

Import datasets from Kaggle by APIs

```
!mkdir ~/.kaggle
!cp kaggle.json ~/.kaggle/
!chmod 600 ~/.kaggle/kaggle.json
!kaggle datasets download -d camnugent/california-housing-prices
```

```
mkdir: cannot create directory '/root/.kaggle': File exists
Downloading california-housing-prices.zip to /content
 0% 0.00/400k [00:00<?, ?B/s]
100% 400k/400k [00:00<00:00, 120MB/s]
```

```
!unzip california-housing-prices.zip
```

```
Archive:  california-housing-prices.zip
  inflating: housing.csv
```

Import các Libraries để chuẩn bị dữ liệu , thực hiện tiền xử lý dữ liệu và huấn luyện các mô hình.

```
from pandas.plotting import scatter_matrix
from sklearn.impute import SimpleImputer
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import OneHotEncoder
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler
import numpy as np
import pandas as pd
```

```
path = "/content/housing.csv"
data = pd.read_csv(path)
```

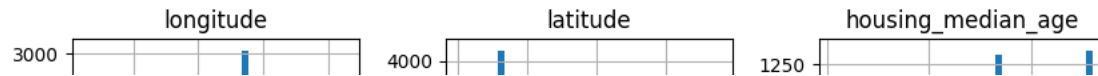
```
data.info()
data.describe()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20640 entries, 0 to 20639
Data columns (total 10 columns):
#   Column                Non-Null Count  Dtype
---  ---
0   longitude              20640 non-null  float64
1   latitude               20640 non-null  float64
2   housing_median_age     20640 non-null  float64
3   total_rooms            20640 non-null  float64
4   total_bedrooms         20433 non-null  float64
5   population             20640 non-null  float64
6   households              20640 non-null  float64
7   median_income          20640 non-null  float64
```

Trực quan hóa phân phối dữ liệu

```
#data visualization
import matplotlib.pyplot as plt
plt.figure()
data.hist(bins=40, figsize=(10,9))
```

```
array([[<Axes: title={'center': 'longitude'}>,
       <Axes: title={'center': 'latitude'}>,
       <Axes: title={'center': 'housing_median_age'}>],
      [ <Axes: title={'center': 'total_rooms'}>,
        <Axes: title={'center': 'total_bedrooms'}>,
        <Axes: title={'center': 'population'}>],
      [ <Axes: title={'center': 'households'}>,
        <Axes: title={'center': 'median_income'}>,
        <Axes: title={'center': 'median_house_value'}>]], dtype=object)
<Figure size 640x480 with 0 Axes>
```



Xác định độ tương quan giữa 'median\_house\_value' với các biến khác trong dữ liệu giúp xác định mỗi biến ảnh hưởng đến biến này.

```
data_temp = data.drop(['ocean_proximity'], axis=1)
corr_matrix = data_temp.corr()["median_house_value"].sort_values(ascending=False)
```

corr\_matrix

```
median_house_value    1.000000
median_income         0.688075
total_rooms           0.134153
housing_median_age    0.105623
households            0.065843
total_bedrooms        0.049686
population            -0.024650
longitude             -0.045967
latitude              -0.144160
Name: median_house_value, dtype: float64
```



Tiền xử lý dữ liệu - Data Preprocessing



```
#data cleaning
from sklearn.compose import ColumnTransformer

num_attr = list(data.columns)
num_attr.remove("ocean_proximity")
cat_attr = ["ocean_proximity"]

num_pipeline= Pipeline([
    ("imputer",SimpleImputer(strategy="median")),
    ("std_scaler", StandardScaler())
])

full_pipeline= ColumnTransformer([
    ("num", num_pipeline, num_attr),
    ("cat", OneHotEncoder(), cat_attr)
])

final_data = full_pipeline.fit_transform(data)
print(data.shape)
print(final_data.shape)
```

```
(20640, 10)
(20640, 14)
```

### Implementing - Triển khai thuật toán

```
def k_means(k,data = final_data, metric=" manhattan"):
    np.random.seed(42)
    centroids = data[np.random.randint(0, data.shape[0]-1, k)]
    dist_mat = calcDist(data, centroids, metric)
    min_index= dist_mat.argmin(axis=1)
    curr_dist_mat = np.empty((data.shape[0],k))
    index_for_each_cluster=[]
    count = 0

    while (not (np.array_equal(dist_mat, curr_dist_mat))):
        if count == 299:
            count = 0
            print("again")
            centroids = data[np.random.randint(0, data.shape[0]-1, k)]
            dist_mat = calcDist(data, centroids, metric)
            min_index= dist_mat.argmin(axis=1)

        sse = 0
        count+=1
        dist_mat = curr_dist_mat
        min_index= dist_mat.argmin(axis=1)
        index_for_each_cluster=[]
        std = np.empty((k, data.shape[1]))

        for i in range(k):
            indexes= [j for j, value in enumerate(min_index) if value == i]
            index_for_each_cluster.append(indexes)
            centroids[i] = np.average(data[indexes],axis=0)
            std[i] = np.std(data[indexes], axis=0)
            sse += (calcDist(data[indexes], centroids[np.newaxis,i], metric="euclidean")**2).sum()
        curr_dist_mat = calcDist(data, centroids, metric)
        # print(count)

    return centroids, min_index, std, sse

# Khoảng cách: Triển khai tính khoảng cách gồm 3 loại: Manhattan distance,
# Euclidean distance và Sup distance
def calcDist(x,y,metric):
    m = x.shape[0]
    dist = np.empty((x.shape[0],y.shape[0]))
    p = 1
    if metric == "euclidean":
        p = 2
    if metric == "sup":
        for i in range(m):
            dist[i] = (np.abs(x[i]-y).max(axis=1))
    else:
        for i in range(m):
            dist[i] = (((np.abs(x[i]-y)**p).sum(axis=1))**(1/p))
    return dist
```

Tiến hành phân cụm và trực quan hóa kết quả trên biểu đồ

```
# -PHÂN CỤM DỮ LIỆU
# -GỒM CÁC THÔNG TIN NHƯ SSE(TỔNG KHOẢNG CÁCH BÌNH PHƯƠNG), TÂM CỤM(CENTROID),V.V
# DATA VIZUALIZATION BY PLOT LATITUDE ALONG THE X AND LONGTITUDE ALONG THE Y(TRỰC QUAN HÓA DỮ LIỆU)
# BẢNG CÁCH VĨ ĐỘ DỌC THEO X CA KINH ĐỘ THEO TRỤC)
color = np.array(['teal', 'salmon', 'plum', 'navy', 'goldenrod', 'silver', 'pink', 'lime', 'lightblue', 'magenta'])
import plotly.graph_objects as go

val = list(data.columns)
val.extend(["ocean proximity1", "ocean proximity2", "ocean proximity3", "ocean proximity4"])

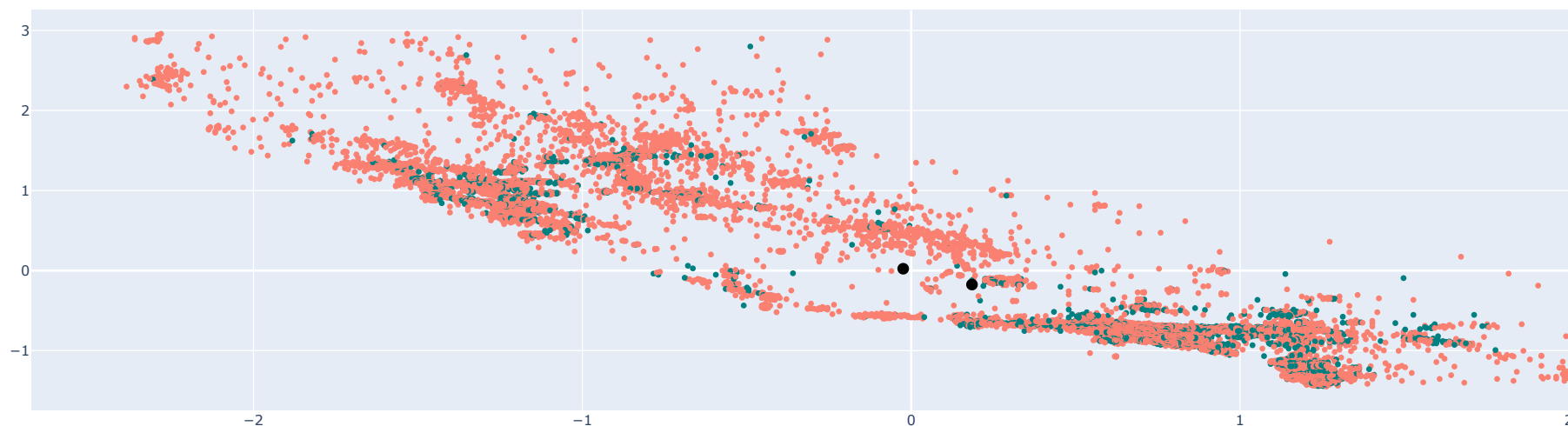
for i in range(2, 11): # Thay đổi khoảng giá trị của i nếu cần
    centroids, index_for_each_cluster, std, sse = k_means(i, metric="euclidean")
    print("k=", i)
    print("SSE:", sse)
    for k in range(0, i):
        print("feature", k + 1, ":")
        for j in range(len(val)):
            print(val[j], "mean:", centroids[k][j])
            print(val[j], "standard deviation:", std[k][j])
        print("\n")

fig = go.Figure()
fig.add_trace(go.Scatter(x=final_data[:, 0], y=final_data[:, 1], mode='markers', marker=dict(size=5, color=color[index_for_each_cluster])))
fig.add_trace(go.Scatter(x=centroids[:, 0], y=centroids[:, 1], mode='markers', marker=dict(size=10, color='black')))
fig.update_layout(title="k=" + str(i))
fig.show()
```

```
k= 2
SSE: 155912.96730341995
feature 1 :
longitude mean: 0.1848448872922426
longitude standard deviation: 0.98250429746025
latitude mean: -0.17499203444255
latitude standard deviation: 0.923293156463424
housing_median_age mean: -0.8762493696213745
housing_median_age standard deviation: 0.7363926371406387
total_rooms mean: 1.9314816521338047
total_rooms standard deviation: 1.6589342961101763
total_bedrooms mean: 2.005906012940545
total_bedrooms standard deviation: 1.5130269343162828
population mean: 1.8567159135485547
population standard deviation: 1.6430320424413145
households mean: 2.0084019946626674
households standard deviation: 1.4876696795895528
median_income mean: 0.16082391882658206
median_income standard deviation: 0.9427572093071994
median_house_value mean: 0.14092422981026598
median_house_value standard deviation: 0.9335317395037899
ocean_proximity mean: 0.4766666666666667
ocean_proximity standard deviation: 0.4994552588125977
ocean_proximity1 mean: 0.32625
ocean_proximity1 standard deviation: 0.46883999136165716
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.08208333333333333
ocean_proximity3 standard deviation: 0.27449163871094723
ocean_proximity4 mean: 0.115
ocean_proximity4 standard deviation: 0.3190219428189877
```

```
feature 2 :
longitude mean: -0.02432169569635598
longitude standard deviation: 0.9997382507446056
latitude mean: 0.023025267689808615
latitude standard deviation: 1.0073988323682912
housing_median_age mean: 0.11529596968702903
housing_median_age standard deviation: 0.9725769422576367
total_rooms mean: -0.25414232264918507
total_rooms standard deviation: 0.46260765396203024
total_bedrooms mean: -0.2639350017027054
total_bedrooms standard deviation: 0.4809067308004223
population mean: -0.24430472546691478
population standard deviation: 0.5129182827545086
households mean: -0.2642634203503513
households standard deviation: 0.4896848035265707
median_income mean: -0.021161041950865538
median_income standard deviation: 1.0053764226803417
median_house_value mean: -0.018542661817138765
median_house_value standard deviation: 1.0069525247822335
ocean_proximity mean: 0.4381578947368421
ocean_proximity standard deviation: 0.49616081467266726
ocean_proximity1 mean: 0.3162280701754386
ocean_proximity1 standard deviation: 0.4650030944074417
ocean_proximity2 mean: 0.00027412280701754384
ocean_proximity2 standard deviation: 0.016554385029470844
ocean_proximity3 mean: 0.11474780701754386
ocean_proximity3 standard deviation: 0.318717347821336
ocean_proximity4 mean: 0.1305921052631579
ocean_proximity4 standard deviation: 0.33695371686047126
```

