

In [1]:

```

import csv
import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler
from sklearn.decomposition import PCA
from sklearn.model_selection import train_test_split

#I've converted the .data file to .csv which is read and replaced ? to NaN in the files
COLUMNS_COUNT = 2

with open('water-treatment.data', 'r') as f:
    columns = [next(f).strip() for line in range(COLUMNS_COUNT)]
temp_df = pd.read_csv('water-treatment.data', skiprows=COLUMNS_COUNT, header=None, delimiter=';', skip_blank_lines=True)
even_df = temp_df.iloc[::2].reset_index(drop=True)
odd_df = temp_df.iloc[1::2].reset_index(drop=True)
df = pd.concat([even_df, odd_df], axis=1)
df.columns = columns
df.to_csv('out.csv', index=False)
text = open("out.csv", "r")
text = ''.join([i for i in text]) \
    .replace("?", "NaN")
x = open("out.csv", "w")
x.writelines(text)
x.close()

reader=pd.read_csv('water-treatment.csv',header=None,delimiter=',');
df=pd.DataFrame(reader)
print('Before Cleaning Up the DataSet\n')
print(df)

#Calculating the Median of each Column and Replacing "NaN" with the Corresponding Median values
for i in range(1,39):
    mean = df.loc[:,i].mean()
    print('The mean of column :'+str(i))
    print(mean)
    df.loc[:,i].fillna(mean, inplace=True)

for i in range(1,39):
    for j in range(0,527):
        mean=df.loc[:,i].mean();
        stdevi=df.loc[:,i].std();
        df.loc[j,i]=(df.loc[j,i]-mean)/stdevi;

print('\n')
print('After Cleaning Up the DataSet and performing Normalization\n')
print(df)

#Dropping the Date Column
print('\n')
print('After Dropping\n')

```

```
df.drop(df.columns[0], axis=1, inplace=True)  
print(df)
```

Before Cleaning Up the DataSet

		0	1	2	3	4	5	6	7	8	9
\											
0	D-1/3/90	44101.0	1.50	7.8	NaN	407.0	166.0	66.3	4.5	2110	
1	D-2/3/90	39024.0	3.00	7.7	NaN	443.0	214.0	69.2	6.5	2660	
2	D-4/3/90	32229.0	5.00	7.6	NaN	528.0	186.0	69.9	3.4	1666	
3	D-5/3/90	35023.0	3.50	7.9	205.0	588.0	192.0	65.6	4.5	2430	
4	D-6/3/90	36924.0	1.50	8.0	242.0	496.0	176.0	64.8	4.0	2110	
5	D-7/3/90	38572.0	3.00	7.8	202.0	372.0	186.0	68.8	4.5	1644	
6	D-8/3/90	41115.0	6.00	7.8	NaN	552.0	262.0	64.1	5.0	1603	
7	D-9/3/90	36107.0	5.00	7.7	215.0	489.0	334.0	40.7	6.0	1613	
8	D-11/3/90	29156.0	2.50	7.7	206.0	451.0	194.0	69.1	4.5	1249	
9	D-12/3/90	39246.0	2.00	7.8	172.0	506.0	200.0	69.0	5.0	1865	
10	D-13/3/90	42393.0	0.70	7.9	189.0	478.0	230.0	67.0	5.5	1410	
11	D-14/3/90	42857.0	1.50	7.7	238.0	319.0	292.0	33.8	3.5	1261	
12	D-15/3/90	42911.0	0.70	7.6	114.0	252.0	116.0	58.6	1.2	1238	
