.056 1.70 1.22 1 0.22 0.20 0.12 0.375 1.875 0.056 1.28 1 0.28 0.28 0.12 0.20 0.12 0.375 1.875 0.056 1.28 1 0.28 0.28 0.12 0.20 0.12 0.375 1.875 0.056 1.28 1 0.28 0.28 0.12 0.20 0.12 0.29 1.531 0.042 1.26 1 0.20 1.20 1.20 1.20 1.20 1.20 1.20 1.	1		antecedents(X)	consequents(Y)	antecedent support	consequent support	Support	confidence	lift	leverage	conviction
4 2 frozenset((반지의제왕1)) frozenset((해리포터1)) 0.32 0.36 0.16 0.50 1.389 0.045 1.28 5 3 frozenset((해리포터1)) frozenset((반지의제왕1)) 0.36 0.32 0.16 0.444 1.389 0.045 1.224 6 4 frozenset((해리포터2)) frozenset((반지의제왕1)) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.55 1.70 0.75 1.875 0.056 1.70 0.70 0.70 0.70 0.70 0.70 0.70 0.70	2	0	frozenset({'반지의제왕1'})	frozenset({'반지의제왕2'})	0.32	0.20	0.20	0.625	3.125	0.136	2.133
5 3 frozenset((해리포터1)) frozenset((반지의제항1)) 0.36 0.32 0.16 0.444 1.389 0.045 1.224 1.266 4 frozenset((배리포터2)) frozenset((반지의제항1)) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 0.50 1.70 1.28 1.28 1.28 1.28 1.28 1.28 1.28 1.28	3	1	frozenset({'반지의제왕2'})	frozenset({'반지의제왕1'})	0.20	0.32	0.20	1.00	3.125	0.136	inf
6 4 frozenset([해리포터2]) frozenset([백지의제왕1]) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 7 5 frozenset([배리포터2]) frozenset([해리포터2]) 0.32 0.20 0.12 0.375 1.875 0.056 1.28 0.28 0.12 0.429 1.531 0.042 1.26 6 frozenset([소선선스]) frozenset([해리포터2]) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 1.28 0.28 0.12 0.429 1.531 0.042 1.26 1.28 0.28 0.12 0.429 1.531 0.042 1.26 1.28 1.28 1.28 1.28 1.28 1.28 1.28 1.28	4	2	frozenset({'반지의제왕1'})	frozenset({'해리포터1'})	0.32	0.36	0.16	0.50	1.389	0.045	1.28
5 frozenset(('반지의제왕1') frozenset(('해리포타(2')) 0.32 0.20 0.12 0.375 1.875 0.056 1.28 6 6 frozenset(('심스센스')) frozenset(('해리포타(2')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 1.26 1.26 1.26 1.26 1.26 1.26 1.2	5	3	frozenset({'해리포터1'})	frozenset({'반지의제왕1'})	0.36	0.32	0.16	0.444	1.389	0.045	1.224
8 6 frozensett("식스센스") frozensett("소성크탈즐") 0.28 0.28 0.12 0.429 1.531 0.042 1.26 1.26 1.26 1.26 1.26 1.26 1.26 1.2	6	4	frozenset({'해리포터2'})	frozenset({'반지의제왕1'})	0.20	0.32	0.12	0.60	1.875	0.056	1.70
9 7 frozenset(('소선크[우플)) frozenset(('식스센스')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 10 8 frozenset(('식스센스')) frozenset(('스타워즈')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 11 9 frozenset(('스타워즈')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 11 0 frozenset(('스타워즈')) 0.48 0.28 0.28 0.12 0.429 1.531 0.042 1.26 11 0 frozenset(('스타워즈')) frozenset(('이벤저스')) 0.48 0.28 0.28 0.583 2.083 0.146 1.728 11 1 frozenset(('스타워즈')) frozenset(('이벤저스')) 0.28 0.48 0.28 0.28 0.583 2.083 0.146 inf 1.728 11 1 frozenset(('이벤저스')) 0.28 0.48 0.28 0.16 0.333 1.19 0.026 1.08 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	7	5	frozenset({'반지의제왕1'})	frozenset({'해리포터2'})	0.32	0.20	0.12	0.375	1.875	0.056	1.28
Note Note	8	6	frozenset({'식스센스'})	frozenset({'쇼생크탈출'})	0.28	0.28	0.12	0.429	1.531	0.042	1.26
11 9 frozenset(('스타워즈')) frozenset(('식스센스')) 0.28 0.28 0.28 0.12 0.429 1.531 0.042 1.26 1.20 10 frozenset(('어탠저스')) frozenset(('어탠저스')) 0.28 0.48 0.28 0.28 0.583 2.083 0.146 1.728 1.10 frozenset(('어탠저스')) 0.28 0.48 0.28 1.00 2.083 0.146 inf 1.20 frozenset(('어탠저스')) 0.28 0.48 0.28 1.00 2.083 0.146 inf 1.20 frozenset(('어탠저스')) 0.28 0.48 0.28 0.16 0.333 1.19 0.026 1.28 1.33 frozenset(('어낸저스')) frozenset(('어댄저스')) 0.28 0.48 0.16 0.571 1.19 0.026 1.213 1.30 frozenset(('어밴저스')) 0.24 0.48 0.26 0.16 0.571 1.19 0.026 1.213 1.30 frozenset(('어밴저스')) frozenset(('어밴저스')) 0.24 0.48 0.20 0.833 1.736 0.085 3.12 1.30 frozenset(('어밴저스')) frozenset(('어밴저스')) 0.24 0.48 0.20 0.417 1.736 0.085 1.303 1.30 1.30 1.30 1.30 1.30 1.30 1.3	9	7	frozenset({'쇼생크탈출'})	frozenset({'식스센스'})	0.28	0.28	0.12	0.429	1.531	0.042	1.26
12 10 frozenset(['어벤저스']) frozenset(['스타워즈']) 0.48 0.28 0.28 0.583 2.083 0.146 1.728 11 frozenset(['스타워즈']) frozenset(['어벤저스']) 0.28 0.48 0.28 1.00 2.083 0.146 inf 12 frozenset(['어벤저스']) frozenset(['스타워즈']) 0.48 0.28 0.16 0.333 1.19 0.026 1.08 11 12 frozenset(['어벤저스']) frozenset(['어벤저스']) 0.28 0.48 0.16 0.571 1.19 0.026 1.08 11 14 frozenset(['어벤저스']) 0.28 0.48 0.16 0.571 1.19 0.026 1.21 14 frozenset(['어벤저스']) 0.24 0.48 0.20 0.833 1.736 0.085 3.12 17 15 frozenset(['어벤저스']) 0.24 0.48 0.24 0.20 0.417 1.736 0.085 3.12 17 15 frozenset(['어벤저스']) frozenset(['어버저스']) 0.24 0.48 0.24 0.20 0.417 1.736 0.085 1.303 18 16 frozenset(['헤리포터2']) frozenset(['헤리포터1']) 0.20 0.36 0.20 0.20 0.417 1.736 0.085 1.303 18 frozenset(['헤리포터2']) frozenset(['헤리포터2']) 0.36 0.20 0.20 0.556 2.778 0.128 inf 17 frozenset(['헤리포터1']) frozenset(['헤리포터1']) 0.12 0.36 0.20 0.20 0.556 2.778 0.128 1.80 18 frozenset(['헤리포터2']) frozenset(['헤리포터1']) 0.12 0.36 0.12 1.00 2.778 0.077 inf 18 frozenset(['해리포터2']) frozenset(['해리포터2']) 0.16 0.20 0.32 0.12 0.60 1.875 0.056 1.70 1.70 1.70 1.70 1.70 1.70 1.70 1.70	10	8	frozenset({'식스센스'})	frozenset({'스타워즈'})	0.28	0.28	0.12	0.429	1.531	0.042	1.26
13 11 frozenset(('스타워즈')) frozenset(('이벤저스')) 0.28 0.48 0.28 1.00 2.083 0.146 inf 14 12 frozenset(('어벤저스')) frozenset(('스스센스')) 0.48 0.28 0.16 0.333 1.19 0.026 1.08 15 13 frozenset(('스스센스')) frozenset(('이벤저스')) 0.28 0.48 0.16 0.571 1.19 0.026 1.213 16 14 frozenset(('어벤저스')) frozenset(('어벤저스')) 0.28 0.48 0.20 0.833 1.736 0.085 3.12 17 15 frozenset(('어벤저스')) frozenset(('아버타')) 0.48 0.24 0.20 0.417 1.736 0.085 3.12 18 16 frozenset(('애레고토리')) frozenset(('애레고토리')) 0.20 0.36 0.20 1.00 2.778 0.128 inf 19 17 frozenset(('애리고토리')) frozenset(('해리고토리')) 0.36 0.20 0.20 0.556 2.778 0.128 inf 19 17 frozenset(('애리고토리')) frozenset(('애리고토리')) 0.12 0.36 0.12 1.00 2.778 0.077 inf 19 19 frozenset(('애리고토리')) frozenset(('애리고토리')) 0.10 0.20 0.32 0.12 0.00 1.875 0.056 1.70 21 19 frozenset(('애리고토리')) frozenset(('애리고티리')) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 22 20 frozenset(('애리고토리')) frozenset(('애리고토리')) 0.16 0.20 0.16 0.12 0.60 3.75 0.088 3.20 23 21 frozenset(('애리고토리')) frozenset(('애리고토리')) 0.30 0.16 0.12 0.60 3.75 0.088 3.20 24 22 frozenset(('애리고토리')) frozenset(('애리고토리')) 0.30 0.10 0.10 0.12 0.333 2.778 0.077 1.32 25 23 frozenset(('애리고토리')) frozenset(('따리고토리')) 0.36 0.12 0.12 0.333 2.778 0.077 1.32 26 24 frozenset(('애리고토리')) frozenset(('스타워즈')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 27 frozenset(('어ে퍼스', '스타워즈')) frozenset(('스타워즈')) 0.12 0.48 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(('어ে퍼스', '스타워즈')) frozenset(('어벤저스', '스타워즈')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26	11	9	frozenset({'스타워즈'})	frozenset({'식스센스'})	0.28	0.28	0.12	0.429	1.531	0.042	1.26
14 12 frozenset(('어벤저스')) frozenset(('식스선스')) 0.48 0.28 0.16 0.333 1.19 0.026 1.08 15 13 frozenset(('식스센스')) frozenset(('어벤저스')) 0.28 0.48 0.16 0.571 1.19 0.026 1.213 16 14 frozenset(('어벤저스')) frozenset(('어벤저스')) 0.24 0.48 0.20 0.833 1.736 0.085 3.12 17 15 frozenset(('어벤저스')) frozenset(('어버저스')) 0.48 0.24 0.20 0.417 1.736 0.085 1.303 18 16 frozenset(('헤리포터2')) frozenset(('헤리포터2')) 0.36 0.20 1.00 2.778 0.128 inf 19 17 frozenset(('헤리포터2')) frozenset(('헤리포터2')) 0.36 0.20 0.556 2.778 0.128 inf 20 18 frozenset(('헤리포터2', '世지의제항1')) frozenset(('헤리포터2')) 0.12 0.36 0.12 1.00 2.778 0.077 inf 21 19 frozenset(('헤리포터2', '尚리포터1')) frozenset(('尚리포터2')) 0.12 0.36 0.12 1.00 2.778 0.077 inf 22 20 frozenset(('尚리포터2', '尚리포터1')) frozenset(('尚리포터2')) 0.16 0.20 0.12 0.60 1.875 0.056 1.70 23 21 frozenset(('尚리포터2')) frozenset(('尚리포터2')) 0.16 0.20 0.12 0.75 3.75 0.088 3.20 24 22 frozenset(('尚리포터2')) frozenset(('尚리포터2', '尚리포터1')) 0.20 0.16 0.12 0.60 3.75 0.088 2.10 25 23 frozenset(('尚리포터2')) frozenset(('尚리포터2', '尚리포터1')) 0.32 0.20 0.12 0.375 1.875 0.056 1.28 26 24 frozenset(('尚리포터1')) frozenset(('尚리포터2', '世지의제항1')) 0.36 0.12 0.12 0.333 2.778 0.077 1.32 27 28 26 frozenset(('어벤저스', '스타워즈')) frozenset(('어벤저스')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(('식스센스')) frozenset(('어벤저스')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26	12	10	frozenset({'어벤져스'})	frozenset({'스타워즈'})	0.48	0.28	0.28	0.583	2.083	0.146	1.728
15 13 frozenset(['식스센스']) frozenset(['이벤저스']) 0.28 0.48 0.16 0.571 1.19 0.026 1.213 16 14 frozenset(['이바타']) frozenset(['이벤저스']) 0.24 0.48 0.20 0.833 1.736 0.085 3.12 17 15 frozenset(['이벤저스']) frozenset(['이버타']) 0.48 0.24 0.20 0.417 1.736 0.085 1.303 18 16 frozenset(['레리포터2']) frozenset(['레리포터1']) 0.20 0.36 0.20 1.00 2.778 0.128 inf 19 17 frozenset(['레리포터2']) frozenset(['레리포터2']) 0.36 0.20 0.20 0.556 2.778 0.128 1.80 18 frozenset(['레리포터2']) frozenset(['레리포터2']) 0.12 0.36 0.20 0.20 0.556 2.778 0.128 1.80 19 17 frozenset(['레리포터2']) frozenset(['廿지의제왕1']) 0.12 0.36 0.12 1.00 2.778 0.177 inf 19 17 frozenset(['레리포터2']) frozenset(['廿지의제왕1']) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 20 18 frozenset(['廿지의제왕1']) frozenset(['廿지의제왕1']) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 21 19 frozenset(['廿지의제왕1']) frozenset(['廿지의제왕1']) 0.20 0.16 0.20 0.12 0.75 3.75 0.088 3.20 23 21 frozenset(['廿지의제왕1']) frozenset(['廿지의제왕1']) 0.20 0.16 0.12 0.60 3.75 0.088 2.10 24 22 frozenset(['廿지의제왕1']) frozenset(['廿지의제왕1']) 0.32 0.20 0.12 0.375 1.875 0.056 1.28 25 23 frozenset(['廿지의제왕1']) frozenset(['廿지의제왕1']) 0.36 0.12 0.12 0.333 2.778 0.077 1.32 26 24 frozenset(['ป지의제왕1']) frozenset(['廿지의제왕1']) 0.36 0.12 0.12 0.333 2.778 0.077 1.32 27 25 frozenset(['ป지의제우']) frozenset(['ป지의제우']) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(['십-선선-']) frozenset(['〇벤저스-']) 0.28 0.28 0.12 0.429 1.531 0.042 1.26	13	11	frozenset({'스타워즈'})	frozenset({'어벤져스'})	0.28	0.48	0.28	1.00	2.083	0.146	inf
16 14 frozenset(('아바타')) frozenset(('아버셔스')) 0.24 0.48 0.20 0.833 1.736 0.085 3.12 17 15 frozenset(('아베셔스')) frozenset(('아바타')) 0.48 0.24 0.20 0.417 1.736 0.085 1.303 18 16 frozenset(('해리포터2')) frozenset(('해리포터1')) 0.20 0.36 0.20 1.00 2.778 0.128 inf 19 17 frozenset(('해리포터2')) frozenset(('해리포터2')) 0.36 0.20 0.20 0.556 2.778 0.128 1.80 20 18 frozenset(('해리포터2', '백지의제왕1')) frozenset(('해리포터1')) 0.12 0.36 0.12 1.00 2.778 0.077 inf 21 19 frozenset(('해리포터2', '핵지로터1')) frozenset(('핵지로터1')) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 22 20 frozenset(('핵지로터2')) frozenset(('핵지로터2')) 0.16 0.20 0.12 0.75 3.75 0.088 3.20 23 21 frozenset(('핵지로터2')) frozenset(('世지의제왕1', '핵리포터1')) 0.20 0.16 0.12 0.60 3.75 0.088 2.10 24 22 frozenset(('핵지로터2')) frozenset(('핵지로터2', '핵리포터1')) 0.32 0.20 0.12 0.375 1.875 0.056 1.28 25 23 frozenset(('핵지로터2')) frozenset(('핵지로터2', '핵리포터1')) 0.36 0.12 0.12 0.333 2.778 0.077 1.32 26 24 frozenset(('핵제조는, '식스센스')) frozenset(('핵지로터2', '핵지로터2')) 0.16 0.28 0.12 0.75 2.679 0.075 2.88 27 25 frozenset(('엑서조스, '스타워즈')) frozenset(('엑서조스', '스타워즈')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(('식스센스', '스타워즈')) frozenset(('어벤져스', '스타워즈')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26	14	12	frozenset({'어벤져스'})	frozenset({'식스센스'})	0.48	0.28	0.16	0.333	1.19	0.026	1.08
17 15 frozenset(('어벤저스')) frozenset(('아바타')) 0.48 0.24 0.20 0.417 1.736 0.085 1.303 18 16 frozenset(('해리포터2')) frozenset(('해리포터1')) 0.20 0.36 0.20 1.00 2.778 0.128 inf 19 17 frozenset(('해리포터1')) frozenset(('해리포터2')) 0.36 0.20 0.20 0.556 2.778 0.128 1.80 20 18 frozenset(('해리포터2', '반지의제왕1')) frozenset(('해리포터1')) 0.12 0.36 0.12 1.00 2.778 0.077 inf 21 19 frozenset(('해리포터2', '해리포터1')) frozenset(('반지의제왕1')) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 22 20 frozenset(('반지의제왕1', '해리포터1')) frozenset(('배리포터2')) 0.16 0.20 0.12 0.75 3.75 0.088 3.20 23 21 frozenset(('반지의제왕1', '해리포터2') ifrozenset(('반지의제왕1', '해리포터1')) 0.20 0.16 0.12 0.60 3.75 0.088 2.10 24 22 frozenset(('반지의제왕1')) frozenset(('반지의제왕1', '해리포터1')) 0.32 0.20 0.12 0.375 1.875 0.056 1.28 25 23 frozenset(('반지의제왕1')) frozenset(('해리포터2', '반지의제왕1')) 0.36 0.12 0.12 0.375 1.875 0.077 1.32 26 24 frozenset(('아벤저스', '식스센스')) frozenset(('하리포터2')) 0.16 0.28 0.12 0.75 2.679 0.075 2.88 27 25 frozenset(('어벤저스', '스타워즈')) frozenset(('식스센스')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(('식스센스', '스타워즈')) frozenset(('어벤저스', '스타워즈')) 0.12 0.48 0.12 0.429 1.531 0.042 1.26	15	13	frozenset({'식스센스'})	frozenset({'어벤져스'})	0.28	0.48	0.16	0.571	1.19	0.026	1.213
18 16 frozenset(('해리포터2')) frozenset(('해리포터1')) 0.20 0.36 0.20 1.00 2.778 0.128 inf 19 17 frozenset(('해리포터2')) frozenset(('해리포터2')) 0.36 0.20 0.20 0.556 2.778 0.128 1.80 20 18 frozenset(('해리포터2', '반지의제왕1')) frozenset(('해리포터1')) 0.12 0.36 0.12 1.00 2.778 0.077 inf 21 19 frozenset(('해리포터2', '해리포터1')) frozenset(('반지의제왕1')) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 22 20 frozenset(('반지의제왕1', '해리포터1')) frozenset(('반지의제왕1')) 0.16 0.20 0.12 0.75 3.75 0.088 3.20 23 21 frozenset(('해리포터2')) frozenset(('반지의제왕1', '해리포터1')) 0.20 0.16 0.12 0.60 3.75 0.088 2.10 24 22 frozenset(('반지의제왕1')) frozenset(('해리포터2', '해리포터1')) 0.32 0.20 0.12 0.375 1.875 0.056 1.28 25 23 frozenset(('해리포터2')) frozenset(('해리포터2', '반지의제왕1')) 0.36 0.12 0.12 0.333 2.778 0.077 1.32 26 24 frozenset(('에벤져스', '식스센스')) frozenset(('스타워즈')) 0.16 0.28 0.12 0.75 2.679 0.075 2.88 27 25 frozenset(('이벤져스', '스타워즈')) frozenset(('네저스')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(('식스센스', '스타워즈')) frozenset(('이벤져스', '스타워즈')) 0.12 0.48 0.12 0.429 1.531 0.042 1.26 29 27 frozenset(('식스센스')) frozenset(('어벤져스', '스타워즈')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26	16	14	frozenset({'아바타'})	frozenset({'어벤져스'})	0.24	0.48	0.20	0.833	1.736	0.085	3.12
19 17 frozenset(('해리포터1')) frozenset(('해리포터2')) 0.36 0.20 0.20 0.556 2.778 0.128 1.80 1.80 1.80 1.80 1.80 1.80 1.80 1.8	17	15	frozenset({'어벤져스'})	frozenset({'아바타'})	0.48	0.24	0.20	0.417	1.736	0.085	1.303
20 18 frozenset(('해리포터2', '반지의제왕1')) frozenset(('해리포터1')) 0.12 0.36 0.12 1.00 2.778 0.077 inf 21 19 frozenset(('해리포터2', '해리포터1')) frozenset(('반지의제왕1')) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 22 20 frozenset(('반지의제왕1', '해리포터2')) frozenset(('해리포터2')) 0.16 0.20 0.12 0.75 3.75 0.088 3.20 23 21 frozenset(('반지의제왕1', '해리포터2', '반지의제왕1')) 0.32 0.20 0.12 0.375 1.875 0.056 1.28 25 23 frozenset(('해리포터2')) frozenset(('해리포터2', '해리포터2', '해리포터2', '반지의제왕1')) 0.36 0.12 0.12 0.333 2.778 0.077 1.32 26 24 frozenset(('해리포터2')) frozenset(('스타워즈')) 0.16 0.28 0.12 0.75 2.679 0.075 2.88 27 25 frozenset(('어벤져스', '스타워즈')) <td< td=""><td>18</td><td>16</td><td>frozenset({'해리포터2'})</td><td>frozenset({'해리포터1'})</td><td>0.20</td><td>0.36</td><td>0.20</td><td>1.00</td><td>2.778</td><td>0.128</td><td>inf</td></td<>	18	16	frozenset({'해리포터2'})	frozenset({'해리포터1'})	0.20	0.36	0.20	1.00	2.778	0.128	inf
1 19 frozenset(('해리포터2', '해리포터1')) frozenset(('반지의제왕1')) 0.20 0.32 0.12 0.60 1.875 0.056 1.70 1.70 1.70 1.70 1.70 1.70 1.70 1.70	19	17	frozenset({'해리포터1'})	frozenset({'해리포터2'})	0.36	0.20	0.20	0.556	2.778	0.128	1.80
22 20 frozenset(['반지의제왕1', '해리포터1']) 0.16 0.20 0.12 0.75 3.75 0.088 3.20 23 21 frozenset(['해리포터2']) frozenset(['반지의제왕1', '해리포터1']) 0.20 0.16 0.12 0.60 3.75 0.088 2.10 24 22 frozenset(['반지의제왕1']) frozenset(['해리포터2', '해리포터2', '해리포터2']) 0.32 0.20 0.12 0.375 1.875 0.056 1.28 25 23 frozenset(['해리포터2']) frozenset(['해리포터2']) 0.36 0.12 0.12 0.333 2.778 0.077 1.32 26 24 frozenset(['에벤져스', '식스센스']) frozenset(['스타워즈']) 0.16 0.28 0.12 0.75 2.679 0.075 2.88 27 25 frozenset(['이벤져스', '스타워즈']) frozenset(['식스센스']) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(['식스센스', '스타워즈']) frozenset(['이벤져스', '스타워즈']) 0.12 0.48 0.12 0.429 1.531 0.042 <	20	18	frozenset({'해리포터2', '반지의제왕1'})	frozenset({'해리포터1'})	0.12	0.36	0.12	1.00	2.778	0.077	inf
23 21 frozenset(('해리포터2')) frozenset(('반지의제왕1', '해리포터1')) 0.20 0.16 0.12 0.60 3.75 0.088 2.10 24 22 frozenset(('반지의제왕1')) frozenset(('해리포터2', '해리포터1')) 0.32 0.20 0.12 0.375 1.875 0.056 1.28 25 23 frozenset(('해리포터1')) frozenset(('해리포터2', '반지의제왕1')) 0.36 0.12 0.12 0.333 2.778 0.077 1.32 26 24 frozenset(('어벤져스', '식스센스')) frozenset(('스타워즈')) 0.16 0.28 0.12 0.75 2.679 0.075 2.88 27 25 frozenset(('어벤져스', '스타워즈')) frozenset(('식스센스')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(('식스센스', '스타워즈')) frozenset(('어벤져스', '스타워즈')) 0.12 0.48 0.12 1.00 2.083 0.062 inf 29 27 frozenset(('식스센스')) frozenset(('어벤져스', '스타워즈')) 0.28 0.28 0.12 0.429 1.531 <td>21</td> <td>19</td> <td>frozenset({'해리포터2', '해리포터1'})</td> <td>frozenset({'반지의제왕1'})</td> <td>0.20</td> <td>0.32</td> <td>0.12</td> <td>0.60</td> <td>1.875</td> <td>0.056</td> <td>1.70</td>	21	19	frozenset({'해리포터2', '해리포터1'})	frozenset({'반지의제왕1'})	0.20	0.32	0.12	0.60	1.875	0.056	1.70
24 22 frozenset(['반지의제왕1']) frozenset(['해리포터2', '해리포터1']) 0.32 0.20 0.12 0.375 1.875 0.056 1.28 25 23 frozenset(['해리포터1']) frozenset(['해리포터2', '반지의제왕1']) 0.36 0.12 0.12 0.333 2.778 0.077 1.32 26 24 frozenset(['어벤저스', '식스센스']) frozenset(['스타워즈']) 0.16 0.28 0.12 0.75 2.679 0.075 2.88 27 25 frozenset(['이벤저스', '스타워즈']) frozenset(['식스센스']) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(['식스센스', '스타워즈']) frozenset(['어벤저스']) 0.12 0.48 0.12 1.00 2.083 0.062 inf 29 27 frozenset(['식스센스']) frozenset(['어벤저스', '스타워즈']) 0.28 0.28 0.12 0.429 1.531 0.042 1.26	22	20	frozenset({'반지의제왕1', '해리포터1'})	frozenset({'해리포터2'})	0.16	0.20	0.12	0.75	3.75	0.088	3.20
25 23 frozenset(['해리포터1']) frozenset(['해리포터2', '반지의제왕1']) 0.36 0.12 0.12 0.333 2.778 0.077 1.32 26 24 frozenset(['어벤져스', '식스센스']) frozenset(['스타워즈']) 0.16 0.28 0.12 0.75 2.679 0.075 2.88 27 25 frozenset(['어벤져스', '스타워즈']) frozenset(['식스센스']) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(['식스센스', '스타워즈']) frozenset(['어벤져스']) 0.12 0.48 0.12 1.00 2.083 0.062 inf 29 27 frozenset(['식스센스']) frozenset(['어벤져스', '스타워즈']) 0.28 0.28 0.12 0.429 1.531 0.042 1.26	23	21	frozenset({'해리포터2'})	frozenset({'반지의제왕1', '해리포터1'})	0.20	0.16	0.12	0.60	3.75	0.088	2.10
26 24 frozenset(['어벤저스', '식스센스']) frozenset(['스타워즈']) 0.16 0.28 0.12 0.75 2.679 0.075 2.88 27 25 frozenset(['어벤저스', '스타워즈']) frozenset(['식스센스']) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(['식스센스', '스타워즈']) frozenset(['어벤저스']) 0.12 0.48 0.12 1.00 2.083 0.062 inf 29 27 frozenset(['식스센스']) frozenset(['어벤저스', '스타워즈']) 0.28 0.28 0.12 0.429 1.531 0.042 1.26	24	22	frozenset({'반지의제왕1'})	frozenset({'해리포터2', '해리포터1'})	0.32	0.20	0.12	0.375	1.875	0.056	1.28
27 25 frozenset(['어벤져스', '스타워즈']) frozenset(['식스센스']) 0.28 0.28 0.12 0.429 1.531 0.042 1.26 28 26 frozenset(['식스센스', '스타워즈']) frozenset(['어벤져스']) 0.12 0.48 0.12 1.00 2.083 0.062 inf 29 27 frozenset(['식스센스']) frozenset(['어벤져스', '스타워즈']) 0.28 0.28 0.12 0.429 1.531 0.042 1.26	25	23	frozenset({'해리포터1'})	frozenset({'해리포터2', '반지의제왕1'})	0.36	0.12	0.12	0.333	2.778	0.077	1.32
28 26 frozenset(('식스센스', '스타워즈')) frozenset(('어벤져스')) 0.12 0.48 0.12 1.00 2.083 0.062 inf 29 27 frozenset(('식스센스')) frozenset(('어벤져스', '스타워즈')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26	26	24	frozenset({'어벤져스', '식스센스'})	frozenset({'스타워즈'})	0.16	0.28	0.12	0.75	2.679	0.075	2.88
29 27 frozenset(('식스센스')) frozenset(('어벤져스', '스타워즈')) 0.28 0.28 0.12 0.429 1.531 0.042 1.26	27	25	frozenset({'어벤져스', '스타워즈'})	frozenset({'식스센스'})	0.28	0.28	0.12	0.429	1.531	0.042	1.26
	28	26	frozenset({'식스센스', '스타워즈'})	frozenset({'어벤져스'})	0.12	0.48	0.12	1.00	2.083	0.062	inf
30 28 frozenset(('스타워즈')) frozenset(('어벤져스', '식스센스')) 0.28 0.16 0.12 0.429 2.679 0.075 1.47	29	27	frozenset({'식스센스'})	frozenset({'어벤져스', '스타워즈'})	0.28	0.28	0.12	0.429	1.531	0.042	1.26
	30	28	frozenset({'스타워즈'})	frozenset({'어벤져스', '식스센스'})	0.28	0.16	0.12	0.429	2.679	0.075	1.47

이중에서 우리가 관심있는 Support, confidence, lift만 남긴다.

Support가 0.1이 넘고 confidence가 0.3이 넘는 자료만 있는 것을 확인 할 수 있다.

A	Α	В	С	D	E	F
1		antecedents(X)	consequents(Y)	Support	confidence	lift
2	0	frozenset({'반지의제왕1'})	frozenset({'반지의제왕2'})	0.20	0.625	3.125
3	1	frozenset({'반지의제왕2'})	frozenset({'반지의제왕1'})	0.20	1.00	3.125
4	2	frozenset({'반지의제왕1'})	frozenset({'해리포터1'})	0.16	0.50	1.389
5	3	frozenset({'해리포터1'})	frozenset({'반지의제왕1'})	0.16	0.444	1.389
6	4	frozenset({'해리포터2'})	frozenset({'반지의제왕1'})	0.12	0.60	1.875
7	5	frozenset({'반지의제왕1'})	frozenset({'해리포터2'})	0.12	0.375	1.875
8	6	frozenset({'식스센스'})	frozenset({'쇼생크탈출'})	0.12	0.429	1.531
9	7	frozenset({'쇼생크탈출'})	frozenset({'식스센스'})	0.12	0.429	1.531
10	8	frozenset({'식스센스'})	frozenset({'스타워즈'})	0.12	0.429	1.531
11	9	frozenset({'스타워즈'})	frozenset({'식스센스'})	0.12	0.429	1.531
12	10	frozenset({'어벤져스'})	frozenset({'스타워즈'})	0.28	0.583	2.083
13	11	frozenset({'스타워즈'})	frozenset({'어벤져스'})	0.28	1.00	2.083
14	12	frozenset({'어벤져스'})	frozenset({'식스센스'})	0.16	0.333	1.19
15	13	frozenset({'식스센스'})	frozenset({'어벤져스'})	0.16	0.571	1.19
16	14	frozenset({'아바타)	frozenset({'어벤져스'})	0.20	0.833	1.736
17	15	frozenset({'어벤져스'})	frozenset({'아바타'})	0.20	0.417	1.736
18	16	frozenset({'해리포터2'})	frozenset({'해리포터1'})	0.20	1.00	2.778
19	17	frozenset({'해리포터1'})	frozenset({'해리포터2'})	0.20	0.556	2.778
20	18	frozenset({'해리포터2', '반지의제왕1'})	frozenset({'해리포터1'})	0.12	1.00	2.778
21	19	frozenset({'해리포터2', '해리포터1'})	frozenset({'반지의제왕1'})	0.12	0.60	1.875
22	20	frozenset({'반지의제왕1', '해리포터1'})	frozenset({'해리포터2'})	0.12	0.75	3.75
23	21	frozenset({'해리포터2'})	frozenset({'반지의제왕1', '해리포터1'})	0.12	0.60	3.75
24	22	frozenset({'반지의제왕1'})	frozenset({'해리포터2', '해리포터1'})	0.12	0.375	1.875
25	23	frozenset({'해리포터1'})	frozenset({'해리포터2', '반지의제왕1'})	0.12	0.333	2.778
26	24	frozenset({'어벤져스', '식스센스'})	frozenset({'스타워즈'})	0.12	0.75	2.679
27	25	frozenset({'어벤져스', '스타워즈'})	frozenset({'식스센스'})	0.12	0.429	1.531
28	26	frozenset({'식스센스', '스타워즈'})	frozenset({'어벤져스'})	0.12	1.00	2.083
29	27	frozenset({'식스센스'})	frozenset({'어벤져스', '스타워즈'})	0.12	0.429	1.531
30	28	frozenset({'스타워즈'})	frozenset({'어벤져스', '식스센스'})	0.12	0.429	2.679

Lift를 내림차순으로 정리해보면 <결과 표>를 얻을 수 있다

Α	В	С	D
~	antecedents(X)	consequents(Y)	lift ↓↓
20	frozenset({'반지의제왕1', '해리포터1'})	frozenset({'해리포터2'})	3.75
21	frozenset({'해리포터2'})	frozenset({'반지의제왕1', '해리포터1'})	3.75
0	frozenset({'반지의제왕1'})	frozenset({'반지의제왕2'})	3.125
1	frozenset({'반지의제왕2'})	frozenset({'반지의제왕1'})	3.125
16	frozenset({'해리포터2'})	frozenset({'해리포터1'})	2.778
17	frozenset({'해리포터1'})	frozenset({'해리포터2'})	2.778
18	frozenset({'해리포터2', '반지의제왕1'})	frozenset({'해리포터1'})	2.778
23	frozenset({'해리포터1'})	frozenset({'해리포터2', '반지의제왕1'})	2.778
24	frozenset({'어벤져스', '식스센스'})	frozenset({'스타워즈'})	2.679
28	frozenset({'스타워즈'})	frozenset({'어벤져스', '식스센스'})	2.679
10	frozenset({'어벤져스'})	frozenset({'스타워즈'})	2.083
11	frozenset({'스타워즈'})	frozenset({'어벤져스'})	2.083
26	frozenset({'식스센스', '스타워즈'})	frozenset({'어벤져스'})	2.083
4	frozenset({'해리포터2'})	frozenset({'반지의제왕1'})	1.875
5	frozenset({'반지의제왕1'})	frozenset({'해리포터2'})	1.875
19	frozenset({'해리포터2', '해리포터1'})	frozenset({'반지의제왕1'})	1.875
22	frozenset({'반지의제왕1'})	frozenset({'해리포터2', '해리포터1'})	1.875
14	frozenset({'아바타'})	frozenset({'어벤져스'})	1.736
15	frozenset({'어벤져스'})	frozenset({'아바타'})	1.736
6	frozenset({'식스센스'})	frozenset({'쇼생크탈출'})	1.531
7	frozenset({'쇼생크탈출'})	frozenset({'식스센스'})	1.531
8	frozenset({'식스센스'})	frozenset({'스타워즈'})	1.531
9	frozenset({'스타워즈'})	frozenset({'식스센스'})	1.531
25	frozenset({'어벤져스', '스타워즈'})	frozenset({'식스센스'})	1.531
27	frozenset({'식스센스'})	frozenset({'어벤져스', '스타워즈'})	1.531
2	frozenset({'반지의제왕1'})	frozenset({'해리포터1'})	1.389
3	frozenset({'해리포터1'})	frozenset({'반지의제왕1'})	1.389
12	frozenset({'어벤져스'})	frozenset({'식스센스'})	1.19
13	frozenset({'식스센스'})	frozenset({'어벤져스'})	1.19

<결과 표>

29개의 데이터 모두 lift 값이 1이 넘으므로

X의 itemset과 Y의 itemset이 positively correlated(양의 상관관계)를 갖는다.

<결과 표>에 있는 모든 itemset X는 support 값이 0.1을 넘고 confidence는0.3을 넘고 lift값은 1 이 넘는다.

따라서, 모든 <결과 표>에 있는 itemset X를 대여하는 고객에게 itemset Y를 추천해 줄 수 있다.

Ex) 반지의제왕1, 해리포터1 대여하는 고객에게 해리포터2를 추천해준다.