```
import pandas as pd
import numpy as np
import plotly.express as px
import geopandas as gpd
from geopandas import GeoDataFrame
import seaborn as sns
import matplotlib.pyplot as plt

import geopandas as gpd
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.axes_grid1 import make_axes_locatable
import plotly.graph_objects as go

data =
pd.read_csv('E://Ginu_StudyMaterials//Sem2//Dissertation//MapData//
PRP.csv')

data
```

```
       date_of_sale                                        address  \
0        01/01/2010          5 Braemor Drive, Churchtown, Co.Dublin
1        03/01/2010  134 Ashewood Walk, Summerhill Lane, Portlaoise
2        04/01/2010             1 Meadow Avenue, Dundrum, Dublin 14
3        04/01/2010                          1 The Haven, Mornington
4        04/01/2010                 11 Melville Heights, Kilkenny
...             ...                                             ...
516581   28/01/2022                LACKEN, MULTYFARNHAM, MULLINGAR
516582   28/01/2022                   LARCH HILL, COLMAN, FETHARD
516583   28/01/2022             SHERRYS WOOD, BELLEWSTOWN, CO MEATH
516584   28/01/2022                  ST JUDES, STONEYFORD, KILKENNY
516585   28/01/2022                       SYLVAN, DUBLIN ROAD, BRAY

       postal_code     county   price market_price VAT_exclusive  \
0              NaN     Dublin  343000           No            No
1              NaN      Laois  185000           No           Yes
2              NaN     Dublin  438500           No            No
3              NaN      Meath  400000           No            No
4              NaN   Kilkenny  160000           No            No
...            ...        ...     ...          ...           ...
516581         NaN  Westmeath  305000           No            No
516582         NaN  Tipperary  300000           No            No
516583         NaN      Meath  450000           No            No
516584         NaN   Kilkenny  242000           No            No
516585         NaN    Wicklow  620000           No            No

                       property_description  \
0       Second-Hand Dwelling house /Apartment
1               New Dwelling house /Apartment
2       Second-Hand Dwelling house /Apartment
```

```
3       Second-Hand Dwelling house /Apartment
4       Second-Hand Dwelling house /Apartment
...                                        ...
516581  Second-Hand Dwelling house /Apartment
516582  Second-Hand Dwelling house /Apartment
516583  Second-Hand Dwelling house /Apartment
516584  Second-Hand Dwelling house /Apartment
516585  Second-Hand Dwelling house /Apartment

                               property_size_description  province  \
0                                                    NaN  Leinster
1       greater than or equal to 38 sq metres and less...  Leinster
2                                                    NaN  Leinster
3                                                    NaN  Leinster
4                                                    NaN  Leinster
...                                                  ...       ...
516581                                               NaN  Leinster
516582                                               NaN   Munster
516583                                               NaN  Leinster
516584                                               NaN  Leinster
516585                                               NaN  Leinster

       month_year  year  month
0         2010-01  2010      1
1         2010-03  2010      1
2         2010-04  2010      1
3         2010-04  2010      1
4         2010-04  2010      1
...           ...   ...    ...
516581    2022-01  2022      1
516582    2022-01  2022      1
516583    2022-01  2022      1
516584    2022-01  2022      1
516585    2022-01  2022      1

[516586 rows x 13 columns]
```

```
counties = data['county'].unique()
counties
```

```
array(['Dublin', 'Laois', 'Meath', 'Kilkenny', 'Limerick', 'Carlow',
       'Cork', 'Clare', 'Sligo', 'Cavan', 'Tipperary', 'Wicklow',
       'Roscommon', 'Wexford', 'Mayo', 'Donegal', 'Longford',
'Galway',
       'Offaly', 'Kildare', 'Waterford', 'Louth', 'Kerry',
'Westmeath',
       'Monaghan', 'Leitrim'], dtype=object)
```

```
median_per_county = [data['price'][data['county']==county].median()
for county in counties]
```

```
median_per_county = np.asarray(median_per_county)
median_per_county
```

```
array([308370., 139995., 233480., 160000., 150000., 140000., 200000.,
       140000., 110000., 104225., 125000., 275000.,  89000., 150000.,
       110000., 101743.,  84000., 180000., 130000., 250000., 142000.,
       170000., 142500., 138000., 118000.,  87000.])
```

```
q=[]
for price in median_per_county:
    x = price/10**3
    q.append(x)

county_price = pd.DataFrame(q)

county_price['county'] = counties

county_price.rename(columns={0:'price'},inplace=True)

from opencage.geocoder import OpenCageGeocode
key = '40d783cbf75143b48b8528d1804a3ccd'  # get api key from:
https://opencagedata.com

geocoder = OpenCageGeocode(key)

list_lat = []   # create empty lists

list_long = []

for index, row in county_price.iterrows(): # iterate over rows in
dataframe


    City = row['county']
    #State = row['province']
    query = str(City)
    #loc = row['temp_add']
    #query = str(loc)

    results = geocoder.geocode(query)
    lat = results[0]['geometry']['lat']
    long = results[0]['geometry']['lng']

    list_lat.append(lat)
    list_long.append(long)

# create new columns from lists

county_price['lat'] = list_lat
```

```
county_price['lon'] = list_long
```

```
county_price
```

```
      price     county        lat        lon
0   308.370     Dublin  53.349764  -6.260273
1   139.995      Laois  52.998458  -7.398034
2   233.480      Meath  53.649784  -6.588529
3   160.000   Kilkenny  52.651022  -7.248495
4   150.000   Limerick  52.661252  -8.630124
5   140.000     Carlow  52.690789  -6.825145
6   200.000       Cork  51.897077  -8.465467
7   140.000      Clare  52.857258  -8.937436
8   110.000      Sligo  54.192986  -8.730543
9   104.225      Cavan  48.672173  -3.345742
10  125.000  Tipperary  52.684821  -7.898128
11  275.000    Wicklow  52.958147  -6.381971
12   89.000  Roscommon  44.332693 -84.616516
13  150.000    Wexford  52.460187  -6.606516
14  110.000       Mayo  53.908706  -9.298305
15  101.743    Donegal  54.920754  -7.952385
16   84.000   Longford  53.731985  -7.695351
17  180.000     Galway  53.274412  -9.049060
18  130.000     Offaly  53.136172  -7.810341
19  250.000    Kildare  53.154364  -6.818418
20  142.000  Waterford  52.244963  -7.101788
21  170.000      Louth  53.906285  -6.532050
22  142.500      Kerry  52.145334  -9.517401
23  138.000  Westmeath  53.557790  -7.347856
24  118.000   Monaghan  54.161066  -6.946365
25   87.000    Leitrim  54.140162  -8.052478
```

```
data1 =
gpd.read_file('E://Ginu_StudyMaterials//Sem2//Dissertation//MapData//
IRL_adm1.shp')
#pd.read_csv('E://Ginu_StudyMaterials//Sem2//Dissertation//MapData//
IRL_roads.shp', encoding = 'unicode_escape')
```

```
data1
```

```
    ID_0  ISO   NAME_0  ID_1     NAME_1                TYPE_1
ENGTYPE_1  \
0    109  IRL  Ireland     1     Carlow  Administrative County
County
1    109  IRL  Ireland     2      Cavan  Administrative County
County
2    109  IRL  Ireland     3      Clare  Administrative County
County
3    109  IRL  Ireland     4       Cork     Traditional County
County
```

```
4    109  IRL  Ireland     5    Donegal  Administrative County
County
5    109  IRL  Ireland     6     Dublin  Administrative County
County
6    109  IRL  Ireland     7     Galway     Traditional County
County
7    109  IRL  Ireland     8      Kerry  Administrative County
County
8    109  IRL  Ireland     9    Kildare  Administrative County
County
9    109  IRL  Ireland    10   Kilkenny  Administrative County
County
10   109  IRL  Ireland    11   Laoighis  Administrative County
County
11   109  IRL  Ireland    12    Leitrim  Administrative County
County
12   109  IRL  Ireland    13   Limerick     Traditional County
County
13   109  IRL  Ireland    14   Longford  Administrative County
County
14   109  IRL  Ireland    15      Louth  Administrative County
County
15   109  IRL  Ireland    16       Mayo  Administrative County
County
16   109  IRL  Ireland    17      Meath  Administrative County
County
17   109  IRL  Ireland    18   Monaghan  Administrative County
County
18   109  IRL  Ireland    19     Offaly  Administrative County
County
19   109  IRL  Ireland    20  Roscommon  Administrative County
County
20   109  IRL  Ireland    21      Sligo  Administrative County
County
21   109  IRL  Ireland    22  Tipperary  Administrative County
County
22   109  IRL  Ireland    23  Waterford     Traditional County
County
23   109  IRL  Ireland    24  Westmeath  Administrative County
County
24   109  IRL  Ireland    25    Wexford  Administrative County
County
25   109  IRL  Ireland    26    Wicklow  Administrative County
County

   NL_NAME_1              VARNAME_1  \
0       None             Ceatharlach
1       None               An Cabhán
2       None                 An Clár
3       None                Corcaigh
```

4	None	Dún na nGall|Tyrconnel
5	None	Baile Átha Cliath
6	None	Gaillimh
7	None	Ciarraí
8	None	Cill Dara
9	None	Cill Chainnigh
10	None	Laois|Leix|Queens
11	None	Liatroim
12	None	Luimneach
13	None	An Longfort
14	None	Lú
15	None	Maigh Eo
16	None	An Mhí
17	None	Muineacháin
18	None	Uíbh Fhailí|Kings
19	None	Ros Comáin
20	None	Sligeach
21	None	Tiobraid Árann
22	None	Port Láirge
23	None	An Iarmhí
24	None	Loch Garman
25	None	Cill Mhantáin

	geometry
0	POLYGON ((-6.59242 52.70810, -6.59292 52.70730...
1	POLYGON ((-7.27517 53.78388, -7.27538 53.78377...
2	MULTIPOLYGON (((-9.04528 52.71819, -9.04528 52...
3	MULTIPOLYGON (((-10.16361 51.57986, -10.16528 ...
4	MULTIPOLYGON (((-7.24083 55.44958, -7.24078 55...
5	MULTIPOLYGON (((-6.04858 53.37128, -6.04919 53...
6	MULTIPOLYGON (((-9.59750 53.34375, -9.59750 53...
7	MULTIPOLYGON (((-10.21028 51.99903, -10.20972 ...
8	POLYGON ((-6.46413 53.22897, -6.46419 53.22890...
9	POLYGON ((-6.91620 52.44627, -6.91668 52.44429...
10	POLYGON ((-7.64934 52.79081, -7.66340 52.80828...
11	POLYGON ((-7.60649 53.93723, -7.61732 53.93817...
12	MULTIPOLYGON (((-9.06639 52.63486, -9.06694 52...
13	MULTIPOLYGON (((-7.39471 53.78172, -7.39076 53...
14	MULTIPOLYGON (((-6.16472 53.97681, -6.16583 53...
15	MULTIPOLYGON (((-9.79250 54.36875, -9.79250 54...
16	POLYGON ((-7.03209 53.51403, -7.01779 53.52950...
17	POLYGON ((-6.64686 54.18769, -6.63944 54.18271...
18	MULTIPOLYGON (((-7.09720 53.16462, -7.09755 53...
19	POLYGON ((-7.95265 53.51237, -7.95038 53.50746...
20	MULTIPOLYGON (((-9.05908 54.27736, -9.05917 54...
21	POLYGON ((-8.48679 52.71743, -8.48471 52.72145...
22	MULTIPOLYGON (((-7.55139 52.07764, -7.55528 52...
23	POLYGON ((-7.13612 53.40956, -7.13800 53.40828...
24	MULTIPOLYGON (((-6.79528 52.21458, -6.79528 52...
25	POLYGON ((-6.10917 52.83458, -6.10972 52.83458...

```
data1.rename({'NAME_1':'county' }, axis=1, inplace=True)


data1['county'] = data1['county'].replace(['Laoighis'],['Laois'])

data1['county'].unique()

array(['Carlow', 'Cavan', 'Clare', 'Cork', 'Donegal', 'Dublin',
'Galway',
       'Kerry', 'Kildare', 'Kilkenny', 'Laois', 'Leitrim', 'Limerick',
       'Longford', 'Louth', 'Mayo', 'Meath', 'Monaghan', 'Offaly',
       'Roscommon', 'Sligo', 'Tipperary', 'Waterford', 'Westmeath',
       'Wexford', 'Wicklow'], dtype=object)

df_merge_col = pd.merge(county_price, data1, on='county', how='left')

df_merge_col

      price     county        lat        lon  ID_0  ISO   NAME_0  ID_1
\
0   308.370     Dublin  53.349764  -6.260273   109  IRL  Ireland     6

1   139.995      Laois  52.998458  -7.398034   109  IRL  Ireland    11

2   233.480      Meath  53.649784  -6.588529   109  IRL  Ireland    17

3   160.000   Kilkenny  52.651022  -7.248495   109  IRL  Ireland    10

4   150.000   Limerick  52.661252  -8.630124   109  IRL  Ireland    13

5   140.000     Carlow  52.690789  -6.825145   109  IRL  Ireland     1

6   200.000       Cork  51.897077  -8.465467   109  IRL  Ireland     4

7   140.000      Clare  52.857258  -8.937436   109  IRL  Ireland     3

8   110.000      Sligo  54.192986  -8.730543   109  IRL  Ireland    21

9   104.225      Cavan  48.672173  -3.345742   109  IRL  Ireland     2

10  125.000  Tipperary  52.684821  -7.898128   109  IRL  Ireland    22

11  275.000    Wicklow  52.958147  -6.381971   109  IRL  Ireland    26

12   89.000  Roscommon  44.332693 -84.616516   109  IRL  Ireland    20

13  150.000    Wexford  52.460187  -6.606516   109  IRL  Ireland    25

14  110.000       Mayo  53.908706  -9.298305   109  IRL  Ireland    16
```

15	101.743	Donegal	54.920754	-7.952385	109	IRL	Ireland	5
16	84.000	Longford	53.731985	-7.695351	109	IRL	Ireland	14
17	180.000	Galway	53.274412	-9.049060	109	IRL	Ireland	7
18	130.000	Offaly	53.136172	-7.810341	109	IRL	Ireland	19
19	250.000	Kildare	53.154364	-6.818418	109	IRL	Ireland	9
20	142.000	Waterford	52.244963	-7.101788	109	IRL	Ireland	23
21	170.000	Louth	53.906285	-6.532050	109	IRL	Ireland	15
22	142.500	Kerry	52.145334	-9.517401	109	IRL	Ireland	8
23	138.000	Westmeath	53.557790	-7.347856	109	IRL	Ireland	24
24	118.000	Monaghan	54.161066	-6.946365	109	IRL	Ireland	18
25	87.000	Leitrim	54.140162	-8.052478	109	IRL	Ireland	12

	TYPE_1	ENGTYPE_1	NL_NAME_1	VARNAME_1
0	Administrative County	County	None	Baile Átha Cliath
1	Administrative County	County	None	Laois|Leix|Queens
2	Administrative County	County	None	An Mhí
3	Administrative County	County	None	Cill Chainnigh
4	Traditional County	County	None	Luimneach
5	Administrative County	County	None	Ceatharlach
6	Traditional County	County	None	Corcaigh
7	Administrative County	County	None	An Clár
8	Administrative County	County	None	Sligeach
9	Administrative County	County	None	An Cabhán
10	Administrative County	County	None	Tiobraid Árann
11	Administrative County	County	None	Cill Mhantáin

12	Administrative County	County	None	Ros Comáin	
13	Administrative County	County	None	Loch Garman	
14	Administrative County	County	None	Maigh Eo	
15	Administrative County	County	None	Dún na nGall|Tyrconnel	
16	Administrative County	County	None	An Longfort	
17	Traditional County	County	None	Gaillimh	
18	Administrative County	County	None	Uíbh Fhailí|Kings	
19	Administrative County	County	None	Cill Dara	
20	Traditional County	County	None	Port Láirge	
21	Administrative County	County	None	Lú	
22	Administrative County	County	None	Ciarraí	
23	Administrative County	County	None	An Iarmhí	
24	Administrative County	County	None	Muineachán	
25	Administrative County	County	None	Liatroim	

	geometry
0	MULTIPOLYGON (((-6.04858 53.37128, -6.04919 53...
1	POLYGON ((-7.64934 52.79081, -7.66340 52.80828...
2	POLYGON ((-7.03209 53.51403, -7.01779 53.52950...
3	POLYGON ((-6.91620 52.44627, -6.91668 52.44429...
4	MULTIPOLYGON (((-9.06639 52.63486, -9.06694 52...
5	POLYGON ((-6.59242 52.70810, -6.59292 52.70730...
6	MULTIPOLYGON (((-10.16361 51.57986, -10.16528 ...
7	MULTIPOLYGON (((-9.04528 52.71819, -9.04528 52...
8	MULTIPOLYGON (((-9.05908 54.27736, -9.05917 54...
9	POLYGON ((-7.27517 53.78388, -7.27538 53.78377...
10	POLYGON ((-8.48679 52.71743, -8.48471 52.72145...
11	POLYGON ((-6.10917 52.83458, -6.10972 52.83458...
12	POLYGON ((-7.95265 53.51237, -7.95038 53.50746...
13	MULTIPOLYGON (((-6.79528 52.21458, -6.79528 52...
14	MULTIPOLYGON (((-9.79250 54.36875, -9.79250 54...
15	MULTIPOLYGON (((-7.24083 55.44958, -7.24078 55...
16	MULTIPOLYGON (((-7.39471 53.78172, -7.39076 53...
17	MULTIPOLYGON (((-9.59750 53.34375, -9.59750 53...

```
18  MULTIPOLYGON (((-7.09720 53.16462, -7.09755 53...
19  POLYGON ((-6.46413 53.22897, -6.46419 53.22890...
20  MULTIPOLYGON (((-7.55139 52.07764, -7.55528 52...
21  MULTIPOLYGON (((-6.16472 53.97681, -6.16583 53...
22  MULTIPOLYGON (((-10.21028 51.99903, -10.20972 ...
23  POLYGON ((-7.13612 53.40956, -7.13800 53.40828...
24  POLYGON ((-6.64686 54.18769, -6.63944 54.18271...
25  POLYGON ((-7.60649 53.93723, -7.61732 53.93817...
```

```
df_merge_col =df_merge_col[['price', 'county' , 'geometry', 'ID_1']]
```

```
df_merge_col = df_merge_col.dropna(subset=['price',
'geometry']).set_index('ID_1')
df_merge_col
```

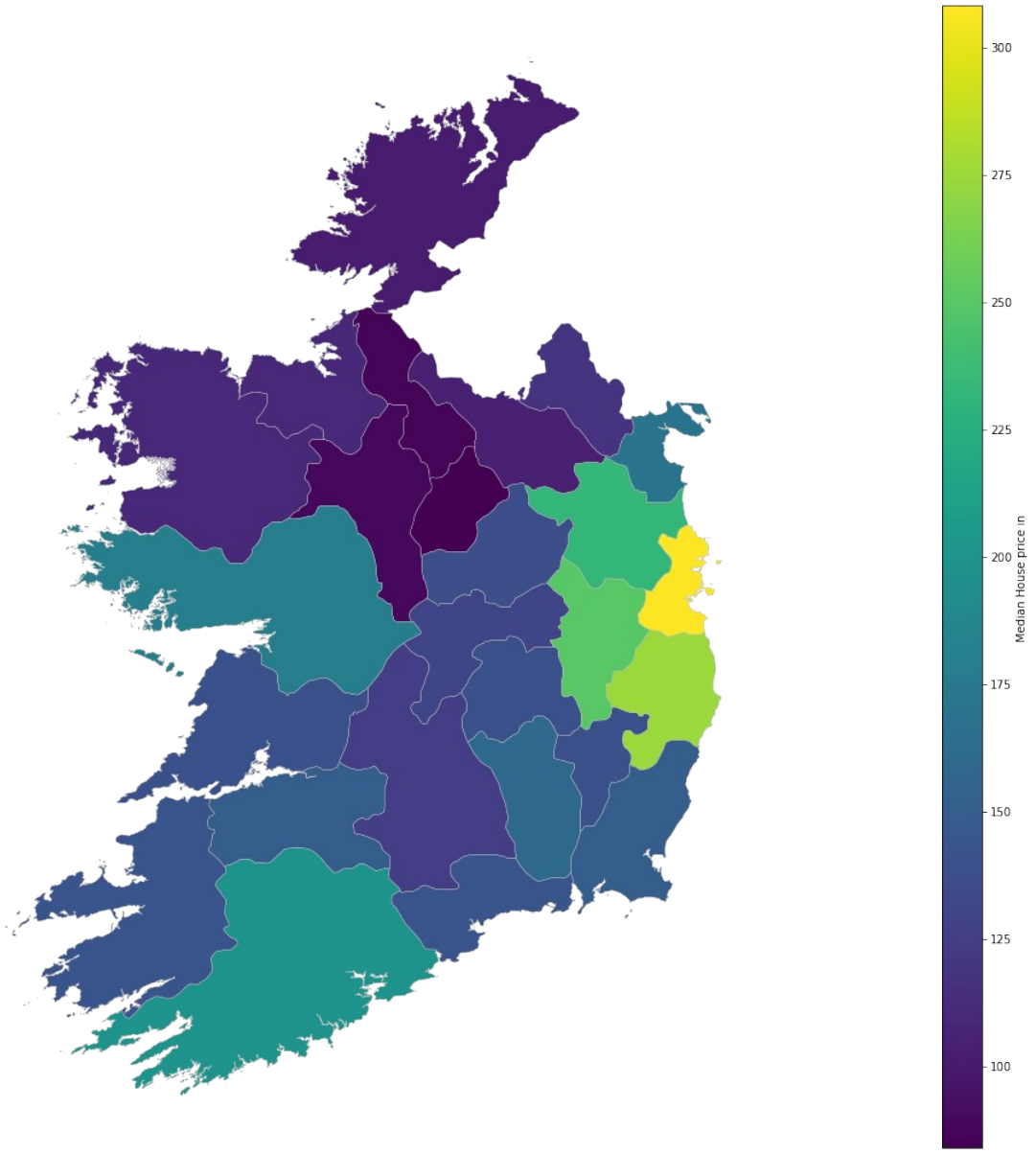
```
        price     county
geometry
ID_1

6     308.370     Dublin  MULTIPOLYGON (((-6.04858 53.37128, -6.04919
53...
11    139.995      Laois  POLYGON ((-7.64934 52.79081, -7.66340
52.80828...
17    233.480      Meath  POLYGON ((-7.03209 53.51403, -7.01779
53.52950...
10    160.000   Kilkenny  POLYGON ((-6.91620 52.44627, -6.91668
52.44429...
13    150.000   Limerick  MULTIPOLYGON (((-9.06639 52.63486, -9.06694
52...
1     140.000     Carlow  POLYGON ((-6.59242 52.70810, -6.59292
52.70730...
4     200.000       Cork  MULTIPOLYGON (((-10.16361 51.57986, -
10.16528 ...
3     140.000      Clare  MULTIPOLYGON (((-9.04528 52.71819, -9.04528
52...
21    110.000      Sligo  MULTIPOLYGON (((-9.05908 54.27736, -9.05917
54...
2     104.225      Cavan  POLYGON ((-7.27517 53.78388, -7.27538
53.78377...
22    125.000  Tipperary  POLYGON ((-8.48679 52.71743, -8.48471
52.72145...
26    275.000    Wicklow  POLYGON ((-6.10917 52.83458, -6.10972
52.83458...
20     89.000  Roscommon  POLYGON ((-7.95265 53.51237, -7.95038
53.50746...
25    150.000    Wexford  MULTIPOLYGON (((-6.79528 52.21458, -6.79528
52...
16    110.000       Mayo  MULTIPOLYGON (((-9.79250 54.36875, -9.79250
54...
5     101.743    Donegal  MULTIPOLYGON (((-7.24083 55.44958, -7.24078
55...
```

```
14     84.000   Longford  MULTIPOLYGON (((-7.39471 53.78172, -7.39076
53...
7     180.000     Galway  MULTIPOLYGON (((-9.59750 53.34375, -9.59750
53...
19    130.000     Offaly  MULTIPOLYGON (((-7.09720 53.16462, -7.09755
53...
9     250.000    Kildare  POLYGON ((-6.46413 53.22897, -6.46419
53.22890...
23    142.000  Waterford  MULTIPOLYGON (((-7.55139 52.07764, -7.55528
52...
15    170.000      Louth  MULTIPOLYGON (((-6.16472 53.97681, -6.16583
53...
8     142.500      Kerry  MULTIPOLYGON (((-10.21028 51.99903, -
10.20972 ...
24    138.000  Westmeath  POLYGON ((-7.13612 53.40956, -7.13800
53.40828...
18    118.000   Monaghan  POLYGON ((-6.64686 54.18769, -6.63944
54.18271...
12     87.000    Leitrim  POLYGON ((-7.60649 53.93723, -7.61732
53.93817...
```

```
from geopandas import GeoDataFrame

df_merge_col = GeoDataFrame(df_merge_col)
```

```
# OPTIONAL: Display using geopandas
fig, ax = plt.subplots(1,1, figsize=(20,20))
divider = make_axes_locatable(ax)
tmp = df_merge_col.copy()
#tmp['price'] = tmp['price']*100 #To display percentages
cax = divider.append_axes("right", size="3%", pad=-1) #resize the
colorbar
tmp.plot(column='price', ax=ax,cax=cax,  legend=True,
         legend_kwds={'label': "Median House price in "})

tmp.geometry.boundary.plot(color='#BABABA', ax=ax, linewidth=0.3) #Add
some borders to the geometries
ax.axis('off')
```

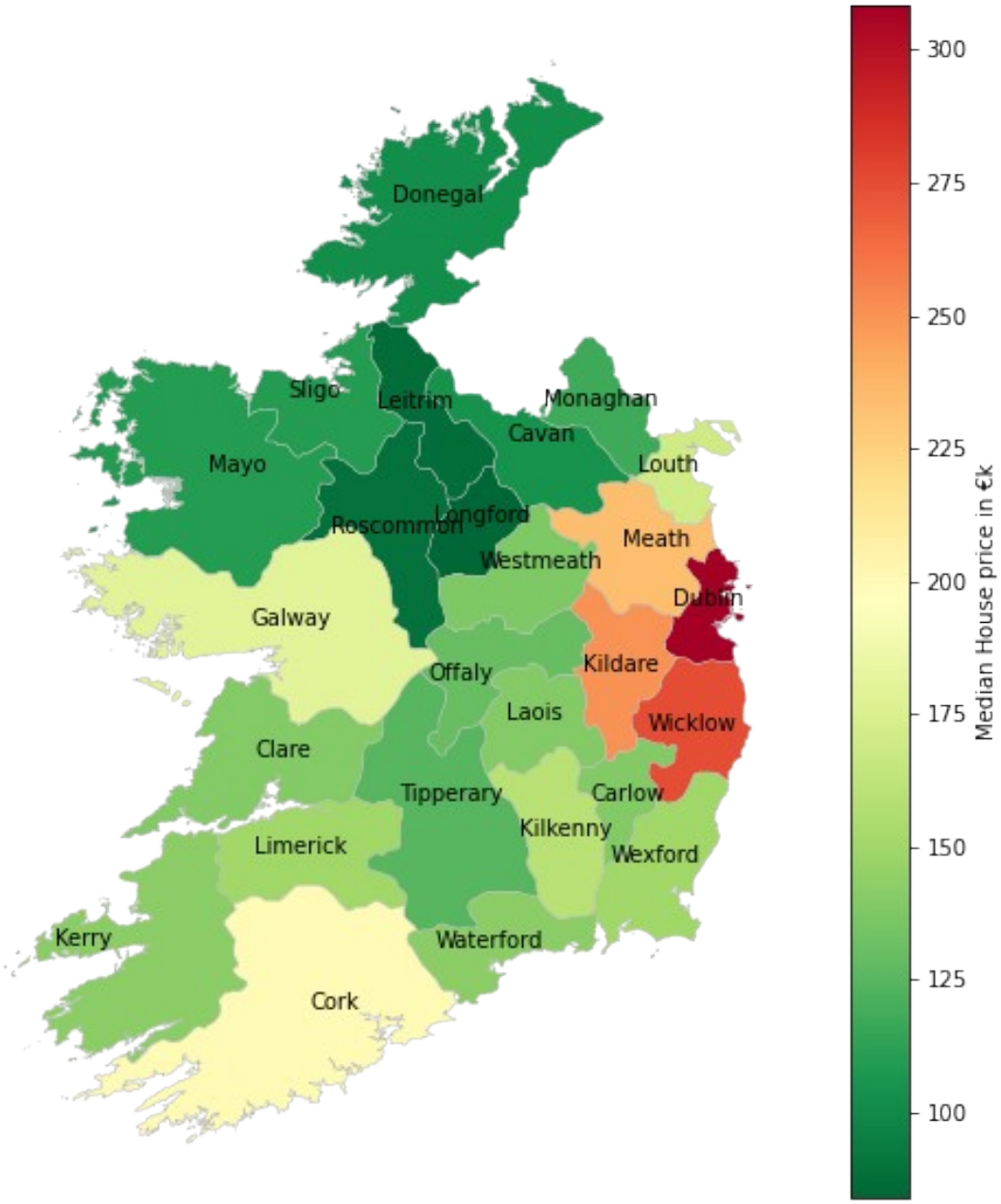
```
(-10.896526646614074, -5.76013867855072, 51.218040657043574,
55.65195827484136)
```




```
# OPTIONAL: Display using geopandas

tmp = df_merge_col.copy()
tmp['coords'] = tmp['geometry'].apply(lambda x:
x.representative_point().coords[:])
tmp['coords']= [coords[0] for coords in tmp['coords']]

fig, ax = plt.subplots(1,1, figsize=(10,10))
#divider = make_axes_locatable(ax)

#tmp['price'] = tmp['price']*100 #To display percentages
#cax = divider.append_axes("right", size="3%", pad=-1) #resize the
colorbar
tmp.plot(column='price', ax=ax,  legend=True, colormap = 'RdYlGn_r',
```

```
        legend_kwds={'label': "Median House price in €k"})

for idx, row in tmp.iterrows():
   plt.annotate(text=row['county'], xy=row['coords'],
horizontalalignment='center', color='black')

tmp.geometry.boundary.plot(color='#BABABA', ax=ax, linewidth=0.3) #Add
some borders to the geometries
ax.axis('off')
```

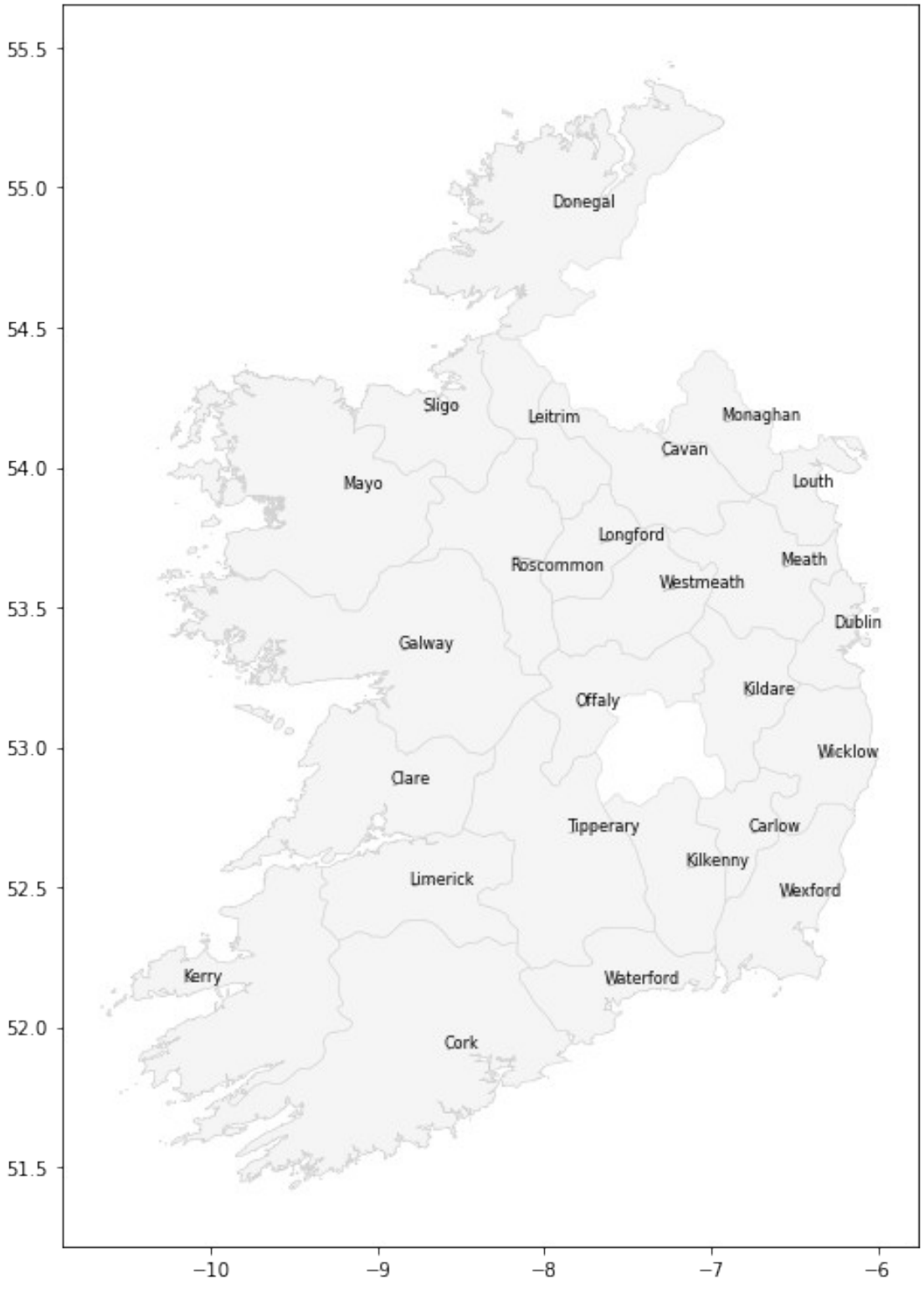
```
C:\Users\35385\anaconda3\lib\site-packages\geopandas\plotting.py:627:
FutureWarning: 'colormap' is deprecated, please use 'cmap' instead
(for consistency with matplotlib)
  warnings.warn(

(-10.896526646614074, -5.76013867855072, 51.218040657043574,
55.65195827484136)
```




```
import adjustText as aT

tmp1 = df_merge_col.copy()

tmp1["rep"] = tmp1["geometry"].representative_point()
za_points = tmp1.copy()
za_points.set_geometry("rep", inplace = True)

ax = tmp1.plot(figsize = (15, 12), color = "whitesmoke", edgecolor =
"lightgrey", linewidth = 0.5)
texts = []
```

```
for x, y, label in zip(za_points.geometry.x, za_points.geometry.y,
za_points["county"]):
    texts.append(plt.text(x, y, label, fontsize = 8))

aT.adjust_text(texts, force_points=0.3, force_text=0.8,
expand_points=(1,1), expand_text=(1,1),
               arrowprops=dict(arrowstyle="-", color='grey', lw=0.5))
```

```
1
```




```
data_dub =
pd.read_csv('E://Ginu_StudyMaterials//Sem2//Dissertation//Data//PRP_Dublin.csv')
```

```
codes = data['postal_code'].unique()
codes
```

```
array([nan, 'Dublin 14', 'Dublin 2', 'Dublin 13', 'Dublin 12', 'Dublin
4',
       'Dublin 11', 'Dublin 9', 'Dublin 24', 'Dublin 15', 'Dublin 22',
       'Dublin 5', 'Dublin 18', 'Dublin 6', 'Dublin 6w', 'Dublin 7',
       'Dublin 16', 'Dublin 8', 'Dublin 3', 'Dublin 1', 'Dublin 17',
       'Dublin 20', 'Dublin 10'], dtype=object)
```

```
median_per_county = [data['price']
[data['postal_code']==postal_code].median() for postal_code in codes]
```

```
median_per_county = np.asarray(median_per_county)
median_per_county
```

```
array([     nan, 495000. , 333000. , 315000. , 280000. , 480000. ,
       204000. , 330000. , 250000. , 274669.5, 225000. , 335000. ,
       380000. , 535000. , 475800. , 285250. , 425000. , 259456. ,
       354500. , 237000. , 196000. , 262000. , 170000. ])
```

```
q=[]
for price in median_per_county:
    x = price/10**3
    q.append(x)
```

```
county_price = pd.DataFrame(q)
```

```
county_price['postal_code'] = codes
```

```
county_price['county'] = "Dublin"
```

```
county_price.rename(columns={0:'price'},inplace=True)
```

```
county_price.dropna()
```

	price	postal_code	county
1	495.0000	Dublin 14	Dublin
2	333.0000	Dublin 2	Dublin
3	315.0000	Dublin 13	Dublin
4	280.0000	Dublin 12	Dublin
5	480.0000	Dublin 4	Dublin
6	204.0000	Dublin 11	Dublin
7	330.0000	Dublin 9	Dublin
8	250.0000	Dublin 24	Dublin
9	274.6695	Dublin 15	Dublin
10	225.0000	Dublin 22	Dublin
11	335.0000	Dublin 5	Dublin
12	380.0000	Dublin 18	Dublin
13	535.0000	Dublin 6	Dublin
14	475.8000	Dublin 6w	Dublin
15	285.2500	Dublin 7	Dublin

```
16  425.0000   Dublin 16  Dublin
17  259.4560    Dublin 8  Dublin
18  354.5000    Dublin 3  Dublin
19  237.0000    Dublin 1  Dublin
20  196.0000   Dublin 17  Dublin
21  262.0000   Dublin 20  Dublin
22  170.0000   Dublin 10  Dublin
```

```
county_price['postal_code'] =
county_price['postal_code'].replace(['Dublin 6w'],['Dublin 6W'])
```

```
data1 =
gpd.read_file('E://Ginu_StudyMaterials//Sem2//Dissertation//MapData//
dublin_postcodes//Postcode_dissolve.shp')
```

```
data1
```

```
             Yelp_postc
geometry
0              Dublin 1  POLYGON ((316956.134 235998.134, 317010.169
23...
1             Dublin 10  POLYGON ((309782.544 234202.191, 309808.724
23...
2             Dublin 11  POLYGON ((310163.675 245333.645, 310213.215
24...
3             Dublin 12  POLYGON ((313179.907 230983.889, 313217.891
23...
4             Dublin 13  MULTIPOLYGON (((324073.470 241251.565,
324112....
5             Dublin 14  POLYGON ((317420.557 230644.051, 317427.114
23...
6             Dublin 15  POLYGON ((305414.820 242509.687, 305493.402
24...
7             Dublin 16  POLYGON ((312682.400 227779.478, 312686.689
22...
8             Dublin 17  POLYGON ((322212.089 241140.723, 322203.651
24...
9             Dublin 18  POLYGON ((320085.236 226289.150, 320069.927
22...
10             Dublin 2  POLYGON ((315452.278 232444.163, 315386.068
23...
11            Dublin 20  POLYGON ((308642.399 235883.441, 308685.002
23...
12            Dublin 22  POLYGON ((305875.927 236192.165, 305896.985
23...
13            Dublin 24  POLYGON ((308642.704 230930.203, 309121.958
23...
14             Dublin 3  POLYGON ((318034.251 236800.004, 318083.576
23...
15             Dublin 4  POLYGON ((318707.918 234038.963, 318784.900
23...
```

```
16             Dublin 5  POLYGON ((319912.153 239220.806, 319966.295
23...
17             Dublin 6  POLYGON ((316734.938 232409.790, 316778.736
23...
18            Dublin 6W  POLYGON ((314521.468 230457.830, 314507.058
23...
19             Dublin 7  POLYGON ((311831.087 237894.067, 311872.032
23...
20             Dublin 8  POLYGON ((313482.094 234322.835, 313535.361
23...
21             Dublin 9  POLYGON ((317692.522 241579.902, 317741.187
24...
22  North County Dublin  MULTIPOLYGON (((319662.714 247573.957,
319615....
23         Phoenix Park  POLYGON ((309966.721 236748.048, 310094.529
23...
24  South County Dublin  MULTIPOLYGON (((327725.163 226488.393,
327770....
```

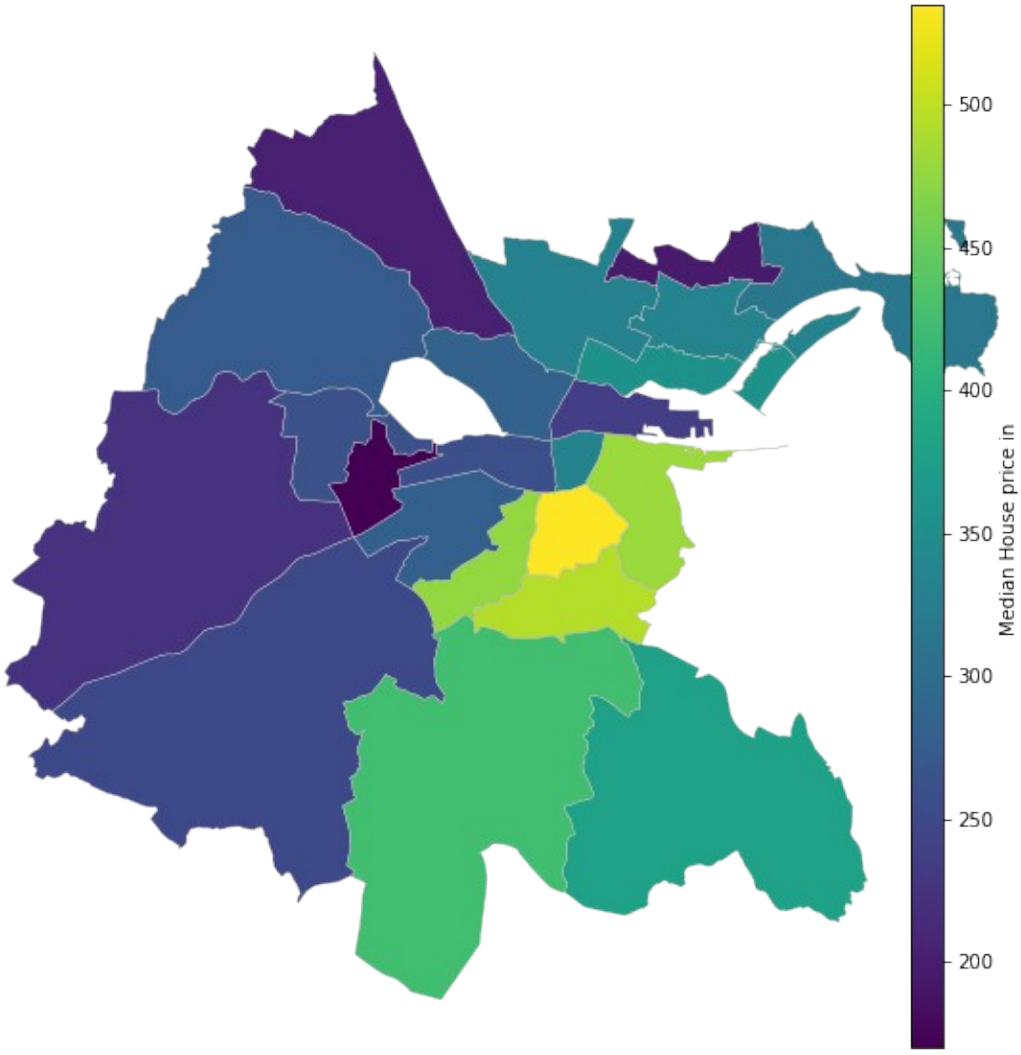
```
data1.rename({'Yelp_postc':'postal_code' }, axis=1, inplace=True)

df_merge = pd.merge(county_price, data1, on='postal_code', how='left')

df_merged = df_merge.copy()

df_merged =df_merged[['price', 'county' ,'postal_code', 'geometry']]

df_merged.dropna()
```

```
       price  county postal_code  \
1   495.0000  Dublin   Dublin 14
2   333.0000  Dublin    Dublin 2
3   315.0000  Dublin   Dublin 13
4   280.0000  Dublin   Dublin 12
5   480.0000  Dublin    Dublin 4
6   204.0000  Dublin   Dublin 11
7   330.0000  Dublin    Dublin 9
8   250.0000  Dublin   Dublin 24
9   274.6695  Dublin   Dublin 15
10  225.0000  Dublin   Dublin 22
11  335.0000  Dublin    Dublin 5
12  380.0000  Dublin   Dublin 18
13  535.0000  Dublin    Dublin 6
14  475.8000  Dublin   Dublin 6W
15  285.2500  Dublin    Dublin 7
16  425.0000  Dublin   Dublin 16
17  259.4560  Dublin    Dublin 8
18  354.5000  Dublin    Dublin 3
19  237.0000  Dublin    Dublin 1
20  196.0000  Dublin   Dublin 17
21  262.0000  Dublin   Dublin 20
```

```
22  170.0000  Dublin   Dublin 10

                                                 geometry
1   POLYGON ((317420.557 230644.051, 317427.114 23...
2   POLYGON ((315452.278 232444.163, 315386.068 23...
3   MULTIPOLYGON (((324073.470 241251.565, 324112....
4   POLYGON ((313179.907 230983.889, 313217.891 23...
5   POLYGON ((318707.918 234038.963, 318784.900 23...
6   POLYGON ((310163.675 245333.645, 310213.215 24...
7   POLYGON ((317692.522 241579.902, 317741.187 24...
8   POLYGON ((308642.704 230930.203, 309121.958 23...
9   POLYGON ((305414.820 242509.687, 305493.402 24...
10  POLYGON ((305875.927 236192.165, 305896.985 23...
11  POLYGON ((319912.153 239220.806, 319966.295 23...
12  POLYGON ((320085.236 226289.150, 320069.927 22...
13  POLYGON ((316734.938 232409.790, 316778.736 23...
14  POLYGON ((314521.468 230457.830, 314507.058 23...
15  POLYGON ((311831.087 237894.067, 311872.032 23...
16  POLYGON ((312682.400 227779.478, 312686.689 22...
17  POLYGON ((313482.094 234322.835, 313535.361 23...
18  POLYGON ((318034.251 236800.004, 318083.576 23...
19  POLYGON ((316956.134 235998.134, 317010.169 23...
20  POLYGON ((322212.089 241140.723, 322203.651 24...
21  POLYGON ((308642.399 235883.441, 308685.002 23...
22  POLYGON ((309782.544 234202.191, 309808.724 23...
```

```
#df_merged = df_merged.dropna(subset=['price',
'geometry']).set_index()
#df_merged

from geopandas import GeoDataFrame

df_merged = GeoDataFrame(df_merged)

df_merged1 = df_merged.dropna()

# OPTIONAL: Display using geopandas
fig, ax = plt.subplots(1,1, figsize=(10,10))
divider = make_axes_locatable(ax)
tmp = df_merged.copy()
#tmp['price'] = tmp['price']*100 #To display percentages
cax = divider.append_axes("right", size="3%", pad=-1) #resize the
colorbar
tmp.plot(column='price', ax=ax,cax=cax,  legend=True,
         legend_kwds={'label': "Median House price in "})

tmp.geometry.boundary.plot(color='#BABABA', ax=ax, linewidth=0.3) #Add
some borders to the geometries
ax.axis('off')
```

```
(295315.0962572824, 331878.1806627306, 213883.70210066572,
248701.77545546932)
```

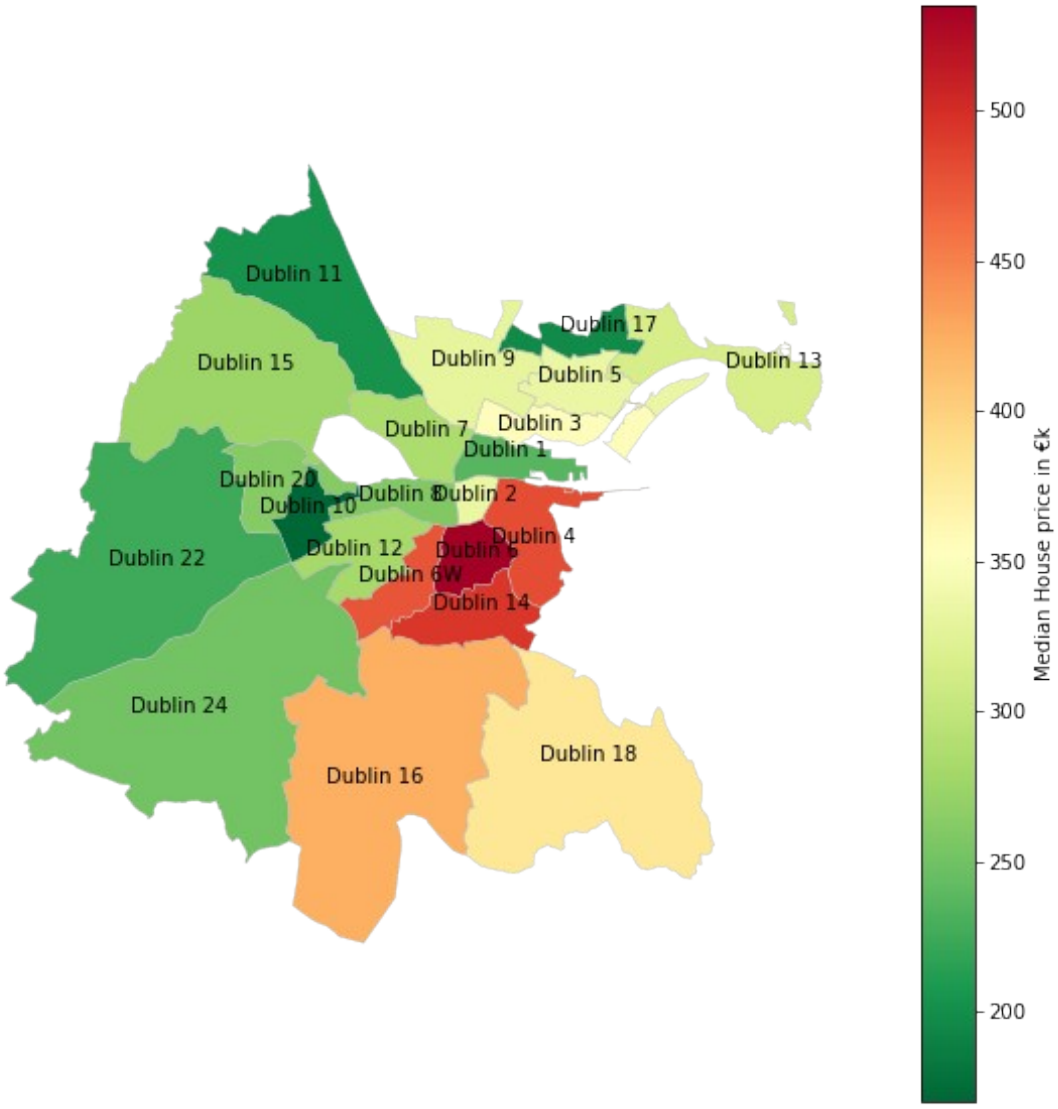



```
# OPTIONAL: Display using geopandas
from matplotlib import cm
#from colorspacious import cspace_converter


tmp = df_merged1.copy()
#tmp["geometry"] = tmp["geometry"].centroid
tmp['coords'] = tmp['geometry'].apply(lambda x:
x.representative_point().coords[:])
tmp['coords']= [coords[0] for coords in tmp['coords']]

fig, ax = plt.subplots(1,1, figsize=(10,10))
#divider = make_axes_locatable(ax)

#tmp['price'] = tmp['price']*100 #To display percentages
```

```
#cax = divider.append_axes("right", size="3%", pad=-1) #resize the
colorbar
tmp.plot(column='price', ax=ax,  legend=True, colormap = 'RdYlGn_r',
         legend_kwds={'label': "Median House price in €k"})

for idx, row in tmp.iterrows():
   plt.annotate(text=row['postal_code'], xy=row['coords'],
horizontalalignment='center', color='black')

tmp.geometry.boundary.plot(color='#BABABA', ax=ax, linewidth=0.3) #Add
some borders to the geometries
ax.axis('off')
```

```
C:\Users\35385\anaconda3\lib\site-packages\geopandas\plotting.py:627:
FutureWarning: 'colormap' is deprecated, please use 'cmap' instead
(for consistency with matplotlib)
  warnings.warn(
```

```
(295315.0962572824, 331878.1806627306, 213883.70210066572,
248701.77545546932)
```


Dublin 11
Dublin 15
Dublin 17
Dublin 9
Dublin 5
Dublin 13
Dublin 7
Dublin 3
Dublin 1
Dublin 20
Dublin 8
Dublin 2
Dublin 10
Dublin 4
Dublin 22
Dublin 12
Dublin 6
Dublin 6W
Dublin 14
Dublin 24
Dublin 18
Dublin 16
Median House price in €k
500
450
400
350
300
250
200