k=2



k= 3

SSE: 122226.85564020059

feature 1 :

longitude mean: 0.7859866678707745

longitude standard deviation: 0.3680114207301736

latitude mean: -0.8165358892089509

latitude standard deviation: 0.2598347563311823

housing\_median\_age mean: 0.09338098856720205

housing\_median\_age standard deviation: 0.9231123888495774

total\_rooms mean: -0.21476534428297006

total\_rooms standard deviation: 0.5005914860044748

total\_bedrooms mean: -0.19648990841544056

total\_bedrooms standard deviation: 0.531539884461147

population mean: -0.1388426162175823

population standard deviation: 0.5755794523690899

households mean: -0.19159843496958287

households standard deviation: 0.5315999006856018

median\_income mean: 0.027990877057746638

median\_income standard deviation: 1.0189594481911735

median\_house\_value mean: 0.0811124654303228

median\_house\_value standard deviation: 0.9772581463035862

ocean\_proximity mean: 0.6530535072792588

ocean\_proximity standard deviation: 0.4759985545246193

ocean proximity1 mean: 0.18850444318396672

ocean proximity1 standard deviation: 0.3911144565007427

ocean proximity2 mean: 0.00047267914539610514

ocean proximity2 standard deviation: 0.021736046554556382

ocean proximity3 mean: 0.0

ocean proximity3 standard deviation: 0.0

ocean proximity4 mean: 0.15796937039137834

ocean proximity4 standard deviation: 0.364712281681775

```

feature 2 :
longitude mean: 0.200619507464979
longitude standard deviation: 0.9745991647126568
latitude mean: -0.17787195546809112
latitude standard deviation: 0.9048999678067969
housing_median_age mean: -0.9500418265502015
housing_median_age standard deviation: 0.7171499552253504
total_rooms mean: 2.3619046312111998
total_rooms standard deviation: 1.7857964518169802
total_bedrooms mean: 2.42245862864918
total_bedrooms standard deviation: 1.6099995778150689
population mean: 2.2402922532446468
population standard deviation: 1.7858040862394804
households mean: 2.4217745280593177
households standard deviation: 1.5810287210920992
median_income mean: 0.19194841439128663
median_income standard deviation: 0.9435346650746042
median_house_value mean: 0.14321481584154822
median_house_value standard deviation: 0.9424484786105422
ocean_proximity mean: 0.464938126104891
ocean_proximity standard deviation: 0.4987691500072701
ocean_proximity1 mean: 0.3512080141426046
ocean_proximity1 standard deviation: 0.4773478238607743
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.08131997642899234
ocean_proximity3 standard deviation: 0.27332588216737974
ocean_proximity4 mean: 0.10253388332351208
ocean_proximity4 standard deviation: 0.30334911586176133

```

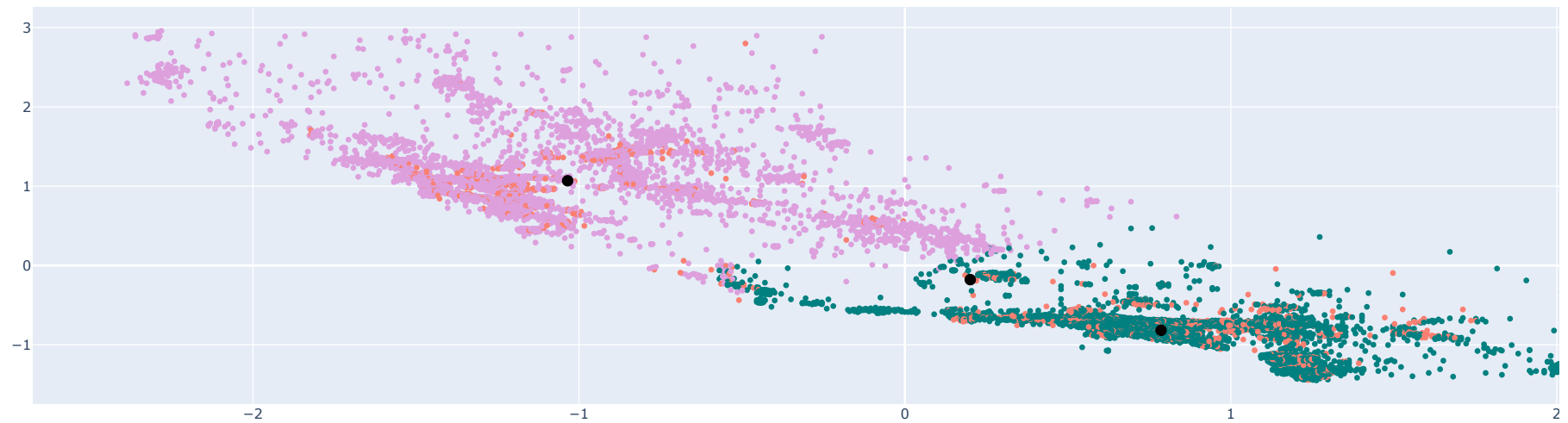
```

feature 3 :
longitude mean: -1.034622627245096
longitude standard deviation: 0.4936079244637241
latitude mean: 1.0686390130880672
latitude standard deviation: 0.47371399342567616
housing_median_age mean: 0.0746487606206636
housing_median_age standard deviation: 1.042021762521996
total_rooms mean: -0.20757493692052084
total_rooms standard deviation: 0.5200337204546583
total_bedrooms mean: -0.24296975990425973
total_bedrooms standard deviation: 0.5347261621290972
population mean: -0.2789119855835748
population standard deviation: 0.5302523522489174
households mean: -0.24901651273262515
households standard deviation: 0.5519999075319377
median_income mean: -0.07433639650195528
median_income standard deviation: 0.979728043623096
median_house_value mean: -0.13162500918171463
median_house_value standard deviation: 1.024566076439934
ocean_proximity mean: 0.17202630005977287
ocean_proximity standard deviation: 0.37740330171782277
ocean_proximity1 mean: 0.4735206216377765
ocean_proximity1 standard deviation: 0.49929835020914204
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.2572624028690974
ocean_proximity3 standard deviation: 0.43712522111986485
ocean_proximity4 mean: 0.09719067543335326
ocean_proximity4 standard deviation: 0.2962172311702181

```



K=3



k= 4

SSE: 109378.90105118466

feature 1 :

longitude mean: 0.7870009262335171

longitude standard deviation: 0.365710561404446

latitude mean: -0.819481708467919

latitude standard deviation: 0.25870431990641174

housing\_median\_age mean: 0.17592167604343045

housing\_median\_age standard deviation: 0.903936822489469

total\_rooms mean: -0.3122332661257467

total\_rooms standard deviation: 0.4067447460280257

total\_bedrooms mean: -0.30419405739796523

total\_bedrooms standard deviation: 0.4262324678094468

population mean: -0.2391640241287118

population standard deviation: 0.48247017324990454

households mean: -0.298632537732729

households standard deviation: 0.4313201487941555

median\_income mean: 0.02158548972280082

median\_income standard deviation: 1.02228346343144

median\_house\_value mean: 0.07194669231130016

median\_house\_value standard deviation: 0.9787158413346709

ocean\_proximity mean: 0.6572356701246987

ocean\_proximity standard deviation: 0.47463348390149623

ocean proximity1 mean: 0.18296133291417793

ocean proximity1 standard deviation: 0.3866348193999561

ocean proximity2 mean: 0.000523944252331552

ocean proximity2 standard deviation: 0.022883831295303008

ocean proximity3 mean: 0.0

ocean proximity3 standard deviation: 0.0

ocean proximity4 mean: 0.15927905270879178

ocean proximity4 standard deviation: 0.3659361092827373

feature 2 :

longitude mean: 0.18984738039927665

longitude standard deviation: 0.9477018937169768

```

latitude mean: -0.206279525160095
latitude standard deviation: 0.8762589999762636
housing_median_age mean: -0.7731833040347945
housing_median_age standard deviation: 0.7337776799747538
total_rooms mean: 1.2220960643640832
total_rooms standard deviation: 0.7837307642263633
total_bedrooms mean: 1.3063002449072612
total_bedrooms standard deviation: 0.7610999624232961
population mean: 1.2030060008558712
population standard deviation: 0.7937047349787734
households mean: 1.3176784649727558
households standard deviation: 0.7366192972947767
median_income mean: 0.14267808779858274
median_income standard deviation: 0.9663974683671746
median_house_value mean: 0.1581354428030024
median_house_value standard deviation: 0.9653867585412762
ocean_proximity mean: 0.49588477366255146
ocean_proximity standard deviation: 0.49998306462537806
ocean_proximity1 mean: 0.3058984910836763
ocean_proximity1 standard deviation: 0.46078694017561367
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.0720164609053498
ocean_proximity3 standard deviation: 0.25851516447592154
ocean_proximity4 mean: 0.1262002743484225
ocean_proximity4 standard deviation: 0.332074938986375

```

feature 3 :

```

longitude mean: 0.33929388981225544
longitude standard deviation: 0.9641067862459302
latitude mean: -0.2442675131080271
latitude standard deviation: 0.904412446460622
housing_median_age mean: -1.3125652397670862
housing_median_age standard deviation: 0.6199166870361272
total_rooms mean: 5.126979859137466
total_rooms standard deviation: 2.380994355477216
total_bedrooms mean: 5.003514819936633
total_bedrooms standard deviation: 1.9909597740245337
population mean: 4.7697860167510475
population standard deviation: 2.670817006564792
households mean: 4.951763483210934
households standard deviation: 2.0082630295579285
median_income mean: 0.27468269714219024
median_income standard deviation: 0.8111916071315158
median_house_value mean: 0.04594057401908153
median_house_value standard deviation: 0.8394467355585042
ocean_proximity mean: 0.3973941368078176
ocean_proximity standard deviation: 0.4893588017381397
ocean_proximity1 mean: 0.4592833876221498
ocean_proximity1 standard deviation: 0.4983393998837258
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.06840390879478828
ocean_proximity3 standard deviation: 0.25243774293156335
ocean_proximity4 mean: 0.0749185667752443
ocean_proximity4 standard deviation: 0.2632599003410654

