nyc_noise

June 4, 2023

[1]:
```
# import modules
import pandas as pd
import regex as re
from pandas import read_csv
from matplotlib import pyplot
from collections import Counter
import numpy as np
from sklearn.linear_model import LinearRegression
```

[7]:
```
# load data
# data is derived from NYC OpenData (https://opendata.cityofnewyork.us/) using␣
 ↪the search term
#       "Noise Complaints (in 2017)"
nyc_data = pd.read_csv('nyc_noise_complaints.csv')
nyc_data.head()
```

[7]:

	descriptor	incident_zip	created_date	location	city	:@computed_region_sbqj_enih	cross_street_2
671140	Loud Music/Party	10025.0	2021-10-01T00:03:21.000	{'latitude': '40.79736830568546', 'human_addre…	NEW YORK	15.0	WEST 100 STREET
671141	Loud Talking	11206.0	2021-10-01T00:02:25.000	{'latitude': '40.70867837750297', 'human_addre…	BROOKLYN	56.0	GRAHAM AVENUE
671142	Loud Music/Party	11211.0	2021-10-01T00:00:46.000	{'latitude': '40.708933873120394', 'human_addr…	BROOKLYN	56.0	SOUTH 2 STREET
671143	Loud Music/Party	10453.0	2021-10-01T00:00:44.000	{'latitude': '40.85368904676198', 'human_addre…	BRONX	29.0	EAST 180 STREET
671144	Banging/Pounding	10035.0	2021-10-01T00:00:04.000	{'latitude': '40.80140331720816', 'human_addre…	NEW YORK	16.0	ALFREDO CHOCOLATE ARMENTEROS WAY

```
        :@computed_region_efsh_h5xi park_facility_name  \
671140                      12422.0        Unspecified
671141                      17213.0        Unspecified
671142                      17613.0        Unspecified
671143                      10931.0        Unspecified
671144                      13093.0        Unspecified

        :@computed_region_92fq_4b7q  … :@computed_region_f5dn_yrer  status  \
671140                         19.0  …                        20.0  Closed
671141                         30.0  …                        36.0  Closed
671142                         30.0  …                        36.0  Closed
671143                         29.0  …                         6.0  Closed
671144                         35.0  …                         7.0  Closed

       unique_key  y_coordinate_state_plane  resolution_action_updated_date  \
671140   52043931                  229781.0         2021-10-01T00:27:00.000
671141   52037025                  197472.0         2021-10-01T00:21:21.000
671142   52041256                  197564.0         2021-10-01T00:40:32.000
671143   52035597                  250314.0         2021-10-01T00:53:49.000
671144   52040915                  231256.0         2021-10-01T00:13:04.000

        address_type             intersection_street_2  \
671140       ADDRESS                  WEST  100 STREET
671141       ADDRESS                     GRAHAM AVENUE
671142       ADDRESS                 SOUTH    2 STREET
671143       ADDRESS                  EAST  180 STREET
671144       ADDRESS  ALFREDO CHOCOLATE ARMENTEROS WAY

                   closed_date  \
671140  2021-10-01T00:26:53.000
671141  2021-10-01T00:21:17.000
671142  2021-10-01T00:40:27.000
671143  2021-10-01T00:53:43.000
671144  2021-10-01T00:13:01.000

                                resolution_description facility_type
671140  The Police Department responded to the complai…           NaN
671141  The Police Department responded to the complai…           NaN
671142  The Police Department responded to the complai…           NaN
671143  The Police Department responded to the complai…           NaN
671144  The Police Department responded to the complai…           NaN

[5 rows x 36 columns]
```

[26]:
```
nyc_data.tail()
```

[26]:

	descriptor	incident_zip	created_date	location	city
671140	Loud Music/Party	10025.0	2021-10-01T00:03:21.000	{'latitude': '40.79736830568546', 'human_addre…	NEW YORK
671141	Loud Talking	11206.0	2021-10-01T00:02:25.000	{'latitude': '40.70867837750297', 'human_addre…	BROOKLYN
671142	Loud Music/Party	11211.0	2021-10-01T00:00:46.000	{'latitude': '40.708933873120394', 'human_addr…	BROOKLYN
671143	Loud Music/Party	10453.0	2021-10-01T00:00:44.000	{'latitude': '40.85368904676198', 'human_addre…	BRONX
671144	Banging/Pounding	10035.0	2021-10-01T00:00:04.000	{'latitude': '40.80140331720816', 'human_addre…	NEW YORK

	:@computed_region_sbqj_enih	cross_street_2
671140	15.0	WEST 100 STREET
671141	56.0	GRAHAM AVENUE
671142	56.0	SOUTH 2 STREET
671143	29.0	EAST 180 STREET
671144	16.0	ALFREDO CHOCOLATE ARMENTEROS WAY

	:@computed_region_efsh_h5xi	park_facility_name
671140	12422.0	Unspecified
671141	17213.0	Unspecified
671142	17613.0	Unspecified
671143	10931.0	Unspecified
671144	13093.0	Unspecified

	:@computed_region_92fq_4b7q	…	:@computed_region_f5dn_yrer	status
671140	19.0	…	20.0	Closed
671141	30.0	…	36.0	Closed
671142	30.0	…	36.0	Closed
671143	29.0	…	6.0	Closed
671144	35.0	…	7.0	Closed

	unique_key	y_coordinate_state_plane	resolution_action_updated_date
671140	52043931	229781.0	2021-10-01T00:27:00.000
671141	52037025	197472.0	2021-10-01T00:21:21.000
671142	52041256	197564.0	2021-10-01T00:40:32.000
671143	52035597	250314.0	2021-10-01T00:53:49.000
671144	52040915	231256.0	2021-10-01T00:13:04.000

	address_type	intersection_street_2
671140	ADDRESS	WEST 100 STREET
671141	ADDRESS	GRAHAM AVENUE
671142	ADDRESS	SOUTH 2 STREET
671143	ADDRESS	EAST 180 STREET

```
671144       ADDRESS  ALFREDO CHOCOLATE ARMENTEROS WAY

                    closed_date  \
671140  2021-10-01T00:26:53.000
671141  2021-10-01T00:21:17.000
671142  2021-10-01T00:40:27.000
671143  2021-10-01T00:53:43.000
671144  2021-10-01T00:13:01.000

                                  resolution_description facility_type
671140  The Police Department responded to the complai…           NaN
671141  The Police Department responded to the complai…           NaN
671142  The Police Department responded to the complai…           NaN
671143  The Police Department responded to the complai…           NaN
671144  The Police Department responded to the complai…           NaN

[5 rows x 36 columns]
```

[8]:
```
"""
QUESTION:
1.1 How many rows are in the data set?
"""
print("\n*********\n1.1 ANSWER:")
print("Number of rows:",len(nyc_data))
print("*********\n")
```

```
*********
1.1 ANSWER:
Number of rows: 671145
*********
```

[10]:
```
"""
QUESTION:
1.2 What fraction of noise complaints deal with music? A complaint is␣
 ↪considered to deal with
music if it has the string "Music" present in the value of the "descriptor"␣
 ↪column.
"""
count = 0
for row in nyc_data["descriptor"]:
  if 'Music' in row:
    count = count + 1
print("\n*********\n1.2 ANSWER:")
print("Fraction of noise complaints dealing with music:", count/len(nyc_data))
print("*********\n")
```

```
*********
1.2 ANSWER:
Fraction of noise complaints dealing with music: 0.6228788115831899
*********
```

[11]:
```
"""
QUESTION:
1.3 For noise complaints with creation date in 2022, what is the probability a␣
 ↪complaint's
status is "Closed" given that it happened in Manhattan? Complaint creation date␣
 ↪is logged
in column "created_date", status of a complaint is in column "status" and the␣
 ↪borough is
in column "borough".
"""
nyc_data1 = nyc_data[  nyc_data['complaint_type'].str.contains('Noise')  ]
print("\nNumber of Noise rows:",len(nyc_data1))
nyc_data2 = nyc_data1[nyc_data1['created_date'].str.contains('2022')  ]
print("\nNumber of Noise 2022 rows:",len(nyc_data2))
nyc_data3 = nyc_data2[nyc_data2['status'].str.contains('Closed')  ]
print("\nNumber of Noise 2022 Closed rows:",len(nyc_data3))
nyc_data4 = nyc_data3[nyc_data3['borough'].str.contains('MANHATTAN')  ]
print("\nNumber of Noise 2022 Closed MANHATTAN rows:",len(nyc_data4))
print("\n***\n1.3 ANSWER:")
print("Probability of a closed, noise complaint located in Mahahattan in 2022:
 ↪", len(nyc_data4)/len(nyc_data2))
print("***\n")
```

```
Number of Noise rows: 671145

Number of Noise 2022 rows: 516605

Number of Noise 2022 Closed rows: 497256

Number of Noise 2022 Closed MANHATTAN rows: 131006

***
1.3 ANSWER:
Probability of a closed, noise complaint located in Mahahattan in 2022:
0.25359026722544303
***
```

[16]:
```
"""
QUESTION:
1.4 How does construction noise vary across New York City? For each ZIP code, calculate
fraction of noise complaints that are due to construction. For simplification, a
complaint dealing with construction noise is one with with the string "Construction"
appearing anywhere in the "descriptor" column. Once you have the fractions for each ZIP code,
report the standard deviation. Exclude ZIP codes that do not have at least 100 complaints
dealing with construction noise.
"""
# isolate construction noise complaints
nyc_data1 = nyc_data[  nyc_data['complaint_type'].str.contains('Noise')  ]
print("Number of Noise rows:",len(nyc_data1))
nyc_data5 = nyc_data1[nyc_data1['descriptor'].str.contains('Construction')  ]
print("Number of Construction Noise rows:",len(nyc_data5))
listy = nyc_data5['incident_zip'].unique()
print("Number of unique zipcodes:",listy.shape)
print("Dimensions of component dataframe containing only complaints due to construction noise", nyc_data5.shape)

# form dictionary of keys (zipcodes) : values (complaints)
ZIPCODES = Counter(nyc_data5['incident_zip']).keys()
COMPLAINTS = Counter(nyc_data5['incident_zip']).values()
print("\nZipcodes as Keys in Key:Value pairs:\n",ZIPCODES)
print("\nComplaints per zipcode as Values in Key:Value pairs:\n", COMPLAINTS)
zip_total_data = {'ZIP_CODE':list(ZIPCODES), 'COMPLAINTS':list(COMPLAINTS)}

# limit to at least 100 complaints, convert dictionary to dataframe of integers
construc_zips = pd.DataFrame(zip_total_data)
construc_zips_final = construc_zips[construc_zips['COMPLAINTS'] >= 100]
construc_zips_final = construc_zips_final.astype({"ZIP_CODE":"int","COMPLAINTS":"int"})


"""
print("\nZipcodes with over 100 complaints:")
print(construc_zips_final.head())
print(construc_zips_final.tail())
"""
# sum total complaints to form fractions
print(construc_zips_final['COMPLAINTS'].sum())
```

```
fractions = (construc_zips_final['COMPLAINTS']/
 ↪construc_zips_final['COMPLAINTS'].sum())
# add new column for fractions
construc_zips_final['FRACTIONS'] = fractions
print(construc_zips_final.head())
print(construc_zips_final.tail())
print("\n*********\n1.4 ANSWER:")
print("Standard deviation for construction complaints in NYC zipcodes:",␣
 ↪construc_zips_final['FRACTIONS'].std())
print("*********\n")
```

```
Number of Noise rows: 671145
Number of Construction Noise rows: 25074
Number of unique zipcodes: (191,)
Dimensions of component dataframe containing only complaints due to construction
noise (25074, 36)

Zipcodes as Keys in Key:Value pairs:
 dict_keys([11231.0, 10454.0, 11234.0, 10462.0, 10034.0, 10023.0, 11249.0,
10001.0, 10031.0, 11205.0, 11377.0, 11210.0, 10128.0, 11215.0, 10458.0, 11221.0,
10033.0, 10019.0, 11356.0, 10026.0, 11233.0, 11237.0, 10459.0, 11208.0, 11102.0,
11211.0, 11101.0, 10028.0, 11232.0, 10021.0, 10467.0, 11375.0, 11372.0, 10463.0,
10025.0, 10032.0, 10011.0, 10029.0, 10469.0, 11213.0, 11355.0, 11219.0, 10016.0,
11222.0, 11104.0, 11217.0, 11368.0, 11218.0, 11378.0, 10002.0, 11358.0, 10003.0,
11224.0, 10314.0, 10065.0, 10013.0, 10027.0, 10009.0, 11201.0, 11226.0, 10310.0,
11106.0, 11223.0, 11427.0, 10306.0, 11357.0, 11204.0, 11417.0, 10014.0, 11385.0,
11235.0, 10468.0, 11214.0, 11209.0, 10472.0, 11366.0, 11229.0, 10010.0, 11436.0,
10040.0, 10038.0, 11411.0, 11206.0, 11203.0, 10024.0, 11225.0, 11103.0, 11230.0,
11238.0, 11691.0, 10075.0, 11374.0, 10453.0, 10461.0, 11207.0, 11361.0, 10036.0,
10309.0, 10301.0, 11419.0, 11412.0, 10312.0, 10017.0, 10307.0, 10470.0, 11109.0,
10069.0, 11423.0, 10308.0, 10012.0, 11426.0, 11220.0, 10022.0, 11362.0, 10460.0,
11228.0, 11367.0, 11216.0, 11373.0, 10457.0, 10018.0, 11239.0, 11416.0, 10037.0,
10465.0, 10455.0, 10451.0, 11004.0, 11236.0, 11433.0, 10007.0, 10039.0, 11365.0,
11360.0, 11434.0, 10305.0, 11212.0, 11693.0, 11105.0, 10303.0, 11428.0, 11692.0,
10030.0, 11364.0, 11354.0, 10302.0, 11379.0, 10004.0, 11413.0, 10452.0, 10473.0,
10005.0, 11418.0, 11421.0, 10456.0, 10464.0, 10006.0, 10278.0, 10471.0, 11420.0,
10035.0, 10282.0, 11422.0, 10044.0, 11370.0, 11432.0, 11414.0, 11415.0, 11435.0,
10304.0, 11369.0, 11429.0, 11040.0, 11363.0, 10475.0, 10153.0, nan, 11694.0,
10020.0, 10280.0, 10474.0, nan, 11251.0, nan, 10162.0, 10110.0, 10118.0,
10121.0, 10158.0, nan, nan, 11697.0, 11001.0, nan, 10152.0, nan, nan, nan, nan,
nan, nan, 10041.0])

Complaints per zipcode as Values in Key:Value pairs:
 dict_values([190, 45, 181, 98, 74, 455, 194, 388, 199, 231, 156, 140, 397, 450,
147, 279, 209, 490, 23, 107, 80, 111, 35, 72, 172, 393, 338, 410, 46, 301, 101,
343, 83, 238, 632, 93, 551, 193, 42, 149, 200, 111, 534, 416, 178, 416, 60, 181,
67, 495, 66, 441, 79, 125, 331, 342, 218, 354, 727, 170, 74, 182, 191, 34, 175,
```

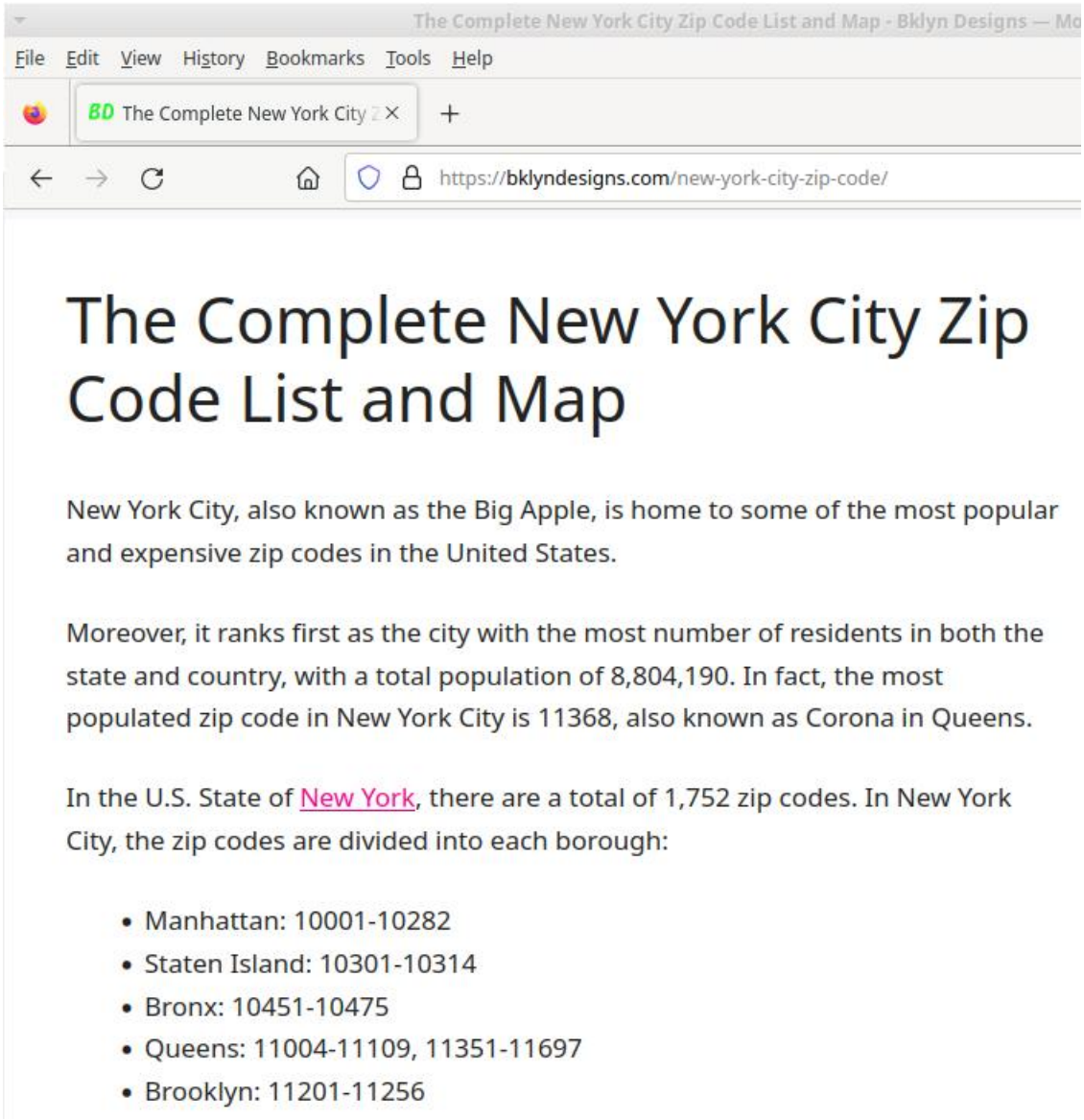
```
90, 185, 26, 312, 205, 187, 71, 146, 193, 68, 24, 117, 220, 20, 127, 304, 7,
263, 92, 471, 186, 118, 135, 352, 52, 204, 164, 57, 45, 154, 62, 424, 77, 46,
43, 29, 57, 191, 137, 45, 5, 16, 16, 36, 232, 17, 156, 323, 52, 55, 54, 62, 226,
105, 70, 129, 6, 37, 55, 32, 35, 124, 19, 30, 43, 171, 59, 73, 15, 53, 53, 47,
15, 102, 13, 47, 8, 55, 47, 69, 44, 56, 67, 34, 98, 22, 205, 64, 27, 102, 7, 74,
10, 44, 36, 98, 16, 18, 20, 40, 106, 30, 35, 90, 37, 52, 24, 9, 34, 15, 1, 1,
42, 4, 10, 6, 1, 1, 1, 1, 1, 1, 4, 1, 1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1])
20708
   ZIP_CODE  COMPLAINTS  FRACTIONS
0     11231         190   0.009175
2     11234         181   0.008741
5     10023         455   0.021972
6     11249         194   0.009368
7     10001         388   0.018737
     ZIP_CODE  COMPLAINTS  FRACTIONS
130     10007         171   0.008258
138     11105         102   0.004926
151     10005         205   0.009900
154     10456         102   0.004926
165     11432         106   0.005119

*********
1.4 ANSWER:
Standard deviation for construction complaints in NYC zipcodes:
0.006635322594282114
*********
```

[20]:
```
"""
QUESTION:
1.5 As the population of a ZIP code increases so do the number of complaints.
We can visualize this trend by plotting the number of complaints as a function␣
 ↪of the
ZIP code population. What is the slope of a line of best fit? A CSV file with␣
 ↪the population
data for each ZIP code can be downloaded here.
"""
# load data
# data is derived from NYC OpenData (https://opendata.cityofnewyork.us/) using␣
 ↪the search term
#       "Modified Zip Code Tabulation Areas (MODZCTA)"
nyc_pop_data = pd.read_csv('nyc_population.csv')
```

[23]:
```
# limit analysis to NYC zip codes based on https://bklyndesigns.com/
 ↪new-york-city-zip-code/
from IPython.display import Image
Image(filename = "nyc_zip_codes.jpg", width=500, height=500)
```

[23]:



[28]:

```
# form dataframe of true NYC zips with associated populations
nyc_pop_true_zips = nyc_pop_data[ (nyc_pop_data['ZIP_CODE'] >= 10000) &␣
 ↪(nyc_pop_data['ZIP_CODE'] <= 11300) ]
# form dataframe of true NYC zips with associated construction complaints
construc_zips_final = construc_zips_final[construc_zips_final['ZIP_CODE'].
 ↪between(10000, 11300) ]
# merge two dataframes using shared zip code column
merged_nyc_pop_zips_complaints = pd.merge(construc_zips_final,␣
 ↪nyc_pop_true_zips, on ='ZIP_CODE' )
merged_nyc_pop_zips_complaints.head()
```

[28]:

	ZIP_CODE	COMPLAINTS	FRACTIONS	POPULATION
0	11231	190	0.009175	33336.0
1	11234	181	0.008741	87757.0
2	10023	455	0.021972	60998.0
3	10001	388	0.018737	21102.0
4	10031	199	0.009610	56438.0

[29]:
```
merged_nyc_pop_zips_complaints.tail()
```

[29]:

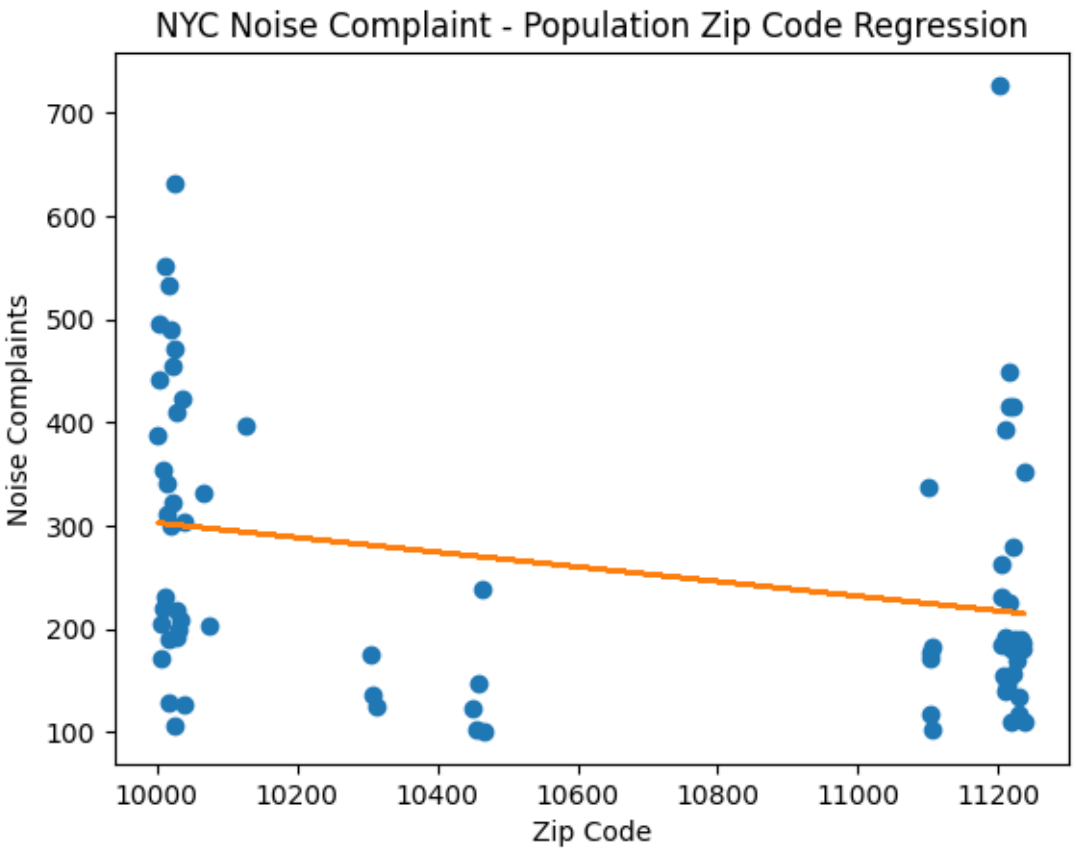
	ZIP_CODE	COMPLAINTS	FRACTIONS	POPULATION
69	10451	124	0.005988	45713.0
70	10007	171	0.008258	6988.0
71	11105	102	0.004926	36688.0
72	10005	205	0.009900	7135.0
73	10456	102	0.004926	86547.0

[42]:
```
# extract x and y data for regression
x = np.array(merged_nyc_pop_zips_complaints['ZIP_CODE']).reshape((-1, 1))
y = np.array(merged_nyc_pop_zips_complaints['COMPLAINTS'])
complaint_zip_model = LinearRegression().fit(x,y)
COD = complaint_zip_model.score(x,y)
intercept = complaint_zip_model.intercept_
slope = complaint_zip_model.coef_
print("\n*********\n1.5 ANSWER:")
print("Model Coefficient of Determination:",COD)
print("Model Y-intercept:",intercept)
print("Model Slope:",slope)
print("*********\n")
```

```
*********
1.5 ANSWER:
Model Coefficient of Determination: 0.08051720003040586
Model Y-intercept: 1012.1992374450942
Model Slope: [-0.07093176]
*********
```

[50]:
```
# plot linear regression data and best fit line
pyplot.plot(x, y, 'o')
pyplot.plot(x, slope*x + intercept)
pyplot.title("NYC Noise Complaint - Population Zip Code Regression")
pyplot.ylabel("Noise Complaints")
pyplot.xlabel("Zip Code")
```

[50]:
```
Text(0.5, 0, 'Zip Code')
```


NYC Noise Complaint - Population Zip Code Regression
Noise Complaints
700
600
500
400
300
200
100
10000
10200
10400
10600
10800
11000
11200
Zip Code

[ ]: