

# 基本数据处理

## 1.选择区域

### 读取西安POI数据

```
In [ ]: import geopandas as gpd
import pandas as pd
from shapely.geometry import Polygon
import matplotlib.pyplot as plt

raw = pd.read_csv('test.csv') # 原始数据
```

### 获得查询区域边框

```
In [ ]: def getBounds(p1, p2):
    uponright = p1
    downleft = p2
    rightpoint = [0]*2
    leftpoint = [0]*2
    for index, row in raw.iterrows():
        if row['名称'] == uponright:
            rightpoint[0] = row["WGS84_经度"]
            rightpoint[1] = row["WGS84_纬度"]
        if row['名称'] == downleft:
            leftpoint[0] = row["WGS84_经度"]
            leftpoint[1] = row["WGS84_纬度"]
    return leftpoint, rightpoint
```

### 确定查询区域

```
In [ ]: leftpoint, rightpoint = getBounds('李家村(地铁站)', '省体育场西门(公交站)')
```

## 2.数据及预处理

### 2.1(POI)西安数据

```
In [ ]: def getPoints(leftpoint, rightpoint):
    points = []
    for index, row in raw.iterrows():
        long = row["WGS84_经度"]
        lai = row["WGS84_纬度"]
        if (leftpoint[0] < long < rightpoint[0]) and (leftpoint[1] < lai < rightpoint[1]):
            points.append([row['名称'], long, lai])
    return points
```

### 获得查询区域的所有点

```
In [ ]: points = getPoints(leftpoint, rightpoint)
```

### 显示表格

```
In [ ]: df = pd.DataFrame(points, columns=['名称', '经度', '纬度'])
gdf = gpd.GeoDataFrame(
    df, geometry=gpd.points_from_xy(df['经度'], df['纬度']), crs="EPSG:32749")
gdf
```

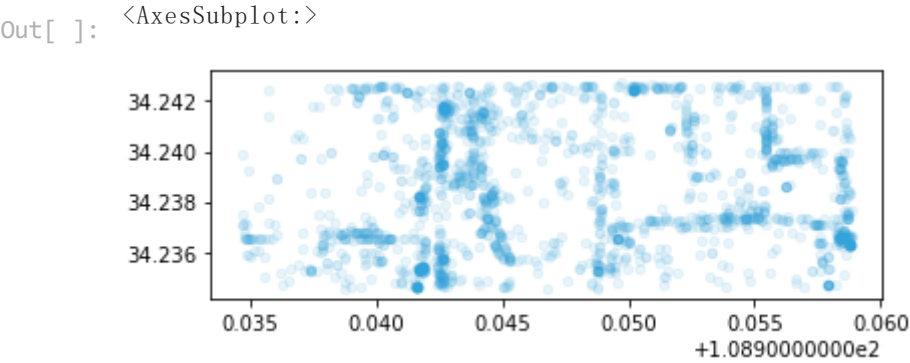
Out [ ]:

	名称	经度	纬度	geometry
0	碑林区长兴停车场	108.941591	34.242213	POINT (108.942 34.242)
1	7天酒店西安小雁塔南稍门店停车场	108.939183	34.242473	POINT (108.939 34.242)
2	小雁塔-停车场	108.938466	34.242524	POINT (108.938 34.243)
3	文艺路(地铁站)	108.949714	34.242779	POINT (108.950 34.243)
4	南稍门(公交站)	108.942346	34.242179	POINT (108.942 34.242)
...	...	...	...	...
2062	厚义兴小吃店	108.957231	34.239928	POINT (108.957 34.240)
2063	好食来中式快餐	108.957490	34.237094	POINT (108.957 34.237)
2064	陕南风味餐厅	108.956163	34.239976	POINT (108.956 34.240)
2065	湘秦中式营养快餐	108.955425	34.240327	POINT (108.955 34.240)
2066	中国兰州牛肉拉面(建设西路店)	108.952027	34.237291	POINT (108.952 34.237)

2067 rows × 4 columns

画出图形

```
In [ ]: gdf.plot(color='#33a3dc', marker="o", markersize=20, alpha=0.1)
```



2.2建筑高度数据

读取西安建筑高度shp文件

```
In [ ]: shpdata = gpd.GeoDataFrame.from_file(r'xian1/建筑.shp', encoding='gb18030')
shpdata.head()
```

Out [ ]:

	FLOOR	GEOMINDEX	层数	geometry
0	4	104552052594001	4.0	POLYGON ((107.88946 34.07040, 107.88946 34.070...
1	4	104553052594001	4.0	POLYGON ((107.88946 34.07029, 107.88946 34.070...
2	4	104552052595001	4.0	POLYGON ((107.88946 34.07040, 107.88948 34.070...

	FLOOR	GEOMINDEX	层数	geometry
3	4	104552052595002	4.0	POLYGON ((107.89094 34.07041, 107.89101 34.070...
4	4	104552052595003	4.0	POLYGON ((107.89072 34.07048, 107.89076 34.070...

获取区域高度数据

In [ ]:

```
# shpdata.to_crs({'init':'epsg:32749'})
from copy import deepcopy
geo = []
gaopoints=deepcopy(points)
for j in range(len(shpdata)):
    bounds = shpdata.geometry[j].bounds
    if bounds[0] < leftpoint[0] or bounds[2] > rightpoint[0] or bounds[1] < leftpoint[
        continue
    else:
        geo.append(shpdata.iloc[j])
geo=gpd.GeoDataFrame(geo)
for i in range(len(gaopoints)):
    point = gaopoints[i]
    flag = False
    for item in geo.geometry:
        bounds=item.bounds

        if bounds[0]<point[1]<bounds[2] and bounds[1]<point[2]<bounds[3]:
            gaopoints[i].append(shpdata.FLOOR[j])
            flag=True
            break
    if flag==False:
        gaopoints[i].append(1)

gaopoints
```

Out [ ]:

```
['碑林区长兴停车场', 108.9415914, 34.24221253, 1],
['7天酒店西安小雁塔南稍门店停车场', 108.9391834, 34.24247298, 1],
['小雁塔-停车场', 108.9384655, 34.24252427, 1],
['文艺路(地铁站)', 108.9497138, 34.24277937, 1],
['南稍门(公交站)', 108.9423462, 34.24217907, 1],
['紫晶大厦停车场', 108.9445126, 34.24258157, 1],
['碑林区友谊路停车场', 108.9495653, 34.24260477, 1],
['文艺西路北段停车场', 108.9456211, 34.24233737, 1],
['停车场(物资路3号院北)', 108.9458085, 34.2423, 1],
['停车场(盛达时代西)', 108.9470575, 34.24259524, 1],
['测绘科技大厦停车场', 108.9510623, 34.24262239, 1],
['和平花园停车场', 108.9482287, 34.24256473, 1],
['友谊东路工商银行至卫校家属院门前停车场', 108.9461375, 34.24264118, 1],
['和平花园停车场(出入口)', 108.9482238, 34.24259473, 1],
['南稍门地铁站D东北口', 108.9425835, 34.24232555, 1],
['南稍门地铁站A1口', 108.9418118, 34.24241502, 1],
['南稍门地铁站A2口', 108.941731, 34.24244317, 1],
['万达大厦停车场', 108.953481, 34.2426038, 1],
['测绘西路路西停车场', 108.9523709, 34.24214957, 1],
['停车场(新时代小区西)', 108.9560091, 34.24262175, 1],
['停车场(测绘东路)', 108.955478, 34.24246609, 1],
['碑林区友谊路长城大厦停车场', 108.9544228, 34.24263756, 1],
['停车场(中煤物资公司家属院西北)', 108.9551352, 34.24262786, 1],
['体育北路东口路北侧停车场', 108.9403765, 34.23671991, 1],
['停车场(体育场北路)', 108.9354183, 34.23656785, '16'],
['停车场(体育场北路)', 108.9360636, 34.23673469, 1],
['停车场(朱雀大街北段)', 108.9353534, 34.23785748, 1],
['陕西省体育场停车场', 108.9376353, 34.23609917, 1],
```

['电力公司停车场', 108.9347989, 34.23676382, 1],  
['爱客酒店停车场', 108.934738, 34.23747265, 1],  
['陕西省体育场停车场', 108.9365713, 34.23537631, 1],  
['体育场北路西段路南停车场', 108.934784, 34.23659191, '16'],  
['厦家庄停车场', 108.938792, 34.23656091, 1],  
['停车场(金兰商务会馆C座东南)', 108.9380562, 34.23535669, 1],  
['体育场停车场', 108.9397353, 34.23661115, 1],  
['陕西省体育场停车场', 108.9389747, 34.23464529, 1],  
['停车场(小雁塔苗圃家属院西南)', 108.9351391, 34.23604351, 1],  
['西安市振安执法专用停车场', 108.9371117, 34.23675186, 1],  
['陕西体育宾馆停车场', 108.9400126, 34.23571397, 1],  
['体育场停车场', 108.9398152, 34.2349956, 1],  
['停车场(朱雀国际商务中心东)', 108.9386027, 34.23521276, 1],  
['国展商务酒店停车场', 108.9411573, 34.2356948, 1],  
['停车场(西安宾馆西)', 108.9407402, 34.23934024, 1],  
['停车场(国展商务酒店西南)', 108.9407086, 34.23479499, 1],  
['小雁塔风景区大巴停车场', 108.9383508, 34.24205966, 1],  
['国展商务酒店体育场地铁站店停车场', 108.9410277, 34.23520723, 1],  
['西安博物院停车场', 108.9349663, 34.2392776, 1],  
['西安博物院西门停车场P', 108.934663, 34.23987388, 1],  
['南稍门(地铁站)', 108.9422455, 34.24196435, 1],  
['建设路(公交站)', 108.9489857, 34.23656732, 1],  
['白金广场小区停车场', 108.9488064, 34.23585198, '16'],  
['建设路·文艺路口(公交站)', 108.9503392, 34.23717108, 1],  
['草场坡(公交站)', 108.9423086, 34.23912429, 1],  
['西安宾馆(公交站)', 108.9420872, 34.23910973, 1],  
['草场坡西路北侧停车场', 108.9433445, 34.23864941, 1],  
['唐乐宫停车场', 108.9425589, 34.23833809, 1],  
['草场坡南侧至长安路口停车场', 108.9433624, 34.23852043, 1],  
['停车场(文艺西路)', 108.9470706, 34.24067394, 1],  
['草场坡路西停车场', 108.9450215, 34.23580106, 1],  
['草场坡东侧停车场', 108.944844, 34.23666011, '16'],  
['速8酒店停车场', 108.9444482, 34.23737066, '16'],  
['停车场(四院家属院西)', 108.9496136, 34.23722968, 1],  
['闽台茶城停车场', 108.9488552, 34.23681651, 1],  
['文艺南路自由自宅停车场', 108.9488583, 34.23548, '16'],  
['永宁路东侧停车场', 108.9440592, 34.23913179, 1],  
['嘉怡豪庭停车场', 108.9433925, 34.23620823, 1],  
['停车场(文艺南路)', 108.9492649, 34.23582797, 1],  
['停车场(草场坡)', 108.9451243, 34.23463828, 1],  
['停车场', 108.9492647, 34.23856695, 1],  
['安徽三建西北大厦停车场', 108.949235, 34.23542719, 1],  
['恒佳尊者汇地上停车场', 108.9426498, 34.23548397, '16'],  
['恒兴文艺广场停车场', 108.9481362, 34.24009686, '16'],  
['停车场(长安北路)', 108.9419519, 34.2355883, 1],  
['长安壹栋停车场', 108.9444043, 34.23699089, 1],  
['唐乐宫停车场', 108.9424483, 34.23743165, 1],  
['开成大厦停车场', 108.9424255, 34.23584628, 1],  
['停车场(尚城公馆西)', 108.9467128, 34.24050776, 1],  
['恒佳·尊者汇停车场', 108.9424873, 34.23522539, 1],  
['长安壹栋公共立体停车场', 108.9442777, 34.23700814, 1],  
['荣城停车场', 108.9463723, 34.23552135, 1],  
['金地园停车场', 108.948566, 34.23804669, '16'],  
['恒佳·尊者汇停车场', 108.9426947, 34.23522998, '16'],  
['恒兴文艺广场停车场', 108.9485778, 34.24042877, 1],  
['翡翠明珠停车场', 108.9435746, 34.24047227, 1],  
['中信大厦停车场', 108.942469, 34.23956981, 1],  
['翡翠明珠停车场', 108.9426744, 34.24020017, 1],  
['停车场(长安北路)', 108.9419389, 34.23599518, 1],  
['西安宾馆停车场', 108.9419636, 34.23854218, 1],  
['停车场', 108.9424505, 34.23476863, 1],  
['尚客快捷酒店文艺南路店停车场', 108.9494942, 34.2352077, 1],  
['景致雅居停车场', 108.944163, 34.23792303, '16'],  
['停车场(艺术学校家属院东)', 108.9510309, 34.23710554, 1],

['停车场', 108.9457318, 34.24145148, 1],  
['停车场(大话南门南)', 108.944076, 34.24146888, 1],  
['停车场', 108.9428338, 34.2411315, 1],  
['停车场(华夏大厦东)', 108.942463, 34.24074938, 1],  
['陕西艺术职业学院停车场', 108.9498828, 34.23629543, '16'],  
['金地园停车场(入口)', 108.9486139, 34.23802559, '16'],  
['长安银行停车场', 108.9425901, 34.23481634, '16'],  
['高尔夫花园停车场', 108.9417264, 34.23829474, 1],  
['翡翠明珠停车场(入口)', 108.9438049, 34.24050979, 1],  
['停车场(文艺西路)', 108.9456322, 34.24143069, 1],  
['长安壹栋停车场(出口)', 108.9446057, 34.2369405, 1],  
['停车场(出口)', 108.9492799, 34.23522217, 1],  
['恒佳·尊者汇停车场(出入口)', 108.9424455, 34.23522747, 1],  
['翡翠明珠停车场(西入口)', 108.942471, 34.24022856, 1],  
['骊马豪城停车场', 108.9446475, 34.23800501, '16'],  
['恒兴文艺广场停车场(出口)', 108.947612, 34.23998004, 1],  
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['停车场(入口)', 108.9419688, 34.23599912, 1],  
['荣城停车场(出入口)', 108.9462965, 34.23563746, 1],  
['停车场三五三八住宅院西', 108.9425619, 34.23833709, 1],  
['景致雅居停车场(出入口)', 108.9442996, 34.23793175, '16'],  
['陕西测绘局停车场', 108.9494919, 34.23835453, '16'],  
['西安宾馆停车场(出口)', 108.9420433, 34.23939371, 1],  
['恒兴文艺广场停车场(入口)', 108.9489147, 34.24022511, 1],  
['长安壹栋停车场(出入口)', 108.944517, 34.23711661, 1],  
['西安宾馆停车场', 108.9420005, 34.23938879, 1],  
['骊马豪城停车场(出入口)', 108.9445927, 34.23800113, '16'],  
['陕西测绘局停车场(出入口)', 108.9493733, 34.23835179, 1],  
['恒兴文艺广场停车场(出口)', 108.9476608, 34.24043976, 1],  
['太平洋大厦停车场', 108.941844, 34.23828451, 1],  
['停车场(出入口)', 108.945213, 34.23481703, 1],  
['停车场(出口)', 108.9457598, 34.24144742, 1],  
['唐乐宫停车场(出入口)', 108.9424502, 34.23842427, 1],  
['长兴饭店停车场', 108.9418477, 34.24196412, 1],  
['高尔夫花园停车场(出入口)', 108.9419437, 34.23820435, 1],  
['恒兴文艺广场停车场(出入口)', 108.9484074, 34.23994632, '16'],  
['三二三医院(公交站)', 108.9574554, 34.23721822, 1],  
['建设西路南侧停车场', 108.9573278, 34.23714557, 1],  
['建设西路北侧停车场', 108.9577204, 34.23731353, 1],  
['解放军第三二三医院停车场', 108.9565118, 34.23679271, 1],  
['东新科贸A座停车场', 108.9584258, 34.23732377, 1],  
['金萨餐饮停车场', 108.9554077, 34.23779702, 1],  
['东新科贸电脑摄影器材广场停车场', 108.9584416, 34.23966086, 1],  
['金萨餐饮世界停车场', 108.9552732, 34.23728453, 1],  
['百脑汇停车场', 108.9581758, 34.23706349, 1],  
['金萨餐饮世界停车场', 108.9549105, 34.23730639, 1],  
['停车场(测绘西路1号院东)', 108.9543774, 34.23724569, 1],  
['新旅城停车场', 108.95531, 34.23844401, 1],  
['百脑汇科技大厦停车场', 108.9587846, 34.23655016, 1],  
['停车场', 108.9581687, 34.23824307, 1],  
['解放军第三二三医院停车场', 108.9557177, 34.23599893, 1],  
['东新科贸A座停车场', 108.9588533, 34.23762558, 1],  
['新旅城地下停车场', 108.9538631, 34.23733088, 1],  
['百脑汇科技大厦-地下停车场', 108.9583073, 34.23706616, 1],  
['新旅城停车场', 108.9540126, 34.23733952, 1],  
['停车场', 108.9538153, 34.23721904, 1],  
['丰润广场停车场', 108.9557204, 34.23939066, '16'],  
['停车场(丰润广场西)', 108.9556407, 34.23956079, 1],  
['测绘-大队·雁塔路停车场', 108.9571622, 34.23979898, 1],  
['东新科技贸易广场B座停车场', 108.9588034, 34.23826847, 1],  
['西安科技大学雁塔校区停车场', 108.9586163, 34.23593081, 1],  
['停车场(测绘路)', 108.958318, 34.23979312, 1],  
['停车场(测绘路)', 108.9585213, 34.23994155, '16'],  
['停车场(建设路西段)', 108.951875, 34.23722456, 1],

['停车场(测绘西路1号院东南)', 108.9529045, 34.23725516, 1],  
['雁塔路石化大厦停车场', 108.9588052, 34.24049363, 1],  
['长安大学停车场', 108.9519848, 34.23521705, '16'],  
['测绘外业基地后勤管理办公室停车场', 108.9564329, 34.23975379, 1],  
['东新科贸电脑外设耗材广场停车场', 108.9582722, 34.2396193, 1],  
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['长安大学停车场', 108.9528139, 34.23591887, '16'],  
['新旅城停车场', 108.9549214, 34.23789515, 1],  
['建设路西段三颗树超市西停车场', 108.9523424, 34.23707654, 1],  
['长安大学停车场', 108.9532345, 34.23502322, 1],  
['停车场(入口)', 108.9535313, 34.23731267, 1],  
['西安科技大学雁塔校区停车场', 108.9579397, 34.23623939, 1],  
['营海酒店停车场', 108.9558847, 34.24113561, '16'],  
['停车场(出口)', 108.9543305, 34.23732477, 1],  
['百脑汇停车场(出入口)', 108.9580961, 34.23709868, 1],  
['新旅城停车场(出入口)', 108.9545438, 34.23736425, 1],  
['新旅城停车场(出入口)', 108.9553458, 34.23844092, 1],  
['东新科贸摄影器材广场停车场', 108.9587376, 34.23842758, 1],  
['东新科贸A座停车场(出入口)', 108.958667, 34.23731417, 1],  
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['西安七星级赖床客栈', 108.9426597, 34.23626966, '16'],  
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显示表格

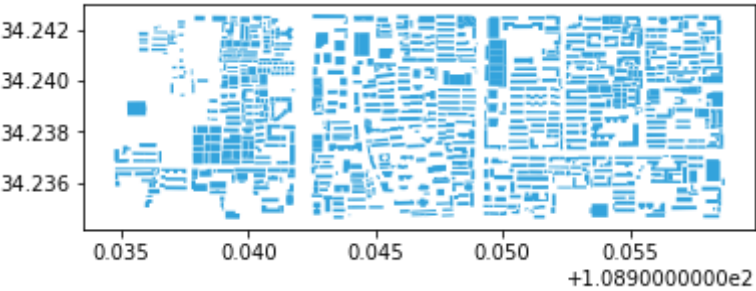
```
In [ ]: df = pd.DataFrame(gaopoints, columns=['名称', '经度', '纬度', '高度'],)
df
```

	名称	经度	纬度	高度
0	碑林区长兴停车场	108.941591	34.242213	1
1	7天酒店西安小雁塔南稍门店停车场	108.939183	34.242473	1
2	小雁塔-停车场	108.938466	34.242524	1
3	文艺路(地铁站)	108.949714	34.242779	1
4	南稍门(公交站)	108.942346	34.242179	1
...	...	...	...	...
2062	厚义兴小吃店	108.957231	34.239928	16
2063	好食来中式快餐	108.957490	34.237094	1
2064	陕南风味餐厅	108.956163	34.239976	16
2065	湘秦中式营养快餐	108.955425	34.240327	16
2066	中国兰州牛肉拉面(建设西路店)	108.952027	34.237291	1

2067 rows × 4 columns

```
In [ ]: geo.plot(color='#33a3dc')
```

Out[ ]: <AxesSubplot:>



3.分析

### 3.1核密度计算

```
In [ ]: import scipy.stats as st
import numpy as np
x=[]
y=[]
hepoints=deepcopy(points)
for point in hepoints:
    x.append(point[1])
    y.append(point[2])
X=np.array(np.vstack((x,y)))
# X
kernel = st.gaussian_kde(X)
res=kernel.evaluate(X)
for i in range(len(points)):
    hepoints[i].append(res[i])
```

#### 显示表格

```
In [ ]: df = pd.DataFrame(hepoints, columns=['名称', '经度', '纬度', '核密度'],)
df
```

```
Out[ ]:
```

	名称	经度	纬度	核密度
0	碑林区长兴停车场	108.941591	34.242213	6411.701469
1	7天酒店西安小雁塔南稍门店停车场	108.939183	34.242473	3240.145648
2	小雁塔-停车场	108.938466	34.242524	2421.910580
3	文艺路(地铁站)	108.949714	34.242779	4705.927755
4	南稍门(公交站)	108.942346	34.242179	7264.022519
...	...	...	...	...
2062	厚义兴小吃店	108.957231	34.239928	5720.278109
2063	好食来中式快餐	108.957490	34.237094	8175.010801
2064	陕南风味餐厅	108.956163	34.239976	6239.043780
2065	湘秦中式营养快餐	108.955425	34.240327	5703.555365
2066	中国兰州牛肉拉面(建设西路店)	108.952027	34.237291	5978.753692

2067 rows × 4 columns

### 3.2 K-Means聚类

#### 导入sklearn的Kmeans方法

```
In [ ]: from sklearn.cluster import KMeans
kpoints=[[item[1],item[2],item[3]]for item in gaopoints]
kpoints=np.array(kpoints,dtype=np.float64)
classcount=len(set([item[2] for item in kpoints]))
# classcount#聚类数
```

#### 对数据进行聚类

```
In [ ]:
```

```
clf = KMeans(n_clusters=classcount) # 聚类
clf.fit(kpoints) # 拟合模型
clf.labels_=clf.labels_.reshape(2067, 1)
```

## 显示聚类结果

```
In [ ]: temp = np.hstack([kpoints, clf.labels_])
df = pd.DataFrame(temp, columns=['经度', '纬度', '高度', '类别'],)
df
```

```
Out [ ]:
```

	经度	纬度	高度	类别
0	108.941591	34.242213	1.0	0.0
1	108.939183	34.242473	1.0	0.0
2	108.938466	34.242524	1.0	0.0
3	108.949714	34.242779	1.0	0.0
4	108.942346	34.242179	1.0	0.0
...	...	...	...	...
2062	108.957231	34.239928	16.0	1.0
2063	108.957490	34.237094	1.0	0.0
2064	108.956163	34.239976	16.0	1.0
2065	108.955425	34.240327	16.0	1.0
2066	108.952027	34.237291	1.0	0.0

2067 rows × 4 columns

## 3.3个人实验

### 获取该区域点信息

```
In [ ]: points = []
for index, row in raw.iterrows():
    long = row["WGS84_经度"]
    lai = row["WGS84_纬度"]
    if (leftpoint[0] < long < rightpoint[0]) and (leftpoint[1] < lai < rightpoint[1]):
        points.append([row['名称'], row['大类']])
```

### 该区域大类建筑数量

```
In [ ]: temp = [item[1] for item in points]
templ={}
for item in temp:
    if item not in templ:
        templ[item] = 0
    else:
        templ[item] += 1
templ
```

```
Out [ ]: {'交通设施服务': 176,
          '住宿服务': 180,
          '商务住宅': 167,
```

```
'体育休闲服务': 80,  
'公共设施': 14,  
'公司企业': 430,  
'科教文化服务': 194,  
'医疗保健服务': 106,  
'政府机构及社会团体': 113,  
'生活服务': 154,  
'购物服务': 13,  
'金融保险服务': 79,  
'风景名胜': 6,  
'餐饮服务': 341}
```

## 4.总结

通过本次实验，我提高了学习python的兴趣和编程水平，通过请教同学和老师解决了曾经想解决而没有解决的疑惑，熟练掌握了python的数据处理方法：

- Anaconda的安装与使用
- pip的安装与使用
- Geopandas的安装与使用
- numpy的安装与使用
- python基本数据结构的使用
- Jupyter note的安装与使用
- vs code开发python的环境配置