```

feature 4 :

```

longitude mean: -1.037351793810418
longitude standard deviation: 0.49573423085762086
latitude mean: 1.0790976842520177
latitude standard deviation: 0.4769657186886658

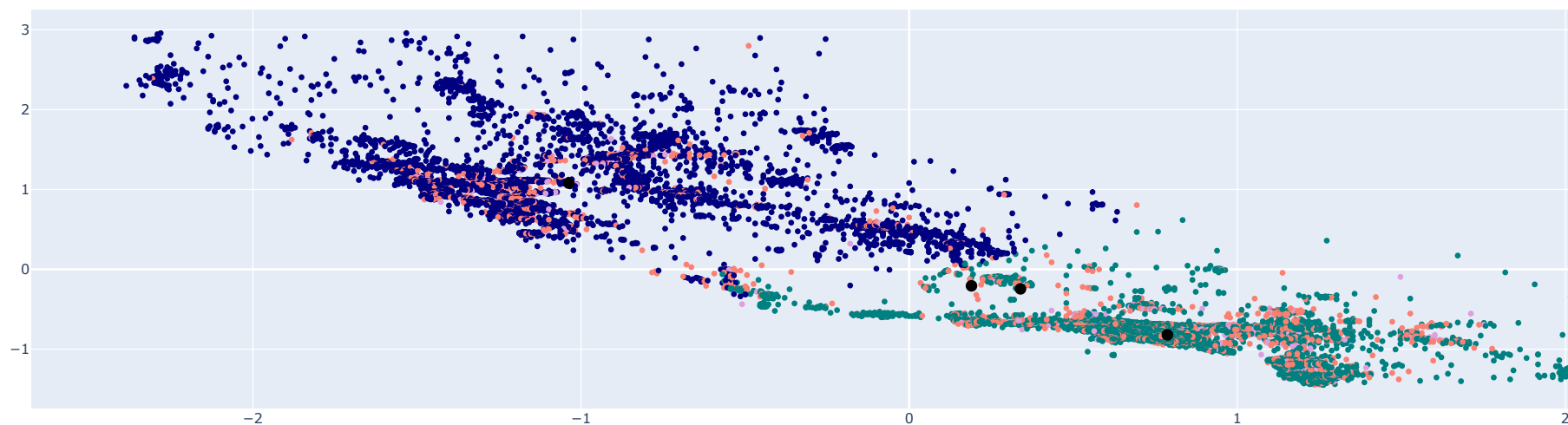
```

```

housing_median_age mean: 0.12430016366415263
housing_median_age standard deviation: 1.036863726110524
total_rooms mean: -0.2740631041151737
total_rooms standard deviation: 0.4483792977470308
total_bedrooms mean: -0.31017610796562545
total_bedrooms standard deviation: 0.464361077392356
population mean: -0.34162401871704395
population standard deviation: 0.4676866530352413
households mean: -0.31911245689901924
households standard deviation: 0.4782194881009669
median_income mean: -0.08970881641706976
median_income standard deviation: 0.9818833048879101
median_house_value mean: -0.14755067210618902
median_house_value standard deviation: 1.024871754605812
ocean_proximity mean: 0.16459232918465838
ocean_proximity standard deviation: 0.3708122090199212
ocean_proximity1 mean: 0.4790449580899162
ocean_proximity1 standard deviation: 0.49956069322810726
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.261493522987046
ocean_proximity3 standard deviation: 0.4394481316639026
ocean_proximity4 mean: 0.09486918973837948
ocean_proximity4 standard deviation: 0.29303417305286594

```

k=4



```

k= 5
SSE: 94857.05192825556
feature 1 :
longitude mean: 0.807731292283194
longitude standard deviation: 0.3784645458341183
latitude mean: -0.8166028554401259
latitude standard deviation: 0.27912943726824996
housing_median_age mean: 0.17551765871841432

```

```

housing_median_age standard deviation: 0.8844699776195002
total_rooms mean: -0.3420017707438879
total_rooms standard deviation: 0.39423416640840814
total_bedrooms mean: -0.28275795945052945
total_bedrooms standard deviation: 0.4409979841064514
population mean: -0.19458606081199112
population standard deviation: 0.5033297433077535
households mean: -0.27964564125889524
households standard deviation: 0.4436744430866075
median_income mean: -0.29542785335172606
median_income standard deviation: 0.632728313338058
median_house_value mean: -0.2792238815636589
median_house_value standard deviation: 0.6057092739598507
ocean_proximity mean: 0.6329129729054813
ocean_proximity standard deviation: 0.4820105202518065
ocean_proximity1 mean: 0.21201148707703832
ocean_proximity1 standard deviation: 0.408732940224351
ocean_proximity2 mean: 0.0006242976651267324
ocean_proximity2 standard deviation: 0.02497814880154327
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.1544512423523536
ocean_proximity4 standard deviation: 0.36138076330675056

```

feature 2 :

```

longitude mean: -0.044670394242782525
longitude standard deviation: 0.9703097795167932
latitude mean: -0.18107491726780667
latitude standard deviation: 0.8405639962735977
housing_median_age mean: 0.1430285854601364
housing_median_age standard deviation: 1.0225159068400762
total_rooms mean: -0.026564610664899083
total_rooms standard deviation: 0.5656080866752202
total_bedrooms mean: -0.28031622850331905
total_bedrooms standard deviation: 0.48066709602108315
population mean: -0.3290049687292176
population standard deviation: 0.4619234728679447
households mean: -0.2599954288739259
households standard deviation: 0.4941085712512614
median_income mean: 1.5832127391692272
median_income standard deviation: 1.2038650482193534
median_house_value mean: 1.7540472985308582
median_house_value standard deviation: 0.7087378535030656
ocean_proximity mean: 0.5958640028040659
ocean_proximity standard deviation: 0.4907240497126458
ocean_proximity1 mean: 0.0627409744128987
ocean_proximity1 standard deviation: 0.2424964835675427
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.15177006659656503
ocean_proximity3 standard deviation: 0.35879787273873526
ocean_proximity4 mean: 0.18962495618647038
ocean_proximity4 standard deviation: 0.3920042502036828

```

feature 3 :

```

longitude mean: 0.1790990784166851
longitude standard deviation: 0.9576279041046267
latitude mean: -0.18504743995907277
latitude standard deviation: 0.888919054416256
housing_median_age mean: -0.7982139704613067
housing_median_age standard deviation: 0.7310037736125029
total_rooms mean: 1.2720091032490617

```

```

total_rooms standard deviation: 0.8074024873906933
total_bedrooms mean: 1.4007476222878332
total_bedrooms standard deviation: 0.7710574515801745
population mean: 1.2858448185446314
population standard deviation: 0.8064113044542777
households mean: 1.4120914668189548
households standard deviation: 0.7426324131244822
median_income mean: 0.026768196539666864
median_income standard deviation: 0.7932412762752812
median_house_value mean: 0.04721964524704513
median_house_value standard deviation: 0.8374009427247061
ocean_proximity mean: 0.48611639406618484
ocean_proximity standard deviation: 0.49980720831764375
ocean_proximity1 mean: 0.3187523773297832
ocean_proximity1 standard deviation: 0.4659928103269417
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.07683529859262077
ocean_proximity3 standard deviation: 0.26632993726354814
ocean_proximity4 mean: 0.11829593001141119
ocean_proximity4 standard deviation: 0.3229582062034461

```

feature 4 :

```

longitude mean: -1.0082816797667429
longitude standard deviation: 0.5125440576980311
latitude mean: 1.110739525551138
latitude standard deviation: 0.4949611748193332
housing_median_age mean: 0.0975039772479926
housing_median_age standard deviation: 1.0332089304275278
total_rooms mean: -0.29914197085992067
total_rooms standard deviation: 0.4380327217578449
total_bedrooms mean: -0.3056338380374187
total_bedrooms standard deviation: 0.4669056258793081
population mean: -0.33509993062057863
population standard deviation: 0.4745345132719125
households mean: -0.319977526812839
households standard deviation: 0.4797064537489501
median_income mean: -0.336593869159937
median_income standard deviation: 0.6382457609660569
median_house_value mean: -0.4244549652388378
median_house_value standard deviation: 0.72164772296573
ocean_proximity mean: 0.14200320746464498
ocean_proximity standard deviation: 0.3490534293405481
ocean_proximity1 mean: 0.54002041113865
ocean_proximity1 standard deviation: 0.4983957932128708
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.23837294066190406
ocean_proximity3 standard deviation: 0.42608834978455945
ocean_proximity4 mean: 0.079603440734801
ocean_proximity4 standard deviation: 0.2706782831295942

```

feature 5 :

```

longitude mean: 0.3561285491070012
longitude standard deviation: 0.9626423394573176
latitude mean: -0.259633372130389
latitude standard deviation: 0.9028590175652056
housing_median_age mean: -1.3243335675681047
housing_median_age standard deviation: 0.618087757952037
total_rooms mean: 5.250289178624659
total_rooms standard deviation: 2.3869701787221937
total_bedrooms mean: 5.096992045735162

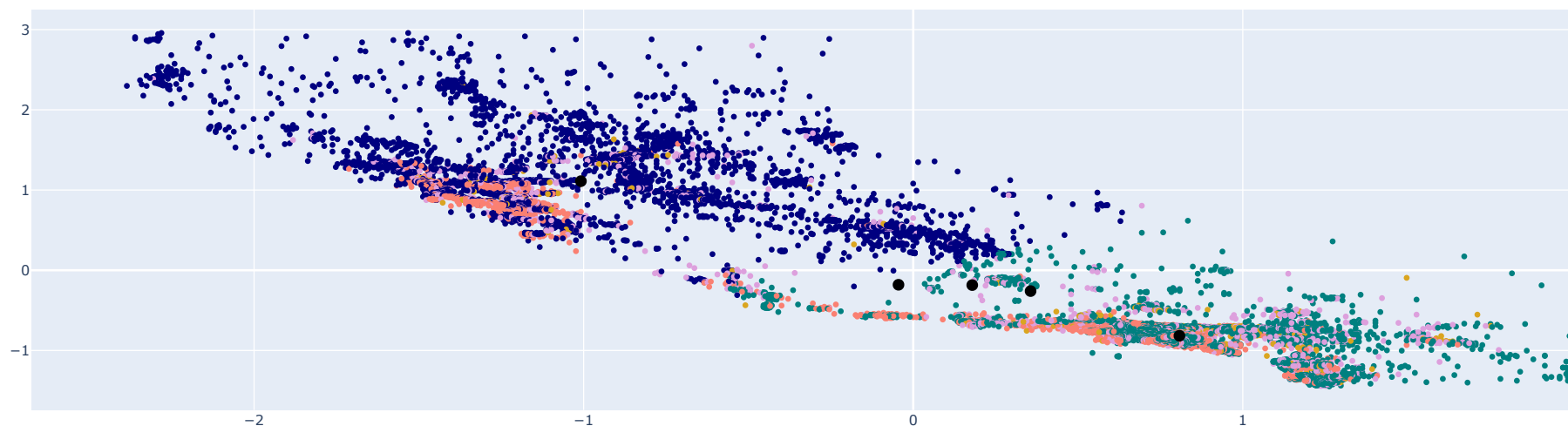
```

```

total_bedrooms standard deviation: 2.0063607146174847
population mean: 4.879501148277214
population standard deviation: 2.700093088117749
households mean: 5.047538929524311
households standard deviation: 2.022666784442699
median_income mean: 0.3017223879634166
median_income standard deviation: 0.8197667275376586
median_house_value mean: 0.06621822052928447
median_house_value standard deviation: 0.8467225517522843
ocean_proximity mean: 0.39655172413793105
ocean_proximity standard deviation: 0.489181412383141
ocean_proximity1 mean: 0.45517241379310347
ocean_proximity1 standard deviation: 0.49798643306305307
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.06896551724137931
ocean_proximity3 standard deviation: 0.2533954906327427
ocean_proximity4 mean: 0.07931034482758621
ocean_proximity4 standard deviation: 0.27022252687538006

```

k=5



```

k= 6
SSE: 87383.14038822993
feature 1 :
longitude mean: 0.46454276752453516
longitude standard deviation: 0.6872451180842613
latitude mean: -0.6203123469211315
latitude standard deviation: 0.5742770589688876
housing_median_age mean: -0.036852617635571204
housing_median_age standard deviation: 0.9971235705239643
total_rooms mean: -0.006212637437669428
total_rooms standard deviation: 0.5867080845610871
total_bedrooms mean: -0.2738537700203401
total bedrooms standard deviation: 0.48023704846551

```

```

total_rooms standard deviation: 0.700297040001
population mean: -0.3048331547706187
population standard deviation: 0.46210837791542725
households mean: -0.2553236165963742
households standard deviation: 0.49170743762974306
median_income mean: 1.6365889204315558
median_income standard deviation: 1.2677305282479356
median_house_value mean: 1.6540462073616968
median_house_value standard deviation: 0.7889148056005222
ocean_proximity mean: 0.7231473771856786
ocean_proximity standard deviation: 0.44744301095798744
ocean_proximity1 mean: 0.07077435470441298
ocean_proximity1 standard deviation: 0.25644754906333034
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.028726061615320566
ocean_proximity3 standard deviation: 0.16703555010653634
ocean_proximity4 mean: 0.17735220649458786
ocean_proximity4 standard deviation: 0.38196649243891456