13	D-16/3/90	40376.0	NaN	8.1	204.0	333.0	174.0	67.8	3.0	2390	
14	D-18/3/90	40923.0	3.50	7.6	146.0	329.0	188.0	57.4	2.5	1300	
15	D-19/3/90	43830.0	1.50	7.8	177.0	512.0	214.0	58.9	5.5	1605	
16	D-20/3/90	39165.0	1.20	7.4	250.0	447.0	252.0	61.1	7.0	1533	
17	D-21/3/90	35791.0	1.20	7.8	277.0	466.0	246.0	63.4	4.0	1556	
18	D-22/3/90	37419.0	1.20	7.6	219.0	446.0	222.0	61.3	5.5	1600	
19	D-23/3/90	40983.0	3.00	7.6	182.0	431.0	214.0	57.0	7.0	1591	
20	D-25/3/90	42217.0	8.50	7.5	138.0	333.0	240.0	55.0	3.8	1087	
21	D-26/3/90	47665.0	1.20	7.7	156.0	405.0	200.0	74.0	4.0	1856	
22	D-27/3/90	44314.0	3.00	7.8	155.0	389.0	308.0	49.4	6.0	1927	
23	D-28/3/90	40841.0	1.00	7.6	179.0	389.0	168.0	69.0	3.5	1240	
24	D-29/3/90	41157.0	3.00	8.0	145.0	398.0	192.0	66.7	4.5	2240	
25	D-30/3/90	40078.0	1.40	7.9	198.0	464.0	228.0	64.9	4.6	1431	
26	D-1/2/90	44365.0	7.50	7.9	NaN	365.0	212.0	62.3	3.5	1339	
27	D-2/2/90	43080.0	4.25	7.8	95.0	349.0	136.0	76.5	2.5	1063	
28	D-4/2/90	29414.0	3.00	7.6	160.0	374.0	168.0	69.0	3.1	1042	
29	D-5/2/90	37312.0	1.00	8.1	205.0	492.0	192.0	70.8	4.0	1454	
..	
497	D-25/10/91	35400.0	0.70	7.6	156.0	364.0	194.0	63.9	5.5	1680	
498	D-26/10/91	30964.0	3.30	7.7	220.0	540.0	184.0	62.0	3.5	1445	
499	D-27/10/91	35573.0	7.30	7.6	176.0	333.0	178.0	64.0	3.5	1627	
500	D-29/10/91	29801.0	1.60	7.7	172.0	400.0	136.0	70.1	1.5	1402	
501	D-30/10/91	31524.0	1.60	7.9	NaN	478.0	204.0	64.7	6.0	1798	
502	D-1/8/91	29834.0	3.00	7.4	160.0	348.0	194.0	61.9	3.0	1720	
503	D-2/8/91	28492.0	2.60	7.5	124.0	281.0	172.0	66.3	3.0	1520	
504	D-4/8/91	24978.0	0.50	7.3	146.0	288.0	124.0	67.7	2.0	1210	
505	D-5/8/91	29719.0	0.20	7.6	133.0	284.0	186.0	71.0	5.0	1114	
506	D-6/8/91	29741.0	0.45	7.9	151.0	316.0	196.0	64.3	2.5	948	
507	D-7/8/91	29027.0	0.40	7.6	136.0	328.0	186.0	67.7	3.0	899	
508	D-8/8/91	30211.0	0.50	7.6	114.0	521.0	506.0	44.3	7.5	866	
509	D-9/8/91	30848.0	0.20	7.7	142.0	376.0	144.0	70.8	3.0	940	
510	D-11/8/91	17527.0	0.55	7.5	150.0	171.0	172.0	37.2	1.4	732	
511	D-12/8/91	33331.0	0.23	7.6	92.0	233.0	234.0	37.6	1.4	829	
512	D-13/8/91	27998.0	0.62	7.5	138.0	268.0	154.0	66.2	1.7	890	
513	D-14/8/91	32845.0	0.23	7.6	84.0	251.0	98.0	71.4	2.0	866	
514	D-16/8/91	27933.0	0.20	7.6	158.0	375.0	178.0	60.7	3.5	1049	
515	D-18/8/91	27527.0	0.20	7.3	191.0	240.0	166.0	73.5	3.0	1072	
516	D-19/8/91	32363.0	0.10	7.6	159.0	310.0	146.0	68.5	1.6	1096	
517	D-20/8/91	31437.0	0.47	7.6	132.0	304.0	148.0	64.9	2.0	939	
518	D-21/8/91	31914.0	2.00	7.7	127.0	274.0	144.0	72.2	2.0	1031	

519	D-22/8/91	28088.0	0.20	7.5	153.0	307.0	124.0	82.3	2.5	1044
520	D-23/8/91	27838.0	0.13	7.6	179.0	265.0	128.0	71.9	1.8	992
521	D-25/8/91	29271.0	0.36	7.5	99.0	585.0	140.0	71.4	NaN	962
522	D-26/8/91	32723.0	0.16	7.7	93.0	252.0	176.0	56.8	2.3	894
523	D-27/8/91	33535.0	0.32	7.8	192.0	346.0	172.0	68.6	4.0	988
524	D-28/8/91	32922.0	0.30	7.4	139.0	367.0	180.0	64.4	3.0	1060
525	D-29/8/91	32190.0	0.30	7.3	200.0	545.0	258.0	65.1	4.0	1260
526	D-30/8/91	30488.0	0.21	7.5	152.0	300.0	132.0	69.7	NaN	1073

	...	29	30	31	32	33	34	35	36	37	38
0	...	2000.0	NaN	58.8	95.5	NaN	70.0	NaN	79.4	87.3	99.6
1	...	2590.0	NaN	60.7	94.8	NaN	80.8	NaN	79.5	92.1	100.0
2	...	1888.0	NaN	58.2	95.6	NaN	52.9	NaN	75.8	88.7	98.5
3	...	1840.0	33.1	64.2	95.3	87.3	72.3	90.2	82.3	89.6	100.0
4	...	2120.0	NaN	62.7	95.6	NaN	71.0	92.1	78.2	87.5	99.5
5	...	1764.0	NaN	59.7	96.5	86.7	78.3	90.1	73.1	84.9	100.0
6	...	1703.0	NaN	61.9	93.8	89.1	79.8	NaN	86.2	90.1	99.0
7	...	1606.0	NaN	70.4	95.6	90.6	53.7	92.1	66.9	94.6	100.0
8	...	1338.0	46.1	43.6	92.5	85.6	58.2	92.2	73.8	90.2	99.4
9	...	1616.0	21.2	59.7	90.8	88.4	66.1	89.0	69.0	86.5	99.6
10	...	1575.0	0.6	45.8	92.0	11.6	25.7	19.6	36.0	43.0	36.4
11	...	1304.0	31.8	61.2	92.9	NaN	NaN	NaN	NaN	18.5	42.9
12	...	1221.0	46.6	48.5	91.7	NaN	20.4	26.3	31.7	10.3	95.4
13	...	2550.0	41.1	50.0	84.0	76.5	52.9	84.3	54.1	43.7	100.0
14	...	1545.0	32.7	33.3	90.0	82.6	61.3	87.0	71.4	78.2	99.2
15	...	1110.0	28.0	72.7	92.7	78.8	36.6	85.9	60.4	90.7	100.0
16	...	1402.0	49.8	58.3	92.3	89.9	96.8	94.4	98.1	92.1	100.0
17	...	1606.0	NaN	39.6	78.3	85.5	70.4	91.3	73.4	89.4	99.4
18	...	1780.0	35.3	57.5	92.0	75.6	49.3	80.8	60.8	76.1	99.6
19	...	1597.0	20.1	64.5	93.6	86.9	68.1	87.4	72.2	88.3	100.0
20	...	1223.0	29.4	55.4	91.3	85.2	68.0	88.4	81.4	92.9	100.0
21	...	1706.0	28.1	50.0	91.4	85.2	76.5	87.8	82.5	88.5	99.8
22	...	1869.0	52.0	64.9	90.8	87.6	71.2	90.3	77.6	92.5	100.0
23	...	1416.0	26.7	66.2	95.0	89.2	72.5	91.1	78.7	88.1	100.0
24	...	2290.0	34.3	65.0	94.2	89.3	69.7	89.7	78.1	89.1	100.0
25	...	1475.0	27.2	67.6	97.3	90.4	68.0	91.4	78.0	90.4	100.0
26	...	1377.0	NaN	50.0	89.4	NaN	76.6	NaN	79.5	90.6	98.6
27	...	1220.0	6.8	47.9	80.0	84.6	78.9	80.0	80.8	82.4	100.0
28	...	1087.0	42.7	54.5	95.7	84.9	73.6	88.1	78.9	83.3	100.0
29	...	1275.0	NaN	33.0	94.5	85.3	73.7	84.4	76.8	80.7	100.0
..
497	...	1840.0	47.3	61.3	94.0	76.4	NaN	86.5	82.4	90.7	99.8
498	...	1337.0	NaN	38.6	93.3	NaN	87.0	92.7	95.0	91.8	95.7
499	...	1799.0	NaN	40.4	95.0	NaN	72.9	90.9	79.9	NaN	98.6
500	...	1468.0	32.4	40.4	88.0	87.8	77.6	91.3	85.3	83.8	96.7
501	...	1568.0	NaN	43.9	65.3	NaN	75.3	NaN	81.2	89.7	99.2
502	...	1772.0	29.1	53.5	92.0	85.7	64.2	90.6	72.7	85.6	99.3
503	...	1549.0	34.2	47.7	99.0	84.4	66.1	90.3	73.3	88.4	99.3
504	...	1259.0	NaN	52.3	92.3	75.3	NaN	86.3	NaN	76.6	99.0
505	...	1100.0	55.1	73.2	96.0	82.0	62.5	91.7	78.9	88.7	99.6
506	...	951.0	44.8	64.5	95.0	82.2	80.0	89.4	86.1	88.8	100.0
507	...	898.0	NaN	64.1	94.0	84.9	60.4	91.9	76.8	87.6	99.3
508	...	884.0	48.7	86.9	98.8	81.0	67.9	90.4	91.6	96.0	99.7
509	...	947.0	NaN	47.6	97.3	NaN	77.6	93.7	84.8	90.3	99.3
510	...	728.0	62.8	77.7	90.0	73.8	65.5	92.7	77.2	90.7	98.6
511	...	929.0	36.9	43.6	86.7	87.7	71.9	91.3	79.8	92.3	99.3
512	...	858.0	38.1	41.6	86.7	87.7	79.0	94.2	87.7	91.6	98.8

513	...	879.0	50.9	36.5	80.0	87.0	69.6	91.7	80.5	82.7	99.0
514	...	828.0	68.0	66.7	96.7	81.6	41.8	94.3	72.5	83.1	98.6
515	...	999.0	38.5	54.5	88.0	90.0	NaN	95.8	81.7	93.4	99.3
516	...	1083.0	25.2	61.4	91.2	78.6	65.1	86.8	81.0	89.0	99.4
517	...	1012.0	45.6	60.3	94.4	82.5	72.9	89.4	86.2	91.2	99.5
518	...	1053.0	NaN	NaN	NaN	NaN	77.7	NaN	NaN	NaN	NaN
519	...	1038.0	40.5	54.4	94.0	89.7	75.5	93.5	85.0	90.3	100.0
520	...	1044.0	13.7	45.0	95.0	87.5	71.3	93.9	79.6	89.1	100.0
521	...	968.0	40.8	71.6	NaN	59.0	26.4	74.7	83.8	81.4	NaN
522	...	942.0	NaN	62.3	93.3	69.8	75.9	79.6	78.6	96.6	99.6
523	...	950.0	NaN	58.3	97.8	83.0	59.1	91.1	74.6	90.7	100.0
524	...	1136.0	NaN	65.0	97.1	76.2	66.4	82.0	77.1	88.9	99.0
525	...	1326.0	39.8	65.9	97.1	81.7	70.9	89.5	87.0	89.5	99.8
526	...	1224.0	NaN	69.5	NaN	81.7	76.4	NaN	81.7	86.4	NaN

[527 rows x 39 columns]

