

```
In [1]: # data
import numpy as np
import pandas as pd

# visualization
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
import plotly.graph_objects as go

# warning
import warnings
warnings.filterwarnings('ignore')
```

```
In [2]: df = pd.read_excel("main.xlsx")
df.info()
```

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11500 entries, 0 to 11499
Data columns (total 14 columns):

#	Column	Non-Null Count	Dtype
0	자치구(구)	11500 non-null	object
1	날짜	11500 non-null	int64
2	1hr 최대 강수량	11500 non-null	float64
3	일평균 강수량	11500 non-null	float64
4	경사도	11500 non-null	float64
5	고도(해발고도)	11500 non-null	float64
6	불투수면	11500 non-null	float64
7	녹지 면적율	11500 non-null	float64
8	하천 면적율	11500 non-null	float64
9	복개하천 개수	11500 non-null	int64
10	맨홀개수	11500 non-null	int64
11	빗물받이 개수	11500 non-null	int64
12	빗물 펌프 개수	11500 non-null	int64
13	하수관로 비율	11500 non-null	object

dtypes: float64(7), int64(5), object(2)
memory usage: 1.2+ MB

```
In [4]: df1 = df.drop_duplicates('녹지 면적율')
df1
df2 = df1[['날짜', '자치구(구)', '녹지 면적율']]
df2
```

Out[4]:

	날짜	자치구(구)	녹지 면적율
0	20180601	종로	0.009418
92	20180601	중	0.022957
184	20180601	용산	0.016664
276	20180601	성동	0.017750
368	20180601	광진	0.017115
...
11040	20220601	관악	0.029419
11132	20220601	서초	0.027221
11224	20220601	강남	0.029274
11316	20220601	송파	0.096774
11408	20220601	강동	0.035874

119 rows × 3 columns

In [6]: df2.to_excel('test.xlsx')

In [8]: df = pd.read_excel("test.xlsx")
df

Out[8]:

	Unnamed: 0	날짜	자치구(구)	녹지 면적율
0	0	20180601	종로	0.009418
1	92	20180601	중	0.022957
2	184	20180601	용산	0.016664
3	276	20180601	성동	0.017750
4	368	20180601	광진	0.017115
...
120	11592	20220601	관악	0.029419
121	11684	20220601	서초	0.027221
122	11776	20220601	강남	0.029274
123	11868	20220601	송파	0.096774
124	11960	20220601	강동	0.035874

125 rows × 4 columns

In [17]: # 데이터 프레임을 25개씩 끊어서 새로운 데이터 프레임 생성
num_subframes = 5
subframe_size = len(df) // num_subframes # 각 데이터 프레임의 크기 계산

subframes = [df.iloc[i*subframe_size:(i+1)*subframe_size] for i in range(num_subframes)]

각각의 데이터 프레임을 다른 변수에 저장
df1, df2, df3, df4, df5 = subframes

```
new_df1 = df1.copy()
new_df1['자치구(구)'] = new_df1['자치구(구)'] + '구'

new_df2 = df2.copy()
new_df2['자치구(구)'] = new_df2['자치구(구)'] + '구'

new_df3 = df3.copy()
new_df3['자치구(구)'] = new_df3['자치구(구)'] + '구'

new_df4 = df4.copy()
new_df4['자치구(구)'] = new_df4['자치구(구)'] + '구'

new_df5 = df5.copy()
new_df5['자치구(구)'] = new_df5['자치구(구)'] + '구'

new_df5
```

Out[17]:

	Unnamed: 0	날짜	자치구(구)	녹지 면적율
100	9752	20220601	종로구	0.008689
101	9844	20220601	중구	0.012675
102	9936	20220601	용산구	0.010724
103	10028	20220601	성동구	0.013973
104	10120	20220601	광진구	0.015830
105	10212	20220601	동대문구	0.004315
106	10304	20220601	중랑구	0.008163
107	10396	20220601	성북구	0.004382
108	10488	20220601	강북구	0.000923
109	10580	20220601	도봉구	0.008378
110	10672	20220601	노원구	0.022998
111	10764	20220601	은평구	0.004418
112	10856	20220601	서대문구	0.004578
113	10948	20220601	마포구	0.108200
114	11040	20220601	양천구	0.050820
115	11132	20220601	강서구	0.037256
116	11224	20220601	구로구	0.019508
117	11316	20220601	금천구	0.032182
118	11408	20220601	영등포구	0.069282
119	11500	20220601	동작구	0.003568
120	11592	20220601	관악구	0.029419
121	11684	20220601	서초구	0.027221
122	11776	20220601	강남구	0.029274
123	11868	20220601	송파구	0.096774
124	11960	20220601	강동구	0.035874

In [46]: # 위도경도 매핑

```
locs = {
    '종로구': (37.595176, 126.977262),
    '중구': (37.560229, 126.995971),
    '용산구': (37.531486, 126.980292),
    '성동구': (37.550983, 127.041041),
    '광진구': (37.546714, 127.085754),
    '동대문구': (37.581916, 127.054846),
    '중랑구': (37.597810, 127.092896),
    '성북구': (37.605636, 127.017551),
    '강북구': (37.643463, 127.011188),
    '도봉구': (37.6691, 127.0324),
    '노원구': (37.6524, 127.075),
    '은평구': (37.619161, 126.927011),
    '서대문구': (37.5778, 126.9391),
    '마포구': (37.5593, 126.9083),
    '양천구': (37.5248, 126.8553),
    '강서구': (37.5612, 126.8229),
    '구로구': (37.4944, 126.8564),
    '금천구': (37.4605, 126.9008),
    '영등포구': (37.5223, 126.9102),
    '동작구': (37.4988, 126.9516),
    '관악구': (37.4673, 126.9454),
    '서초구': (37.4733, 127.0312),
    '강남구': (37.4966, 127.063),
    '송파구': (37.5056, 127.1153),
    '강동구': (37.5504, 127.147),
}
```

locs

Out[46]: {'종로구': (37.595176, 126.977262),
'중구': (37.560229, 126.995971),
'용산구': (37.531486, 126.980292),
'성동구': (37.550983, 127.041041),
'광진구': (37.546714, 127.085754),
'동대문구': (37.581916, 127.054846),
'중랑구': (37.59781, 127.092896),
'성북구': (37.605636, 127.017551),
'강북구': (37.643463, 127.011188),
'도봉구': (37.6691, 127.0324),
'노원구': (37.6524, 127.075),
'은평구': (37.619161, 126.927011),
'서대문구': (37.5778, 126.9391),
'마포구': (37.5593, 126.9083),
'양천구': (37.5248, 126.8553),
'강서구': (37.5612, 126.8229),
'구로구': (37.4944, 126.8564),
'금천구': (37.4605, 126.9008),
'영등포구': (37.5223, 126.9102),
'동작구': (37.4988, 126.9516),
'관악구': (37.4673, 126.9454),
'서초구': (37.4733, 127.0312),
'강남구': (37.4966, 127.063),
'송파구': (37.5056, 127.1153),
'강동구': (37.5504, 127.147)}

In [47]: # 연도별 녹지 면적율
2018
import folium

```

geo_json = 'https://raw.githubusercontent.com/southkorea/seoul-maps/master/kostat/20

m = folium.Map(location=[37.5642135, 127.0016985])

folium.Choropleth(geo_data = geo_json,
                  name = 'choropleth',
                  data = new_df1,
                  columns=['자치구(구)', '녹지 면적율'],
                  key_on = 'feature.properties.name',
                  fill_color = 'YlGn',
                  fill_opacity = 0.7,
                  line_opacity = 0.2,

).add_to(m)

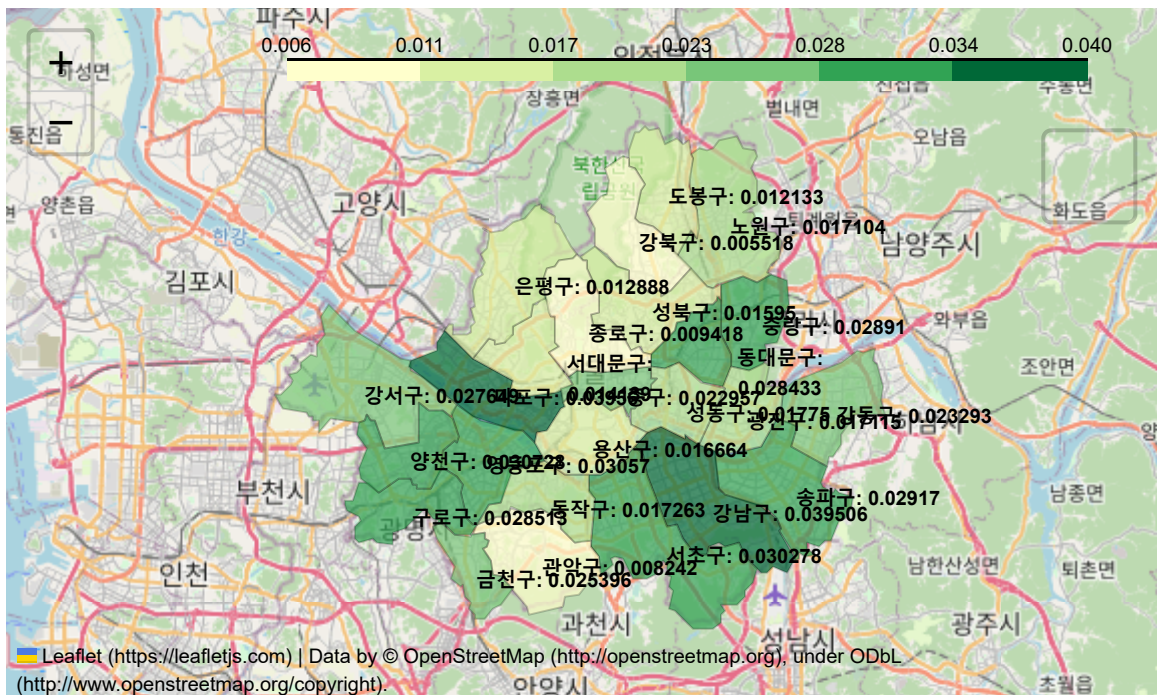
folium.LayerControl().add_to(m)

for key, value in locs.items():
    text = f'{key}: {new_df1.loc[new_df1["자치구(구)"] == key, "녹지 면적율"].values[0]}'
    folium.Marker(
        location=value,
        icon=folium.DivIcon(
            icon_size=(0, 0),
            icon_anchor=(0, 0),
            html=f'<div style="font-size: 0.8rem; color: black; background-color:rgb
        )
    ).add_to(m)

m

```

Out[47]:



In [48]:

```

# 2019
import folium

geo_json = 'https://raw.githubusercontent.com/southkorea/seoul-maps/master/kostat/20

m = folium.Map(location=[37.5642135, 127.0016985])

folium.Choropleth(geo_data = geo_json,
                  name = 'choropleth',

```

```

data = new_df2,
columns=['자치구(구)', '녹지 면적율'],
key_on = 'feature.properties.name',
fill_color = 'YlGn',
fill_opacity = 0.7,
line_opacity = 0.2,

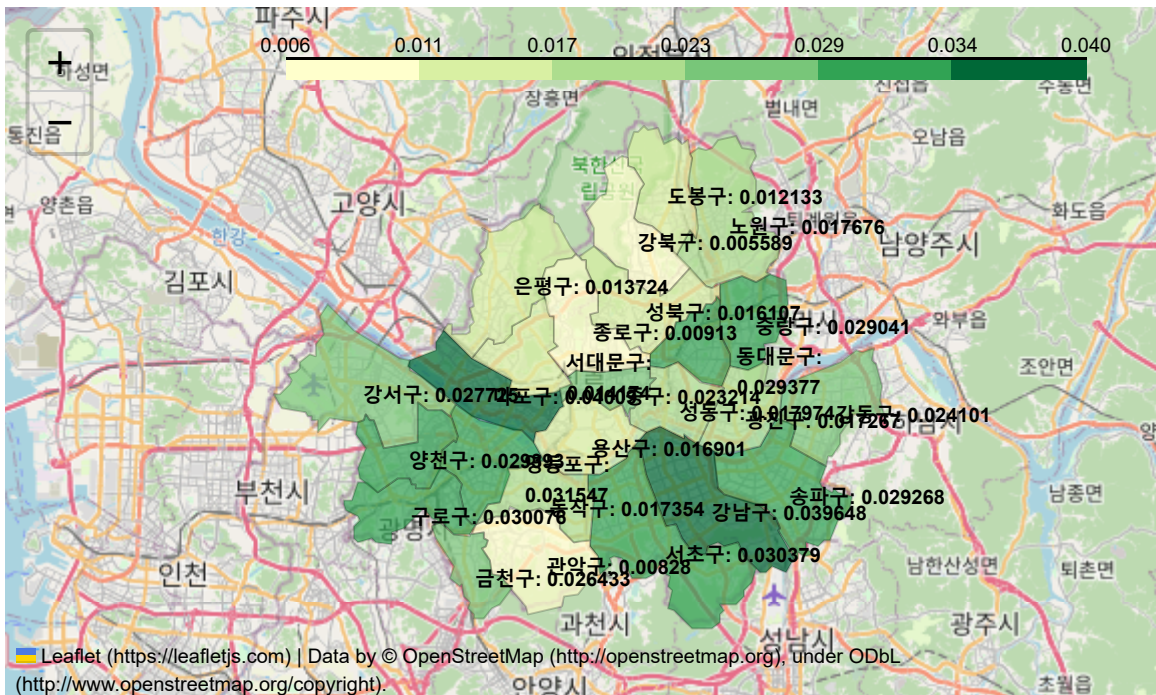
).add_to(m)

for key, value in locs.items():
    text = f"{key}: {new_df2.loc[new_df2['자치구(구)'] == key, '녹지 면적율'].values[0]}"
    folium.Marker(
        location=value,
        icon=folium.DivIcon(
            icon_size=(0, 0),
            icon_anchor=(0, 0),
            html=f'<div style="font-size: 1.0rem; color: black; background-color:rgb(255, 255, 255); padding: 2px 5px; border: 1px solid black;">{text}</div>'
        )
    ).add_to(m)

m