```

feature 2 :

```

longitude mean: 0.3676426015140386
longitude standard deviation: 0.956604884524557
latitude mean: -0.2795279428370658
latitude standard deviation: 0.8866293256330126
housing_median_age mean: -1.3276514873355423
housing_median_age standard deviation: 0.6169694008424467
total_rooms mean: 5.356177503541711
total_rooms standard deviation: 2.406976413335365
total_bedrooms mean: 5.191002407488631
total_bedrooms standard deviation: 2.01761490535205
population mean: 5.001424003314223
population standard deviation: 2.71677269917564
households mean: 5.155638665245238
households standard deviation: 2.0213235410373755
median_income mean: 0.3105851587974932
median_income standard deviation: 0.8332354102135955
median_house_value mean: 0.07580941251427747
median_house_value standard deviation: 0.8576117923579065
ocean_proximity mean: 0.40145985401459855
ocean_proximity standard deviation: 0.49019367563155525
ocean_proximity1 mean: 0.44525547445255476
ocean_proximity1 standard deviation: 0.49699400089194745
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.06934306569343066
ocean_proximity3 standard deviation: 0.2540366212451805
ocean_proximity4 mean: 0.08394160583941605
ocean_proximity4 standard deviation: 0.27730022114761466

```

feature 3 :

```

longitude mean: -1.309504221720273
longitude standard deviation: 0.1818732949103292
latitude mean: 0.9610793083700534
latitude standard deviation: 0.2309292362521948
housing_median_age mean: 0.6774616960249823
housing_median_age standard deviation: 0.9491720640930604
total_rooms mean: -0.21133309232611586
total_rooms standard deviation: 0.4711456657628896
total_bedrooms mean: -0.2555303731256413
total_bedrooms standard deviation: 0.49975780729783675
population mean: -0.3038779613752656
population standard deviation: 0.48498286676755775

```

```

population standard deviation: 0.4743020007075775
households mean: -0.23637303564928522
households standard deviation: 0.5160905447328916
median_income mean: 0.2591774299736797
median_income standard deviation: 0.7844178293634981
median_house_value mean: 0.5818818132482299
median_house_value standard deviation: 0.8683598758595188
ocean_proximity mean: 0.25188083057478183
ocean_proximity standard deviation: 0.4340931671470296
ocean_proximity1 mean: 0.049653927174240144
ocean_proximity1 standard deviation: 0.21722894533284448
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.5272344267228408
ocean_proximity3 standard deviation: 0.49925773504381793
ocean_proximity4 mean: 0.17123081552813724
ocean_proximity4 standard deviation: 0.37671052990553944

```

feature 4 :

```

longitude mean: 0.8132753427223917
longitude standard deviation: 0.38057847284411206
latitude mean: -0.8248798608568481
latitude standard deviation: 0.2638100376338316
housing_median_age mean: 0.20233584969512056
housing_median_age standard deviation: 0.8776037600461223
total_rooms mean: -0.3481215502012916
total_rooms standard deviation: 0.3916681331168225
total_bedrooms mean: -0.28004958722870926
total_bedrooms standard deviation: 0.4443138174321773
population mean: -0.18902530850142588
population standard deviation: 0.5077197777997522
households mean: -0.27672022643552513
households standard deviation: 0.44672289529029624
median_income mean: -0.32646260579631686
median_income standard deviation: 0.5990831569553934
median_house_value mean: -0.29720265129623824
median_house_value standard deviation: 0.5765004632659658
ocean_proximity mean: 0.6376565762004175
ocean_proximity standard deviation: 0.48067730030529593
ocean_proximity1 mean: 0.20433194154488518
ocean_proximity1 standard deviation: 0.4032125980291079
ocean_proximity2 mean: 0.0006524008350730689
ocean_proximity2 standard deviation: 0.025533805204538663
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.1573590814196242
ocean_proximity4 standard deviation: 0.36413898571067493

```

feature 5 :

```

longitude mean: 0.2098109162232889
longitude standard deviation: 0.9505060410677055
latitude mean: -0.21372174808755098
latitude standard deviation: 0.8820803551906629
housing_median_age mean: -0.8095025860968614
housing_median_age standard deviation: 0.7166444673323863
total_rooms mean: 1.3280751931275865
total_rooms standard deviation: 0.8347800519945977
total_bedrooms mean: 1.4695951892497126
total_bedrooms standard deviation: 0.783926704388212
population mean: 1.347061933644365
population standard deviation: 0.8183084628145981
households mean: 1.4759199112830317
households standard deviation: 0.7524480276878075

```



```

median_income standard deviation: 0.77247002700707
median_income mean: 0.01009169921602284
median_income standard deviation: 0.7800824465995586
median_house_value mean: 0.032381056418673795
median_house_value standard deviation: 0.8262343921792913
ocean_proximity mean: 0.493681206685691
ocean_proximity standard deviation: 0.49996007125674
ocean_proximity1 mean: 0.3204239706481859
ocean_proximity1 standard deviation: 0.46663952863235914
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.06930289441500204
ocean_proximity3 standard deviation: 0.2539685083641355
ocean_proximity4 mean: 0.11659192825112108
ocean_proximity4 standard deviation: 0.32093340511359625

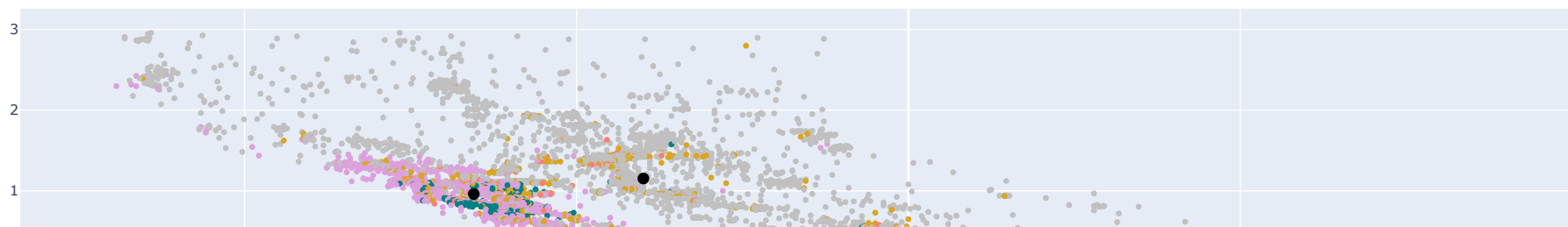
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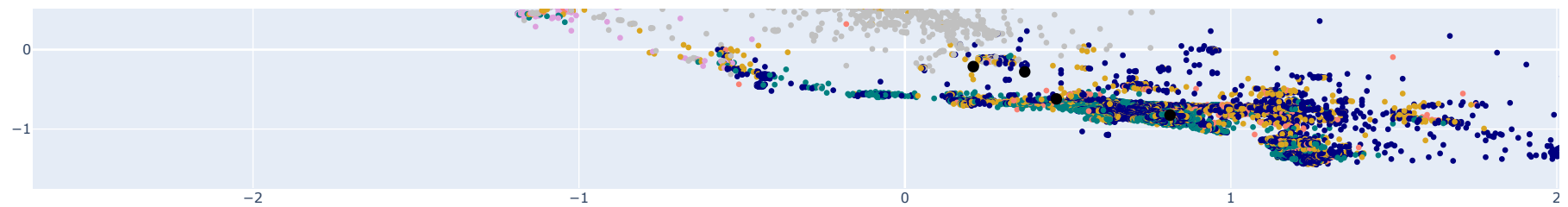
```

feature 6 :
longitude mean: -0.798561378371488
longitude standard deviation: 0.5763761367240591
latitude mean: 1.1536368420853031
latitude standard deviation: 0.6040112505512043
housing_median_age mean: -0.30148117355618764
housing_median_age standard deviation: 0.897912136365299
total_rooms mean: -0.296236715969219
total_rooms standard deviation: 0.456187444198232
total_bedrooms mean: -0.30371959258957715
total_bedrooms standard deviation: 0.4756728384999315
population mean: -0.3280387781551215
population standard deviation: 0.4951400730876943
households mean: -0.3345574263319047
households standard deviation: 0.4873222406598032
median_income mean: -0.5305435560441158
median_income standard deviation: 0.5811128222866517
median_house_value mean: -0.8242824152069328
median_house_value standard deviation: 0.4110797967425819
ocean_proximity mean: 0.07824933687002653
ocean_proximity standard deviation: 0.26856354583119757
ocean_proximity1 mean: 0.8271441202475686
ocean_proximity1 standard deviation: 0.37812263167843824
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.0618921308576481
ocean_proximity3 standard deviation: 0.24095952978776927
ocean_proximity4 mean: 0.032714412024756855
ocean_proximity4 standard deviation: 0.17788810885114023

```

k=6





k= 7

SSE: 81292.192151536

feature 1 :

longitude mean: -1.3117957905363111

longitude standard deviation: 0.18399632017480172

latitude mean: 0.9647647030023547

latitude standard deviation: 0.23571469845565962

housing\_median\_age mean: 0.6875054416563675

housing\_median\_age standard deviation: 0.9421474411380619

total\_rooms mean: -0.2065666016870085

total\_rooms standard deviation: 0.4784867283536269

total\_bedrooms mean: -0.2426767346672153

total\_bedrooms standard deviation: 0.5113429193393803

population mean: -0.2909994064937117

population standard deviation: 0.49722716047868937

households mean: -0.2236668882482733

households standard deviation: 0.5283514297417266

median\_income mean: 0.2155879868459716

median\_income standard deviation: 0.7589995458578324

median\_house\_value mean: 0.538484781672292

median\_house\_value standard deviation: 0.8589365515007199

ocean\_proximity mean: 0.25479041916167666

ocean\_proximity standard deviation: 0.4357433435694662

ocean\_proximity1 mean: 0.04790419161676647

ocean\_proximity1 standard deviation: 0.2135635269476197

ocean\_proximity2 mean: 0.0

ocean\_proximity2 standard deviation: 0.0

ocean\_proximity3 mean: 0.5263473053892216

ocean\_proximity3 standard deviation: 0.4993053369419808

ocean\_proximity4 mean: 0.17095808383233532

ocean\_proximity4 standard deviation: 0.3764723328542376

feature 2 :

longitude mean: -0.8099317307777517

longitude standard deviation: 0.5662061158878262

latitude mean: 1.1700691977894488

latitude standard deviation: 0.5915429148024488

housing\_median\_age mean: -0.3226829338472505

housing\_median\_age standard deviation: 0.8868714883887209

total\_rooms mean: -0.2875232256139729

total\_rooms standard deviation: 0.4668945727458215

total\_bedrooms mean: -0.29634507648145925

total\_bedrooms standard deviation: 0.48537037133649247

population mean: -0.3221080247560585

population standard deviation: 0.5028434896427967

households mean: -0.3264174180768322

households standard deviation: 0.4984692965493605

median\_income mean: -0.5205968004315646

median\_income standard deviation: 0.586861232376612

median\_house\_value mean: 0.0173227440324202

```

median_house_value mean: -0.0113312402254392
median_house_value standard deviation: 0.4152337001591442
ocean_proximity mean: 0.08045719408337068
ocean_proximity standard deviation: 0.27199969485940023
ocean_proximity1 mean: 0.8310174809502465
ocean_proximity1 standard deviation: 0.37473647714806974
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.05849394890183774
ocean_proximity3 standard deviation: 0.2346751091268746
ocean_proximity4 mean: 0.03003137606454505
ocean_proximity4 standard deviation: 0.17067364329681964

```

feature 3 :

```

longitude mean: 0.31626122905818743
longitude standard deviation: 0.9647007024256058
latitude mean: -0.2572448174638362
latitude standard deviation: 0.9136467674560609
housing_median_age mean: -1.3884232338587255
housing_median_age standard deviation: 0.5843712427076152
total_rooms mean: 6.07618125722557
total_rooms standard deviation: 2.4179200054642376
total_bedrooms mean: 5.766733614040409
total_bedrooms standard deviation: 2.0566556148986477
population mean: 5.613755713023247
population standard deviation: 2.9185786086589753
households mean: 5.765146622591245
households standard deviation: 2.0356422002644217
median_income mean: 0.4298131602666378
median_income standard deviation: 0.8426650685695996
median_house_value mean: 0.16605713522236565
median_house_value standard deviation: 0.8491450553579314
ocean_proximity mean: 0.44221105527638194
ocean_proximity standard deviation: 0.49664921007460633
ocean_proximity1 mean: 0.39195979899497485
ocean_proximity1 standard deviation: 0.48818778658093565
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.07035175879396985
ocean_proximity3 standard deviation: 0.25573890753767875
ocean_proximity4 mean: 0.09547738693467336
ocean_proximity4 standard deviation: 0.29387319632589876

```

feature 4 :

```

longitude mean: 0.8292563915707473
longitude standard deviation: 0.43491569763551724
latitude mean: -0.8163224360932636
latitude standard deviation: 0.331578199345124
housing_median_age mean: -0.559056922408891
housing_median_age standard deviation: 0.7420267345510866
total_rooms mean: 0.24396780460067263
total_rooms standard deviation: 0.4451058704206222
total_bedrooms mean: 0.36986283827353944
total_bedrooms standard deviation: 0.4806446610365445
population mean: 0.4043875690342299
population standard deviation: 0.5853453942298247
households mean: 0.3698553784667018
households standard deviation: 0.4658925719001742
median_income mean: -0.19107554457349735
median_income standard deviation: 0.644440158546684
median_house_value mean: -0.19833339890420043
median_house_value standard deviation: 0.632085765851064
ocean_proximity mean: 0.5527050310550007

```

```

ocean_proximity mean: 0.5521950310559001
ocean_proximity standard deviation: 0.49720487195502433
ocean_proximity1 mean: 0.26312817617165446
ocean_proximity1 standard deviation: 0.44033139687767636
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.18407679277244496
ocean_proximity4 standard deviation: 0.38754680637963396

```

```

feature 5 :
longitude mean: -0.043159675930760415
longitude standard deviation: 1.0123072313769303
latitude mean: 0.03840243693921081
latitude standard deviation: 0.9425049146599122
housing_median_age mean: -0.8888959229985084
housing_median_age standard deviation: 0.7030223638643294
total_rooms mean: 1.839257008592287
total_rooms standard deviation: 0.8787478998152267
total_bedrooms mean: 1.9477194382517322
total_bedrooms standard deviation: 0.8502948249430804
population mean: 1.7524709348107634
population standard deviation: 0.8975096608231038
households mean: 1.9530607595557206
households standard deviation: 0.7940533278606684
median_income mean: 0.1322062963306172
median_income standard deviation: 0.842701121897463
median_house_value mean: 0.13177562297478504
median_house_value standard deviation: 0.8990105321868441
ocean_proximity mean: 0.44854881266490765
ocean_proximity standard deviation: 0.49734573017349437
ocean_proximity1 mean: 0.3476253298153034
ocean_proximity1 standard deviation: 0.4762162952756969
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.10686015831134564
ocean_proximity3 standard deviation: 0.3089353733016325
ocean_proximity4 mean: 0.09696569920844327
ocean_proximity4 standard deviation: 0.295911054855104

```

```

feature 6 :
longitude mean: 0.3771597401357334
longitude standard deviation: 0.762942020101124
latitude mean: -0.5466658303331484
latitude standard deviation: 0.6457840246490797
housing_median_age mean: -0.03042881823242519
housing_median_age standard deviation: 0.9895156224795227
total_rooms mean: -0.01855570165244646
total_rooms standard deviation: 0.5906012287850507
total_bedrooms mean: -0.3043489403984476
total_bedrooms standard deviation: 0.47241356065136086
population mean: -0.3360487212734245
population standard deviation: 0.44587161136714054
households mean: -0.2879926098408065
households standard deviation: 0.483179454419496
median_income mean: 1.8059219723146314
median_income standard deviation: 1.2682899878846514
median_house_value mean: 1.7859303764685266
median_house_value standard deviation: 0.7457739027712609
ocean_proximity mean: 0.7045130641330166
ocean_proximity standard deviation: 0.45626133585798967
ocean_proximity1 mean: 0.2702087880057482
ocean_proximity1 standard deviation: 0.4762162952756969
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.10686015831134564
ocean_proximity3 standard deviation: 0.3089353733016325
ocean_proximity4 mean: 0.09696569920844327
ocean_proximity4 standard deviation: 0.295911054855104

```

```

ocean_proximity1 mean: 0.010308/883983/483
ocean_proximity1 standard deviation: 0.255666702650882
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.04513064133016627
ocean_proximity3 standard deviation: 0.2075906224840014
ocean_proximity4 mean: 0.18004750593824229
ocean_proximity4 standard deviation: 0.3842270182374761

```

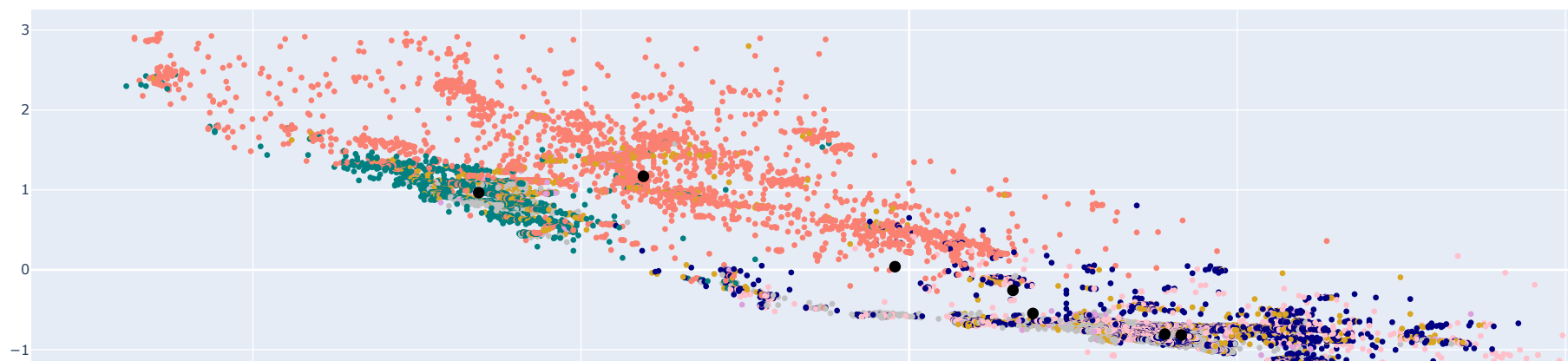
feature 7 :

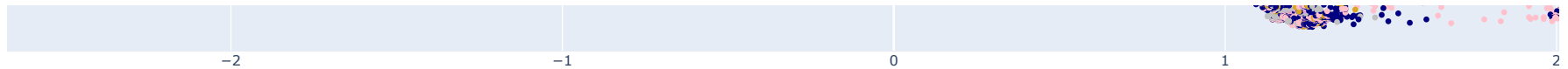
```

longitude mean: 0.7791563212784126
longitude standard deviation: 0.3589767554881438
latitude mean: -0.8049750918179821
latitude standard deviation: 0.2500149437898488
housing_median_age mean: 0.5134473703523349
housing_median_age standard deviation: 0.7596233265396434
total_rooms mean: -0.5203956948149795
total_rooms standard deviation: 0.2870399863674881
total_bedrooms mean: -0.481535844806618
total_bedrooms standard deviation: 0.3262643482404495
population mean: -0.38160290561594223
population standard deviation: 0.39405800431372573
households mean: -0.4763304726191631
households standard deviation: 0.3357447658447119
median_income mean: -0.33013051305937596
median_income standard deviation: 0.6170769973808505
median_house_value mean: -0.2632001755747795
median_house_value standard deviation: 0.6393037985020943
ocean_proximity mean: 0.6787801314828342
ocean_proximity standard deviation: 0.4669450337962558
ocean_proximity1 mean: 0.18224981738495252
ocean_proximity1 standard deviation: 0.3860502835747162
ocean_proximity2 mean: 0.0009130752373995618
ocean_proximity2 standard deviation: 0.030203336421833482
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.13805697589481372
ocean_proximity4 standard deviation: 0.344959776353116

```

k=7





```

k= 8
SSE: 78079.96446588697
feature 1 :
longitude mean: 0.80895919295285
longitude standard deviation: 0.3771295531326078
latitude mean: -0.8183762742677443
latitude standard deviation: 0.26428775600985993
housing_median_age mean: 0.3040914684303878
housing_median_age standard deviation: 0.8379406717027489
total_rooms mean: -0.4316893543923616
total_rooms standard deviation: 0.33320359449637943
total_bedrooms mean: -0.3699144350087293
total_bedrooms standard deviation: 0.38212468418639073
population mean: -0.26823939503081723
population standard deviation: 0.4505231342136129
households mean: -0.366808590509146
households standard deviation: 0.3869192944329638
median_income mean: -0.37077231279619766
median_income standard deviation: 0.5854264791394949
median_house_value mean: -0.34812843073765165
median_house_value standard deviation: 0.5445253988796169
ocean_proximity mean: 0.6360018368284096
ocean_proximity standard deviation: 0.4811481064903918
ocean_proximity1 mean: 0.20955150772998624
ocean_proximity1 standard deviation: 0.40698854202309553
ocean_proximity2 mean: 0.00030613806826878924
ocean_proximity2 standard deviation: 0.017494123234731526
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.15414051737333537
ocean_proximity4 standard deviation: 0.36108339518346555

```

```

feature 2 :
longitude mean: 0.6988985247060091
longitude standard deviation: 0.29890013928917186
latitude mean: -0.8237914713390331
latitude standard deviation: 0.19555946569337507
housing_median_age mean: 0.038202296733293555
housing_median_age standard deviation: 0.987012957007462
total_rooms mean: -0.0503827452092842
total_rooms standard deviation: 0.5478322331817522
total_bedrooms mean: -0.27308209793990995
total_bedrooms standard deviation: 0.45757535241596425
population mean: -0.32045963669042116
population standard deviation: 0.4288353141053793
households mean: -0.25689177195328117
households standard deviation: 0.46578118572854543
median_income mean: 1.3405791655287946
median_income standard deviation: 1.1633990023087406
median_house_value mean: 1.4980707530158834
median_house_value standard deviation: 0.807834338844313
ocean_proximity mean: 0.7611559711007225
ocean_proximity standard deviation: 0.42637724934433635
ocean_proximity1 mean: 0.06502337441563961
ocean_proximity1 standard deviation: 0.2465671007966064
ocean_proximity2 mean: 0.0012749681257968552

```

```
ocean_proximity2 standard deviation: 0.03568392610230957
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.17254568635784107
ocean_proximity4 standard deviation: 0.37785403594131495
```

```
feature 3 :
longitude mean: 0.3547789023747888
longitude standard deviation: 0.9359751928170108
latitude mean: -0.2802073665789577
latitude standard deviation: 0.8702623575149973
housing_median_age mean: -1.225179163298669
housing_median_age standard deviation: 0.6899347228939391
total_rooms mean: 4.61094245701081
total_rooms standard deviation: 2.296662619788253
total_bedrooms mean: 4.528714703787246
total_bedrooms standard deviation: 1.9507408352135154
population mean: 4.26309287246619
population standard deviation: 2.5177417176609715
households mean: 4.4844184741638085
households standard deviation: 1.953643098439365
median_income mean: 0.29895871063326945
median_income standard deviation: 0.8519635588965914
median_house_value mean: 0.11053219052302024
median_house_value standard deviation: 0.8894080247629874
ocean_proximity mean: 0.4282178217821782
ocean_proximity standard deviation: 0.49482049158286306
ocean_proximity1 mean: 0.42574257425742573
ocean_proximity1 standard deviation: 0.4944550886805464
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.06930693069306931
ocean_proximity3 standard deviation: 0.25397535323525955
ocean_proximity4 mean: 0.07673267326732673
ocean_proximity4 standard deviation: 0.2661668088259243
```

```
feature 4 :
longitude mean: -1.2538955690851374
longitude standard deviation: 0.35238783692568365
latitude mean: 1.0770402688328684
latitude standard deviation: 0.37540166559486793
housing_median_age mean: 1.158024719992987
housing_median_age standard deviation: 0.5910746880382812
total_rooms mean: -0.43372112979073163
total_rooms standard deviation: 0.363914450447664
total_bedrooms mean: -0.40317375978153874
total_bedrooms standard deviation: 0.42123388337476736
population mean: -0.44412352263911153
population standard deviation: 0.40822406659118177
households mean: -0.4014743351979679
households standard deviation: 0.4319162152747919
median_income mean: -0.41173172279024317
median_income standard deviation: 0.5514516277301869
median_house_value mean: -0.2177415069316406
median_house_value standard deviation: 0.7363955054646579
ocean_proximity mean: 0.14303380049464137
ocean_proximity standard deviation: 0.350107315562961
ocean_proximity1 mean: 0.23083264633140974
ocean_proximity1 standard deviation: 0.421365560670349
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.49793899422918386
```

```
ocean_proximity3 standard deviation: 0.4999957522371752
ocean_proximity4 mean: 0.12819455894476506
ocean_proximity4 standard deviation: 0.33430631762160956
```

feature 5 :

```
longitude mean: 0.8505559531461369
longitude standard deviation: 0.3575331046615569
latitude mean: -0.8228203040763057
latitude standard deviation: 0.2648703247258625
housing_median_age mean: -0.6850657167023747
housing_median_age standard deviation: 0.7403844078136074
total_rooms mean: 0.8268896786232439
total_rooms standard deviation: 0.7320452402939386
total_bedrooms mean: 1.019885283672666
total_bedrooms standard deviation: 0.7252743863623151
population mean: 0.9846902525903354
population standard deviation: 0.766414808838374
households mean: 1.0121764814879084
households standard deviation: 0.6913712887405861
median_income mean: -0.12583517728746504
median_income standard deviation: 0.7062289430657394
median_house_value mean: -0.07598061809153002
median_house_value standard deviation: 0.7384334093860172
ocean_proximity mean: 0.5914911193721603
ocean_proximity standard deviation: 0.4915581095618571
ocean_proximity1 mean: 0.26394052044609667
ocean_proximity1 standard deviation: 0.44076742406028535
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.14456836018174307
ocean_proximity4 standard deviation: 0.3516651097508907
```

feature 6 :

```
longitude mean: -1.1054408521613661
longitude standard deviation: 0.3492840892553697
latitude mean: 1.0263166467878397
latitude standard deviation: 0.41426510049326737
housing_median_age mean: -0.7060057732360141
housing_median_age standard deviation: 0.761905299318096
total_rooms mean: 1.0257980934337305
total_rooms standard deviation: 0.708264481664563
total_bedrooms mean: 1.0471011684775058
total_bedrooms standard deviation: 0.6740599479331297
population mean: 0.9290577292004629
population standard deviation: 0.7190617310370708
households mean: 1.0914643682147298
households standard deviation: 0.6851933351065684
median_income mean: 0.03711712312247903
median_income standard deviation: 0.7196510160419994
median_house_value mean: 0.014032642446955575
median_house_value standard deviation: 0.7917394413346323
ocean_proximity mean: 0.28098591549295776
ocean_proximity standard deviation: 0.4494806233727356
ocean_proximity1 mean: 0.37746478873239436
ocean_proximity1 standard deviation: 0.48475264001303137
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.22464788732394367
ocean_proximity3 standard deviation: 0.4173502294773969
ocean_proximity4 mean: 0.11690140845070422
```



ocean\_proximity4 standard deviation: 0.32130276866679247

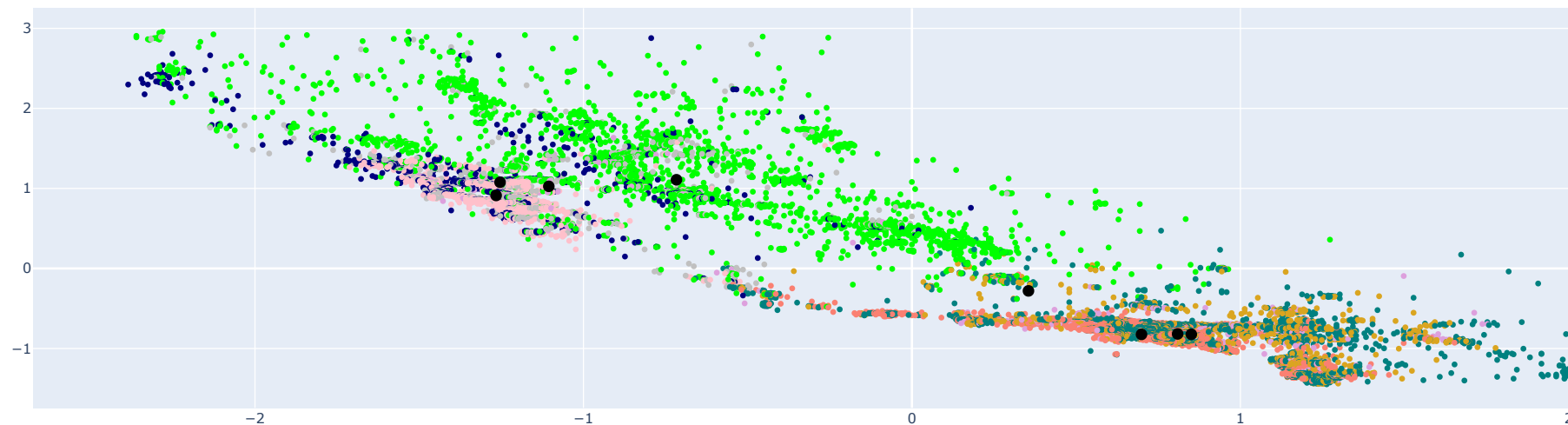
feature 7 :

longitude mean: -1.265826746832447  
longitude standard deviation: 0.18413817948019706  
latitude mean: 0.9118695057893246  
latitude standard deviation: 0.20636836886463159  
housing\_median\_age mean: 0.12701053763136705  
housing\_median\_age standard deviation: 0.9893501608429349  
total\_rooms mean: -0.11499448847600213  
total\_rooms standard deviation: 0.4987111806057393  
total\_bedrooms mean: -0.329976550611273  
total\_bedrooms standard deviation: 0.43997656234840016  
population mean: -0.3484699966731575  
population standard deviation: 0.45313745074897066  
households mean: -0.3028532913151376  
households standard deviation: 0.4622240567334816  
median\_income mean: 1.295726743599135  
median\_income standard deviation: 1.1055393557689124  
median\_house\_value mean: 1.3972732901105565  
median\_house\_value standard deviation: 0.8136541179204289  
ocean\_proximity mean: 0.35316217908578584  
ocean\_proximity standard deviation: 0.4779525649572013  
ocean\_proximity1 mean: 0.07576706324358172  
ocean\_proximity1 standard deviation: 0.26462504675677373  
ocean\_proximity2 mean: 0.0  
ocean\_proximity2 standard deviation: 0.0  
ocean\_proximity3 mean: 0.3876017532874139  
ocean\_proximity3 standard deviation: 0.48720286753666125  
ocean\_proximity4 mean: 0.18346900438321853  
ocean\_proximity4 standard deviation: 0.3870505507215475

feature 8 :

longitude mean: -0.7167995696957769  
longitude standard deviation: 0.5823173524724291  
latitude mean: 1.1083076112294168  
latitude standard deviation: 0.6340369727914005  
housing\_median\_age mean: -0.5544115567025666  
housing\_median\_age standard deviation: 0.6769664995247969  
total\_rooms mean: -0.32895098868729467  
total\_rooms standard deviation: 0.39075691881192254  
total\_bedrooms mean: -0.35035610970131414  
total\_bedrooms standard deviation: 0.40481081495408167  
population mean: -0.3686422415329314  
population standard deviation: 0.43463938146519104  
households mean: -0.38829702337534555  
households standard deviation: 0.4141977773178815  
median\_income mean: -0.4794550707823286  
median\_income standard deviation: 0.5850972444120909  
median\_house\_value mean: -0.8131022011399962  
median\_house\_value standard deviation: 0.4269370668447043  
ocean\_proximity mean: 0.07888697647733792  
ocean\_proximity standard deviation: 0.26956227744178896  
ocean\_proximity1 mean: 0.8608720596672403  
ocean\_proximity1 standard deviation: 0.34607998577139226  
ocean\_proximity2 mean: 0.0  
ocean\_proximity2 standard deviation: 0.0  
ocean\_proximity3 mean: 0.03327596098680436  
ocean\_proximity3 standard deviation: 0.17935626949512273  
ocean\_proximity4 mean: 0.026965002868617326  
ocean\_proximity4 standard deviation: 0.16198114547351447

k=8



k= 9

SSE: 72626.19154370931

feature 1 :

longitude mean: -1.3309478672273596

longitude standard deviation: 0.2014044697136109

latitude mean: 0.9965643731493167

latitude standard deviation: 0.2601730728211554

housing\_median\_age mean: 1.0603414962081765

housing\_median\_age standard deviation: 0.7255152692630598

total\_rooms mean: -0.3669659137661464

total\_rooms standard deviation: 0.37298993038459544

total\_bedrooms mean: -0.3673775400517872

total\_bedrooms standard deviation: 0.4343044782593207

population mean: -0.43105703524618

population standard deviation: 0.40116194964172064

households mean: -0.3592222191118836

households standard deviation: 0.4447209528599044

median\_income mean: -0.01789153402569192

median\_income standard deviation: 0.6754342622349119

median\_house\_value mean: 0.3856025336701485

median\_house\_value standard deviation: 0.9000931692649471

ocean\_proximity mean: 0.1770998415213946

ocean\_proximity standard deviation: 0.3817531763515426

ocean proximity1 mean: 0.05388272583201268

ocean proximity1 standard deviation: 0.2257861326320275

ocean proximity2 mean: 0.0

ocean proximity2 standard deviation: 0.0

ocean proximity3 mean: 0.5998415213946118

ocean proximity3 standard deviation: 0.4899302711668418

ocean proximity4 mean: 0.16917591125198098

ocean proximity4 standard deviation: 0.37490721826078344

```
feature 2 :  
longitude mean: -1.1085530904265632  
longitude standard deviation: 0.3703379668577205  
latitude mean: 1.0462333159671706  
latitude standard deviation: 0.4396492446724856  
housing_median_age mean: -0.7181974106725086  
housing_median_age standard deviation: 0.6793160138417097  
total_rooms mean: 0.5244347877177088  
total_rooms standard deviation: 0.5268027140558215  
total_bedrooms mean: 0.47483927317082114  
total_bedrooms standard deviation: 0.5488764125520302  
population mean: 0.41762569978579644  
population standard deviation: 0.5396710955437268  
households mean: 0.5030657784266643  
households standard deviation: 0.5529878713555132  
median_income mean: 0.13810284168990816  
median_income standard deviation: 0.7007553616964336  
median_house_value mean: 0.003645990565878241  
median_house_value standard deviation: 0.7495305792941781  
ocean_proximity mean: 0.3275691699604743  
ocean_proximity standard deviation: 0.46932676127819223  
ocean_proximity1 mean: 0.38735177865612647  
ocean_proximity1 standard deviation: 0.4871451305597264  
ocean_proximity2 mean: 0.0  
ocean_proximity2 standard deviation: 0.0  
ocean_proximity3 mean: 0.17885375494071146  
ocean_proximity3 standard deviation: 0.3832298126246489  
ocean_proximity4 mean: 0.10622529644268774  
ocean_proximity4 standard deviation: 0.30812575815460574
```

```
feature 3 :  
longitude mean: 0.3053818300718009  
longitude standard deviation: 0.9542346839926295  
latitude mean: -0.24971658351642112  
latitude standard deviation: 0.9208464945488449  
housing_median_age mean: -1.40293139879146  
housing_median_age standard deviation: 0.5589251255780239  
total_rooms mean: 6.2833149359411395  
total_rooms standard deviation: 2.4406515804205133  
total_bedrooms mean: 5.948978887825522  
total_bedrooms standard deviation: 2.0805414237331195  
population mean: 5.823255228754772  
population standard deviation: 2.983387561953841  
households mean: 5.981883491257705  
households standard deviation: 2.023665856298215  
median_income mean: 0.4215116567349148  
median_income standard deviation: 0.8367044096973214  
median_house_value mean: 0.16831574818191422  
median_house_value standard deviation: 0.8392293285025926  
ocean_proximity mean: 0.44692737430167595  
ocean_proximity standard deviation: 0.49717531757065986  
ocean_proximity1 mean: 0.37988826815642457  
ocean_proximity1 standard deviation: 0.4853588073513629  
ocean_proximity2 mean: 0.0  
ocean_proximity2 standard deviation: 0.0  
ocean_proximity3 mean: 0.0782122905027933  
ocean_proximity3 standard deviation: 0.26850535956866894  
ocean_proximity4 mean: 0.09497206703910614  
ocean_proximity4 standard deviation: 0.2931763522547916
```

```
feature 4 :  
longitude mean: 0.26713602835738065
```

```

longitude standard deviation: 0.9325911928210135
latitude mean: -0.24630619926269598
latitude standard deviation: 0.8679814673928322
housing_median_age mean: -0.9334515752702018
housing_median_age standard deviation: 0.7155571133457267
total_rooms mean: 2.1729831835593116
total_rooms standard deviation: 0.9229411901722302
total_bedrooms mean: 2.318707643949375
total_bedrooms standard deviation: 0.8364489328578897
population mean: 2.0830675996360104
population standard deviation: 0.9170587503945251
households mean: 2.3013619473487568
households standard deviation: 0.7684157275472189
median_income mean: 0.12784745494326918
median_income standard deviation: 0.8706944712428372
median_house_value mean: 0.12012582048407126
median_house_value standard deviation: 0.9100658449792155
ocean_proximity mean: 0.4789272030651341
ocean_proximity standard deviation: 0.49955573986227125
ocean_proximity1 mean: 0.3524904214559387
ocean_proximity1 standard deviation: 0.4777456689890077
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.07183908045977011
ocean_proximity3 standard deviation: 0.25822127522430394
ocean_proximity4 mean: 0.09674329501915709
ocean_proximity4 standard deviation: 0.2956078988931007

```

feature 5 :

```

longitude mean: -0.7405030207042677
longitude standard deviation: 0.5781324741938517
latitude mean: 1.1448632988009642
latitude standard deviation: 0.6170014788296799
housing_median_age mean: -0.2283130952086646
housing_median_age standard deviation: 0.8574186857331336
total_rooms mean: -0.44644471997105
total_rooms standard deviation: 0.3427983498701387
total_bedrooms mean: -0.4574934831741373
total_bedrooms standard deviation: 0.3679310224195357
population mean: -0.4750107912468414
population standard deviation: 0.3941235623471525
households mean: -0.4956988742435739
households standard deviation: 0.3768040187843164
median_income mean: -0.5840543465268617
median_income standard deviation: 0.5673437004773931
median_house_value mean: -0.8807244464929227
median_house_value standard deviation: 0.3999518191594235
ocean_proximity mean: 0.056485949474879366
ocean_proximity standard deviation: 0.23085772022351364
ocean_proximity1 mean: 0.8796480272495033
ocean_proximity1 standard deviation: 0.32537267157148675
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.03888731195004258
ocean_proximity3 standard deviation: 0.19332637926403362
ocean_proximity4 mean: 0.024978711325574793
ocean_proximity4 standard deviation: 0.15606016566083303

```

feature 6 :

```

longitude mean: 0.7979501778620369
longitude standard deviation: 0.3740538456325285
latitude mean: -0.8085877389140049

```

latitude standard deviation: 0.2556538385764978  
housing\_median\_age mean: 0.48976416137932904  
housing\_median\_age standard deviation: 0.7706190860704604  
total\_rooms mean: -0.5322168712842388  
total\_rooms standard deviation: 0.2787820145001983  
total\_bedrooms mean: -0.47416747263504394  
total\_bedrooms standard deviation: 0.3288432833984706  
population mean: -0.3528556726185637  
population standard deviation: 0.40836707092187263  
households mean: -0.4708828375797676  
households standard deviation: 0.33742468772586426  
median\_income mean: -0.4480229450787225  
median\_income standard deviation: 0.5510440259118973  
median\_house\_value mean: -0.4235542328806145  
median\_house\_value standard deviation: 0.4955847817161254  
ocean\_proximity mean: 0.6477366255144033  
ocean\_proximity standard deviation: 0.47767550647024776  
ocean\_proximity1 mean: 0.205761316872428  
ocean\_proximity1 standard deviation: 0.40425684576931925  
ocean\_proximity2 mean: 0.00041152263374485596  
ocean\_proximity2 standard deviation: 0.020281846140495493  
ocean\_proximity3 mean: 0.0  
ocean\_proximity3 standard deviation: 0.0  
ocean\_proximity4 mean: 0.14609053497942387  
ocean\_proximity4 standard deviation: 0.3531969571908163

feature 7 :

longitude mean: -0.45372345036896594  
longitude standard deviation: 0.9638290755601446  
latitude mean: 0.1912005966876953  
latitude standard deviation: 0.8460009885681063  
housing\_median\_age mean: 0.03462067738461963  
housing\_median\_age standard deviation: 1.0185759538604686  
total\_rooms mean: 0.04757352699901257  
total\_rooms standard deviation: 0.710017456167817  
total\_bedrooms mean: -0.3631593227408814  
total\_bedrooms standard deviation: 0.5077699965413404  
population mean: -0.34112290935469336  
population standard deviation: 0.5398003532955723  
households mean: -0.3397201964011623  
households standard deviation: 0.5283033282685341  
median\_income mean: 2.824837614468715  
median\_income standard deviation: 1.2053852547683495  
median\_house\_value mean: 2.1769535733762355  
median\_house\_value standard deviation: 0.5627207982215471  
ocean\_proximity mean: 0.5387205387205387  
ocean\_proximity standard deviation: 0.49849846527465835  
ocean\_proximity1 mean: 0.0707070707070707  
ocean\_proximity1 standard deviation: 0.25633489980706176  
ocean\_proximity2 mean: 0.0  
ocean\_proximity2 standard deviation: 0.0  
ocean\_proximity3 mean: 0.21099887766554434  
ocean\_proximity3 standard deviation: 0.4080175869854432  
ocean\_proximity4 mean: 0.17957351290684623  
ocean\_proximity4 standard deviation: 0.3838318204228781

feature 8 :

longitude mean: 0.7024442883512193  
longitude standard deviation: 0.32007934193325355  
latitude mean: -0.8243461390598499  
latitude standard deviation: 0.21032370851640472  
housing\_median\_age mean: 0.028892192419694776

```

housing_median_age standard deviation: 0.9375531258457681
total_rooms mean: -0.14275904336089226
total_rooms standard deviation: 0.45216621994031275
total_bedrooms mean: -0.2897398544431049
total_bedrooms standard deviation: 0.4223211702116566
population mean: -0.3377397547802381
population standard deviation: 0.3868748837501375
households mean: -0.2718200807795053
households standard deviation: 0.42891996219753303
median_income mean: 0.8136127518236257
median_income standard deviation: 0.6962589541207455
median_house_value mean: 1.132149215695793
median_house_value standard deviation: 0.7941188502038641
ocean_proximity mean: 0.7731678945327647
ocean_proximity standard deviation: 0.41878311976073423
ocean_proximity1 mean: 0.06669251647925553
ocean_proximity1 standard deviation: 0.24948872664895844
ocean_proximity2 mean: 0.0011632415664986429
ocean_proximity2 standard deviation: 0.03408648464650718
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.1589763474214812
ocean_proximity4 standard deviation: 0.36565402825895854

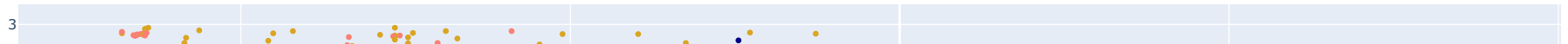
```

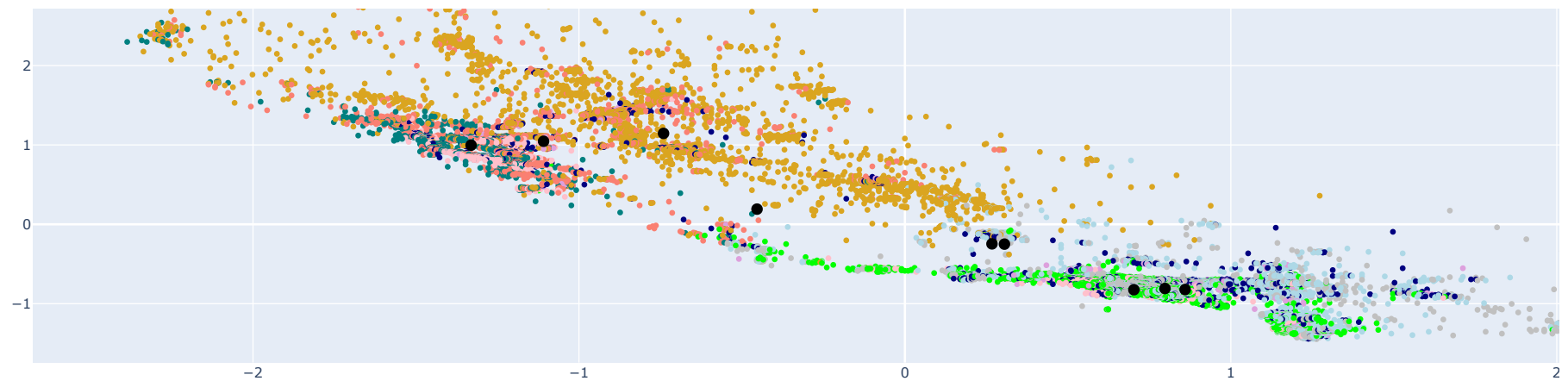
```

feature 9 :
longitude mean: 0.8597110619594399
longitude standard deviation: 0.398376542551232
latitude mean: -0.8219661135390652
latitude standard deviation: 0.32283687958323376
housing_median_age mean: -0.5564618666929664
housing_median_age standard deviation: 0.7483762413147413
total_rooms mean: 0.31718980172637823
total_rooms standard deviation: 0.4725580884717151
total_bedrooms mean: 0.4866066712164232
total_bedrooms standard deviation: 0.4932074176936591
population mean: 0.5268372702022266
population standard deviation: 0.6074139480791273
households mean: 0.4819778324013955
households standard deviation: 0.476941426809556
median_income mean: -0.2730463775742328
median_income standard deviation: 0.6082319627195123
median_house_value mean: -0.2766554442181726
median_house_value standard deviation: 0.5879332855880223
ocean_proximity mean: 0.5387931034482759
ocean_proximity standard deviation: 0.49849282354398444
ocean_proximity1 mean: 0.2854774535809019
ocean_proximity1 standard deviation: 0.45164153604144713
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.17572944297082227
ocean_proximity4 standard deviation: 0.3805898131111598

```

k=9





```

k= 10
SSE: 68976.25157316976
feature 1 :
longitude mean: -0.7221191712177318
longitude standard deviation: 0.5708700617092624
latitude mean: 1.1345199001473611
latitude standard deviation: 0.6161673909954535
housing_median_age mean: -0.44562887646046545
housing_median_age standard deviation: 0.7100122489840782
total_rooms mean: -0.40595126923877084
total_rooms standard deviation: 0.34962778665348243
total_bedrooms mean: -0.427024790933352
total_bedrooms standard deviation: 0.3638927903280462
population mean: -0.4381627328849425
population standard deviation: 0.400373830537811
households mean: -0.4657204649997163
households standard deviation: 0.37503595395957695
median_income mean: -0.5192754043929029
median_income standard deviation: 0.5770734226027922
median_house_value mean: -0.8449184702494856
median_house_value standard deviation: 0.4208152408830354
ocean_proximity mean: 0.06504315659679408
ocean_proximity standard deviation: 0.24660199588957082
ocean_proximity1 mean: 0.8831689272503083
ocean_proximity1 standard deviation: 0.3212188867265596
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.032059186189889025
ocean_proximity3 standard deviation: 0.17615730121324055
ocean_proximity4 mean: 0.01972872996300863
ocean_proximity4 standard deviation: 0.1390665566448551

```