The mean of column :1

37226.56777996071

The mean of column :2

2.3590648854961835

The mean of column :3

7.8100569259962045

The mean of column :4

188.71428571428572

The mean of column :5

406.8982725527831

The mean of column :6

227.4448669201521

The mean of column :7

61.393217054263566

The mean of column :8

4.593824701195219

The mean of column :9

1478.6204933586337

The mean of column :10

7.829981024667931

The mean of column :11

206.20739219712524

The mean of column :12

253.9525616698292

The mean of column :13

60.3703488372093

The mean of column :14

5.033598409542742

The mean of column :15

1496.034155597723

The mean of column :16

7.811954459203036

The mean of column :17

122.34869739478958

The mean of column :18

274.04633204633205

The mean of column :19

94.2247619047619

The mean of column :20

72.96848249027238

The mean of column :21

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0.4167330677290837
The mean of column :22
1490.5692599620493
The mean of column :23
7.709885931558936
The mean of column :24
19.988095238095237
The mean of column :25
87.29469548133595
The mean of column :26
22.235632183908045
The mean of column :27
80.15176470588234
The mean of column :28
0.03707414829659319
The mean of column :29
1494.8174904942966
The mean of column :30
39.0858064516129
The mean of column :31
58.51873804971319
The mean of column :32
90.55420000000001
The mean of column :33
83.44804928131417
The mean of column :34
67.81736526946108
The mean of column :35
89.01364562118125
The mean of column :36
77.85657370517929
The mean of column :37
88.96339113680155
The mean of column :38
99.08629032258065

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After Cleaning Up the DataSet and performing Normalization

	0	1	2	3	4	5	\
0	D-1/3/90	1.054123	-0.313338	-0.040853	0.000000	0.000850	
1	D-2/3/90	0.280211	0.234842	-0.225874	0.005847	0.304794	
2	D-4/3/90	-0.700928	0.965155	-0.329090	0.011590	1.003766	
3	D-5/3/90	-0.280000	0.421825	0.207093	0.278506	1.488793	
4	D-6/3/90	-0.002369	-0.304951	0.341847	0.870963	0.746324	
5	D-7/3/90	0.228464	0.242690	0.080250	0.240084	-0.240822	
6	D-8/3/90	0.566869	1.336242	0.090982	0.036070	1.187132	
7	D-9/3/90	-0.078785	0.977084	-0.007218	0.449725	0.692755	
8	D-11/3/90	-0.943680	0.068668	0.008053	0.313819	0.399108	
9	D-12/3/90	0.327342	-0.111953	0.117725	-0.202833	0.825085	
10	D-13/3/90	0.711699	-0.583942	0.217199	0.061824	0.612136	
11	D-14/3/90	0.763988	-0.291440	0.045389	0.805408	-0.588767	
12	D-15/3/90	0.766949	-0.580950	-0.028489	-1.050044	-1.082092	
13	D-16/3/90	0.471927	0.023338	0.390158	0.299099	-0.467368	
14	D-18/3/90	0.535075	0.439337	-0.003682	-0.554444	-0.488526	
15	D-19/3/90	0.859953	-0.284913	0.159631	-0.091569	0.861495	
16	D-20/3/90	0.343615	-0.392327	-0.129882	0.978349	0.389283	

17	D-21/3/90	-0.019047	-0.390939	0.171091	1.371052	0.529735
18	D-22/3/90	0.162465	-0.389554	0.037048	0.535247	0.388785
19	D-23/3/90	0.543418	0.263508	0.045893	0.007295	0.285188
20	D-25/3/90	0.672841	2.255657	-0.012175	-0.614797	-0.403821
21	D-26/3/90	1.232463	-0.383702	0.127330	-0.352451	0.108834
22	D-27/3/90	0.887495	0.271769	0.197394	-0.360209	0.001905
23	D-28/3/90	0.536942	-0.452934	0.077781	-0.018073	0.007002
24	D-29/3/90	0.569795	0.274340	0.329509	-0.486187	0.073905
25	D-30/3/90	0.465143	-0.304416	0.272435	0.253440	0.529315
26	D-1/2/90	0.883609	1.908612	0.276323	0.129455	-0.139914
27	D-2/2/90	0.759197	0.736679	0.222113	-1.147772	-0.242232
28	D-4/2/90	-0.540658	0.284394	0.112487	-0.255365	-0.068751
29	D-5/2/90	0.213736	-0.441379	0.399739	0.359320	0.722162

..
497	D-25/10/91	4.777715	0.125073	3.619049	4.175253	4.164288
498	D-26/10/91	4.251179	2.069214	3.724185	6.110878	6.413070
499	D-27/10/91	5.014997	5.075017	3.711501	5.028573	4.034509
500	D-29/10/91	4.276528	0.816808	3.820660	5.040797	4.980628
501	D-30/10/91	4.626772	0.818419	3.996418	5.705868	6.154998
502	D-1/8/91	4.467630	1.885062	3.737681	4.965300	4.598430
503	D-2/8/91	4.348868	1.586120	3.849232	3.892021	3.754150
504	D-4/8/91	3.864494	-0.013764	3.771028	4.703675	3.913523
505	D-5/8/91	4.713342	-0.242147	4.015526	4.364538	3.921365
506	D-6/8/91	4.829422	-0.050552	4.270798	5.090292	4.461065
507	D-7/8/91	4.826420	-0.087989	4.135000	4.687391	4.737840
508	D-8/8/91	5.156382	-0.010937	4.195012	3.983698	7.825772
509	D-9/8/91	5.418108	-0.239146	4.325887	5.105366	5.965182
510	D-11/8/91	3.096156	0.028591	4.252190	5.555424	2.709195
511	D-12/8/91	6.113422	-0.214776	4.386092	3.432568	3.793918
512	D-13/8/91	5.311350	0.083366	4.381583	5.327123	4.461366
513	D-14/8/91	6.446245	-0.213283	4.521286	3.256324	4.256706
514	D-16/8/91	5.700189	-0.235462	4.592800	6.385124	6.571251
515	D-18/8/91	5.808640	-0.234772	4.440586	8.095314	4.337384
516	D-19/8/91	7.098974	-0.310288	4.736163	7.182547	5.764480
517	D-20/8/91	7.262664	-0.027733	4.813793	6.256728	5.848888
518	D-21/8/91	7.790607	1.138403	4.972262	6.261663	5.447744
519	D-22/8/91	7.290098	-0.231660	4.897507	7.896039	6.313619
520	D-23/8/91	7.634824	-0.284339	5.059342	9.890451	5.661090
521	D-25/8/91	8.536258	-0.108384	5.062704	5.989049	13.081441
522	D-26/8/91	10.314482	-0.260073	5.314858	5.827934	6.801317
523	D-27/8/91	11.862446	-0.137520	5.493496	12.656300	9.843776
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509	4.602321	5.684600	1.584088	5.028471	...	4.987743	4.800010
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17	-1.045150	-0.510193	2.778170e-01	0.283201	2.944973e-01	-0.13557
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18	0.054454	0.247204	-2.974613e-01	-0.998990	-3.141887e-01	-0.89304
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499 8	2.793599	4.355134	4.280876e+00	4.465986	4.263323e+00	4.15828
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501 4	3.120679	3.021199	4.466096e+00	4.842255	4.339193e+00	4.40653
502 3	3.913123	4.417899	4.693112e+00	4.187812	4.511618e+00	3.99777
503 5	3.514825	4.875494	4.726657e+00	4.402703	4.594323e+00	4.10377
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506 9	5.180636	5.024645	4.916617e+00	5.737302	4.869974e+00	5.17838
507 5	5.293183	5.102629	5.218091e+00	4.412433	5.140417e+00	4.72111
508 1	7.492405	5.525196	5.109722e+00	5.099466	5.194219e+00	5.81727
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510 0	7.200065	5.345923	4.909916e+00	5.240583	5.664548e+00	5.20167
511 9	4.133983	5.296569	6.034580e+00	5.946979	5.764494e+00	5.54005
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514 7	6.793733	6.480394	6.323609e+00	3.803033	6.682754e+00	5.60003
515 2	5.769472	6.137404	7.295829e+00	6.437092	7.114112e+00	6.55192
516 2	6.763277	6.622434	6.699800e+00	6.438210	6.769202e+00	6.78831
517 3	6.957147	7.181347	7.378821e+00	7.556684	7.317606e+00	7.59251
518 6	7.087764	7.256818	7.899079e+00	8.561669	7.700192e+00	7.25521
519 5	6.917731	7.963993	9.078327e+00	8.971607	8.613678e+00	8.38673
520 6	5.960374	8.599741	9.650046e+00	9.200536	9.349370e+00	8.43473
521 7	10.006064	8.844964	7.090771e+00	3.538299	8.103808e+00	9.57590
522 9	9.639611	9.898832	8.884289e+00	10.856066	9.260702e+00	9.87816
523 9	9.921731	11.527783	1.152386e+01	9.526371	1.163557e+01	10.38154
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22     0.357125 0.241712
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[527 rows x 39 columns]

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12	0.766949	-0.580950	-0.028489	-1.050044	-1.082092	-0.761451
13	0.471927	0.023338	0.390158	0.299099	-0.467368	-0.344339
14	0.535075	0.439337	-0.003682	-0.554444	-0.488526	-0.241468
15	0.859953	-0.284913	0.159631	-0.091569	0.861495	-0.053587
16	0.343615	-0.392327	-0.129882	0.978349	0.389283	0.218855
17	-0.019047	-0.390939	0.171091	1.371052	0.529735	0.179291
18	0.162465	-0.389554	0.037048	0.535247	0.388785	0.012779
19	0.543418	0.263508	0.045893	0.007295	0.285188	-0.040621
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21	1.232463	-0.383702	0.127330	-0.352451	0.108834	-0.132550
22	0.887495	0.271769	0.197394	-0.360209	0.001905	0.625868
23	0.536942	-0.452934	0.077781	-0.018073	0.007002	-0.348725
24	0.569795	0.274340	0.329509	-0.486187	0.073905	-0.178546
25	0.465143	-0.304416	0.272435	0.253440	0.529315	0.074674
26	0.883609	1.908612	0.276323	0.129455	-0.139914	-0.033492
27	0.759197	0.736679	0.222113	-1.147772	-0.242232	-0.556783
28	-0.540658	0.284394	0.112487	-0.255365	-0.068751	-0.332838
29	0.213736	-0.441379	0.399739	0.359320	0.722162	-0.164453
..
497	4.777715	0.125073	3.619049	4.175253	4.164288	4.121248
498	4.251179	2.069214	3.724185	6.110878	6.413070	3.968659
499	5.014997	5.075017	3.711501	5.028573	4.034509	3.897870
500	4.276528	0.816808	3.820660	5.040797	4.980628	2.971944
501	4.626772	0.818419	3.996418	5.705868	6.154998	4.621789
502	4.467630	1.885062	3.737681	4.965300	4.598430	4.484894
503	4.348868	1.586120	3.849232	3.892021	3.754150	4.037030
504	3.864494	-0.013764	3.771028	4.703675	3.913523	2.900776

505	4.713342	-0.242147	4.015526	4.364538	3.921365	4.503534
506	4.829422	-0.050552	4.270798	5.090292	4.461065	4.860832
507	4.826420	-0.087989	4.135000	4.687391	4.737840	4.718769
508	5.156382	-0.010937	4.195012	3.983698	7.825772	13.492443
509	5.418108	-0.239146	4.325887	5.105366	5.965182	4.602321
510	3.096156	0.028591	4.252190	5.555424	2.709195	5.664196
511	6.113422	-0.214776	4.386092	3.432568	3.793918	8.043935
512	5.311350	0.083366	4.381583	5.327123	4.461366	5.592833
513	6.446245	-0.213283	4.521286	3.256324	4.256706	3.602630
514	5.700189	-0.235462	4.592800	6.385124	6.571251	6.802157
515	5.808640	-0.234772	4.440586	8.095314	4.337384	6.642274
516	7.098974	-0.310288	4.736163	7.182547	5.764480	6.092375
517	7.262664	-0.027733	4.813793	6.256728	5.848888	6.420986
518	7.790607	1.138403	4.972262	6.261663	5.447744	6.515357
519	7.290098	-0.231660	4.897507	7.896039	6.313619	5.838107
520	7.634824	-0.284339	5.059342	9.890451	5.661090	6.249222
521	8.536258	-0.108384	5.062704	5.989049	13.081441	7.133132
522	10.314482	-0.260073	5.314858	5.827934	6.801317	9.494955
523	11.862446	-0.137520	5.493496	12.656300	9.843776	10.209117
524	13.636375	-0.152063	5.245299	10.951790	11.590955	11.959784
525	16.621551	-0.151377	5.243064	18.045910	20.043191	20.190575
526	22.912902	-0.219207	5.505738	22.110918	22.700871	21.563752

	7	8	9	10	...	29	30
\							
0	0.399420	-0.035036	1.598842	0.308556	...	1.303571	0.000000
1	0.631169	0.713001	2.969786	-0.290004	...	2.801119	0.005298
2	0.682571	-0.436600	0.489926	-0.188598	...	1.018109	0.010519
3	0.350678	-0.024819	2.373915	0.022882	...	0.894530	-0.405809
4	0.293184	-0.206401	1.585924	0.179510	...	1.584620	0.020000
5	0.590375	-0.018573	0.451197	0.055464	...	0.707216	0.025009
6	0.250229	0.168425	0.355289	0.068153	...	0.559517	0.029951
7	-1.404017	0.538084	0.382201	-0.137197	...	0.328880	0.034828
8	0.604636	-0.008157	-0.467638	-0.012176	...	-0.301146	0.517001
9	0.597154	0.177542	0.970831	0.098633	...	0.357953	-1.164646
10	0.461647	0.362588	-0.075038	0.382095	...	0.266379	-2.541288
11	-1.747483	-0.361639	-0.406784	-0.059880	...	-0.349601	-0.441423
12	-0.090474	-1.191692	-0.449137	0.207787	...	-0.528345	0.553844
13	0.513979	-0.536129	2.127554	0.130974	...	2.461612	0.191261
14	-0.149369	-0.712435	-0.289783	-0.019190	...	0.218382	-0.359246
15	-0.045906	0.370205	0.388095	0.068470	...	-0.738981	-0.661394
16	0.098503	0.911166	0.234532	-0.144210	...	-0.087948	0.768259
17	0.245611	-0.160929	0.288307	0.085082	...	0.361411	0.074900
18	0.122486	0.378710	0.386164	0.092922	...	0.738960	-0.165124
19	-0.129745	0.916883	0.370248	-0.035540	...	0.349647	-1.135510
20	-0.240259	-0.221048	-0.685903	-0.025191	...	-0.437739	-0.533483
21	0.881118	-0.146614	0.927555	0.049446	...	0.583474	-0.609619
22	-0.545591	0.566356	1.075065	0.120873	...	0.924492	0.907770
23	0.589549	-0.316795	-0.337339	0.189496	...	-0.010172	-0.682411
24	0.460441	0.040064	1.710300	0.316606	...	1.785067	-0.199789
25	0.361761	0.078230	0.068080	0.080261	...	0.124503	-0.636987
26	0.220344	-0.306054	-0.112335	0.263607	...	-0.068944	0.106243
27	1.007135	-0.653831	-0.658423	0.209814	...	-0.378179	-1.881151
28	0.596743	-0.439973	-0.691592	0.100824	...	-0.635665	0.333488
29	0.695945	-0.122153	0.129789	0.387103	...	-0.255333	0.115441
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497	3.956930	3.301112	5.959328	3.606646	...	6.451180	4.595303

