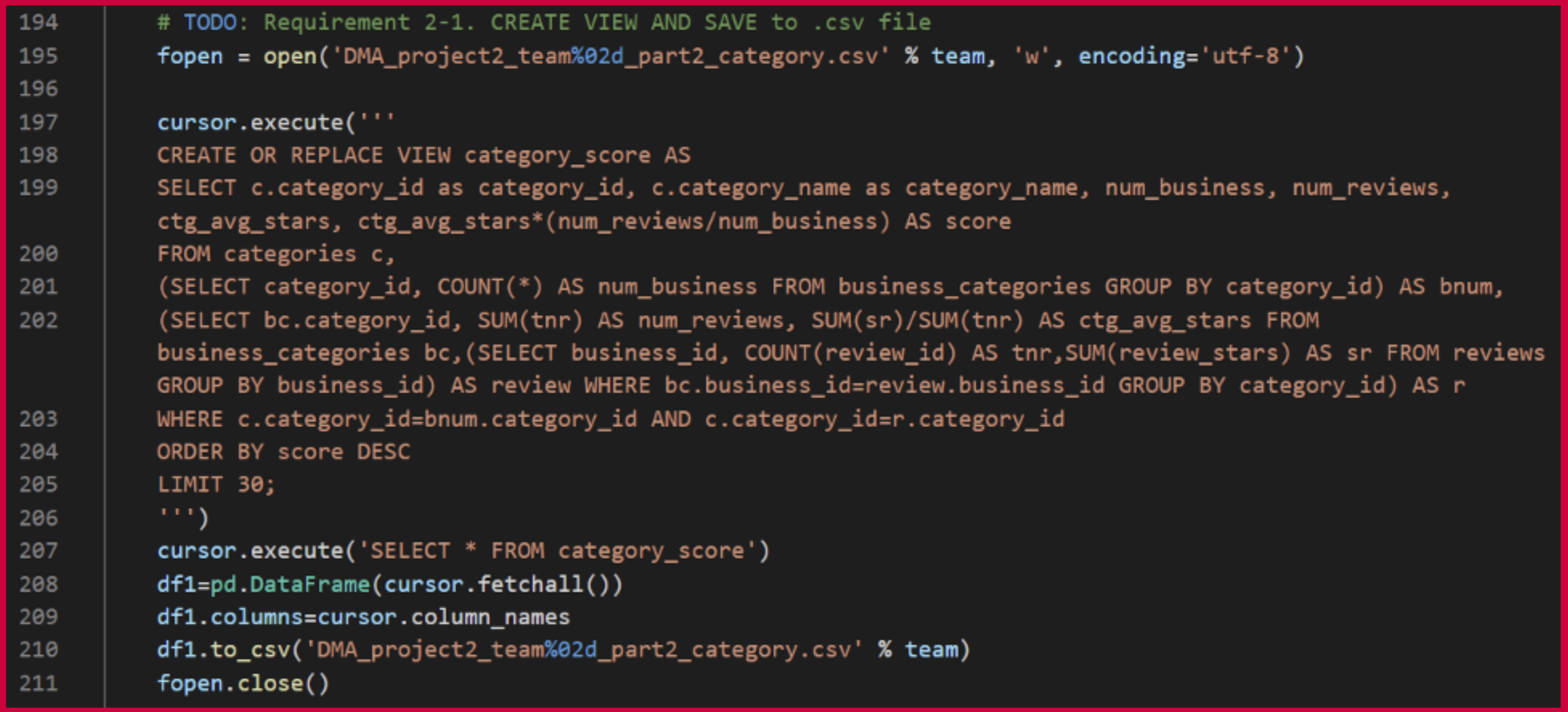
PART II
연관분석

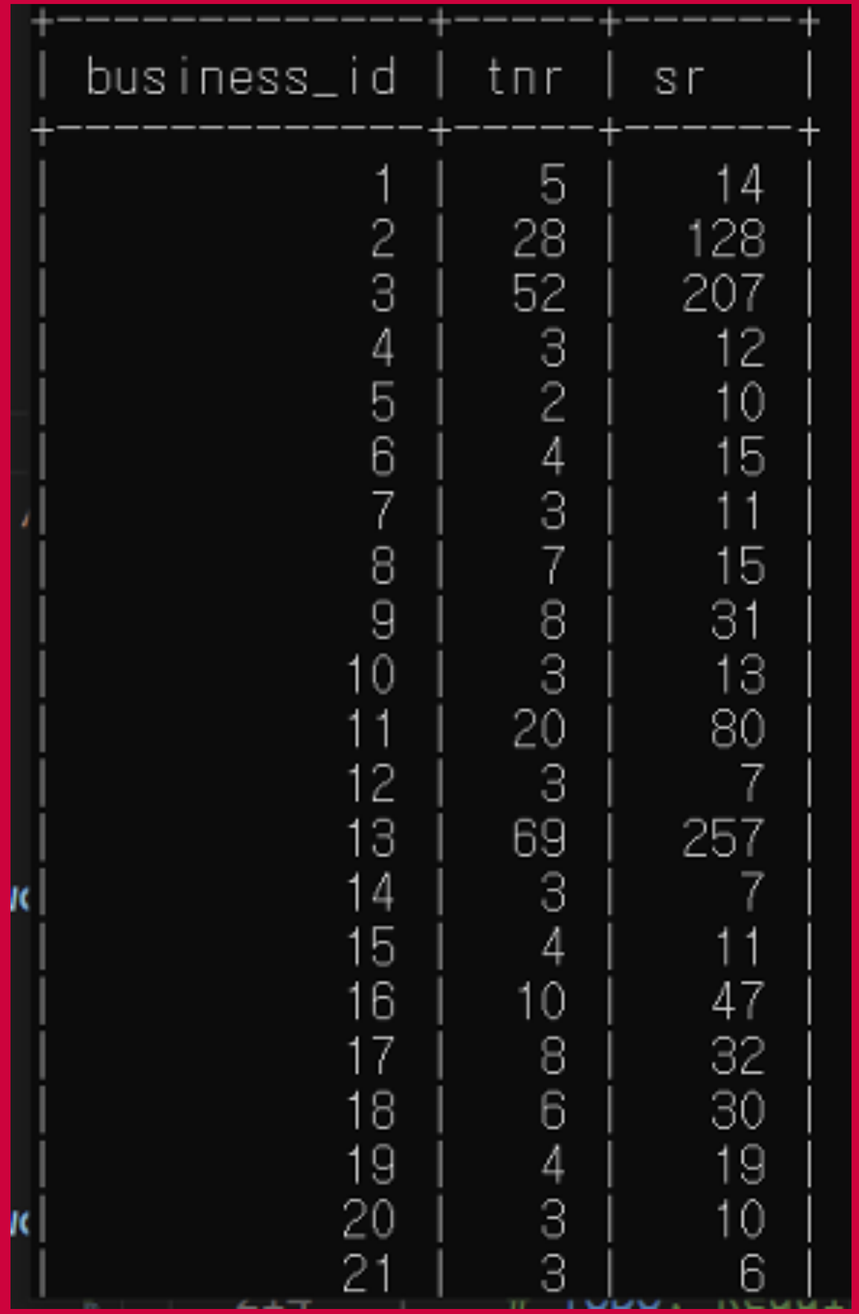
Requirement 2-1

View 'category_score' & category.csv



```
    # TODO: Requirement 2-1. CREATE VIEW AND SAVE to .csv file
    fopen = open('DMA_project2_team%02d_part2_category.csv' % team, 'w', encoding='utf-8')

    cursor.execute('''
    CREATE OR REPLACE VIEW category_score AS
    SELECT c.category_id as category_id, c.category_name as category_name, num_business, num_reviews,
    ctg_avg_stars, ctg_avg_stars*(num_reviews/num_business) AS score
    FROM categories c,
    (SELECT category_id, COUNT(*) AS num_business FROM business_categories GROUP BY category_id) AS bnum,
    (SELECT bc.category_id, SUM(tnr) AS num_reviews, SUM(sr)/SUM(tnr) AS ctg_avg_stars FROM
    business_categories bc,(SELECT business_id, COUNT(review_id) AS tnr,SUM(review_stars) AS sr FROM reviews
    GROUP BY business_id) AS review WHERE bc.business_id=review.business_id GROUP BY category_id) AS r
    WHERE c.category_id=bnum.category_id AND c.category_id=r.category_id
    ORDER BY score DESC
    LIMIT 30;
    ''')
    cursor.execute('SELECT * FROM category_score')
    df1=pd.DataFrame(cursor.fetchall())
    df1.columns=cursor.column_names
    df1.to_csv('DMA_project2_team%02d_part2_category.csv' % team)
    fopen.close()
```

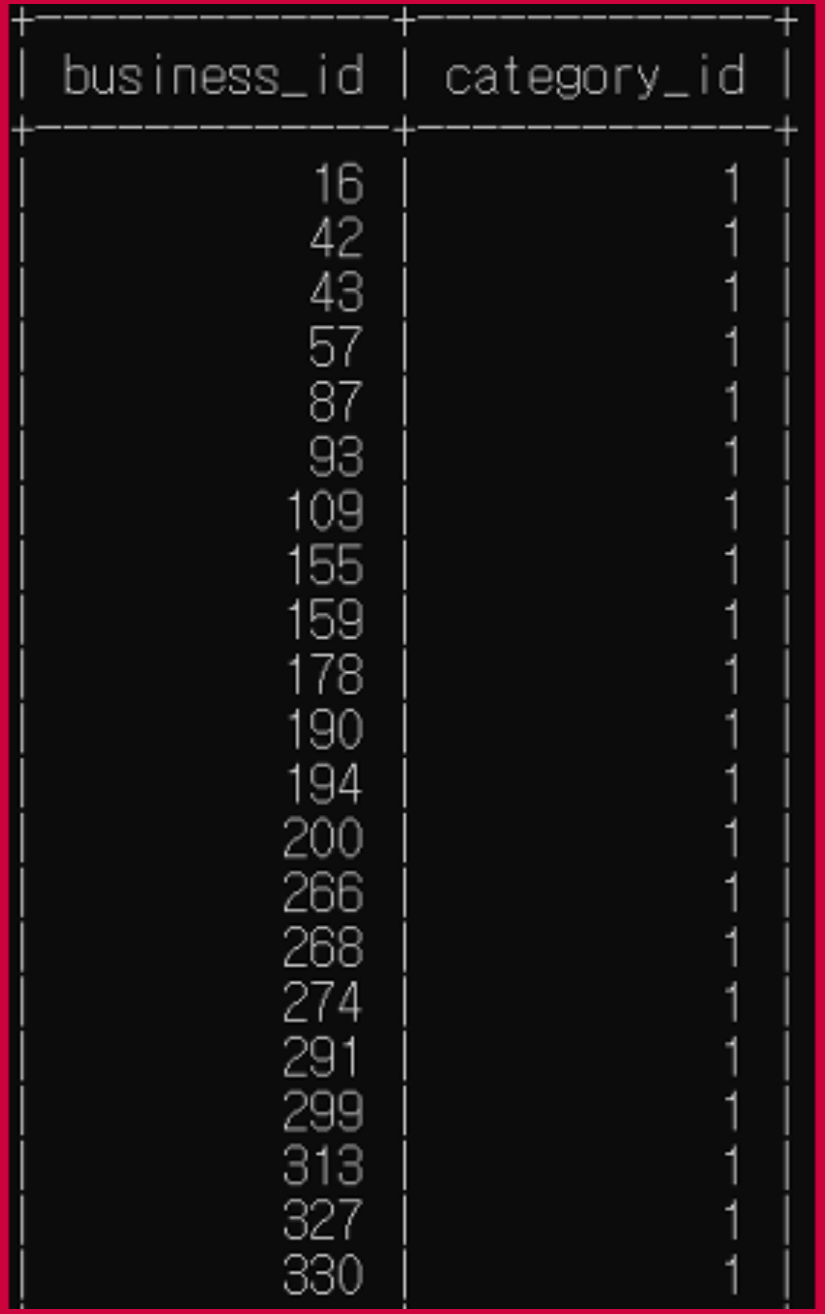
{



business_id	tnr	sr
1	5	14
2	28	128
3	52	207
4	3	12
5	2	10
6	4	15
7	3	11
8	7	15
9	8	31
10	3	13
11	20	80
12	3	7
13	69	257
14	3	7
15	4	11
16	10	47
17	8	32
18	6	30
19	4	19
20	3	10
21	3	6

서브쿼리 review

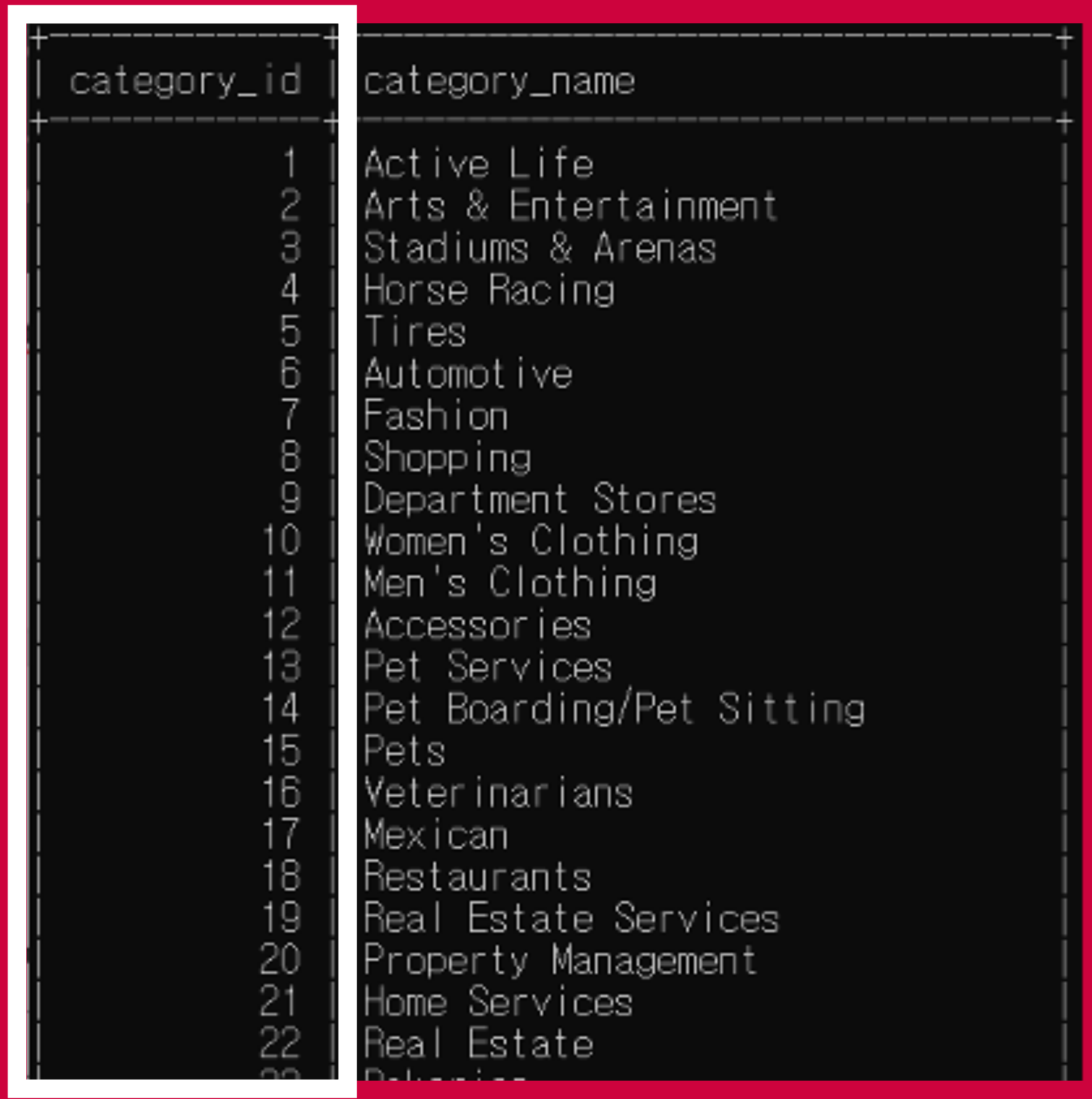
+



business_id	category_id
16	1
42	1
43	1
57	1
87	1
93	1
109	1
155	1
159	1
178	1
190	1
194	1
200	1
266	1
268	1
274	1
291	1
299	1
313	1
327	1
330	1

Business categories

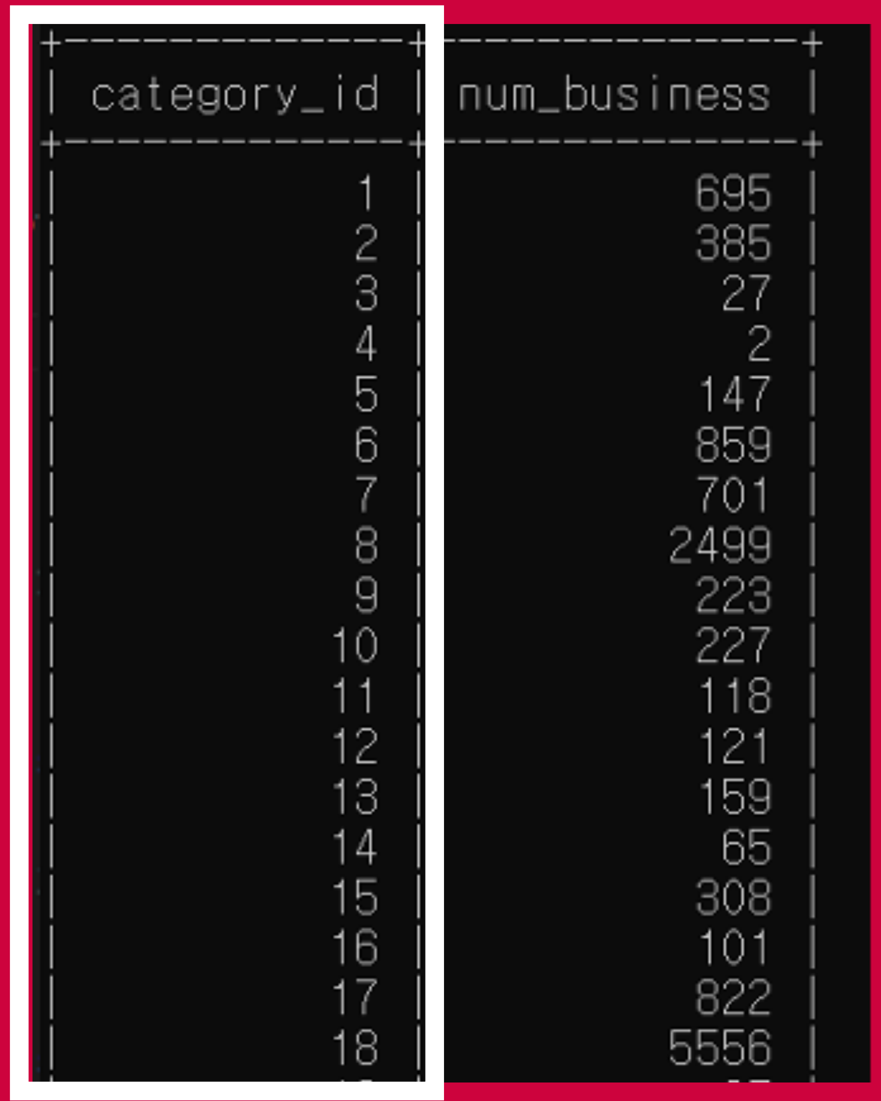
}



category_id	category_name
1	Active Life
2	Arts & Entertainment
3	Stadiums & Arenas
4	Horse Racing
5	Tires
6	Automotive
7	Fashion
8	Shopping
9	Department Stores
10	Women's Clothing
11	Men's Clothing
12	Accessories
13	Pet Services
14	Pet Boarding/Pet Sitting
15	Pets
16	Veterinarians
17	Mexican
18	Restaurants
19	Real Estate Services
20	Property Management
21	Home Services
22	Real Estate

categories

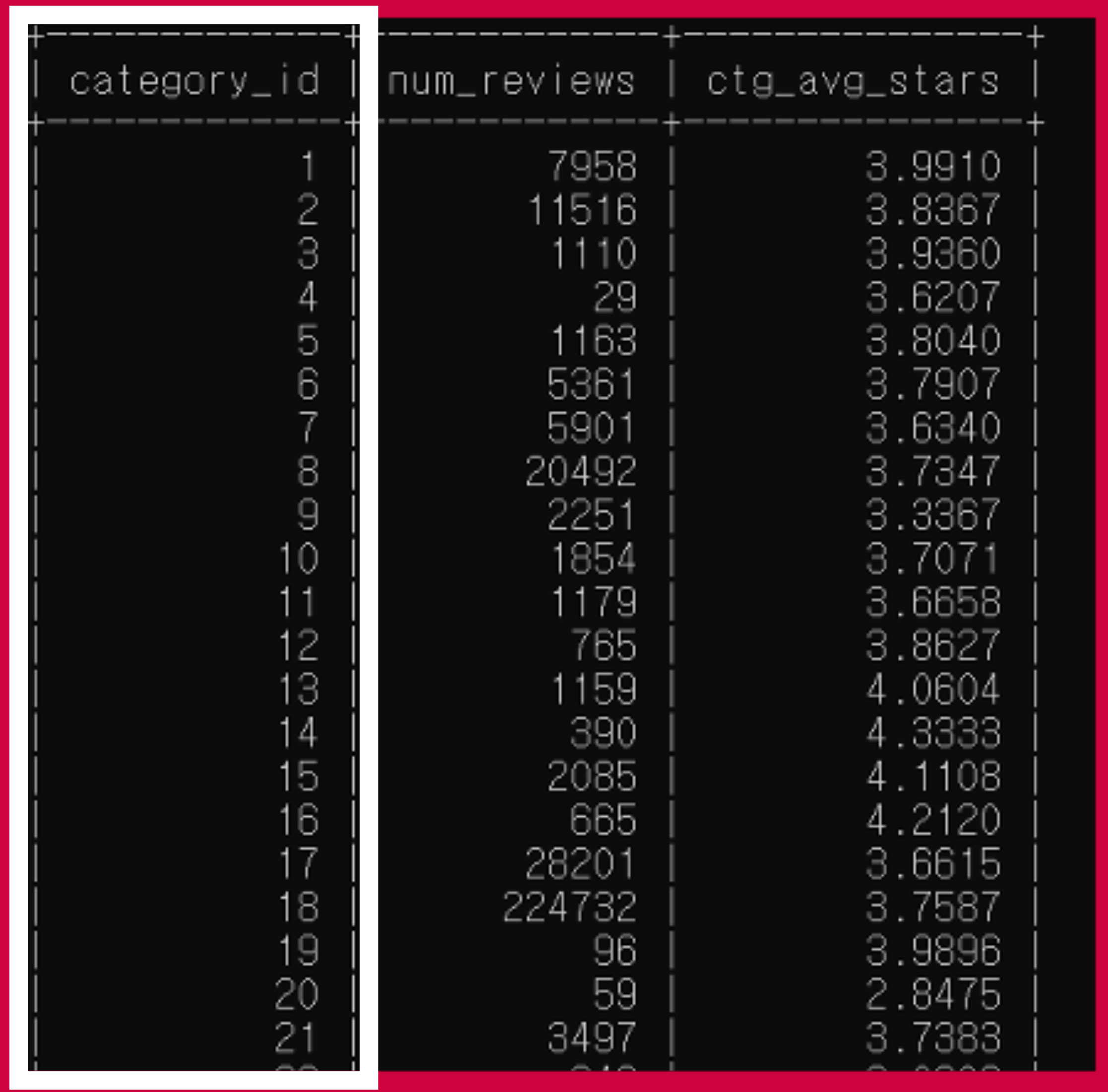
+



category_id	num_business
1	695
2	385
3	27
4	2
5	147
6	859
7	701
8	2499
9	223
10	227
11	118
12	121
13	159
14	65
15	308
16	101
17	822
18	5556

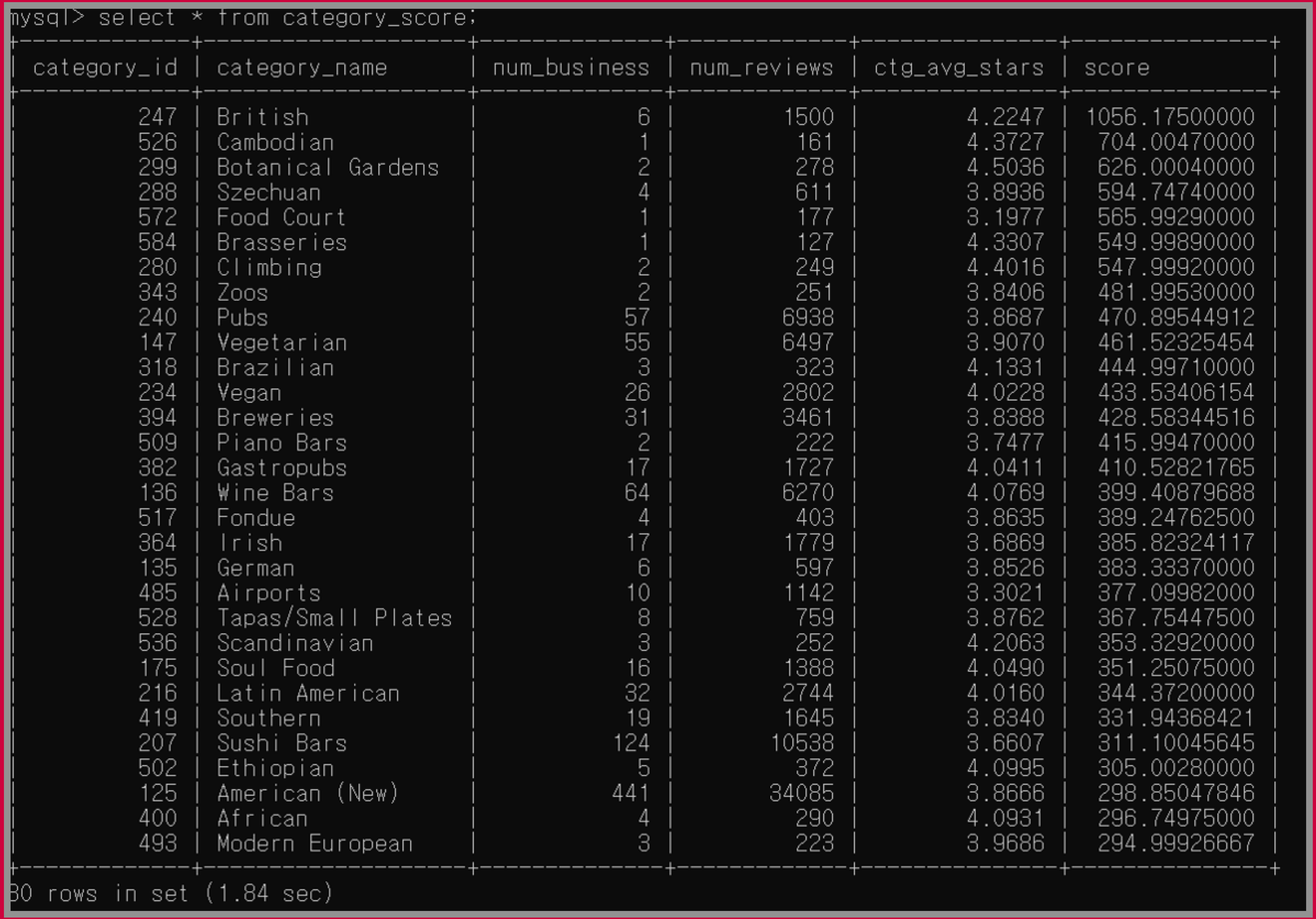
서브쿼리 bnum

+



category_id	num_reviews	ctg_avg_stars
1	7958	3.9910
2	11516	3.8367
3	1110	3.9360
4	29	3.6207
5	1163	3.8040
6	5361	3.7907
7	5901	3.6340
8	20492	3.7347
9	2251	3.3367
10	1854	3.7071
11	1179	3.6658
12	765	3.8627
13	1159	4.0604
14	390	4.3333
15	2085	4.1108
16	665	4.2120
17	28201	3.6615
18	224732	3.7587
19	96	3.9896
20	59	2.8475
21	3497	3.7383

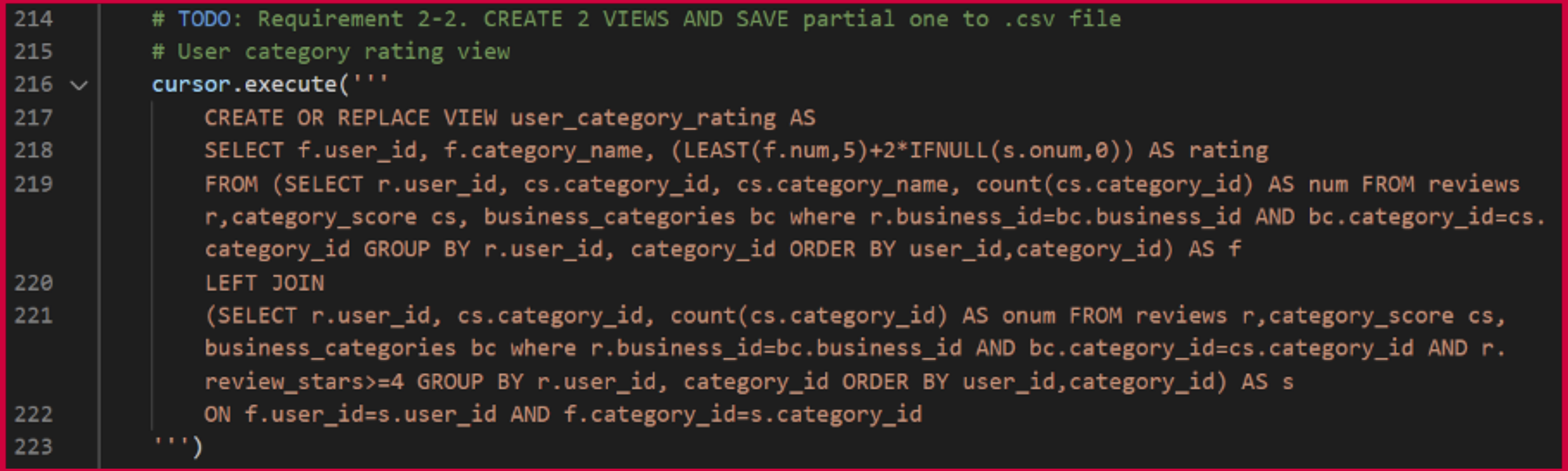
서브쿼리 r



```
mysql> select * from category_score;
+-------------+--------------------+--------------+-------------+---------------+---------------+
| category_id | category_name      | num_business | num_reviews | ctg_avg_stars | score         |
+-------------+--------------------+--------------+-------------+---------------+---------------+
|         247 | British            |            6 |        1500 |        4.2247 | 1056.17500000 |
|         526 | Cambodian          |            1 |         161 |        4.3727 |  704.00470000 |
|         299 | Botanical Gardens  |            2 |         278 |        4.5036 |  626.00040000 |
|         288 | Szechuan           |            4 |         611 |        3.8936 |  594.74740000 |
|         572 | Food Court         |            1 |         177 |        3.1977 |  565.99290000 |
|         584 | Brasseries         |            1 |         127 |        4.3307 |  549.99890000 |
|         280 | Climbing           |            2 |         249 |        4.4016 |  547.99920000 |
|         343 | Zoos               |            2 |         251 |        3.8406 |  481.99530000 |
|         240 | Pubs               |           57 |        6938 |        3.8687 |  470.89544912 |
|         147 | Vegetarian         |           55 |        6497 |        3.9070 |  461.52325454 |
|         318 | Brazilian          |            3 |         323 |        4.1331 |  444.99710000 |
|         234 | Vegan              |           26 |        2802 |        4.0228 |  433.53406154 |
|         394 | Breweries          |           31 |        3461 |        3.8388 |  428.58344516 |
|         509 | Piano Bars         |            2 |         222 |        3.7477 |  415.99470000 |
|         382 | Gastropubs         |           17 |        1727 |        4.0411 |  410.52821765 |
|         136 | Wine Bars          |           64 |        6270 |        4.0769 |  399.40879688 |
|         517 | Fondue             |            4 |         403 |        3.8635 |  389.24762500 |
|         364 | Irish              |           17 |        1779 |        3.6869 |  385.82324117 |
|         135 | German             |            6 |         597 |        3.8526 |  383.33370000 |
|         485 | Airports           |           10 |        1142 |        3.3021 |  377.09982000 |
|         528 | Tapas/Small Plates |            8 |         759 |        3.8762 |  367.75447500 |
|         536 | Scandinavian       |            3 |         252 |        4.2063 |  353.32920000 |
|         175 | Soul Food          |           16 |        1388 |        4.0490 |  351.25075000 |
|         216 | Latin American     |           32 |        2744 |        4.0160 |  344.37200000 |
|         419 | Southern           |           19 |        1645 |        3.8340 |  331.94368421 |
|         207 | Sushi Bars         |          124 |       10538 |        3.6607 |  311.10045645 |
|         502 | Ethiopian          |            5 |         372 |        4.0995 |  305.00280000 |
|         125 | American (New)     |          441 |       34085 |        3.8666 |  298.85047846 |
|         400 | African            |            4 |         290 |        4.0931 |  296.74975000 |
|         493 | Modern European    |            3 |         223 |        3.9686 |  294.99926667 |
+-------------+--------------------+--------------+-------------+---------------+---------------+
30 rows in set (1.84 sec)
```

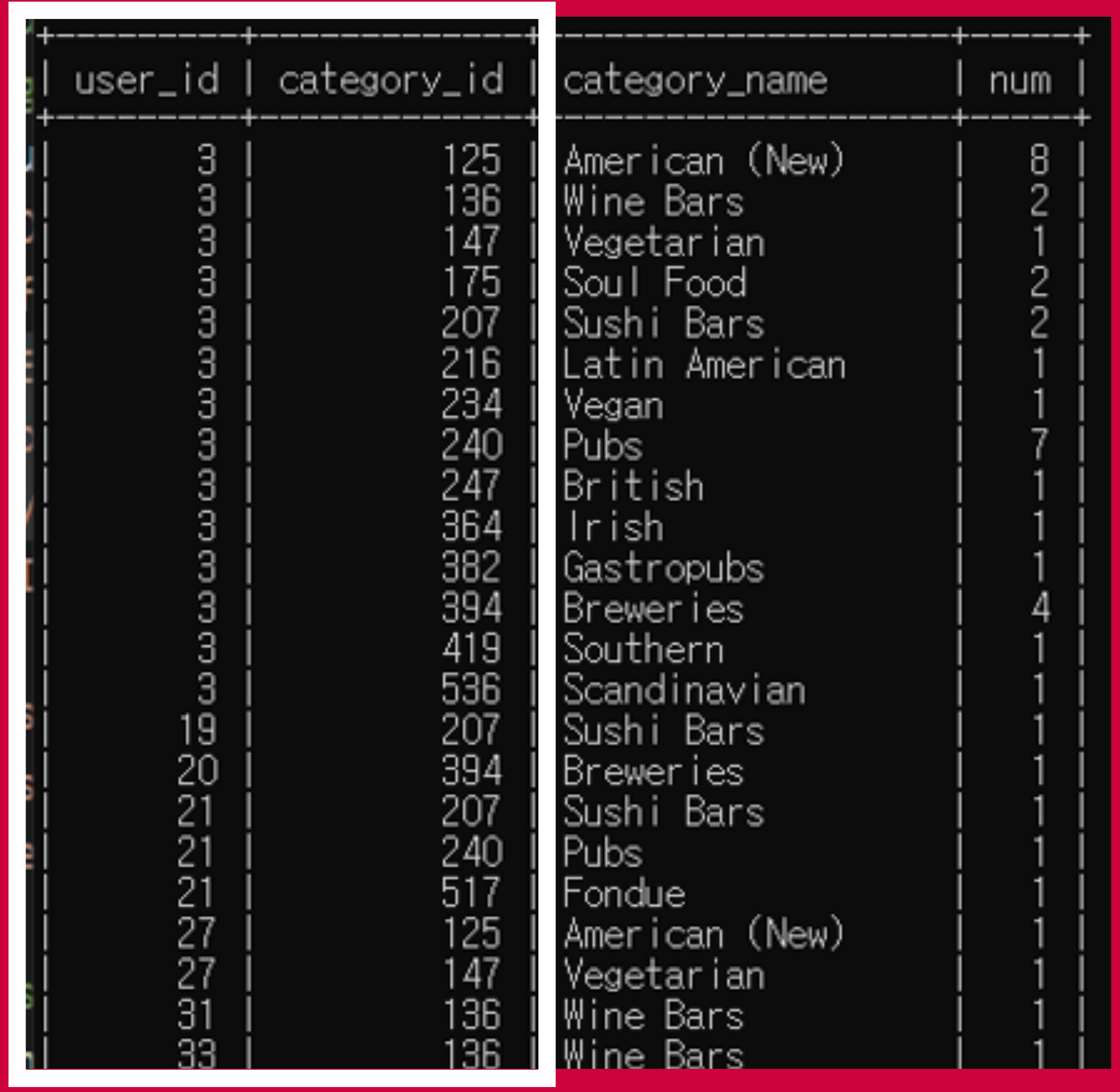
Requirement 2-2.1

View ‘user_category_rating’



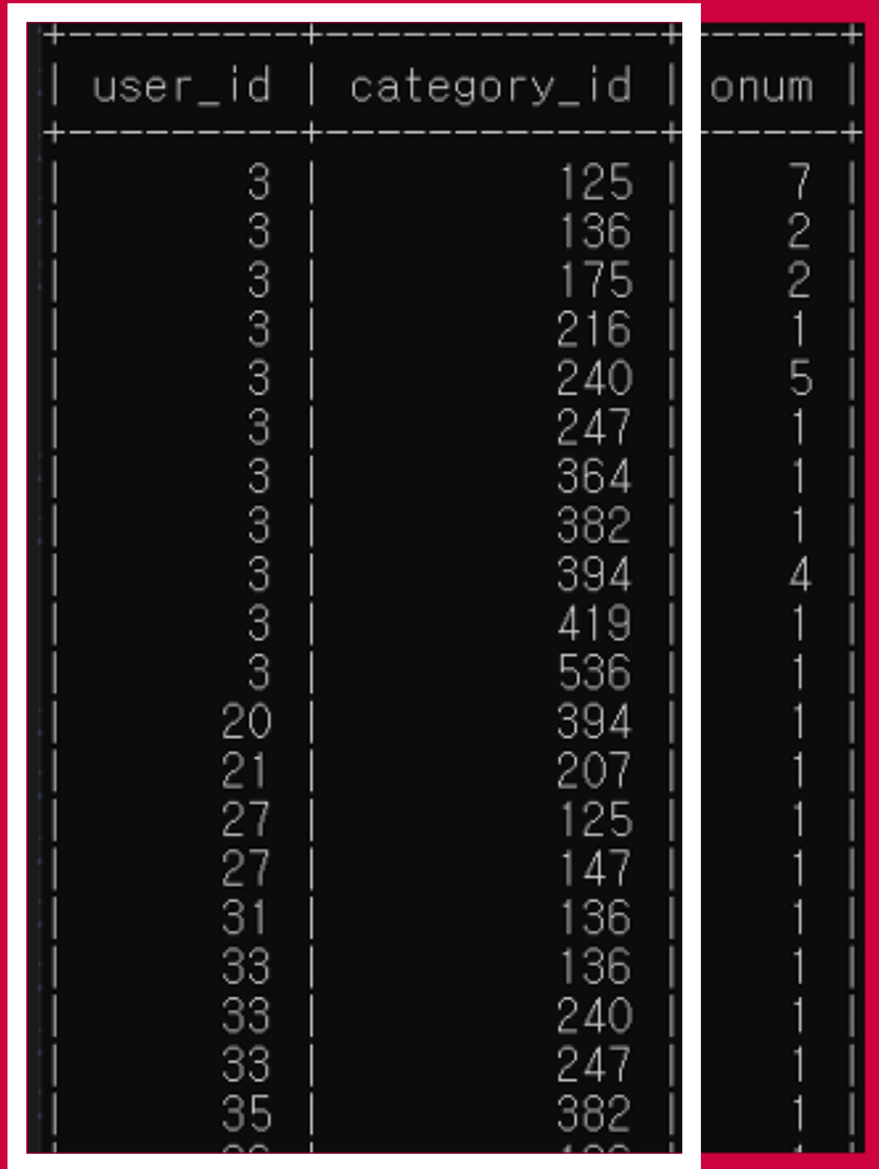
```
    # TODO: Requirement 2-2. CREATE 2 VIEWS AND SAVE partial one to .csv file
    # User category rating view
    cursor.execute('''
        CREATE OR REPLACE VIEW user_category_rating AS
        SELECT f.user_id, f.category_name, (LEAST(f.num,5)+2*IFNULL(s.onum,0)) AS rating
        FROM (SELECT r.user_id, cs.category_id, cs.category_name, count(cs.category_id) AS num FROM reviews
        r,category_score cs, business_categories bc where r.business_id=bc.business_id AND bc.category_id=cs.
        category_id GROUP BY r.user_id, category_id ORDER BY user_id,category_id) AS f
        LEFT JOIN
        (SELECT r.user_id, cs.category_id, count(cs.category_id) AS onum FROM reviews r,category_score cs,
        business_categories bc where r.business_id=bc.business_id AND bc.category_id=cs.category_id AND r.
        review_stars>=4 GROUP BY r.user_id, category_id ORDER BY user_id,category_id) AS s
        ON f.user_id=s.user_id AND f.category_id=s.category_id
    ''')
```

서브쿼리 f   (LEFT JOIN)   서브쿼리 s

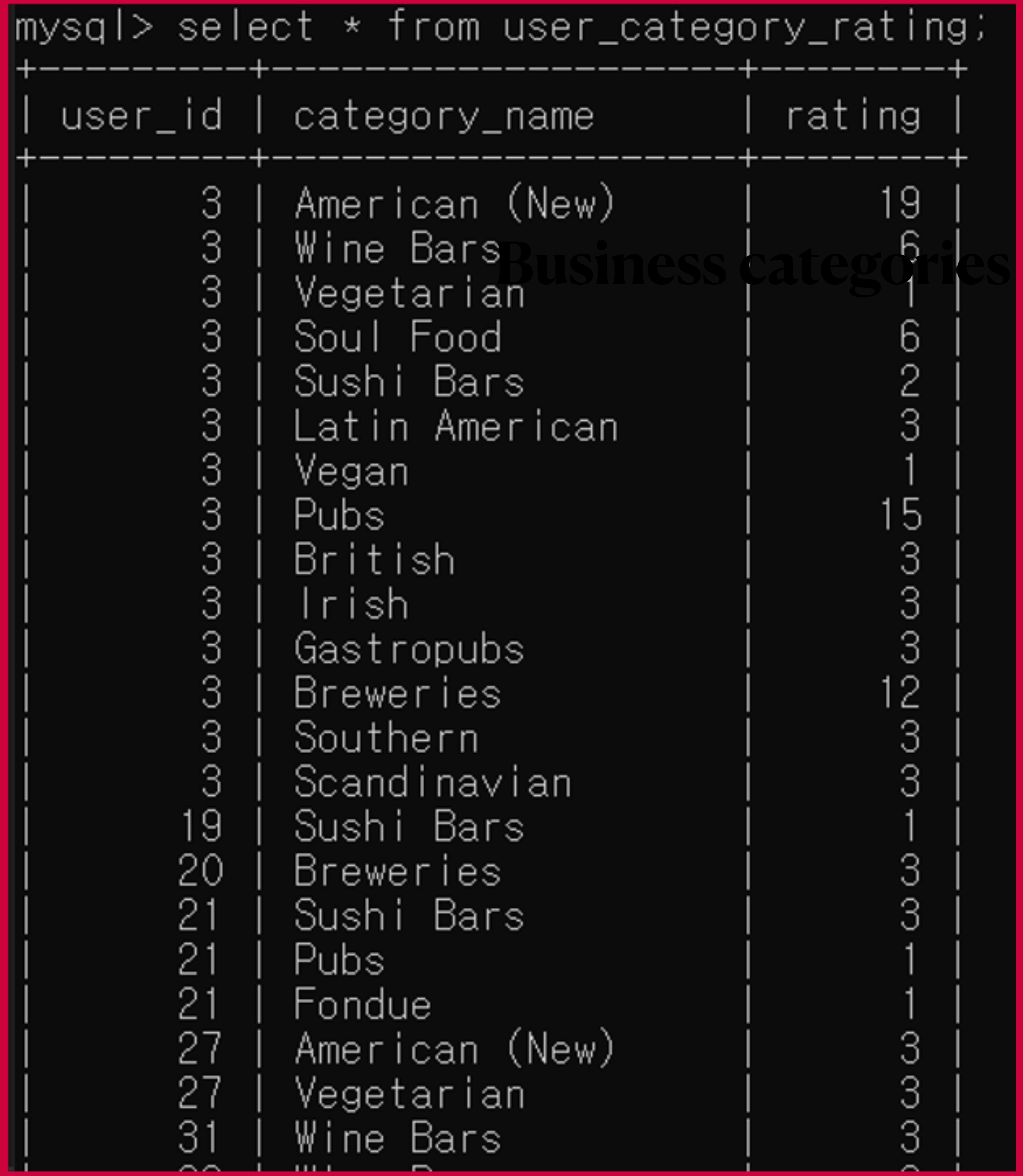


```
+---------+-------------+---------------------+------+
| user_id | category_id | category_name       | num  |
+---------+-------------+---------------------+------+
|       3 |         125 | American (New)      |    8 |
|       3 |         136 | Wine Bars           |    2 |
|       3 |         147 | Vegetarian          |    1 |
|       3 |         175 | Soul Food           |    2 |
|       3 |         207 | Sushi Bars          |    2 |
|       3 |         216 | Latin American      |    1 |
|       3 |         234 | Vegan               |    1 |
|       3 |         240 | Pubs                |    7 |
|       3 |         247 | British             |    1 |
|       3 |         364 | Irish               |    1 |
|       3 |         382 | Gastropubs          |    1 |
|       3 |         394 | Breweries           |    4 |
|       3 |         419 | Southern            |    1 |
|       3 |         536 | Scandinavian        |    1 |
|      19 |         207 | Sushi Bars          |    1 |
|      20 |         394 | Breweries           |    1 |
|      21 |         207 | Sushi Bars          |    1 |
|      21 |         240 | Pubs                |    1 |
|      21 |         517 | Fondue              |    1 |
|      27 |         125 | American (New)      |    1 |
|      27 |         147 | Vegetarian          |    1 |
|      31 |         136 | Wine Bars           |    1 |
|      33 |         136 | Wine Bars           |    1 |
```

+



```
+---------+-------------+------+
| user_id | category_id | onum |
+---------+-------------+------+
|       3 |         125 |    7 |
|       3 |         136 |    2 |
|       3 |         175 |    2 |
|       3 |         216 |    1 |
|       3 |         240 |    5 |
|       3 |         247 |    1 |
|       3 |         364 |    1 |
|       3 |         382 |    1 |
|       3 |         394 |    4 |
|       3 |         419 |    1 |
|       3 |         536 |    1 |
|      20 |         394 |    1 |
|      21 |         207 |    1 |
|      27 |         125 |    1 |
|      27 |         147 |    1 |
|      31 |         136 |    1 |
|      33 |         136 |    1 |
|      33 |         240 |    1 |
|      33 |         247 |    1 |
|      35 |         382 |    1 |
```

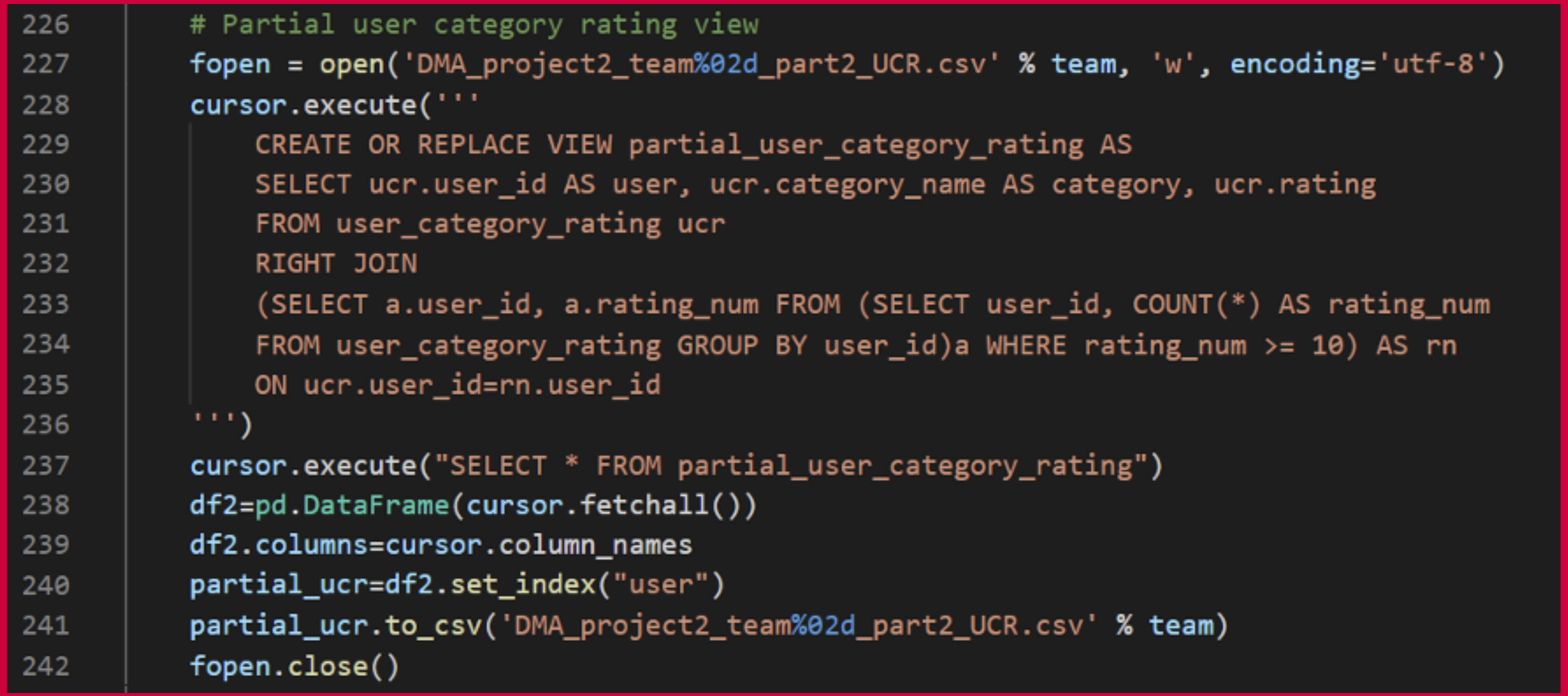


```
mysql> select * from user_category_rating;
+---------+---------------------+--------+
| user_id | category_name       | rating |
+---------+---------------------+--------+
|       3 | American (New)      |     19 |
|       3 | Wine Bars           |      6 |
|       3 | Vegetarian          |      1 |
|       3 | Soul Food           |      6 |
|       3 | Sushi Bars          |      2 |
|       3 | Latin American      |      3 |
|       3 | Vegan               |      1 |
|       3 | Pubs                |     15 |
|       3 | British             |      3 |
|       3 | Irish               |      3 |
|       3 | Gastropubs          |      3 |
|       3 | Breweries           |     12 |
|       3 | Southern            |      3 |
|       3 | Scandinavian        |      3 |
|      19 | Sushi Bars          |      1 |
|      20 | Breweries           |      3 |
|      21 | Sushi Bars          |      3 |
|      21 | Pubs                |      1 |
|      21 | Fondue              |      1 |
|      27 | American (New)      |      3 |
|      27 | Vegetarian          |      3 |
|      31 | Wine Bars           |      3 |
```

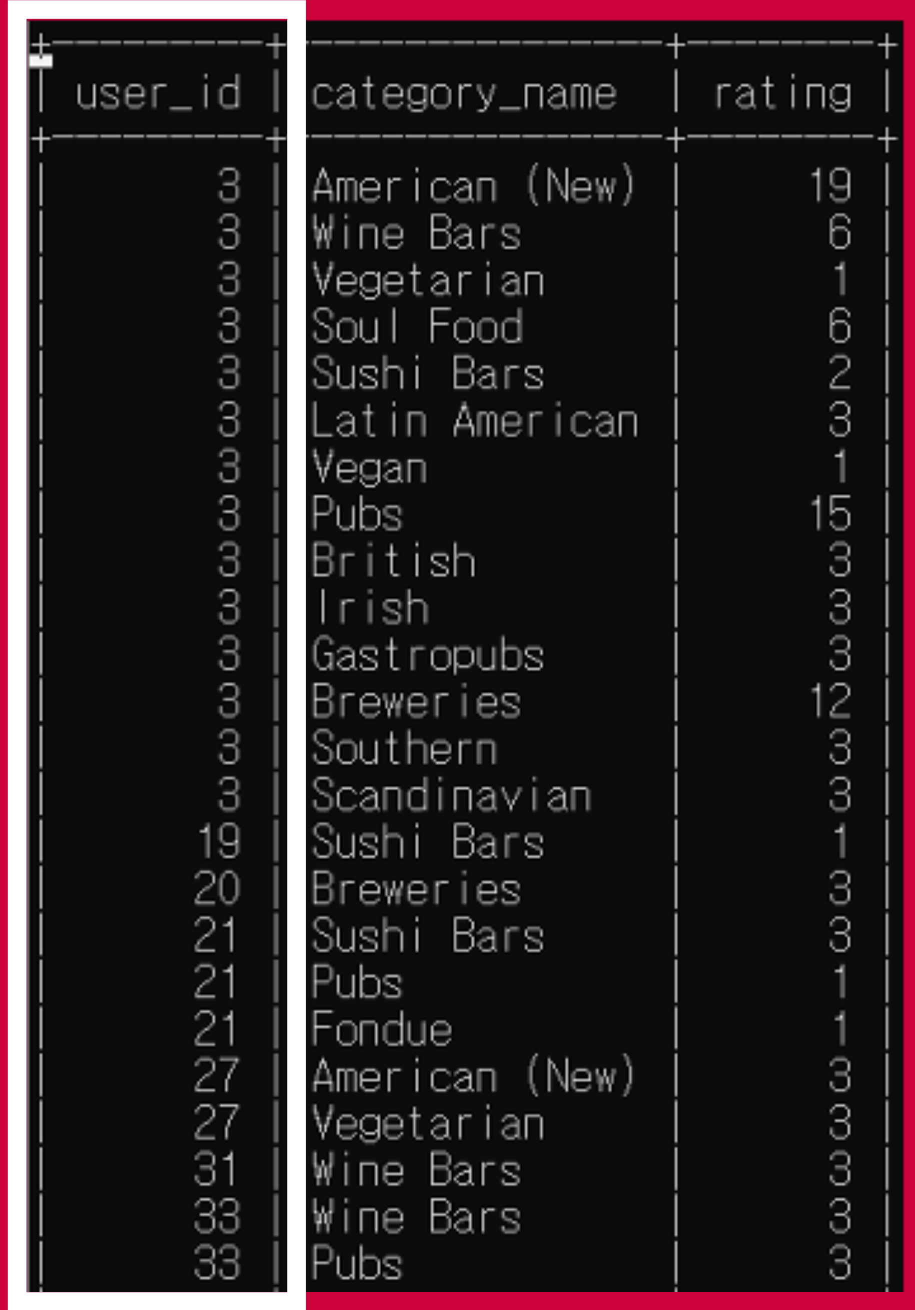
Business categories

Requirement 2-2.2

View & csv ’partial_user_category_rating’



```python
# Partial user category rating view
fopen = open('DMA_project2_team%02d_part2_UCR.csv' % team, 'w', encoding='utf-8')
cursor.execute('''
    CREATE OR REPLACE VIEW partial_user_category_rating AS
    SELECT ucr.user_id AS user, ucr.category_name AS category, ucr.rating
    FROM user_category_rating ucr
    RIGHT JOIN
    (SELECT a.user_id, a.rating_num FROM (SELECT user_id, COUNT(*) AS rating_num
    FROM user_category_rating GROUP BY user_id)a WHERE rating_num >= 10) AS rn
    ON ucr.user_id=rn.user_id
''')
cursor.execute("SELECT * FROM partial_user_category_rating")
df2=pd.DataFrame(cursor.fetchall())
df2.columns=cursor.column_names
partial_ucr=df2.set_index("user")
partial_ucr.to_csv('DMA_project2_team%02d_part2_UCR.csv' % team)
fopen.close()
```

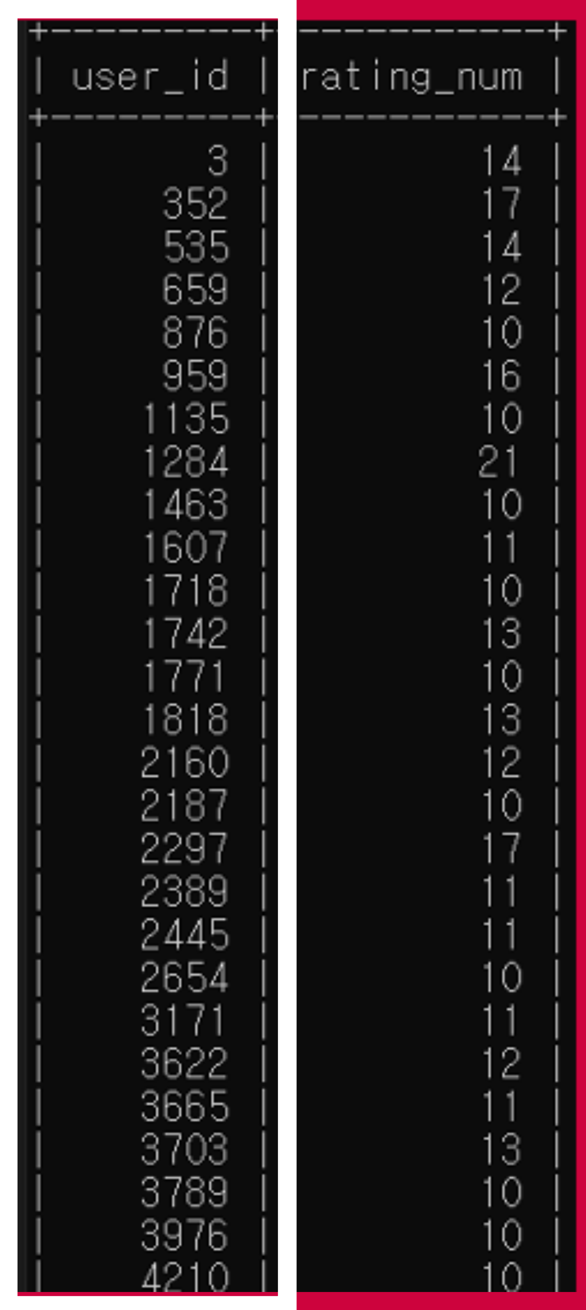


```
+---------+-------------------+--------+
| user_id | category_name     | rating |
+---------+-------------------+--------+
|       3 | American (New)    |     19 |
|       3 | Wine Bars         |      6 |
|       3 | Vegetarian        |      1 |
|       3 | Soul Food         |      6 |
|       3 | Sushi Bars        |      2 |
|       3 | Latin American    |      3 |
|       3 | Vegan             |      1 |
|       3 | Pubs              |     15 |
|       3 | British           |      3 |
|       3 | Irish             |      3 |
|       3 | Gastropubs        |      3 |
|       3 | Breweries         |     12 |
|       3 | Southern          |      3 |
|       3 | Scandinavian      |      3 |
|      19 | Sushi Bars        |      1 |
|      20 | Breweries         |      3 |
|      21 | Sushi Bars        |      3 |
|      21 | Pubs              |      1 |
|      21 | Fondue            |      1 |
|      27 | American (New)    |      3 |
|      27 | Vegetarian        |      3 |
|      31 | Wine Bars         |      3 |
|      33 | Wine Bars         |      3 |
|      33 | Pubs              |      3 |
```

View ‘user_category_rating’

(RIGHT JOIN)

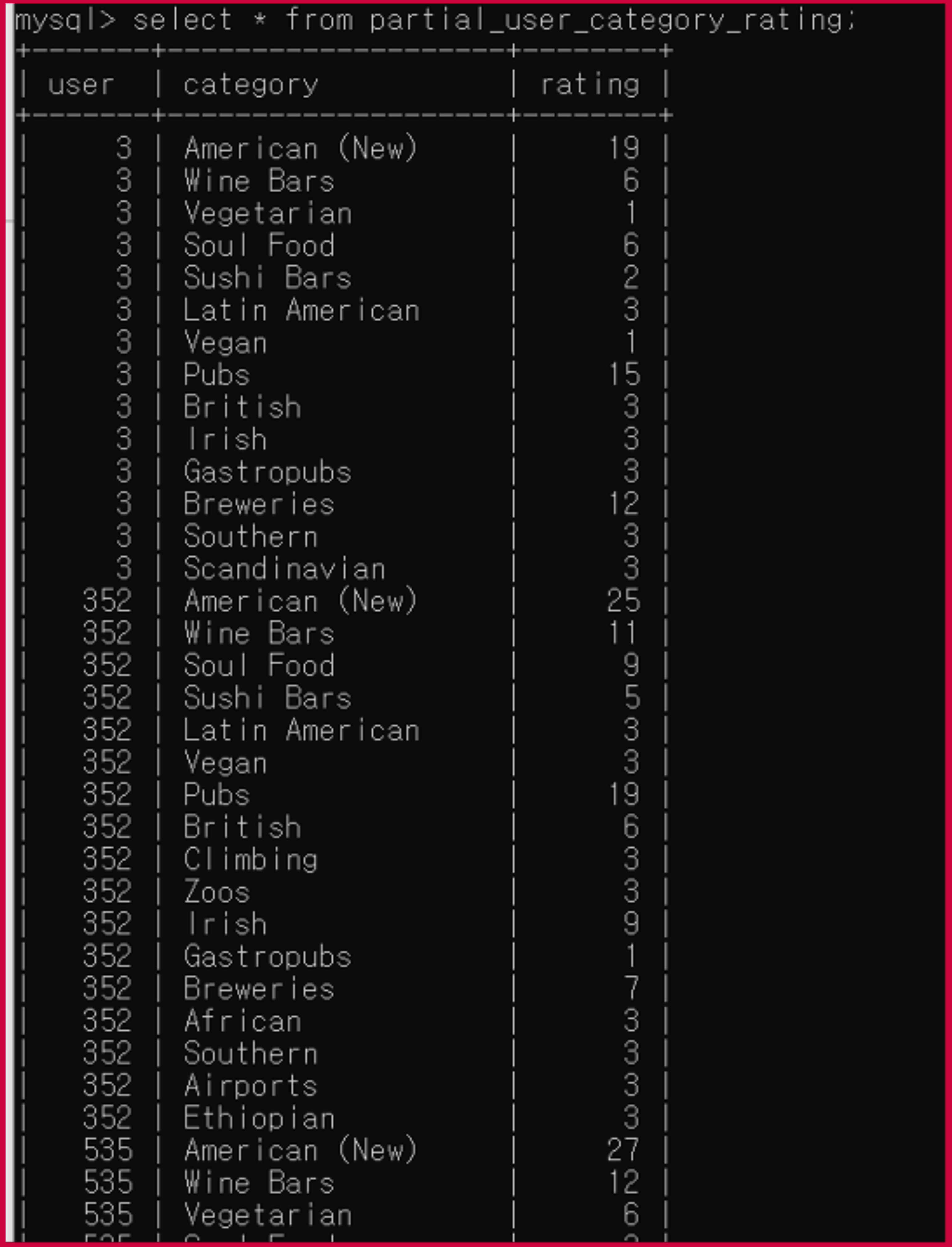
+



```
+---------+------------+
| user_id | rating_num |
+---------+------------+
|       3 |         14 |
|     352 |         17 |
|     535 |         14 |
|     659 |         12 |
|     876 |         10 |
|     959 |         16 |
|    1135 |         10 |
|    1284 |         21 |
|    1463 |         10 |
|    1607 |         11 |
|    1718 |         10 |
|    1742 |         13 |
|    1771 |         10 |
|    1818 |         13 |
|    2160 |         12 |
|    2187 |         10 |
|    2297 |         17 |
|    2389 |         11 |
|    2445 |         11 |
|    2654 |         10 |
|    3171 |         11 |
|    3622 |         12 |
|    3665 |         11 |
|    3703 |         13 |
|    3789 |         10 |
|    3976 |         10 |
|    4210 |         10 |
```

서브쿼리 rn

→

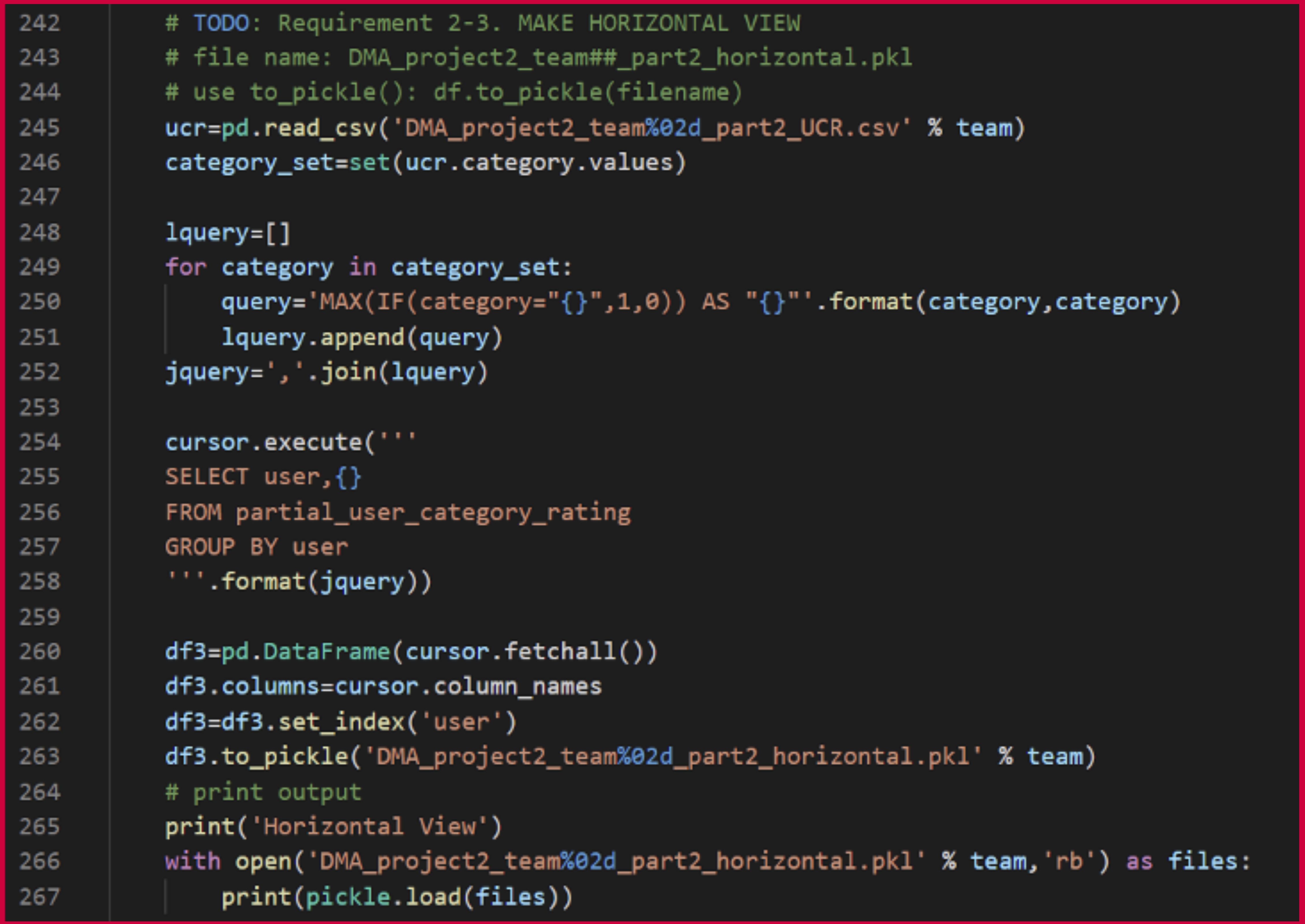


```
mysql> select * from partial_user_category_rating;
+------+---------------------+--------+
| user | category            | rating |
+------+---------------------+--------+
|    3 | American (New)      |     19 |
|    3 | Wine Bars           |      6 |
|    3 | Vegetarian          |      1 |
|    3 | Soul Food           |      6 |
|    3 | Sushi Bars          |      2 |
|    3 | Latin American      |      3 |
|    3 | Vegan               |      1 |
|    3 | Pubs                |     15 |
|    3 | British             |      3 |
|    3 | Irish               |      3 |
|    3 | Gastropubs          |      3 |
|    3 | Breweries           |     12 |
|    3 | Southern            |      3 |
|    3 | Scandinavian        |      3 |
|  352 | American (New)      |     25 |
|  352 | Wine Bars           |     11 |
|  352 | Soul Food           |      9 |
|  352 | Sushi Bars          |      5 |
|  352 | Latin American      |      3 |
|  352 | Vegan               |      3 |
|  352 | Pubs                |     19 |
|  352 | British             |      6 |
|  352 | Climbing            |      3 |
|  352 | Zoos                |      3 |
|  352 | Irish               |      9 |
|  352 | Gastropubs          |      1 |
|  352 | Breweries           |      7 |
|  352 | African             |      3 |
|  352 | Southern            |      3 |
|  352 | Airports            |      3 |
|  352 | Ethiopian           |      3 |
|  535 | American (New)      |     27 |
|  535 | Wine Bars           |     12 |
|  535 | Vegetarian          |      6 |
```

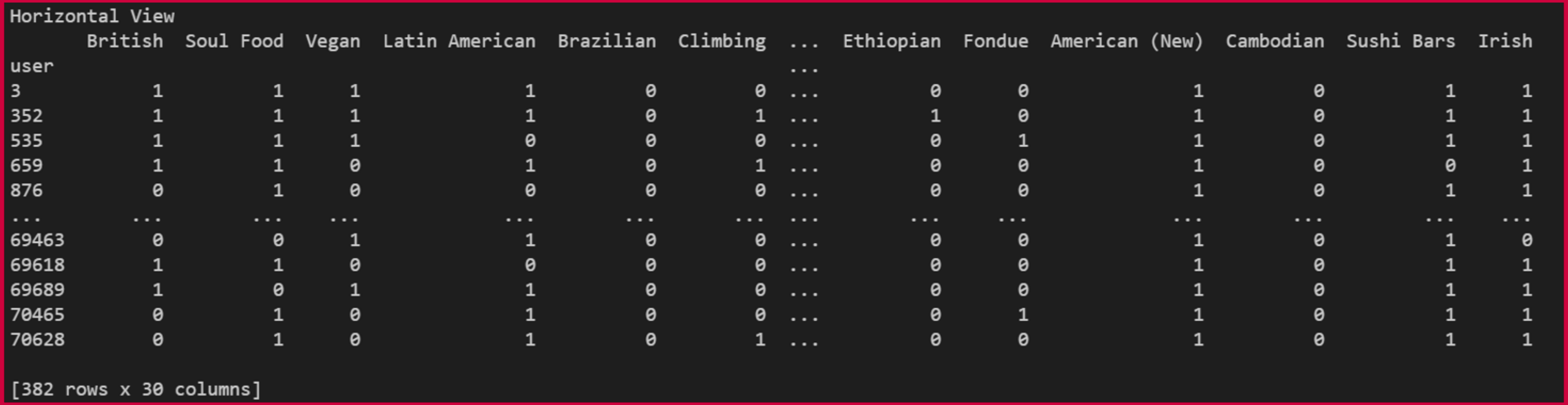
Requirement 2-3
Horizontal View

TA시간의 Code를 참고하여 query 저장

DMA_project2_part2_horizontal.pkl
파일로 저장

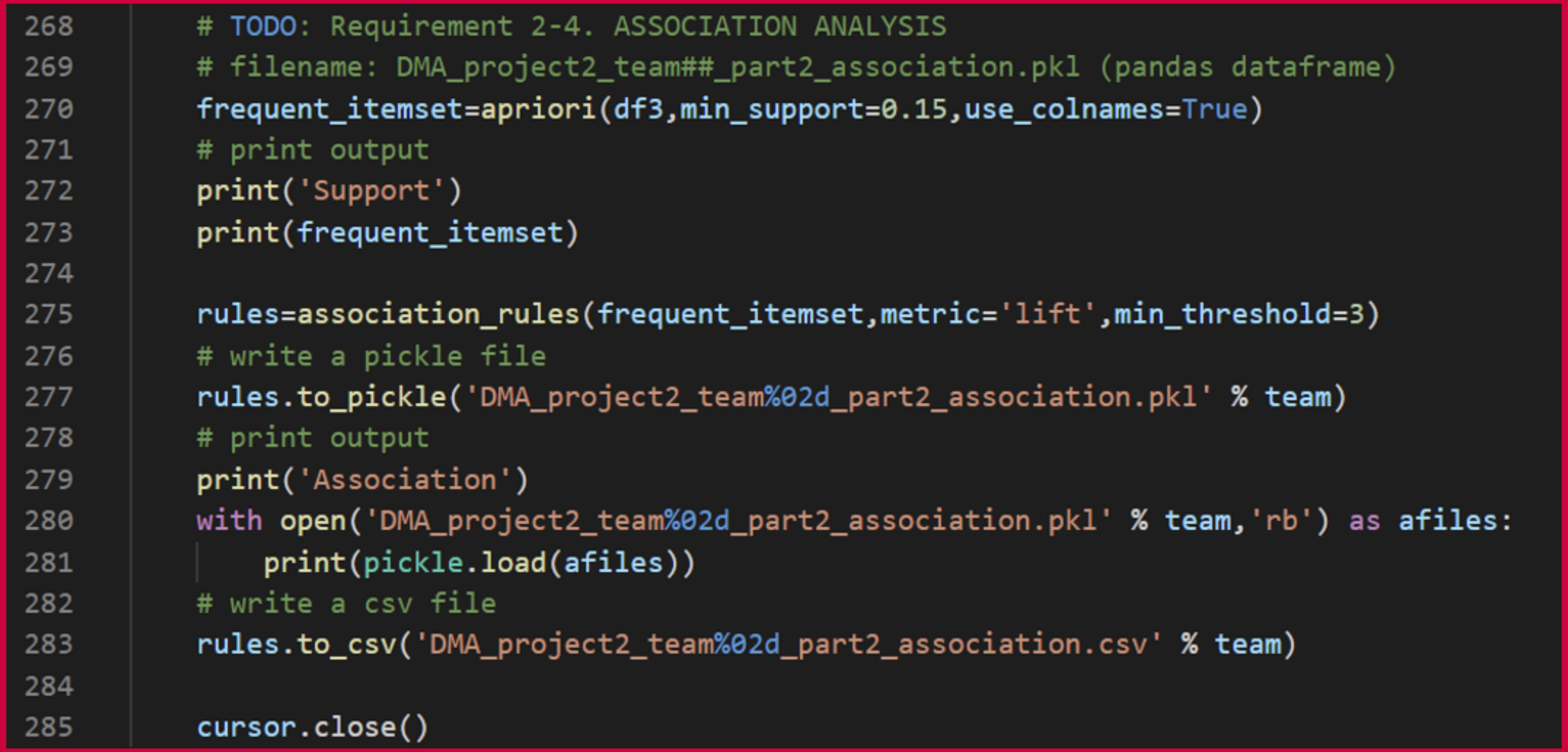


```
    # TODO: Requirement 2-3. MAKE HORIZONTAL VIEW
    # file name: DMA_project2_team##_part2_horizontal.pkl
    # use to_pickle(): df.to_pickle(filename)
    ucr=pd.read_csv('DMA_project2_team%02d_part2_UCR.csv' % team)
    category_set=set(ucr.category.values)

    lquery=[]
    for category in category_set:
        query='MAX(IF(category="{}",1,0)) AS "{}"'.format(category,category)
        lquery.append(query)
    jquery=','.join(lquery)

    cursor.execute('''
    SELECT user,{}
    FROM partial_user_category_rating
    GROUP BY user
    '''.format(jquery))

    df3=pd.DataFrame(cursor.fetchall())
    df3.columns=cursor.column_names
    df3=df3.set_index('user')
    df3.to_pickle('DMA_project2_team%02d_part2_horizontal.pkl' % team)
    # print output
    print('Horizontal View')
    with open('DMA_project2_team%02d_part2_horizontal.pkl' % team,'rb') as files:
        print(pickle.load(files))
```



```
Horizontal View
       British  Soul Food  Vegan  Latin American  Brazilian  Climbing  ...  Ethiopian  Fondue  American (New)  Cambodian  Sushi Bars  Irish
user                                                                   ...
3            1          1      1               1          0         0  ...          0       0               1          0           1      1
352          1          1      1               1          0         1  ...          1       0               1          0           1      1
535          1          1      1               0          0         0  ...          0       1               1          0           1      1
659          1          1      0               1          0         1  ...          0       0               1          0           0      1
876          0          1      0               0          0         0  ...          0       0               1          0           1      1
...        ...        ...    ...             ...        ...       ...  ...        ...     ...             ...        ...         ...    ...
69463        0          0      1               1          0         0  ...          0       0               1          0           1      0
69618        1          1      0               0          0         0  ...          0       0               1          0           1      1
69689        1          0      1               1          0         0  ...          0       0               1          0           1      1
70465        0          1      0               1          0         0  ...          0       1               1          0           1      1
70628        0          1      0               1          0         1  ...          0       0               1          0           1      1

[382 rows x 30 columns]
```

Requirement 2-4
Association.pkl & .csv



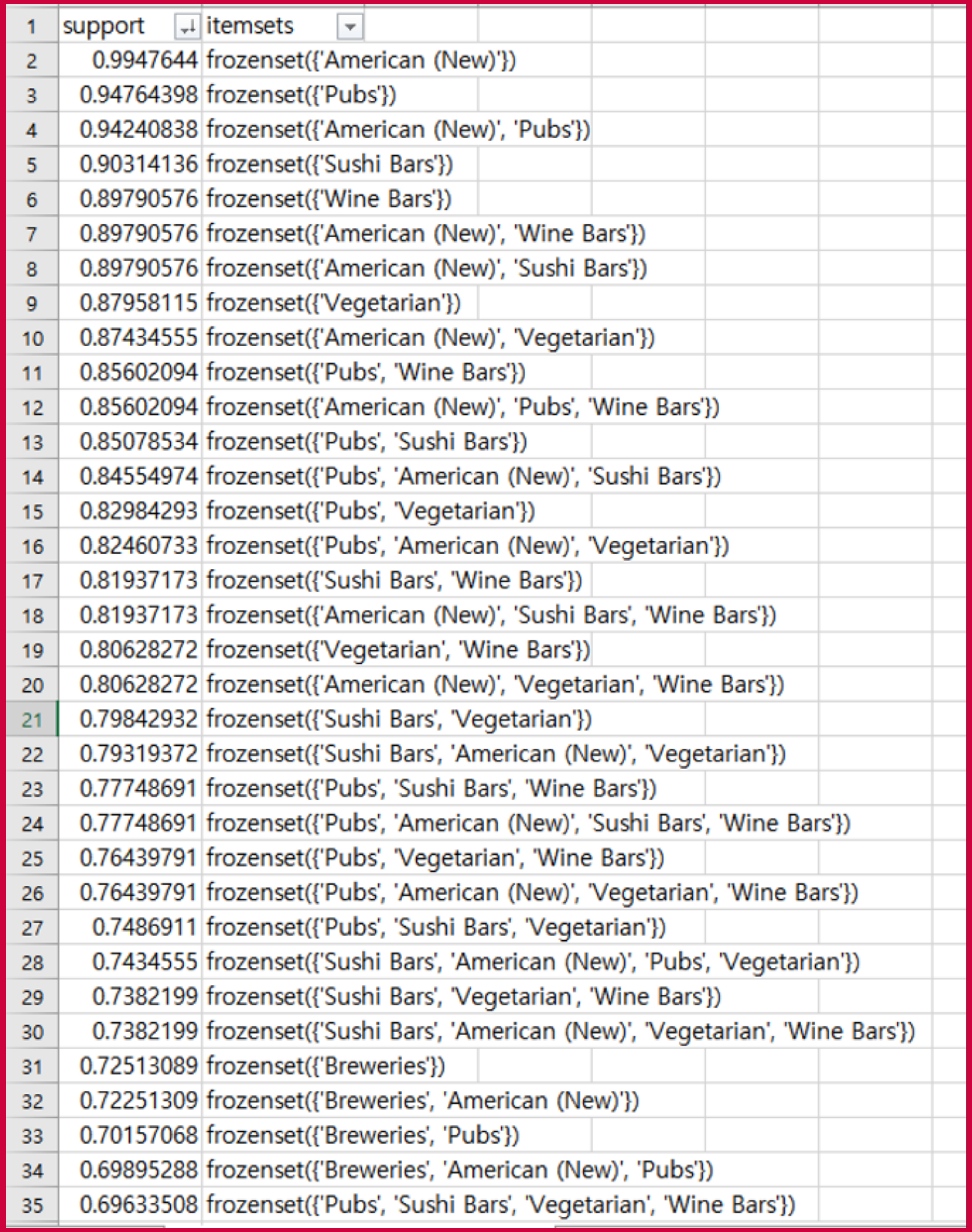
```
    # TODO: Requirement 2-4. ASSOCIATION ANALYSIS
    # filename: DMA_project2_team##_part2_association.pkl (pandas dataframe)
    frequent_itemset=apriori(df3,min_support=0.15,use_colnames=True)
    # print output
    print('Support')
    print(frequent_itemset)

    rules=association_rules(frequent_itemset,metric='lift',min_threshold=3)
    # write a pickle file
    rules.to_pickle('DMA_project2_team%02d_part2_association.pkl' % team)
    # print output
    print('Association')
    with open('DMA_project2_team%02d_part2_association.pkl' % team,'rb') as afiles:
        print(pickle.load(afiles))
    # write a csv file
    rules.to_csv('DMA_project2_team%02d_part2_association.csv' % team)

    cursor.close()
```

support 0.15 이상, lift 3 이상의 값들 연관분석 시행

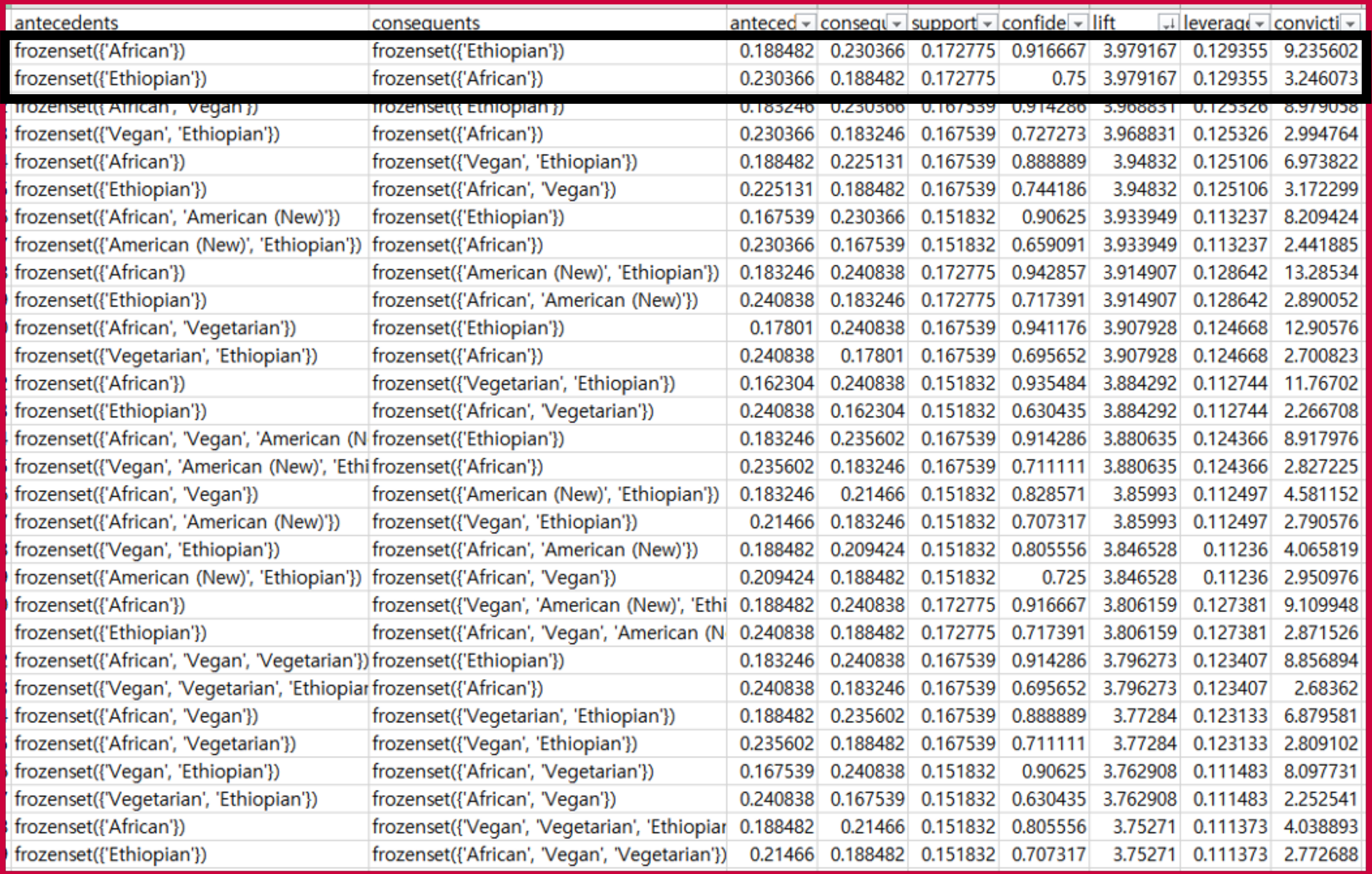
DMA_project2_part2_association.pkl & csv 파일로 저장

Requirement 2-4

연관분석 결과 해설



1	support	itemsets
2	0.9947644	frozenset({'American (New)'})
3	0.94764398	frozenset({'Pubs'})
4	0.94240838	frozenset({'American (New)', 'Pubs'})
5	0.90314136	frozenset({'Sushi Bars'})
6	0.89790576	frozenset({'Wine Bars'})
7	0.89790576	frozenset({'American (New)', 'Wine Bars'})
8	0.89790576	frozenset({'American (New)', 'Sushi Bars'})
9	0.87958115	frozenset({'Vegetarian'})
10	0.87434555	frozenset({'American (New)', 'Vegetarian'})
11	0.85602094	frozenset({'Pubs', 'Wine Bars'})
12	0.85602094	frozenset({'American (New)', 'Pubs', 'Wine Bars'})
13	0.85078534	frozenset({'Pubs', 'Sushi Bars'})
14	0.84554974	frozenset({'Pubs', 'American (New)', 'Sushi Bars'})
15	0.82984293	frozenset({'Pubs', 'Vegetarian'})
16	0.82460733	frozenset({'Pubs', 'American (New)', 'Vegetarian'})
17	0.81937173	frozenset({'Sushi Bars', 'Wine Bars'})
18	0.81937173	frozenset({'American (New)', 'Sushi Bars', 'Wine Bars'})
19	0.80628272	frozenset({'Vegetarian', 'Wine Bars'})
20	0.80628272	frozenset({'American (New)', 'Vegetarian', 'Wine Bars'})
21	0.79842932	frozenset({'Sushi Bars', 'Vegetarian'})
22	0.79319372	frozenset({'Sushi Bars', 'American (New)', 'Vegetarian'})
23	0.77748691	frozenset({'Pubs', 'Sushi Bars', 'Wine Bars'})
24	0.77748691	frozenset({'Pubs', 'American (New)', 'Sushi Bars', 'Wine Bars'})
25	0.76439791	frozenset({'Pubs', 'Vegetarian', 'Wine Bars'})
26	0.76439791	frozenset({'Pubs', 'American (New)', 'Vegetarian', 'Wine Bars'})
27	0.7486911	frozenset({'Pubs', 'Sushi Bars', 'Vegetarian'})
28	0.7434555	frozenset({'Sushi Bars', 'American (New)', 'Pubs', 'Vegetarian'})
29	0.7382199	frozenset({'Sushi Bars', 'Vegetarian', 'Wine Bars'})
30	0.7382199	frozenset({'Sushi Bars', 'American (New)', 'Vegetarian', 'Wine Bars'})
31	0.72513089	frozenset({'Breweries'})
32	0.72251309	frozenset({'Breweries', 'American (New)'})
33	0.70157068	frozenset({'Breweries', 'Pubs'})
34	0.69895288	frozenset({'Breweries', 'American (New)', 'Pubs'})
35	0.69633508	frozenset({'Pubs', 'Sushi Bars', 'Vegetarian', 'Wine Bars'})



antecedents	consequents	anteced	consequ	support	confide	lift	leverage	convicti
frozenset({'African'})	frozenset({'Ethiopian'})	0.188482	0.230366	0.172775	0.916667	3.979167	0.129355	9.235602
frozenset({'Ethiopian'})	frozenset({'African'})	0.230366	0.188482	0.172775	0.75	3.979167	0.129355	3.246073
frozenset({'African', 'Vegan'})	frozenset({'Ethiopian'})	0.183246	0.230366	0.167539	0.914286	3.968831	0.125326	8.979058
frozenset({'Vegan', 'Ethiopian'})	frozenset({'African'})	0.230366	0.183246	0.167539	0.727273	3.968831	0.125326	2.994764
frozenset({'African'})	frozenset({'Vegan', 'Ethiopian'})	0.188482	0.225131	0.167539	0.888889	3.94832	0.125106	6.973822
frozenset({'Ethiopian'})	frozenset({'African', 'Vegan'})	0.225131	0.188482	0.167539	0.744186	3.94832	0.125106	3.172299
frozenset({'African', 'American (New)'})	frozenset({'Ethiopian'})	0.167539	0.230366	0.151832	0.90625	3.933949	0.113237	8.209424
frozenset({'American (New)', 'Ethiopian'})	frozenset({'African'})	0.230366	0.167539	0.151832	0.659091	3.933949	0.113237	2.441885
frozenset({'African'})	frozenset({'American (New)', 'Ethiopian'})	0.183246	0.240838	0.172775	0.942857	3.914907	0.128642	13.28534
frozenset({'Ethiopian'})	frozenset({'African', 'American (New)'})	0.240838	0.183246	0.172775	0.717391	3.914907	0.128642	2.890052
frozenset({'African', 'Vegetarian'})	frozenset({'Ethiopian'})	0.17801	0.240838	0.167539	0.941176	3.907928	0.124668	12.90576
frozenset({'Vegetarian', 'Ethiopian'})	frozenset({'African'})	0.240838	0.17801	0.167539	0.695652	3.907928	0.124668	2.700823
frozenset({'African'})	frozenset({'Vegetarian', 'Ethiopian'})	0.162304	0.240838	0.151832	0.935484	3.884292	0.112744	11.76702
frozenset({'Ethiopian'})	frozenset({'African', 'Vegetarian'})	0.240838	0.162304	0.151832	0.630435	3.884292	0.112744	2.266708
frozenset({'African', 'Vegan', 'American (N	frozenset({'Ethiopian'})	0.183246	0.235602	0.167539	0.914286	3.880635	0.124366	8.917976
frozenset({'Vegan', 'American (New)', 'Ethi	frozenset({'African'})	0.235602	0.183246	0.167539	0.711111	3.880635	0.124366	2.827225
frozenset({'African', 'Vegan'})	frozenset({'American (New)', 'Ethiopian'})	0.183246	0.21466	0.151832	0.828571	3.85993	0.112497	4.581152
frozenset({'African', 'American (New)'})	frozenset({'Vegan', 'Ethiopian'})	0.21466	0.183246	0.151832	0.707317	3.85993	0.112497	2.790576
frozenset({'Vegan', 'Ethiopian'})	frozenset({'African', 'American (New)'})	0.188482	0.209424	0.151832	0.805556	3.846528	0.11236	4.065819
frozenset({'American (New)', 'Ethiopian'})	frozenset({'African', 'Vegan'})	0.209424	0.188482	0.151832	0.725	3.846528	0.11236	2.950976
frozenset({'African'})	frozenset({'Vegan', 'American (New)', 'Ethi	0.188482	0.240838	0.172775	0.916667	3.806159	0.127381	9.109948
frozenset({'Ethiopian'})	frozenset({'African', 'Vegan', 'American (N	0.240838	0.188482	0.172775	0.717391	3.806159	0.127381	2.871526
frozenset({'African', 'Vegan', 'Vegetarian'})	frozenset({'Ethiopian'})	0.183246	0.240838	0.167539	0.914286	3.796273	0.123407	8.856894
frozenset({'Vegan', 'Vegetarian', 'Ethiopiar	frozenset({'African'})	0.240838	0.183246	0.167539	0.695652	3.796273	0.123407	2.68362
frozenset({'African', 'Vegan'})	frozenset({'Vegetarian', 'Ethiopian'})	0.188482	0.235602	0.167539	0.888889	3.77284	0.123133	6.879581
frozenset({'African', 'Vegetarian'})	frozenset({'Vegan', 'Ethiopian'})	0.235602	0.188482	0.167539	0.711111	3.77284	0.123133	2.809102
frozenset({'Vegan', 'Ethiopian'})	frozenset({'African', 'Vegetarian'})	0.167539	0.240838	0.151832	0.90625	3.762908	0.111483	8.097731
frozenset({'Vegetarian', 'Ethiopian'})	frozenset({'African', 'Vegan'})	0.240838	0.167539	0.151832	0.630435	3.762908	0.111483	2.252541
frozenset({'African'})	frozenset({'Vegan', 'Vegetarian', 'Ethiopiar	0.188482	0.21466	0.151832	0.805556	3.75271	0.111373	4.038893
frozenset({'Ethiopian'})	frozenset({'African', 'Vegan', 'Vegetarian'})	0.21466	0.188482	0.151832	0.707317	3.75271	0.111373	2.772688

1. {African->Ethiopian}과 {Ethiopian->African}의 lift값은 동일하지만 confidence의 값은 {African->Ethiopian}가 더 크다.
 -> 포함관계를 유추할 수 있다.
2. African, American(New), Ethiopian, Vegan, Vegetarian의 다섯 항목의 조합 사이에 큰 양의 상관관계가 존재.
3. 위 다섯항목 조합들의 support 값은 낮다.
-> 출현 빈도는 낮지만, 한번 나타나면, 다른 항목이 같이 나오는 경우가 매우 많다.
4. Support값이 0.9이상으로 높았던 Pubs, Sushi Bars의 항목은 많이 출현하지만 lift 값이 3이상인 경우에는 나타나지 않은 것으로 보아, 다른 항목과의 연관성은 상대적으로 적다.