```

feature 2 :
longitude mean: -1.0841726773641864
longitude standard deviation: 0.38350163295796863
latitude mean: 1.0408449933915165
latitude standard deviation: 0.44972105874990836
housing_median_age mean: -0.6871301998790312
housing_median_age standard deviation: 0.7169319944591594
total_rooms mean: 0.676038423699513
total_rooms standard deviation: 0.5375058896016293

```

```
total_rooms standard deviation: 0.5975000000000001
total_bedrooms mean: 0.6792839925033916
total_bedrooms standard deviation: 0.5383256236034901
population mean: 0.5947920817259844
population standard deviation: 0.5535669561639589
households mean: 0.7098475629020599
households standard deviation: 0.5436286608100767
median_income mean: -0.007600711241006825
median_income standard deviation: 0.6649949526054934
median_house_value mean: -0.09256260969372448
median_house_value standard deviation: 0.7234243766754004
ocean_proximity mean: 0.2947739283617146
ocean_proximity standard deviation: 0.4559410702271936
ocean_proximity1 mean: 0.40810334703464474
ocean_proximity1 standard deviation: 0.49148245662869083
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.18672930123311804
ocean_proximity3 standard deviation: 0.3896940714125764
ocean_proximity4 mean: 0.1103934233705226
ocean_proximity4 standard deviation: 0.3133795070630144
```

feature 3 :

```
longitude mean: 0.9759029086530879
longitude standard deviation: 0.49823516637804544
latitude mean: -0.8857288084309554
latitude standard deviation: 0.3410308567515614
housing_median_age mean: -0.7781768750344392
housing_median_age standard deviation: 0.5786462029638285
total_rooms mean: -0.3155121596219998
total_rooms standard deviation: 0.3801185392867055
total_bedrooms mean: -0.28450592685915504
total_bedrooms standard deviation: 0.40316380659522194
population mean: -0.28951172811133946
population standard deviation: 0.4222130536742717
households mean: -0.3119857475614988
households standard deviation: 0.38844242130714646
median_income mean: -0.23820228582418781
median_income standard deviation: 0.6679844901545818
median_house_value mean: -0.41722476281326054
median_house_value standard deviation: 0.5542667379048221
ocean_proximity mean: 0.3841438496117695
ocean_proximity standard deviation: 0.4863921796423233
ocean_proximity1 mean: 0.37351859419697586
ocean_proximity1 standard deviation: 0.4837380013872044
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.2423375561912546
ocean_proximity4 standard deviation: 0.4284974504597515
```

feature 4 :

```
longitude mean: 0.6965141216730446
longitude standard deviation: 0.2879730236908912
latitude mean: -0.8253510800250119
latitude standard deviation: 0.1907795791442375
housing_median_age mean: 0.04380886626595756
housing_median_age standard deviation: 0.9473038697398475
total_rooms mean: -0.022521149345460213
total_rooms standard deviation: 0.5600569004123713
total_bedrooms mean: -0.2681796653482319
total_bedrooms standard deviation: 0.4614080594474639
```



```

total_rooms standard deviation: 0.702400037774033
population mean: -0.31274416830691065
population standard deviation: 0.43547531417040425
households mean: -0.2515428194510989
households standard deviation: 0.46886773409940324
median_income mean: 1.4781859933383081
median_income standard deviation: 1.1832438759470032
median_house_value mean: 1.621535651644574
median_house_value standard deviation: 0.77630617813053
ocean_proximity mean: 0.7683109118086696
ocean_proximity standard deviation: 0.4219114298100992
ocean_proximity1 mean: 0.05829596412556054
ocean_proximity1 standard deviation: 0.2343022507195121
ocean_proximity2 mean: 0.0004982561036372695
ocean_proximity2 standard deviation: 0.02231608936378524
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.17289486796213255
ocean_proximity4 standard deviation: 0.3781563599815422

```

feature 5 :

```

longitude mean: 0.8196064609546267
longitude standard deviation: 0.34288063197151925
latitude mean: -0.81400346160672
latitude standard deviation: 0.25944700784093516
housing_median_age mean: -0.45277042463963046
housing_median_age standard deviation: 0.7494982284887391
total_rooms mean: 0.58331614891319
total_rooms standard deviation: 0.5230845942737866
total_bedrooms mean: 0.7980887844422556
total_bedrooms standard deviation: 0.524292542052442
population mean: 0.8344915821261897
population standard deviation: 0.6092160350280529
households mean: 0.8075566454206557
households standard deviation: 0.4765029052174618
median_income mean: -0.21378537110989954
median_income standard deviation: 0.6377575174204709
median_house_value mean: -0.09684950363225345
median_house_value standard deviation: 0.7043992660956251
ocean_proximity mean: 0.6262991414369634
ocean_proximity standard deviation: 0.48378562077874704
ocean_proximity1 mean: 0.22910076818798011
ocean_proximity1 standard deviation: 0.420254216164048
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.14460009037505647
ocean_proximity4 standard deviation: 0.3516971768987945

```

feature 6 :

```

longitude mean: -1.2789487462962625
longitude standard deviation: 0.3255446046584238
latitude mean: 1.0699815881831927
latitude standard deviation: 0.35242054616466967
housing_median_age mean: 1.1989001327961986
housing_median_age standard deviation: 0.5868753730184106
total_rooms mean: -0.42728089581521844
total_rooms standard deviation: 0.35686616583482794
total_bedrooms mean: -0.3936518399437495
total_bedrooms standard deviation: 0.41899967871856897
population mean: -0.4398286155058832
population standard deviation: 0.40055669347780193

```

```

population standard deviation: 0.14691648269411883
households mean: -0.3917594664201188
households standard deviation: 0.4283740655373484
median_income mean: -0.3849752109404518
median_income standard deviation: 0.5569062761994447
median_house_value mean: -0.14691648269411883
median_house_value standard deviation: 0.7541410174835813
ocean_proximity mean: 0.14279475982532752
ocean_proximity standard deviation: 0.34986342534159587
ocean_proximity1 mean: 0.19082969432314412
ocean_proximity1 standard deviation: 0.39295511459667176
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.5327510917030568
ocean_proximity3 standard deviation: 0.49892621297368683
ocean_proximity4 mean: 0.13362445414847163
ocean_proximity4 standard deviation: 0.3402483789851038

```

feature 7 :

```

longitude mean: -1.2697166908556838
longitude standard deviation: 0.18089877457813644
latitude mean: 0.9129844061916922
latitude standard deviation: 0.197509368767976
housing_median_age mean: 0.16148105662425877
housing_median_age standard deviation: 0.9872749312826751
total_rooms mean: -0.12118163867231835
total_rooms standard deviation: 0.5286776516668293
total_bedrooms mean: -0.34935738410929007
total_bedrooms standard deviation: 0.45734395494625457
population mean: -0.38035736470177234
population standard deviation: 0.43820637627669956
households mean: -0.32183613237509234
households standard deviation: 0.4802151331132774
median_income mean: 1.3867518103660599
median_income standard deviation: 1.1240581235330802
median_house_value mean: 1.4928944935689699
median_house_value standard deviation: 0.794874609680006
ocean_proximity mean: 0.33657858136300417
ocean_proximity standard deviation: 0.4725393527852168
ocean_proximity1 mean: 0.07510431154381085
ocean_proximity1 standard deviation: 0.26355958326599294
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.3984700973574409
ocean_proximity3 standard deviation: 0.48958316849070393
ocean_proximity4 mean: 0.1898470097357441
ocean_proximity4 standard deviation: 0.3921799620456623

```

feature 8 :

```

longitude mean: 0.320740996548649
longitude standard deviation: 0.9355890733919747
latitude mean: -0.2563103945861681
latitude standard deviation: 0.9353875394558354
housing_median_age mean: -1.4491699961936826
housing_median_age standard deviation: 0.5313241500380219
total_rooms mean: 6.647864084986422
total_rooms standard deviation: 2.4469047811815012
total_bedrooms mean: 6.290784688131861
total_bedrooms standard deviation: 2.032094182007557
population mean: 6.093203351466239
population standard deviation: 3.1193519311851094
households mean: 6.260298990439074
households standard deviation: 2.037049403050352

```

```

median_income standard deviation: 0.44678996054283193
median_income mean: 0.44678996054283193
median_income standard deviation: 0.8299633245712157
median_house_value mean: 0.15117815666056575
median_house_value standard deviation: 0.8341420897651197
ocean_proximity mean: 0.4407894736842105
ocean_proximity standard deviation: 0.4964817353875237
ocean_proximity1 mean: 0.40131578947368424
ocean_proximity1 standard deviation: 0.49016469333561524
ocean_proximity2 mean: 0.0
ocean_proximity2 standard deviation: 0.0
ocean_proximity3 mean: 0.06578947368421052
ocean_proximity3 standard deviation: 0.2479137326502206
ocean_proximity4 mean: 0.09210526315789473
ocean_proximity4 standard deviation: 0.28917448652415667

```

feature 9 :

```

longitude mean: 0.712959661697996
longitude standard deviation: 0.2750052452642858
latitude mean: -0.7761396145498676
latitude standard deviation: 0.21738161639666162
housing_median_age mean: 0.7892509464907369
housing_median_age standard deviation: 0.5107023404613262
total_rooms mean: -0.48727336692060447
total_rooms standard deviation: 0.29994199530575366
total_bedrooms mean: -0.4328602212011716
total_bedrooms standard deviation: 0.3465756110698162
population mean: -0.30348316940525555
population standard deviation: 0.4239061343731611
households mean: -0.4206093739698146
households standard deviation: 0.354188154343994
median_income mean: -0.3569676141412595
median_income standard deviation: 0.5853283959701402
median_house_value mean: -0.24380760678144828
median_house_value standard deviation: 0.5984307097803506
ocean_proximity mean: 0.7588652482269503
ocean_proximity standard deviation: 0.42777188226950297
ocean_proximity1 mean: 0.1285746968657058
ocean_proximity1 standard deviation: 0.33472861274709137
ocean_proximity2 mean: 0.0009151223976206818
ocean_proximity2 standard deviation: 0.030237145179696494
ocean_proximity3 mean: 0.0
ocean_proximity3 standard deviation: 0.0
ocean_proximity4 mean: 0.11164493250972317
ocean_proximity4 standard deviation: 0.31492910560095944

```

feature 10 :

```

longitude mean: 0.230605446359267
longitude standard deviation: 0.9625508067863888
latitude mean: -0.20562307782702544
latitude standard deviation: 0.8853361701140502
housing_median_age mean: -0.9976450803171054
housing_median_age standard deviation: 0.6839028319326064
total_rooms mean: 2.534349728201868
total_rooms standard deviation: 0.9388625648734166
total_bedrooms mean: 2.6275758452344093
total_bedrooms standard deviation: 0.8676461010050878
population mean: 2.3901565258473427
population standard deviation: 0.9901343481017859
households mean: 2.619260850290418
households standard deviation: 0.8182117419300219
median_income mean: 0.21494148554607456
median_income standard deviation: 0.913848352026199

```

```
median_income standard deviation: 0.725349222055  
median_house_value mean: 0.14421286211098028  
median_house_value standard deviation: 0.9121620148224477  
ocean_proximity mean: 0.4645161290322581  
ocean_proximity standard deviation: 0.49873930555064944  
ocean_proximity1 mean: 0.36774193548387096  
ocean_proximity1 standard deviation: 0.48219063073689933  
ocean_proximity2 mean: 0.0  
ocean_proximity2 standard deviation: 0.0  
ocean_proximity3 mean: 0.08387096774193549  
ocean_proximity3 standard deviation: 0.2771942072121381  
ocean_proximity4 mean: 0.08387096774193549  
ocean_proximity4 standard deviation: 0.27719420721213905
```

k=10