498	3.896058	1.857861	5.285261	3.711179	...	4.829439	3.824212
499	4.098953	1.865540	6.157218	3.758997	...	6.741380	3.885822
500	4.601091	0.392902	5.487008	3.808205	...	5.724288	3.217361
501	4.319800	3.725180	7.325702	3.983098	...	6.342093	3.995884
502	4.203298	1.522007	7.400537	3.788068	...	7.502010	2.942762
503	4.609617	1.527218	6.897843	3.837453	...	6.925927	3.551163
504	4.820442	0.782293	5.724713	3.823801	...	5.876098	4.161933
505	5.195032	3.036226	5.436685	4.004253	...	5.294942	6.108765
506	4.812117	1.170128	4.740611	4.192438	...	4.685929	5.101469
507	5.206945	1.551754	4.593372	4.121311	...	4.517752	4.532184
508	3.406461	4.968214	4.517914	4.113016	...	4.542096	5.849277
509	5.684600	1.584088	5.028471	4.240568	...	4.987743	4.800010
510	2.955616	0.355935	3.979649	4.233997	...	3.892604	8.093274
511	3.021306	0.357437	4.609832	4.366989	...	5.101016	4.954607
512	5.584764	0.590216	5.075260	4.362230	...	4.828216	5.258579
513	6.243092	0.823336	5.069333	4.500972	...	5.074013	7.337405
514	5.485065	1.983021	6.344031	4.645622	...	4.901136	10.467966
515	6.909178	1.604432	6.763386	4.496935	...	6.098259	6.508145
516	6.746061	0.523978	7.254634	4.717902	...	6.884542	4.325758
517	6.684430	0.835999	6.543835	4.872145	...	6.748120	8.266305
518	7.816726	0.838267	7.525497	4.876262	...	7.367184	7.545365
519	9.529378	1.228988	8.085093	4.957612	...	7.682268	8.294570
520	9.126769	0.687984	8.219870	5.041038	...	8.217799	2.756319
521	9.886199	2.864359	8.552408	5.126496	...	8.169570	9.030953
522	8.658073	1.087743	8.575488	5.297481	...	8.522675	9.380209
523	11.362195	2.422832	10.250153	5.475378	...	9.277922	10.251511
524	12.241054	1.648611	12.326197	5.314583	...	12.174643	11.401777
525	14.581687	2.443079	17.429526	5.315858	...	16.819992	13.259861
526	20.014966	2.926294	22.895658	5.402748	...	22.900369	15.605117

	31	32	33	34	35	3
6 \						
0	0.022053	0.567688	1.679199e-15	0.192696	-2.095101e-15	0.17791
4						
1	0.176290	0.463410	1.719178e-02	1.120642	2.161868e-02	0.19264
1						
2	-0.006970	0.523699	3.198865e-02	-1.215102	3.874170e-02	-0.17727
2						
3	0.446061	0.479072	4.105152e-01	0.392856	1.775476e-01	0.46703
4						
4	0.338089	0.492793	5.745942e-02	0.291048	3.660561e-01	0.08588
1						
5	0.125993	0.555355	3.460357e-01	0.852920	1.766253e-01	-0.34880
5						
6	0.287183	0.334976	5.403730e-01	0.956570	8.795253e-02	0.77089
0						
7	0.881526	0.467423	6.497686e-01	-0.963560	3.495656e-01	-0.79765
8						
8	-0.958033	0.241311	2.610069e-01	-0.612928	3.551854e-01	-0.22373
0						
9	0.148888	0.127852	4.682282e-01	-0.038448	1.141517e-01	-0.56704
7						
10	-0.771652	0.214675	-4.962658e+00	-2.803979	-4.872429e+00	-2.94784
5						
11	0.256669	0.277073	1.159575e-01	0.091343	1.238879e-01	0.10870
9						
12	-0.563017	0.205012	1.232540e-01	-3.053980	-4.146592e+00	-3.08621

3						
13	-0.453804	-0.257720	-3.274925e-01	-0.880574	-1.827095e-01	-1.49836
2						
14	-1.498270	0.113315	8.177201e-02	-0.316125	8.259001e-03	-0.30652
3						
15	0.987052	0.276069	-1.481614e-01	-1.871769	-5.081976e-02	-1.00431
4						
16	0.093594	0.256979	5.423973e-01	1.928051	4.809865e-01	1.41788
9						
17	-1.045150	-0.510193	2.778170e-01	0.283201	2.944973e-01	-0.13557
7						
18	0.054454	0.247204	-2.974613e-01	-0.998990	-3.141887e-01	-0.89304
8						
19	0.479589	0.335886	3.640231e-01	0.150448	7.741331e-02	-0.18669
8						
20	-0.057501	0.219454	2.707439e-01	0.150006	1.405903e-01	0.36503
1						
21	-0.367444	0.229237	2.745910e-01	0.651733	1.140826e-01	0.43088
2						
22	0.506844	0.203827	4.083333e-01	0.346172	2.541871e-01	0.15459
8						
23	0.583797	0.414805	4.953236e-01	0.423323	3.002007e-01	0.22156
1						
24	0.517158	0.378075	5.013016e-01	0.268427	2.315874e-01	0.19328
1						
25	0.666162	0.527783	5.587936e-01	0.178109	3.219821e-01	0.19288
8						
26	-0.317520	0.158871	2.062298e-01	0.654636	2.066084e-01	0.27770
3						
27	-0.425799	-0.268842	2.686324e-01	0.779921	-2.289546e-01	0.34980
5						
28	-0.054203	0.454903	2.874317e-01	0.495251	1.714956e-01	0.25458
2						
29	-1.219563	0.403013	3.106666e-01	0.502609	1.579010e-03	0.15159
5						
..
...						
497	4.282430	4.147605	3.760800e+00	3.946436	3.898367e+00	4.11390
6						
498	2.632327	4.191770	4.200239e+00	5.236447	4.269083e+00	4.87654
5						
499	2.793599	4.355134	4.280876e+00	4.465986	4.263323e+00	4.15828
8						
500	2.820105	4.095747	4.609157e+00	4.875650	4.367869e+00	4.54288
8						
501	3.120679	3.021199	4.466096e+00	4.842255	4.339193e+00	4.40653
4						
502	3.913123	4.417899	4.693112e+00	4.187812	4.511618e+00	3.99777
3						
503	3.514825	4.875494	4.726657e+00	4.402703	4.594323e+00	4.10377
5						
504	3.936260	4.642255	4.287150e+00	4.619163	4.478097e+00	4.45654
0						
505	5.721406	4.950958	4.786715e+00	4.331650	4.878298e+00	4.61669
0						
506	5.180636	5.024645	4.916617e+00	5.737302	4.869974e+00	5.17838
9						

507	5.293183	5.102629	5.218091e+00	4.412433	5.140417e+00	4.72111
5						
508	7.492405	5.525196	5.109722e+00	5.099466	5.194219e+00	5.81727
1						
509	4.216882	5.613294	5.418421e+00	6.028861	5.547687e+00	5.55821
8						
510	7.200065	5.345923	4.909916e+00	5.240583	5.664548e+00	5.20167
0						
511	4.133983	5.296569	6.034580e+00	5.946979	5.764494e+00	5.54005
9						
512	4.004151	5.454136	6.266763e+00	6.805159	6.164636e+00	6.31192
0						
513	3.539446	5.171871	6.472645e+00	6.256544	6.235382e+00	6.01640
9						
514	6.793733	6.480394	6.323609e+00	3.803033	6.682754e+00	5.60003
7						
515	5.769472	6.137404	7.295829e+00	6.437092	7.114112e+00	6.55192
2						
516	6.763277	6.622434	6.699800e+00	6.438210	6.769202e+00	6.78831
2						
517	6.957147	7.181347	7.378821e+00	7.556684	7.317606e+00	7.59251
3						
518	7.087764	7.256818	7.899079e+00	8.561669	7.700192e+00	7.25521
6						
519	6.917731	7.963993	9.078327e+00	8.971607	8.613678e+00	8.38673
5						
520	5.960374	8.599741	9.650046e+00	9.200536	9.349370e+00	8.43473
6						
521	10.006064	8.844964	7.090771e+00	3.538299	8.103808e+00	9.57590
7						
522	9.639611	9.898832	8.884289e+00	10.856066	9.260702e+00	9.87816
9						
523	9.921731	11.527783	1.152386e+01	9.526371	1.163557e+01	10.38154
9						
524	12.300064	13.241629	1.220654e+01	11.804625	1.212442e+01	12.04403
0						
525	14.724083	16.193722	1.545388e+01	14.688618	1.559914e+01	15.98492
9						
526	20.026345	21.110082	2.070713e+01	20.432715	2.098343e+01	20.68173
5						

	37	38
0	-0.203876	0.118809
1	0.365499	0.180564
2	0.007811	-0.027868
3	0.108501	0.171603
4	-0.069900	0.121395
5	-0.271102	0.176312
6	0.171660	0.092077
7	0.521929	0.184073
8	0.190672	0.141799
9	-0.066411	0.163336
10	-3.028021	-4.285504
11	-4.573503	-3.708082
12	-5.038603	-0.108318
13	-2.816940	0.200883
14	-0.558910	0.156367

15	0.235529	0.210325
16	0.323702	0.215004
17	0.167982	0.185863
18	-0.586381	0.202204
19	0.116522	0.228571
20	0.374762	0.233014
21	0.140853	0.227209
22	0.357125	0.241712
23	0.132605	0.245993
24	0.189345	0.250223
25	0.259217	0.254405
26	0.273114	0.193961
27	-0.118118	0.262502
28	-0.066158	0.266552
29	-0.179272	0.270560
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497	4.152357	4.093085
498	4.285328	3.984827
499	4.226614	4.185957
500	4.041823	4.178141
501	4.423949	4.374966
502	4.298019	4.470333
503	4.536642	4.566682
504	3.981217	4.654185
505	4.733435	4.792864
506	4.852751	4.931428
507	4.903961	5.022120
508	5.537347	5.178856
509	5.362199	5.304075
510	5.551262	5.422131
511	5.837952	5.632551
512	6.000490	5.791113
513	5.599257	6.009138
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517	7.296332	7.155627
518	7.514752	7.512954
519	8.090784	8.041443
520	8.542390	8.601242
521	8.400686	9.206345
522	10.775296	10.119783
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525	15.776526	15.741978
526	20.777492	21.345176

[527 rows x 38 columns]

In []: