Data visualisation lab 4

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In [ ]:
```
from labs.definitions import DATA_DIR
import pandas as pd

DATA_PATH = DATA_DIR / "anime_filtered.csv"
df = pd.read_csv(DATA_PATH)
df
```

Out[ ]:

	anime_id	title	title_english	title_japanese	title_synonyms	ima
0	11013	Inu x Boku SS	Inu X Boku Secret Service	妖狐×僕SS	Youko x Boku SS	https://myanimelidena.com/images/ar
1	2104	Seto no Hanayome	My Bride is a Mermaid	瀬戸の花嫁	The Inland Sea Bride	https://myanimelidena.com/images/ar
2	5262	Shugo Chara!! Doki	Shugo Chara!! Doki	しゅごキャラ！！どきっ	Shugo Chara Ninenme, Shugo Chara! Second Year	https://myanimelidena.com/images/ar
3	721	Princess Tutu	Princess Tutu	プリンセスチュチュ	NaN	https://myanimelidena.com/images/ar
4	12365	Bakuman. 3rd Season	Bakuman.	バクマン。	Bakuman Season 3	https://myanimelidena.com/images/ar
...	...	...	...	...	...	
14469	26089	Gutchonpa Omoshiro Hanashi	NaN	グッチョンパおもしろ話	NaN	https://myanimelidena.com/images/ar
14470	21525	Geba Geba Shou Time!	NaN	ゲバゲバ笑タイム!	NaN	https://myanimelidena.com/images/ar
14471	37897	Godzilla: Hoshi wo Kuu Mono	NaN	GODZILLA -星を喰う者-	Godzilla Part 3, Godzilla: Eater of Stars	https://myanimelidena.com/images/ar
14472	34193	Nippon Mukashibanashi: Sannen Netarou	NaN	日本昔ばなし 三ねん寝太郎	NaN	https://myanimelidena.com/images/ar
14473	37908	Senjou no Valkyria Special	NaN	戦場のヴァルキュリア Valkyria Chronicles	Senjou no Valkyria Fake Movie Promo	https://myanimelidena.com/images/ar

14474 rows × 31 columns

In [ ]:
```
df.columns
```

Out[ ]:
```
Index(['anime_id', 'title', 'title_english', 'title_japanese',
       'title_synonyms', 'image_url', 'type', 'source', 'episodes', 'statu
s',
       'airing', 'aired_string', 'aired', 'duration', 'rating', 'score',
       'scored_by', 'rank', 'popularity', 'members', 'favorites', 'backgrou
nd',
       'premiered', 'broadcast', 'related', 'producer', 'licensor', 'studi
o',
       'genre', 'opening_theme', 'ending_theme'],
      dtype='object')
```

In [ ]:
```
df.describe()
```

Out[ ]:

	anime_id	episodes	score	scored_by	rank	popularity	
count	14474.000000	14474.000000	14474.000000	1.447400e+04	12901.000000	14474.000000	1.4
mean	17371.948183	11.310971	6.144179	1.146319e+04	6439.625068	7220.277256	2.2
std	13163.266015	43.449161	1.460617	4.311072e+04	3719.462602	4168.959000	7.4
min	1.000000	0.000000	0.000000	0.000000e+00	0.000000	0.000000	0.0
25%	4387.500000	1.000000	5.550000	4.600000e+01	3218.000000	3613.250000	2.4
50%	15128.000000	1.000000	6.370000	5.010000e+02	6442.000000	7225.500000	1.6
75%	31142.000000	12.000000	7.060000	3.947250e+03	9664.000000	10826.750000	1.0
max	37916.000000	1818.000000	10.000000	1.009477e+06	12919.000000	14487.000000	1.4

First step to calculating distances is choosing the correct features and normalizing them.

In [ ]:
```
import numpy as np
from sklearn import preprocessing
from function_pipes import pipe
from functools import partial

data = pipe(
    df.select_dtypes(include=np.number).drop(columns=["anime_id", "rank"]),
    preprocessing.MinMaxScaler().fit_transform,
    partial(
        pd.DataFrame,
        columns=df.select_dtypes(include=np.number)
        .drop(columns=["anime_id", "rank"])
        .columns,
    ),
)
data
```

Out[ ]:

	episodes	score	scored_by	popularity	members	favorites
0	0.006601	0.763	1.379427e-01	0.015945	0.194923	0.026278
1	0.014301	0.789	9.034976e-02	0.025264	0.140076	0.024126
2	0.028053	0.755	3.678043e-02	0.080969	0.048152	0.007503
3	0.020902	0.821	3.615833e-02	0.063229	0.064071	0.031283
4	0.013751	0.867	1.067553e-01	0.029406	0.125493	0.019477
...	...	...	...	...	...	...
14469	0.002750	0.550	5.943672e-06	0.938635	0.000052	0.000000
14470	0.000550	0.460	4.953060e-06	0.916960	0.000062	0.000000
14471	0.000550	0.000	0.000000e+00	0.498792	0.001195	0.000000
14472	0.000550	0.600	9.906120e-07	0.989439	0.000022	0.000000
14473	0.000550	0.515	4.655876e-05	0.674191	0.000327	0.000000

14474 rows × 6 columns

For easier visualizations we will only use 3 features [popularity, members, favorites] when grouping and calculating distances.

In [ ]:
```
data = data[['popularity', 'members', 'favorites']]
data
```

Out[ ]:

	popularity	members	favorites
0	0.015945	0.194923	0.026278
1	0.025264	0.140076	0.024126
2	0.080969	0.048152	0.007503
3	0.063229	0.064071	0.031283
4	0.029406	0.125493	0.019477
...	...	...	...
14469	0.938635	0.000052	0.000000
14470	0.916960	0.000062	0.000000
14471	0.498792	0.001195	0.000000
14472	0.989439	0.000022	0.000000
14473	0.674191	0.000327	0.000000

14474 rows × 3 columns

Then we calculate a distance matrix using the chosen distance functions:

- Manhattan
- Euclidean
- Cosine

- SMC
- Jaccard

Now having distance matrices a clustering algorithm should be chosen. For this task I chose DBSCAN as it best fit the data at hand with a specific HDBSCAN implementation. This is due to compute requirements and the size of the dataset.

In [ ]:
```
from functools import partial
from scipy.spatial.distance import pdist, squareform
from function_pipes import pipe
from collections import ChainMap
from hdbscan import HDBSCAN

distance_methods = ["cityblock", "euclidean", "matching", "cosine", "jaccard

distace_matricies = pipe(
    distance_methods,
    lambda function_names: [
        {function_name: pipe(pdist(data.values, function_name), squareform,
        for function_name in function_names
    ],
    lambda l: dict(ChainMap(*l)),
    pd.DataFrame,
)
distace_matricies
```

Out[ ]:

	jaccard	cosine	matching	euclidean	cityblock
0	35	-1	8	-1	-1
1	35	-1	8	-1	-1
2	35	-1	8	-1	-1
3	35	-1	8	-1	-1
4	35	-1	8	-1	-1
...	...	...	...	...	...
14469	36	-1	8	440	438
14470	36	-1	8	307	463
14471	-1	-1	8	295	312
14472	36	124	8	167	180
14473	36	82	8	250	365

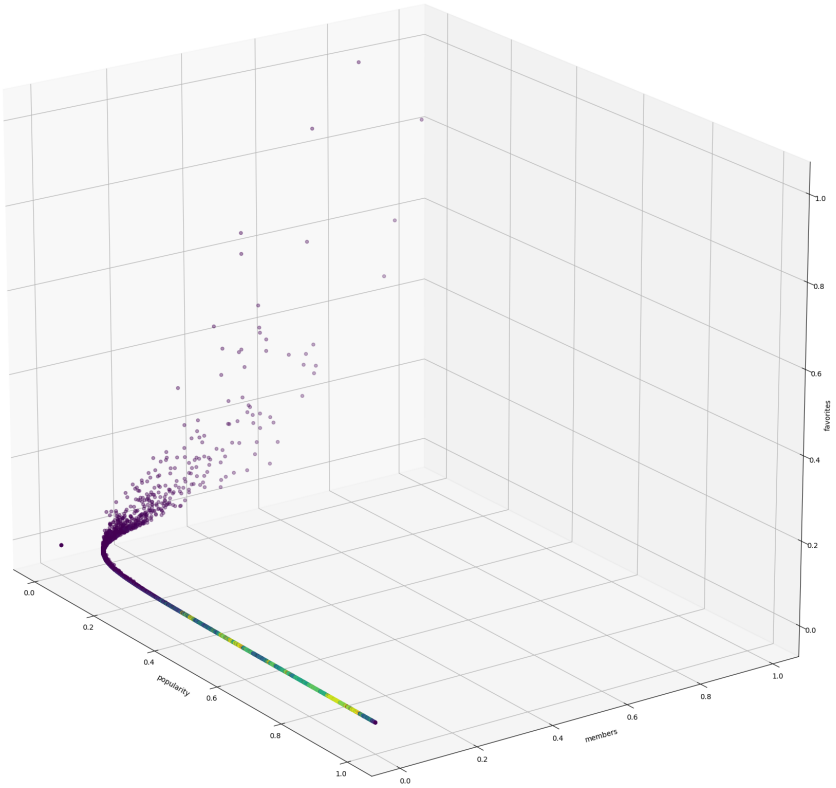
14474 rows × 5 columns

Now we can visualize the clusters for each distance function and compare them.

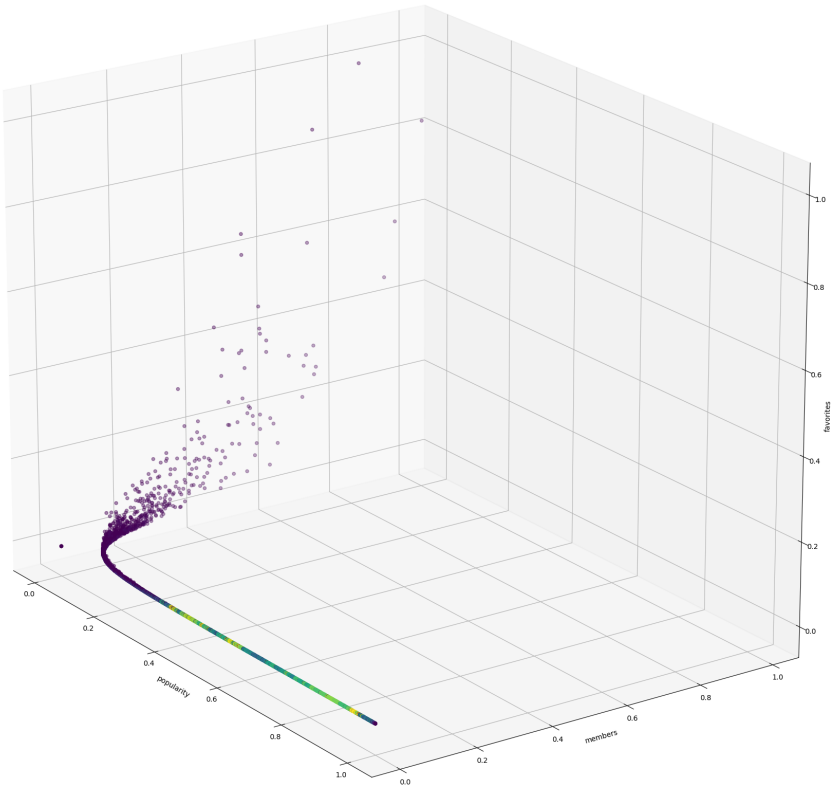
In [ ]:
```
from matplotlib import legend
import matplotlib.pyplot as plt
import numpy as np
from mpl_toolkits.mplot3d import Axes3D
```

```
df = data.join(distace_matricies)
for method in distance_methods:
    fig = plt.figure(figsize=(30, 30))
    ax = fig.add_subplot(projection='3d')
    ax.scatter(df['popularity'], df['members'], df['favorites'], c=df[method
    ax.set_xlabel('popularity')
    ax.set_ylabel('members')
    ax.set_zlabel('favorites')
    ax.view_init(elev=20., azim=-35, roll=0)
    ax.set_box_aspect((5, 4, 4), zoom=0.8)
    ax.title.set_text(method)
    plt.show()
```

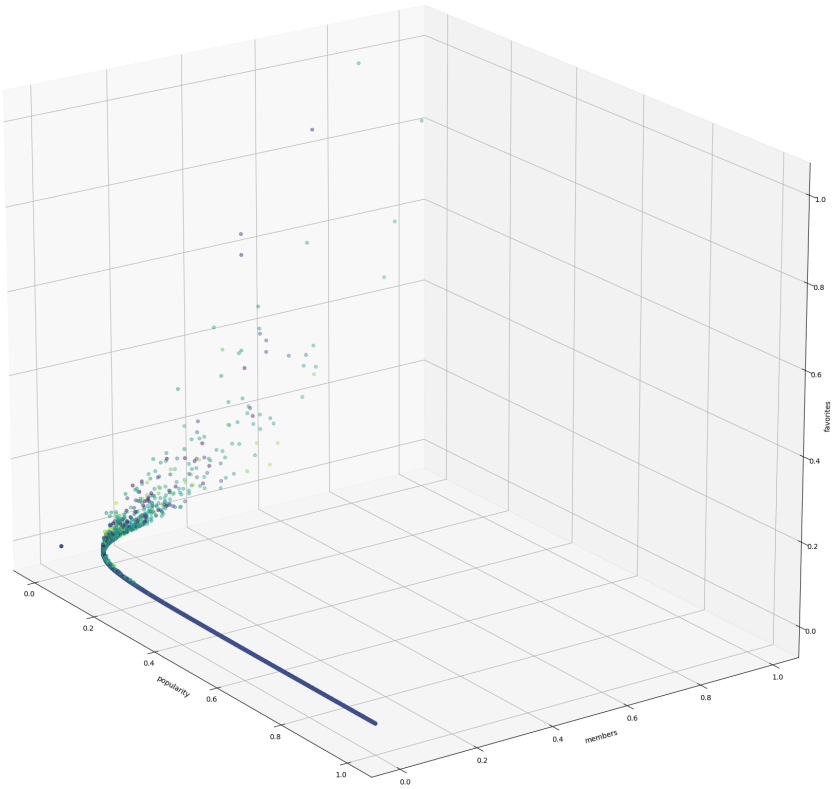
cityblock



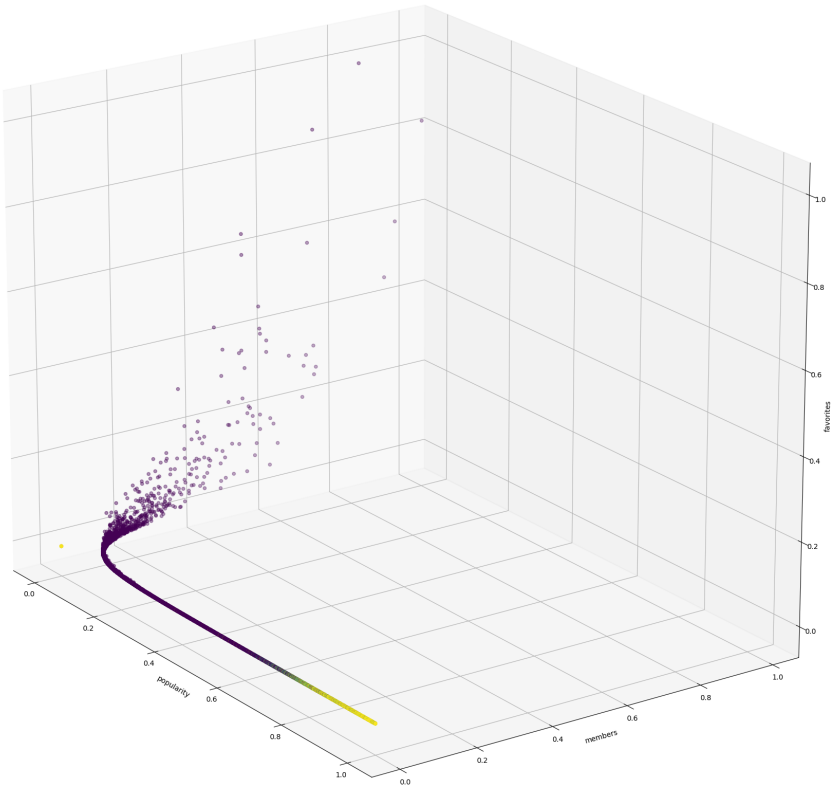
euclidean



matching



cosine



jaccard