```

Out[48]:



In [49]:

```

# 2020
import folium

geo_json = 'https://raw.githubusercontent.com/southkorea/seoul-maps/master/kostat/2020/geojson/2020_green_ratio.geojson'

m = folium.Map(location=[37.5642135, 127.0016985])

folium.Choropleth(geo_data = geo_json,
    name = 'choropleth',
    data = new_df3,
    columns=['자치구(구)', '녹지 면적율'],
    key_on = 'feature.properties.name',
    fill_color = 'YlGn',
    fill_opacity = 0.7,
    line_opacity = 0.2,

).add_to(m)

for key, value in locs.items():
    text = f"{key}: {new_df3.loc[new_df3['자치구(구)'] == key, '녹지 면적율'].values[0]}"

```

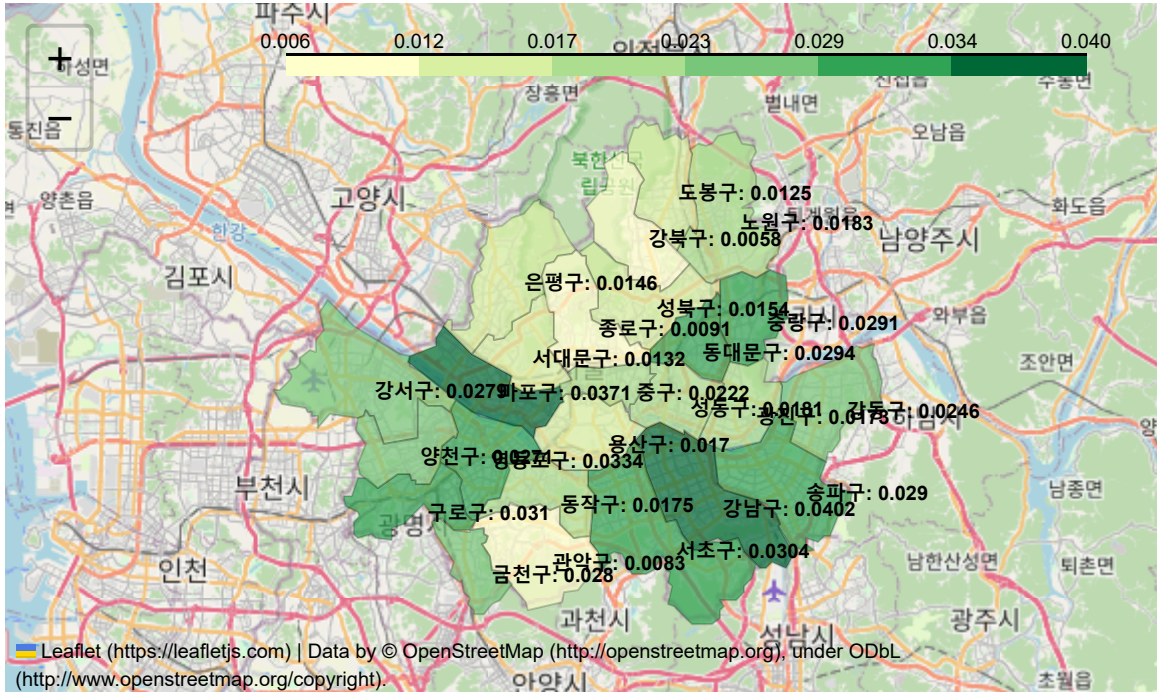


```

folium.Marker(
    location=value,
    icon=folium.DivIcon(
        icon_size=(0, 0),
        icon_anchor=(0, 0),
        html=f'<div style="font-size: 1.0rem; color: black; background-color:rgb
    )
).add_to(m)
m

```

Out[49]:



In [50]:

```

# 2021
import folium

geo_json = 'https://raw.githubusercontent.com/southkorea/seoul-maps/master/kostat/20

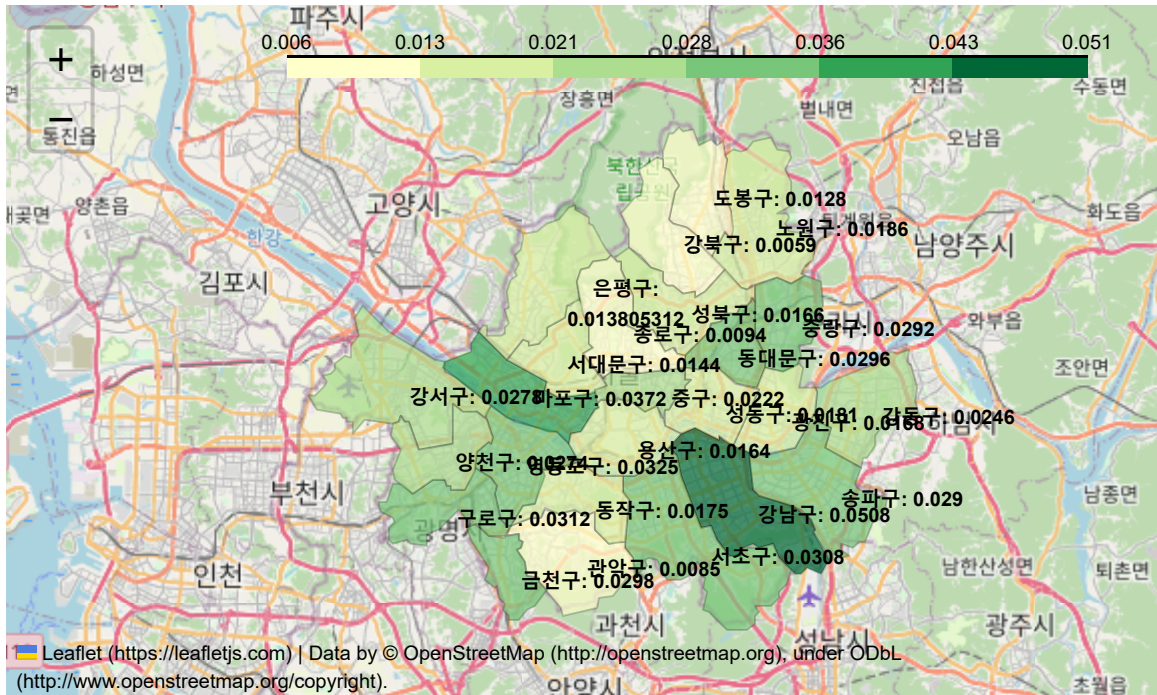
m = folium.Map(location=[37.5665, 126.9780])

folium.Choropleth(geo_data = geo_json,
    name = 'choropleth',
    data = new_df4,
    columns=['자치구(구)', '녹지 면적율'],
    key_on = 'feature.properties.name',
    fill_color = 'YlGn',
    fill_opacity = 0.7,
    line_opacity = 0.2,
).add_to(m)

for key, value in locs.items():
    text = f'{key}: {new_df4.loc[new_df4["자치구(구)"] == key, "녹지 면적율"].values[0]}
    folium.Marker(
        location=value,
        icon=folium.DivIcon(
            icon_size=(0, 0),
            icon_anchor=(0, 0),
            html=f'<div style="font-size: 1.0rem; color: black; background-color:rgb
        )
    ).add_to(m)
m

```

Out[50]:



```
In [51]: # 2022
import folium

geo_json = 'https://raw.githubusercontent.com/southkorea/seoul-maps/master/kostat/20

m = folium.Map(location=[37.5642135, 127.0016985])

folium.Choropleth(geo_data = geo_json,
                  name = 'choropleth',
                  data = new_df5,
                  columns=['자치구(구)', '녹지 면적율'],
                  key_on = 'feature.properties.name',
                  fill_color = 'YlGn',
                  fill_opacity = 0.7,
                  line_opacity = 0.2,
                  ).add_to(m)

for key, value in locs.items():
    text = f"{key}: {new_df5.loc[new_df5['자치구(구)'] == key, '녹지 면적율'].values[0]}"
    folium.Marker(
        location=value,
        icon=folium.DivIcon(
            icon_size=(0, 0),
            icon_anchor=(0, 0),
            html=f"<div style='font-size: 1.0rem; color: black; background-color:rgb(255, 255, 255); padding: 2px 5px; border: 1px solid black;'>{text}</div>"
        )
    ).add_to(m)

m
```


Out[51]:

