Real-Estate Price Prediction

Predicting Property Prices in City of New-York

# Project Score

Scope of this project is to explore and analyze the property sales in city of New-York and examine the correlation between criminal activity in a particular location with the price of property sale. Predict the price of the property based on number of crime incidents in the in and around the area where property is located and other charaterstics of the property.

# Data Understanding

Crime Data:

The data sets used in this study are extracted from “NYC Open Data” Arhives:

“NYPD Complaint Data Historic” :- <https://data.cityofnewyork.us/Public-Safety/NYPD-Complaint-Data-Historic/qgea-i56i> which includes all valid felony, misdemeanor and violoation crimes reported to the NewYork City Police Department (NYPD).



Table1: Attributes in Crime-Data

Sales-data:

“Annualized Rolling Sales Update” :- <https://data.cityofnewyork.us/Housing-Development/Annualized-Rolling-Sales-Update/uzf5-f8n2> which includes Sales Prices of properties.



Table2: Attributes in Sale-Data

1. **Data Cleaning & Preparation**

These data sets have a lot of missing values, inconsistent date-time formats. So, a great deal of time was spent in cleaning the data sets.

Sale-data is coded with zip-code as a location attribute and Crime-data does not have zip-code information but has lattitude and longitude data for each reported incident. To join the crime-data with sales data appropriately, we had to use third-party GeoCoding APIs which are expensive and need high computational times. Open-source solutions frequently timeout and often impose daily limits on number of lat-long pairs can be geo-coded.

Python code for following analysis can be found @ <insert link>

## Import necessary libraries in iphython notebook

Necessary python libraries for analysis have been imported into ipython notebook.

Eg: datetime, csv, glob, zipfile, matplotlib, pandas, numpy, geocoder, scipy and sklearn.

## Read in and Examine Data Set; Check for Missing Values

File paths for Sales data was loaded into into a list using “glob.glob” and all of Sales-data was read and appended into single dataframe using “pd.read\_excel”.

Crime-data was readily available in csv which could read with pd.read\_csv into a dataframe in ipython notebook.

Missing values and formatting issues in data have been correted or eliminated as appropriate.

## Reverse-GeoCoding the Crime data with zip-codes

GeoCoding is to extract lattitude-logitude pair when we have physical address wile Reverse-GeoCoding is to extract a physical address when we have lattitude-logitude information. In our case, we used python - “geocoder” library to access open-souce GeoCoding APIs “Google geocoder” and “Open Street Maps” to extract zip-codes for each lat-long pair in crime-data. As these are free services, they have dailylimit of 10000 geo coding requests. Though, our sample of sales data is not more than 10000, we do not know wich of the crime records match with the zip-codes on sales-data sample until we extract the zip-codes for all crime-data which has around 1Million records. This geo-coding step took 3 weeks time.

## Calcuating crime incidents for sale records

Next step is to calculate the number of crime incidents reported (in past 6 months,1,2,3,4,5 years ) for zip-codes in each record in sales-data as of sale-date.

Written custom python functions for calculating below values for each record in Sale-data:

“past\_crime\_count”, “past6M\_crime\_count”, “past1Y\_crime\_count”, “past2Y\_crime\_count”, “past3Y\_crime\_count”, “past4Y\_crime\_count”, “past5Y\_crime\_count” and “past\_MISDEMEANOR\_count”, “past\_FELONY\_count”, “past\_VIOLATION\_count” ranging from past 6 Months to 5 Years, all-past counts.

This is very time-consuming task as we have to make independent function calls for each record. Each function call for all 8000 sample records takes from 8-10 hours.

# 4 Exploratory Data Analysis

Once we have cleaned sampled data, We started our analysis with an assumption that property values may be inversely proportional to number of criminal incidents in a particular location. Sales-Price, ranges from “zero” through 1B USD. These low price sales ($0 - $100K USD) could be result of family transfers, however there is no attribute that exlains if the sale is an off-market transfer transactions. From Scatter Plots, its very difficult to realize relation between various features due to high variance in sales-price.

## 4.1 Distribution of sales price:

count 8.000000e+03

mean 2.652798e+06

std 3.595869e+07

min 1.000000e+00

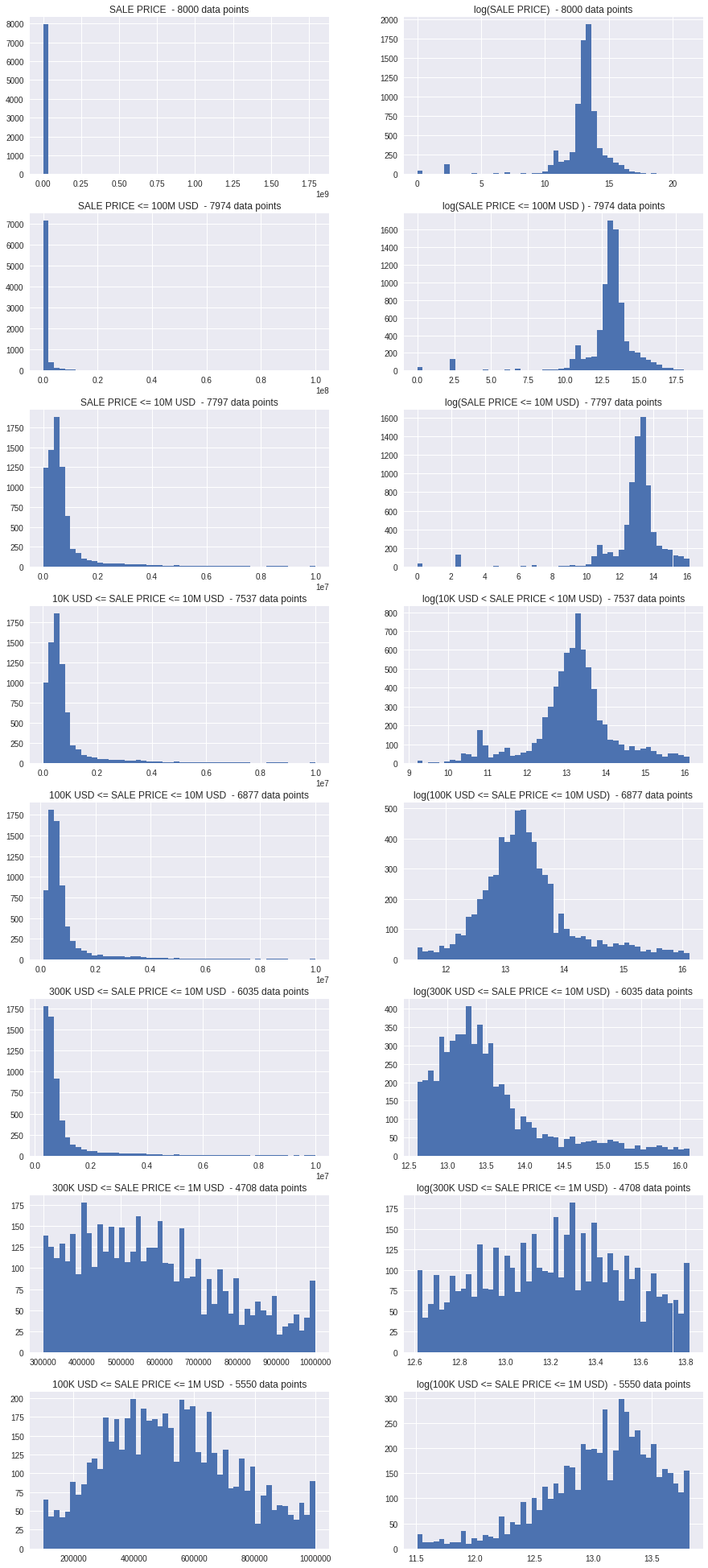
25% 3.250000e+05

50% 5.450000e+05

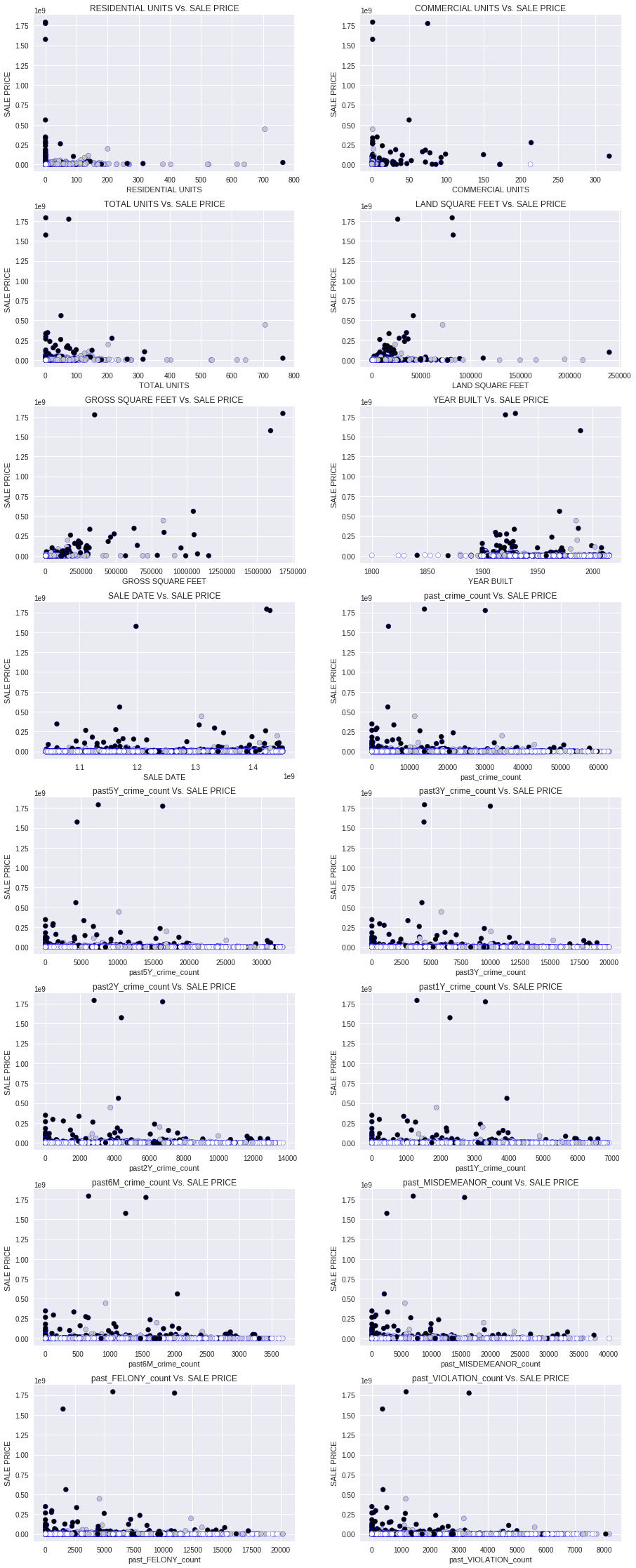
75% 8.500000e+05

max 1.791829e+09

Sales-Price follows an exponential distribution. Please see the histograms in the next page.



## 4.2 Scatter Plotts:



## 4.3 Correlation:

For further analysis, we have considered data with sale-price ranging from 100K USD to 10M USD. Most of the attributes are categorical in nature. So, created dummy variables for further analysis and evaluation.

Surprisingly, the crime\_counts are in positive correlation with Sales-Price as per below correlation table.

|  |  |  |
| --- | --- | --- |
| **feature** | **corr\_coef** | **p\_value** |
| past\_FELONY\_count | 0.0970 | 0.00000 |
| past\_MISDEMEANOR\_count | 0.0905 | 0.00000 |
| past\_crime\_count | 0.0889 | 0.00000 |
| past5Y\_crime\_count | 0.0695 | 0.00000 |
| past3Y\_crime\_count | 0.0654 | 0.00000 |
| past2Y\_crime\_count | 0.0652 | 0.00000 |
| past1Y\_crime\_count | 0.0592 | 0.00000 |
| past\_VIOLATION\_count | 0.0575 | 0.00000 |
| past6M\_crime\_count | 0.0547 | 0.00000 |

Table3: Correlation Table Crime-Data Vs. Sale-Data.

Complete table can be found in Appendix-A.

# 5 Modeling & Evaluation

We have started our modeling with a random sample of 8000 data points from original data. We ran multiple models and realized that none of the models are peforming well due to high bias in SALES price. There are many “zero” in SALE-PRICE which represent that transaction is a simple property transfer within family members. To eliminate this bias issue and improved the models, we have removed all data between $0 to $100,000 from sample with an assumption that a house value cannot be less than $100,00.

With new data, We have started our modeling again with linear-regressor. Linear regressor has produced very poor results with a negative R-Square value. A Negative R-Square indicates that variance of predicted values from actual values is much higher than that of variance in actual values from actual mean.

Then we tried Ridge-Regression and Lasso Regression which can supress curse of dimensionality inherent to our data with 470+ features. These 2 models are similar to Linear-Regression but they impose panalty terms in regression equation to deal with curse of Dimensionality. Lasso Regression, in addition will help in choosing right features. Though these models have improved prediction accuracy, they still have low R-square(0.44) and high Root-Mean-Squared Errors > 990000.

Then we tried ensemble methods Random-Forest Regressor and Gradient Boost Regressor.

Random-Forest constructs multiple decission-trees by randomly selecting a subset of features and a subset of records from given training data. These random samples and random features for each decision-tree are chosen using boot-strap method. Node-Values are determined by weighted average while predicting continuos data. Random-Forest has given best results with R-Square 0.65 and RMSE = $788955.

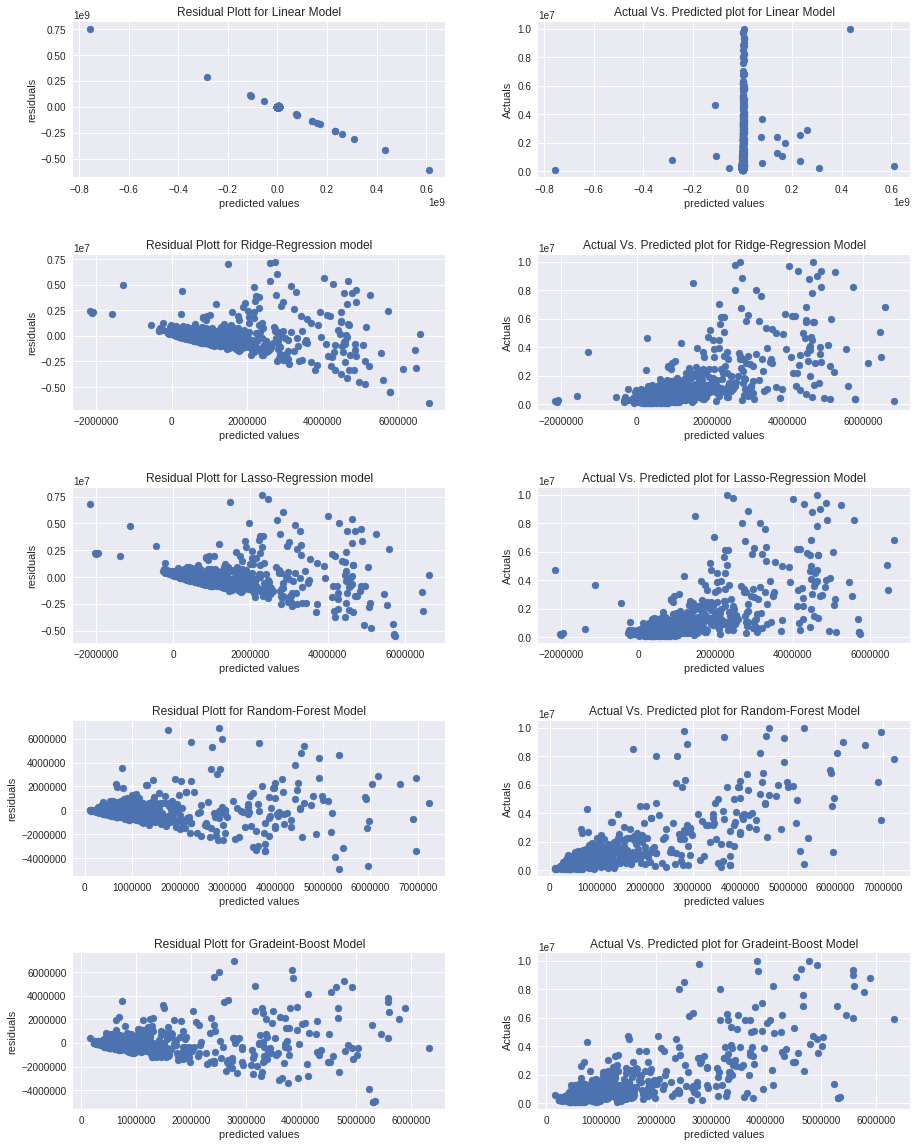
We also tried running Grddient Boost – Regressor. Gradient-boost starts with single tree. After validating results, algorithm will assign more weights to miscalssified/high variance records and runs the model again. This cycle repeats until errror is minimized. Gradient Boost has peformed decentlly with R-square of 0.61 and RMSE of 833002.

Raondom-Forest model has performed consistently well over multiple trials



Table4: Model-Performance Sores

## Residual Plots

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# 6 Future Work

If we can extract reliable neighborhood data for each crime incident, can reveal hidden relations between Sale-Data and Crime-Data.

Collect additional data to support Sale-Data to understand low-value sale-price and improve the model accuracy.

# 9 Acknowledgements

I would like to thank Rajiv Shah for mentoring me on this project.

# 10 Python- code

Ipython notebook: [https://github.com/yerraeee/mY\_SpringBoard/blob/master/Capstone1\_House\_Price\_Prediction/mY\_CapStone1\_HousePrices%20with%20CrimeData-V6.ipynb](https://github.com/yerraeee/mY_SpringBoard/blob/master/Capstone1_House_Price_Prediction/mY_CapStone1_HousePrices with CrimeData-V6.ipynb)

Python Code: <https://github.com/yerraeee/mY_SpringBoard/blob/master/Capstone1_House_Price_Prediction/House_Price_Prediction.py>

# Appendices

## Appendix- A: Correlation Table

|  |  |  |  |
| --- | --- | --- | --- |
|  | **feature** | **corr\_coef** | **p\_value** |
| 0 | TAX CLASS AT PRESENT\_2 | 0.45 | 0.0000 |
| 1 | BOROUGH | -0.35 | 0.0000 |
| 2 | TAX CLASS AT PRESENT\_1 | -0.35 | 0.0000 |
| 3 | BUILDING CLASS CATEGORY\_08 RENTALS - ELEVATOR APARTMENTS | 0.35 | 0.0000 |
| 4 | TAX CLASS AT TIME OF SALE | 0.30 | 0.0000 |
| 5 | ZIP CODE | -0.29 | 0.0000 |
| 6 | BUILDING CLASS AT TIME OF SALE\_D1 | 0.29 | 0.0000 |
| 7 | BUILDING CLASS AT PRESENT\_D1 | 0.27 | 0.0000 |
| 8 | NEIGHBORHOOD\_GREENWICH VILLAGE-WEST | 0.24 | 0.0000 |
| 9 | TOTAL UNITS | 0.24 | 0.0000 |
| 10 | RESIDENTIAL UNITS | 0.24 | 0.0000 |
| 11 | LAND SQUARE FEET | 0.23 | 0.0000 |
| 12 | BUILDING CLASS AT TIME OF SALE\_C7 | 0.23 | 0.0000 |
| 13 | BUILDING CLASS AT PRESENT\_C7 | 0.22 | 0.0000 |
| 14 | BLOCK | -0.20 | 0.0000 |
| 15 | NEIGHBORHOOD\_UPPER EAST SIDE (79-96) | 0.19 | 0.0000 |
| 16 | NEIGHBORHOOD\_UPPER EAST SIDE (59-79) | 0.19 | 0.0000 |
| 17 | BUILDING CLASS AT TIME OF SALE\_C1 | 0.19 | 0.0000 |
| 18 | BUILDING CLASS AT PRESENT\_C1 | 0.19 | 0.0000 |
| 19 | BUILDING CLASS CATEGORY\_07 RENTALS - WALKUP APARTMENTS | 0.18 | 0.0000 |
| 20 | BUILDING CLASS CATEGORY\_02 TWO FAMILY HOMES | -0.18 | 0.0000 |
| 21 | GROSS SQUARE FEET | 0.17 | 0.0000 |
| 22 | SALE DATE | 0.16 | 0.0000 |
| 23 | TAX CLASS AT PRESENT\_4 | 0.15 | 0.0000 |
| 24 | BUILDING CLASS AT PRESENT\_A4 | 0.14 | 0.0000 |
| 25 | YEAR BUILT | -0.13 | 0.0000 |
| 26 | BUILDING CLASS AT TIME OF SALE\_D3 | 0.13 | 0.0000 |
| 27 | BUILDING CLASS AT TIME OF SALE\_A5 | -0.12 | 0.0000 |
| 28 | NEIGHBORHOOD\_WASHINGTON HEIGHTS UPPER | 0.12 | 0.0000 |
| 29 | BUILDING CLASS AT PRESENT\_C0 | -0.12 | 0.0000 |
| 30 | BUILDING CLASS AT PRESENT\_A5 | -0.12 | 0.0000 |
| 31 | NEIGHBORHOOD\_UPPER WEST SIDE (79-96) | 0.12 | 0.0000 |
| 32 | BUILDING CLASS AT TIME OF SALE\_D7 | 0.12 | 0.0000 |
| 33 | NEIGHBORHOOD\_EAST VILLAGE | 0.11 | 0.0000 |
| 34 | BUILDING CLASS AT PRESENT\_C4 | 0.11 | 0.0000 |
| 35 | BUILDING CLASS AT TIME OF SALE\_C4 | 0.11 | 0.0000 |
| 36 | BUILDING CLASS CATEGORY\_23 LOFT BUILDINGS | 0.11 | 0.0000 |
| 37 | BUILDING CLASS AT PRESENT\_B1 | -0.11 | 0.0000 |
| 38 | BUILDING CLASS AT PRESENT\_D3 | 0.11 | 0.0000 |
| 39 | BUILDING CLASS AT TIME OF SALE\_D9 | 0.10 | 0.0000 |
| 40 | NEIGHBORHOOD\_GRAMERCY | 0.10 | 0.0000 |
| 41 | BUILDING CLASS AT TIME OF SALE\_C0 | -0.10 | 0.0000 |
| 42 | BUILDING CLASS CATEGORY\_03 THREE FAMILY HOMES | -0.10 | 0.0000 |
| 43 | BUILDING CLASS AT TIME OF SALE\_B1 | -0.10 | 0.0000 |
| 44 | BUILDING CLASS AT PRESENT\_B2 | -0.10 | 0.0000 |
| 45 | past\_FELONY\_count | 0.10 | 0.0000 |
| 46 | BUILDING CLASS AT TIME OF SALE\_B2 | -0.10 | 0.0000 |
| 47 | BUILDING CLASS AT PRESENT\_D7 | 0.10 | 0.0000 |
| 48 | NEIGHBORHOOD\_FASHION | 0.09 | 0.0000 |
| 49 | BUILDING CLASS CATEGORY\_01 ONE FAMILY HOMES | -0.09 | 0.0000 |
| 50 | BUILDING CLASS AT PRESENT\_D9 | 0.09 | 0.0000 |
| 51 | TAX CLASS AT PRESENT\_2B | 0.09 | 0.0000 |
| 52 | past\_MISDEMEANOR\_count | 0.09 | 0.0000 |
| 53 | past\_crime\_count | 0.09 | 0.0000 |
| 54 | BUILDING CLASS AT TIME OF SALE\_A4 | 0.09 | 0.0000 |
| 55 | NEIGHBORHOOD\_CHINATOWN | 0.09 | 0.0000 |
| 56 | BUILDING CLASS CATEGORY\_22 STORE BUILDINGS | 0.09 | 0.0000 |
| 57 | NEIGHBORHOOD\_UPPER WEST SIDE (59-79) | 0.09 | 0.0000 |
| 58 | NEIGHBORHOOD\_HARLEM-CENTRAL | 0.09 | 0.0000 |
| 59 | NEIGHBORHOOD\_MURRAY HILL | 0.09 | 0.0000 |
| 60 | NEIGHBORHOOD\_UPPER WEST SIDE (96-116) | 0.09 | 0.0000 |
| 61 | NEIGHBORHOOD\_GREENWICH VILLAGE-CENTRAL | 0.08 | 0.0000 |
| 62 | NEIGHBORHOOD\_WASHINGTON HEIGHTS LOWER | 0.08 | 0.0000 |
| 63 | BUILDING CLASS CATEGORY\_21 OFFICE BUILDINGS | 0.08 | 0.0000 |
| 64 | NEIGHBORHOOD\_BUSHWICK | -0.08 | 0.0000 |
| 65 | NEIGHBORHOOD\_LOWER EAST SIDE | 0.08 | 0.0000 |
| 66 | NEIGHBORHOOD\_CIVIC CENTER | 0.08 | 0.0000 |
| 67 | BUILDING CLASS CATEGORY\_27 FACTORIES | 0.08 | 0.0000 |
| 68 | NEIGHBORHOOD\_MIDTOWN CBD | 0.08 | 0.0000 |
| 69 | BUILDING CLASS AT TIME OF SALE\_E7 | 0.08 | 0.0000 |
| 70 | BUILDING CLASS AT TIME OF SALE\_L9 | 0.08 | 0.0000 |
| 71 | BUILDING CLASS CATEGORY\_33 EDUCATIONAL FACILITIES | 0.08 | 0.0000 |
| 72 | BUILDING CLASS AT TIME OF SALE\_L8 | 0.08 | 0.0000 |
| 73 | BUILDING CLASS CATEGORY\_30 WAREHOUSES | 0.08 | 0.0000 |
| 74 | NEIGHBORHOOD\_BROOKLYN HEIGHTS | 0.08 | 0.0000 |
| 75 | BUILDING CLASS AT TIME OF SALE\_K9 | 0.08 | 0.0000 |
| 76 | NEIGHBORHOOD\_INWOOD | 0.07 | 0.0000 |
| 77 | BUILDING CLASS AT PRESENT\_E7 | 0.07 | 0.0000 |
| 78 | NEIGHBORHOOD\_MANHATTAN VALLEY | 0.07 | 0.0000 |
| 79 | BUILDING CLASS AT TIME OF SALE\_W1 | 0.07 | 0.0000 |
| 80 | BUILDING CLASS AT PRESENT\_K9 | 0.07 | 0.0000 |
| 81 | past5Y\_crime\_count | 0.07 | 0.0000 |
| 82 | BUILDING CLASS AT PRESENT\_L8 | 0.07 | 0.0000 |
| 83 | NEIGHBORHOOD\_MIDTOWN EAST | 0.07 | 0.0000 |
| 84 | NEIGHBORHOOD\_CLINTON | 0.07 | 0.0000 |
| 85 | NEIGHBORHOOD\_BEDFORD STUYVESANT | -0.07 | 0.0000 |
| 86 | BUILDING CLASS AT PRESENT\_W2 | 0.07 | 0.0000 |
| 87 | BUILDING CLASS AT TIME OF SALE\_W2 | 0.07 | 0.0000 |
| 88 | NEIGHBORHOOD\_SOHO | 0.07 | 0.0000 |
| 89 | past2Y\_crime\_count | 0.07 | 0.0000 |
| 90 | past3Y\_crime\_count | 0.07 | 0.0000 |
| 91 | NEIGHBORHOOD\_FLATIRON | 0.07 | 0.0000 |
| 92 | NEIGHBORHOOD\_WILLIAMSBURG-NORTH | 0.07 | 0.0000 |
| 93 | BUILDING CLASS AT TIME OF SALE\_C5 | 0.06 | 0.0000 |
| 94 | BUILDING CLASS AT PRESENT\_F1 | 0.06 | 0.0000 |
| 95 | NEIGHBORHOOD\_OCEAN HILL | -0.06 | 0.0000 |
| 96 | past1Y\_crime\_count | 0.06 | 0.0000 |
| 97 | BUILDING CLASS AT PRESENT\_M2 | 0.06 | 0.0000 |
| 98 | BUILDING CLASS AT TIME OF SALE\_M2 | 0.06 | 0.0000 |
| 99 | past\_VIOLATION\_count | 0.06 | 0.0000 |
| 100 | BUILDING CLASS AT PRESENT\_C5 | 0.06 | 0.0000 |
| 101 | BUILDING CLASS AT TIME OF SALE\_O7 | 0.06 | 0.0000 |
| 102 | NEIGHBORHOOD\_COBBLE HILL | 0.06 | 0.0000 |
| 103 | NEIGHBORHOOD\_EAST NEW YORK | -0.06 | 0.0000 |
| 104 | NEIGHBORHOOD\_FINANCIAL | 0.06 | 0.0000 |
| 105 | past6M\_crime\_count | 0.06 | 0.0000 |
| 106 | BUILDING CLASS AT TIME OF SALE\_H9 | 0.06 | 0.0000 |
| 107 | NEIGHBORHOOD\_PARK SLOPE | 0.06 | 0.0000 |
| 108 | BUILDING CLASS AT PRESENT\_L9 | 0.05 | 0.0000 |
| 109 | BUILDING CLASS AT TIME OF SALE\_O9 | 0.05 | 0.0000 |
| 110 | BUILDING CLASS AT TIME OF SALE\_J9 | 0.05 | 0.0000 |
| 111 | NEIGHBORHOOD\_KIPS BAY | 0.05 | 0.0000 |
| 112 | BUILDING CLASS AT PRESENT\_B3 | -0.05 | 0.0000 |
| 113 | BUILDING CLASS AT PRESENT\_J5 | 0.05 | 0.0000 |
| 114 | BUILDING CLASS AT TIME OF SALE\_J5 | 0.05 | 0.0000 |
| 115 | NEIGHBORHOOD\_ARDEN HEIGHTS | -0.05 | 0.0000 |
| 116 | BUILDING CLASS CATEGORY\_14 RENTALS - 4-10 UNIT | 0.05 | 0.0000 |
| 117 | BUILDING CLASS AT TIME OF SALE\_F9 | 0.05 | 0.0000 |
| 118 | BUILDING CLASS AT PRESENT\_O5 | 0.05 | 0.0000 |
| 119 | BUILDING CLASS AT PRESENT\_K2 | 0.05 | 0.0000 |
| 120 | NEIGHBORHOOD\_LONG ISLAND CITY | 0.05 | 0.0001 |
| 121 | NEIGHBORHOOD\_DOWNTOWN-METROTECH | 0.05 | 0.0001 |
| 122 | NEIGHBORHOOD\_CHELSEA | 0.05 | 0.0001 |
| 123 | BUILDING CLASS AT TIME OF SALE\_B3 | -0.05 | 0.0001 |
| 124 | BUILDING CLASS CATEGORY\_34 THEATRES | 0.05 | 0.0001 |
| 125 | BUILDING CLASS AT PRESENT\_O9 | 0.05 | 0.0001 |
| 126 | BUILDING CLASS AT TIME OF SALE\_F4 | 0.05 | 0.0001 |
| 127 | BUILDING CLASS AT TIME OF SALE\_B9 | -0.05 | 0.0001 |
| 128 | BUILDING CLASS AT TIME OF SALE\_E1 | 0.05 | 0.0001 |
| 129 | BUILDING CLASS AT TIME OF SALE\_O5 | 0.05 | 0.0001 |
| 130 | COMMERCIAL UNITS | 0.05 | 0.0001 |
| 131 | BUILDING CLASS AT PRESENT\_O7 | 0.05 | 0.0001 |
| 132 | BUILDING CLASS AT PRESENT\_A7 | 0.05 | 0.0001 |
| 133 | BUILDING CLASS AT TIME OF SALE\_A7 | 0.05 | 0.0001 |
| 134 | BUILDING CLASS AT TIME OF SALE\_K2 | 0.05 | 0.0002 |
| 135 | NEIGHBORHOOD\_DOWNTOWN-FULTON MALL | 0.05 | 0.0002 |
| 136 | BUILDING CLASS AT PRESENT\_B9 | -0.05 | 0.0002 |
| 137 | NEIGHBORHOOD\_CYPRESS HILLS | -0.04 | 0.0003 |
| 138 | BUILDING CLASS AT PRESENT\_D8 | 0.04 | 0.0003 |
| 139 | NEIGHBORHOOD\_BEDFORD PARK/NORWOOD | 0.04 | 0.0003 |
| 140 | NEIGHBORHOOD\_FORDHAM | 0.04 | 0.0004 |
| 141 | NEIGHBORHOOD\_CARROLL GARDENS | 0.04 | 0.0005 |
| 142 | BUILDING CLASS AT PRESENT\_C3 | -0.04 | 0.0005 |
| 143 | NEIGHBORHOOD\_FLATBUSH-CENTRAL | 0.04 | 0.0006 |
| 144 | BUILDING CLASS AT TIME OF SALE\_E9 | 0.04 | 0.0007 |
| 145 | BUILDING CLASS AT TIME OF SALE\_S9 | 0.04 | 0.0008 |
| 146 | BUILDING CLASS AT PRESENT\_K1 | 0.04 | 0.0011 |
| 147 | NEIGHBORHOOD\_ALPHABET CITY | 0.04 | 0.0012 |
| 148 | BUILDING CLASS AT TIME OF SALE\_C3 | -0.04 | 0.0013 |
| 149 | NEIGHBORHOOD\_HARLEM-EAST | 0.04 | 0.0013 |
| 150 | NEIGHBORHOOD\_CANARSIE | -0.04 | 0.0014 |
| 151 | BUILDING CLASS AT PRESENT\_F4 | 0.04 | 0.0016 |
| 152 | BUILDING CLASS CATEGORY\_38 ASYLUMS AND HOMES | 0.04 | 0.0017 |
| 153 | BUILDING CLASS AT TIME OF SALE\_N9 | 0.04 | 0.0017 |
| 154 | BUILDING CLASS AT PRESENT\_N9 | 0.04 | 0.0018 |
| 155 | BUILDING CLASS AT TIME OF SALE\_K1 | 0.04 | 0.0022 |
| 156 | NEIGHBORHOOD\_BAYCHESTER | -0.04 | 0.0023 |
| 157 | BUILDING CLASS AT PRESENT\_H9 | 0.04 | 0.0025 |
| 158 | BUILDING CLASS CATEGORY\_05 TAX CLASS 1 VACANT LAND | -0.04 | 0.0029 |
| 159 | NEIGHBORHOOD\_TRIBECA | 0.04 | 0.0031 |
| 160 | NEIGHBORHOOD\_RIDGEWOOD | -0.04 | 0.0032 |
| 161 | BUILDING CLASS AT PRESENT\_E9 | 0.04 | 0.0036 |
| 162 | BUILDING CLASS AT TIME OF SALE\_F1 | 0.04 | 0.0036 |
| 163 | BUILDING CLASS AT TIME OF SALE\_V0 | -0.03 | 0.0041 |
| 164 | BUILDING CLASS CATEGORY\_25 LUXURY HOTELS | -0.03 | 0.0044 |
| 165 | BUILDING CLASS AT TIME OF SALE\_H2 | -0.03 | 0.0044 |
| 166 | NEIGHBORHOOD\_FLATBUSH-NORTH | -0.03 | 0.0048 |
| 167 | NEIGHBORHOOD\_SOUTHBRIDGE | 0.03 | 0.0056 |
| 168 | BUILDING CLASS AT TIME OF SALE\_A1 | -0.03 | 0.0063 |
| 169 | NEIGHBORHOOD\_SOUTH JAMAICA | -0.03 | 0.0063 |
| 170 | BUILDING CLASS AT PRESENT\_E1 | 0.03 | 0.0070 |
| 171 | BUILDING CLASS AT PRESENT\_H2 | -0.03 | 0.0071 |
| 172 | NEIGHBORHOOD\_RICHMOND HILL | -0.03 | 0.0089 |
| 173 | BUILDING CLASS AT PRESENT\_A1 | -0.03 | 0.0110 |
| 174 | NEIGHBORHOOD\_FLATBUSH-EAST | -0.03 | 0.0119 |
| 175 | BUILDING CLASS AT PRESENT\_F9 | 0.03 | 0.0147 |
| 176 | BUILDING CLASS AT PRESENT\_S9 | 0.03 | 0.0151 |
| 177 | NEIGHBORHOOD\_MORRISANIA/LONGWOOD | -0.03 | 0.0154 |
| 178 | NEIGHBORHOOD\_GLENDALE | -0.03 | 0.0168 |
| 179 | BUILDING CLASS AT PRESENT\_S5 | 0.03 | 0.0179 |
| 180 | BUILDING CLASS AT PRESENT\_C2 | -0.03 | 0.0185 |
| 181 | NEIGHBORHOOD\_SOUNDVIEW | -0.03 | 0.0188 |
| 182 | NEIGHBORHOOD\_ROCKAWAY PARK | 0.03 | 0.0192 |
| 183 | BUILDING CLASS AT TIME OF SALE\_S2 | -0.03 | 0.0206 |
| 184 | BUILDING CLASS AT TIME OF SALE\_G1 | 0.03 | 0.0212 |
| 185 | NEIGHBORHOOD\_FAR ROCKAWAY | -0.03 | 0.0218 |
| 186 | NEIGHBORHOOD\_OZONE PARK | -0.03 | 0.0219 |
| 187 | NEIGHBORHOOD\_MORNINGSIDE HEIGHTS | 0.03 | 0.0231 |
| 188 | BUILDING CLASS AT PRESENT\_D6 | 0.03 | 0.0239 |
| 189 | NEIGHBORHOOD\_MARINERS HARBOR | -0.03 | 0.0304 |
| 190 | BUILDING CLASS AT TIME OF SALE\_F5 | 0.03 | 0.0337 |
| 191 | NEIGHBORHOOD\_GREAT KILLS | -0.03 | 0.0341 |
| 192 | BUILDING CLASS AT PRESENT\_F5 | 0.03 | 0.0346 |
| 193 | NEIGHBORHOOD\_GRAVESEND | -0.03 | 0.0355 |
| 194 | TAX CLASS AT PRESENT\_2A | -0.03 | 0.0356 |
| 195 | NEIGHBORHOOD\_MOUNT HOPE/MOUNT EDEN | 0.03 | 0.0361 |
| 196 | NEIGHBORHOOD\_HOLLIS | -0.02 | 0.0395 |
| 197 | NEIGHBORHOOD\_PARKCHESTER | -0.02 | 0.0411 |
| 198 | NEIGHBORHOOD\_BRIARWOOD | 0.02 | 0.0463 |
| 199 | BUILDING CLASS AT TIME OF SALE\_E3 | 0.02 | 0.0464 |
| 200 | NEIGHBORHOOD\_WOODHAVEN | -0.02 | 0.0496 |
| 201 | NEIGHBORHOOD\_MORRIS PARK/VAN NEST | -0.02 | 0.0555 |
| 202 | NEIGHBORHOOD\_NEW BRIGHTON | -0.02 | 0.0558 |
| 203 | BUILDING CLASS AT TIME OF SALE\_C2 | -0.02 | 0.0566 |
| 204 | NEIGHBORHOOD\_ROSSVILLE | -0.02 | 0.0568 |
| 205 | NEIGHBORHOOD\_LITTLE ITALY | 0.02 | 0.0573 |
| 206 | NEIGHBORHOOD\_TRAVIS | -0.02 | 0.0578 |
| 207 | NEIGHBORHOOD\_BOERUM HILL | 0.02 | 0.0592 |
| 208 | NEIGHBORHOOD\_WILLIAMSBRIDGE | -0.02 | 0.0593 |
| 209 | NEIGHBORHOOD\_EAST ELMHURST | -0.02 | 0.0597 |
| 210 | NEIGHBORHOOD\_WESTCHESTER | -0.02 | 0.0621 |
| 211 | NEIGHBORHOOD\_MELROSE/CONCOURSE | -0.02 | 0.0624 |
| 212 | NEIGHBORHOOD\_NEW SPRINGVILLE | -0.02 | 0.0660 |
| 213 | BUILDING CLASS AT TIME OF SALE\_S3 | 0.02 | 0.0661 |
| 214 | NEIGHBORHOOD\_THROGS NECK | -0.02 | 0.0677 |
| 215 | BUILDING CLASS CATEGORY\_01 ONE FAMILY DWELLINGS | -0.02 | 0.0682 |
| 216 | BUILDING CLASS AT TIME OF SALE\_K4 | 0.02 | 0.0693 |
| 217 | BUILDING CLASS AT TIME OF SALE\_D6 | 0.02 | 0.0698 |
| 218 | NEIGHBORHOOD\_HUNTS POINT | 0.02 | 0.0746 |
| 219 | NEIGHBORHOOD\_QUEENS VILLAGE | -0.02 | 0.0766 |
| 220 | NEIGHBORHOOD\_ROSEBANK | -0.02 | 0.0770 |
| 221 | NEIGHBORHOOD\_SCHUYLERVILLE/PELHAM BAY | -0.02 | 0.0783 |
| 222 | NEIGHBORHOOD\_DOWNTOWN-FULTON FERRY | 0.02 | 0.0833 |
| 223 | BUILDING CLASS AT TIME OF SALE\_A2 | -0.02 | 0.0840 |
| 224 | BUILDING CLASS CATEGORY\_26 OTHER HOTELS | 0.02 | 0.0880 |
| 225 | NEIGHBORHOOD\_VAN CORTLANDT PARK | 0.02 | 0.0914 |
| 226 | NEIGHBORHOOD\_MARINE PARK | -0.02 | 0.0915 |
| 227 | NEIGHBORHOOD\_CONCORD | -0.02 | 0.0920 |
| 228 | BUILDING CLASS AT TIME OF SALE\_S5 | 0.02 | 0.0947 |
| 229 | NEIGHBORHOOD\_HARLEM-UPPER | 0.02 | 0.0947 |
| 230 | BUILDING CLASS AT PRESENT\_O4 | 0.02 | 0.0954 |
| 231 | BUILDING CLASS AT PRESENT\_O6 | 0.02 | 0.0964 |
| 232 | BUILDING CLASS AT TIME OF SALE\_O6 | 0.02 | 0.0964 |
| 233 | BUILDING CLASS AT TIME OF SALE\_W9 | 0.02 | 0.0980 |
| 234 | BUILDING CLASS CATEGORY\_02 TWO FAMILY DWELLINGS | -0.02 | 0.1000 |
| 235 | NEIGHBORHOOD\_WESTERLEIGH | -0.02 | 0.1015 |
| 236 | BUILDING CLASS CATEGORY\_03 THREE FAMILY DWELLINGS | -0.02 | 0.1079 |
| 237 | NEIGHBORHOOD\_FLATLANDS | -0.02 | 0.1109 |
| 238 | BUILDING CLASS AT PRESENT\_S2 | -0.02 | 0.1125 |
| 239 | NEIGHBORHOOD\_SOUTH OZONE PARK | -0.02 | 0.1128 |
| 240 | BUILDING CLASS AT PRESENT\_W3 | 0.02 | 0.1130 |
| 241 | NEIGHBORHOOD\_MIDDLE VILLAGE | -0.02 | 0.1160 |
| 242 | BUILDING CLASS AT PRESENT\_A3 | 0.02 | 0.1163 |
| 243 | NEIGHBORHOOD\_BROWNSVILLE | -0.02 | 0.1167 |
| 244 | NEIGHBORHOOD\_WYCKOFF HEIGHTS | -0.02 | 0.1179 |
| 245 | NEIGHBORHOOD\_CORONA | -0.02 | 0.1208 |
| 246 | NEIGHBORHOOD\_WILLIAMSBURG-SOUTH | 0.02 | 0.1220 |
| 247 | NEIGHBORHOOD\_CROWN HEIGHTS | -0.02 | 0.1241 |
| 248 | NEIGHBORHOOD\_PORT RICHMOND | -0.02 | 0.1404 |
| 249 | NEIGHBORHOOD\_BATHGATE | -0.02 | 0.1413 |
| 250 | BUILDING CLASS AT TIME OF SALE\_C9 | 0.02 | 0.1423 |
| 251 | NEIGHBORHOOD\_OLD MILL BASIN | -0.02 | 0.1424 |
| 252 | BUILDING CLASS AT PRESENT\_K4 | 0.02 | 0.1455 |
| 253 | NEIGHBORHOOD\_CONCORD-FOX HILLS | -0.02 | 0.1455 |
| 254 | BUILDING CLASS AT TIME OF SALE\_O1 | 0.02 | 0.1475 |
| 255 | NEIGHBORHOOD\_FLUSHING-SOUTH | -0.02 | 0.1485 |
| 256 | NEIGHBORHOOD\_SUNSET PARK | -0.02 | 0.1501 |
| 257 | BUILDING CLASS AT TIME OF SALE\_M3 | 0.02 | 0.1539 |
| 258 | NEIGHBORHOOD\_CASTLE HILL/UNIONPORT | -0.02 | 0.1554 |
| 259 | NEIGHBORHOOD\_PROSPECT HEIGHTS | 0.02 | 0.1562 |
| 260 | NEIGHBORHOOD\_STAPLETON | -0.02 | 0.1595 |
| 261 | BUILDING CLASS AT TIME OF SALE\_E4 | 0.02 | 0.1616 |
| 262 | BUILDING CLASS AT PRESENT\_D5 | 0.02 | 0.1667 |
| 263 | BUILDING CLASS AT PRESENT\_W9 | 0.02 | 0.1683 |
| 264 | NEIGHBORHOOD\_HARLEM-WEST | 0.02 | 0.1701 |
| 265 | NEIGHBORHOOD\_DYKER HEIGHTS | -0.02 | 0.1705 |
| 266 | NEIGHBORHOOD\_GERRITSEN BEACH | 0.02 | 0.1711 |
| 267 | NEIGHBORHOOD\_ROSSVILLE-CHARLESTON | -0.02 | 0.1740 |
| 268 | NEIGHBORHOOD\_ARVERNE | -0.02 | 0.1778 |
| 269 | NEIGHBORHOOD\_WAKEFIELD | -0.02 | 0.1811 |
| 270 | NEIGHBORHOOD\_COUNTRY CLUB | -0.02 | 0.1823 |
| 271 | NEIGHBORHOOD\_ELTINGVILLE | -0.02 | 0.1846 |
| 272 | BUILDING CLASS AT PRESENT\_A9 | -0.02 | 0.1869 |
| 273 | BUILDING CLASS CATEGORY\_37 RELIGIOUS FACILITIES | 0.02 | 0.1889 |
| 274 | NEIGHBORHOOD\_RIVERDALE | 0.02 | 0.1892 |
| 275 | NEIGHBORHOOD\_FORT GREENE | 0.02 | 0.1942 |
| 276 | NEIGHBORHOOD\_MADISON | -0.02 | 0.1955 |
| 277 | BUILDING CLASS AT PRESENT\_G1 | 0.02 | 0.1960 |
| 278 | NEIGHBORHOOD\_CROTONA PARK | -0.02 | 0.1970 |
| 279 | NEIGHBORHOOD\_ST. ALBANS | -0.02 | 0.1990 |
| 280 | NEIGHBORHOOD\_MIDWOOD | 0.02 | 0.1994 |
| 281 | NEIGHBORHOOD\_STAPLETON-CLIFTON | -0.02 | 0.2003 |
| 282 | NEIGHBORHOOD\_WEST NEW BRIGHTON | -0.02 | 0.2020 |
| 283 | NEIGHBORHOOD\_BULLS HEAD | -0.02 | 0.2025 |
| 284 | BUILDING CLASS AT PRESENT\_G2 | 0.02 | 0.2029 |
| 285 | NEIGHBORHOOD\_MIDLAND BEACH | -0.02 | 0.2040 |
| 286 | BUILDING CLASS AT TIME OF SALE\_A9 | -0.02 | 0.2051 |
| 287 | NEIGHBORHOOD\_WOODROW | -0.02 | 0.2133 |
| 288 | TAX CLASS AT PRESENT\_2C | 0.01 | 0.2163 |
| 289 | BUILDING CLASS AT PRESENT\_S3 | 0.01 | 0.2208 |
| 290 | NEIGHBORHOOD\_TOTTENVILLE | -0.01 | 0.2233 |
| 291 | NEIGHBORHOOD\_GRASMERE | -0.01 | 0.2266 |
| 292 | NEIGHBORHOOD\_SO. JAMAICA-BAISLEY PARK | -0.01 | 0.2297 |
| 293 | NEIGHBORHOOD\_SPRINGFIELD GARDENS | 0.01 | 0.2298 |
| 294 | NEIGHBORHOOD\_PRINCES BAY | -0.01 | 0.2317 |
| 295 | NEIGHBORHOOD\_BRIGHTON BEACH | 0.01 | 0.2336 |
| 296 | BUILDING CLASS AT PRESENT\_I4 | 0.01 | 0.2403 |
| 297 | BUILDING CLASS AT TIME OF SALE\_I4 | 0.01 | 0.2403 |
| 298 | NEIGHBORHOOD\_SOUTH BEACH | -0.01 | 0.2423 |
| 299 | NEIGHBORHOOD\_ANNADALE | -0.01 | 0.2475 |
| 300 | NEIGHBORHOOD\_KENSINGTON | 0.01 | 0.2475 |
| 301 | NEIGHBORHOOD\_MASPETH | -0.01 | 0.2477 |
| 302 | NEIGHBORHOOD\_COLLEGE POINT | -0.01 | 0.2609 |
| 303 | BUILDING CLASS AT TIME OF SALE\_S4 | 0.01 | 0.2624 |
| 304 | NEIGHBORHOOD\_HAMMELS | -0.01 | 0.2647 |
| 305 | BUILDING CLASS AT TIME OF SALE\_V1 | -0.01 | 0.2654 |
| 306 | BUILDING CLASS CATEGORY\_06 TAX CLASS 1 - OTHER | -0.01 | 0.2669 |
| 307 | BUILDING CLASS AT TIME OF SALE\_G0 | -0.01 | 0.2669 |
| 308 | BUILDING CLASS CATEGORY\_13 CONDOS - ELEVATOR APARTMENTS | 0.01 | 0.2717 |
| 309 | BUILDING CLASS AT PRESENT\_RR | 0.01 | 0.2717 |
| 310 | BUILDING CLASS AT TIME OF SALE\_R4 | 0.01 | 0.2717 |
| 311 | NEIGHBORHOOD\_WILLIAMSBURG-EAST | 0.01 | 0.2725 |
| 312 | NEIGHBORHOOD\_CONEY ISLAND | -0.01 | 0.2797 |
| 313 | NEIGHBORHOOD\_BENSONHURST | -0.01 | 0.2805 |
| 314 | BUILDING CLASS CATEGORY\_31 COMMERCIAL VACANT LAND | -0.01 | 0.2839 |
| 315 | NEIGHBORHOOD\_MANOR HEIGHTS | -0.01 | 0.2869 |
| 316 | NEIGHBORHOOD\_JAMAICA | -0.01 | 0.2940 |
| 317 | NEIGHBORHOOD\_KINGSBRIDGE/JEROME PARK | 0.01 | 0.2958 |
| 318 | NEIGHBORHOOD\_TOMPKINSVILLE | -0.01 | 0.2972 |
| 319 | NEIGHBORHOOD\_SPRING CREEK | -0.01 | 0.3173 |
| 320 | NEIGHBORHOOD\_ASTORIA | -0.01 | 0.3184 |
| 321 | NEIGHBORHOOD\_BERGEN BEACH | -0.01 | 0.3193 |
| 322 | NEIGHBORHOOD\_SHEEPSHEAD BAY | -0.01 | 0.3201 |
| 323 | BUILDING CLASS AT PRESENT\_A2 | -0.01 | 0.3225 |
| 324 | NEIGHBORHOOD\_PLEASANT PLAINS | -0.01 | 0.3239 |
| 325 | NEIGHBORHOOD\_PARK SLOPE SOUTH | 0.01 | 0.3424 |
| 326 | NEIGHBORHOOD\_ROSEDALE | -0.01 | 0.3430 |
| 327 | BUILDING CLASS CATEGORY\_41 TAX CLASS 4 - OTHER | -0.01 | 0.3490 |
| 328 | BUILDING CLASS AT TIME OF SALE\_Z9 | -0.01 | 0.3490 |
| 329 | NEIGHBORHOOD\_WOODSIDE | -0.01 | 0.3490 |
| 330 | BUILDING CLASS AT PRESENT\_S4 | 0.01 | 0.3570 |
| 331 | NEIGHBORHOOD\_MILL BASIN | -0.01 | 0.3573 |
| 332 | NEIGHBORHOOD\_BAY RIDGE | -0.01 | 0.3696 |
| 333 | BUILDING CLASS AT TIME OF SALE\_D5 | 0.01 | 0.3715 |
| 334 | NEIGHBORHOOD\_FOREST HILLS | 0.01 | 0.3755 |
| 335 | NEIGHBORHOOD\_NEW DORP-BEACH | -0.01 | 0.3765 |
| 336 | NEIGHBORHOOD\_CASTLETON CORNERS | -0.01 | 0.3932 |
| 337 | NEIGHBORHOOD\_DONGAN HILLS | 0.01 | 0.3950 |
| 338 | NEIGHBORHOOD\_GRYMES HILL | -0.01 | 0.3990 |
| 339 | NEIGHBORHOOD\_BELMONT | -0.01 | 0.4006 |
| 340 | BUILDING CLASS AT TIME OF SALE\_H4 | -0.01 | 0.4026 |
| 341 | NEIGHBORHOOD\_CAMBRIA HEIGHTS | -0.01 | 0.4055 |
| 342 | BUILDING CLASS AT PRESENT\_I5 | 0.01 | 0.4072 |
| 343 | NEIGHBORHOOD\_FLATBUSH-LEFFERTS GARDEN | 0.01 | 0.4149 |
| 344 | NEIGHBORHOOD\_BATH BEACH | -0.01 | 0.4242 |
| 345 | NEIGHBORHOOD\_GOWANUS | 0.01 | 0.4333 |
| 346 | NEIGHBORHOOD\_HOWARD BEACH | -0.01 | 0.4407 |
| 347 | NEIGHBORHOOD\_JACKSON HEIGHTS | -0.01 | 0.4421 |
| 348 | BUILDING CLASS AT PRESENT\_F2 | 0.01 | 0.4465 |
| 349 | BUILDING CLASS AT TIME OF SALE\_F2 | 0.01 | 0.4465 |
| 350 | BUILDING CLASS AT PRESENT\_O1 | 0.01 | 0.4465 |
| 351 | NEIGHBORHOOD\_BUSH TERMINAL | -0.01 | 0.4570 |
| 352 | NEIGHBORHOOD\_BOROUGH PARK | -0.01 | 0.4613 |
| 353 | BUILDING CLASS AT PRESENT\_E3 | 0.01 | 0.4642 |
| 354 | NEIGHBORHOOD\_AIRPORT LA GUARDIA | -0.01 | 0.4695 |
| 355 | NEIGHBORHOOD\_WILLOWBROOK | -0.01 | 0.4792 |
| 356 | NEIGHBORHOOD\_LAURELTON | -0.01 | 0.4800 |
| 357 | BUILDING CLASS AT PRESENT\_S0 | -0.01 | 0.4864 |
| 358 | BUILDING CLASS AT PRESENT\_P9 | 0.01 | 0.4901 |
| 359 | BUILDING CLASS AT TIME OF SALE\_P9 | 0.01 | 0.4901 |
| 360 | NEIGHBORHOOD\_OAKWOOD-BEACH | -0.01 | 0.4936 |
| 361 | NEIGHBORHOOD\_JAMAICA HILLS | -0.01 | 0.4971 |
| 362 | NEIGHBORHOOD\_PELHAM PARKWAY SOUTH | -0.01 | 0.5104 |
| 363 | BUILDING CLASS AT TIME OF SALE\_G2 | 0.01 | 0.5120 |
| 364 | BUILDING CLASS AT PRESENT\_H4 | -0.01 | 0.5179 |
| 365 | BUILDING CLASS AT TIME OF SALE\_V2 | -0.01 | 0.5277 |
| 366 | BUILDING CLASS AT PRESENT\_M9 | -0.01 | 0.5311 |
| 367 | BUILDING CLASS AT TIME OF SALE\_S1 | -0.01 | 0.5536 |
| 368 | BUILDING CLASS AT TIME OF SALE\_S0 | -0.01 | 0.5620 |
| 369 | NEIGHBORHOOD\_MOTT HAVEN/PORT MORRIS | -0.01 | 0.5640 |
| 370 | BUILDING CLASS CATEGORY\_29 COMMERCIAL GARAGES | 0.01 | 0.5676 |
| 371 | BUILDING CLASS AT TIME OF SALE\_G9 | -0.01 | 0.5680 |
| 372 | BUILDING CLASS AT PRESENT\_N2 | -0.01 | 0.5699 |
| 373 | BUILDING CLASS CATEGORY\_32 HOSPITAL AND HEALTH FACILITIES | 0.01 | 0.5716 |
| 374 | BUILDING CLASS AT TIME OF SALE\_V3 | -0.01 | 0.5728 |
| 375 | BUILDING CLASS AT PRESENT\_N3 | -0.01 | 0.5756 |
| 376 | NEIGHBORHOOD\_NEW DORP | -0.01 | 0.5804 |
| 377 | BUILDING CLASS AT PRESENT\_I6 | -0.01 | 0.5805 |
| 378 | BUILDING CLASS AT TIME OF SALE\_I6 | -0.01 | 0.5805 |
| 379 | BUILDING CLASS AT PRESENT\_J1 | -0.01 | 0.5824 |
| 380 | BUILDING CLASS AT TIME OF SALE\_J1 | -0.01 | 0.5824 |
| 381 | BUILDING CLASS AT PRESENT\_H3 | -0.01 | 0.5875 |
| 382 | NEIGHBORHOOD\_ELMHURST | 0.01 | 0.5929 |
| 383 | BUILDING CLASS CATEGORY\_09 COOPS - WALKUP APARTMENTS | 0.01 | 0.6064 |
| 384 | BUILDING CLASS AT PRESENT\_C6 | 0.01 | 0.6064 |
| 385 | BUILDING CLASS AT TIME OF SALE\_C6 | 0.01 | 0.6064 |
| 386 | NEIGHBORHOOD\_GREAT KILLS-BAY TERRACE | -0.01 | 0.6064 |
| 387 | NEIGHBORHOOD\_FLORAL PARK | -0.01 | 0.6094 |
| 388 | BUILDING CLASS AT TIME OF SALE\_G7 | -0.01 | 0.6098 |
| 389 | NEIGHBORHOOD\_FRESH MEADOWS | -0.01 | 0.6104 |
| 390 | BUILDING CLASS AT TIME OF SALE\_I5 | 0.01 | 0.6137 |
| 391 | BUILDING CLASS AT PRESENT\_N1 | -0.01 | 0.6236 |
| 392 | NEIGHBORHOOD\_PELHAM PARKWAY NORTH | -0.01 | 0.6269 |
| 393 | NEIGHBORHOOD\_CLINTON HILL | 0.01 | 0.6295 |
| 394 | BUILDING CLASS AT TIME OF SALE\_D4 | -0.01 | 0.6306 |
| 395 | NEIGHBORHOOD\_RICHMONDTOWN | -0.01 | 0.6329 |
| 396 | NEIGHBORHOOD\_HIGHBRIDGE/MORRIS HEIGHTS | 0.01 | 0.6330 |
| 397 | BUILDING CLASS AT TIME OF SALE\_G6 | 0.01 | 0.6373 |
| 398 | NEIGHBORHOOD\_REGO PARK | -0.01 | 0.6379 |
| 399 | BUILDING CLASS AT PRESENT\_D0 | 0.01 | 0.6448 |
| 400 | BUILDING CLASS AT TIME OF SALE\_D0 | 0.01 | 0.6448 |
| 401 | BUILDING CLASS AT PRESENT\_O8 | -0.01 | 0.6479 |
| 402 | BUILDING CLASS AT PRESENT\_H8 | -0.01 | 0.6599 |
| 403 | NEIGHBORHOOD\_HILLCREST | -0.01 | 0.6599 |
| 404 | BUILDING CLASS AT PRESENT\_P5 | -0.01 | 0.6599 |
| 405 | BUILDING CLASS AT TIME OF SALE\_P5 | -0.01 | 0.6599 |
| 406 | NEIGHBORHOOD\_FRESH KILLS | -0.01 | 0.6626 |
| 407 | BUILDING CLASS AT TIME OF SALE\_O4 | -0.01 | 0.6783 |
| 408 | NEIGHBORHOOD\_BELLEROSE | 0.00 | 0.6794 |
| 409 | BUILDING CLASS AT TIME OF SALE\_K7 | 0.00 | 0.6894 |
| 410 | BUILDING CLASS AT PRESENT\_O2 | 0.00 | 0.6926 |
| 411 | BUILDING CLASS CATEGORY\_10 COOPS - ELEVATOR APARTMENTS | 0.00 | 0.6976 |
| 412 | NEIGHBORHOOD\_NEW BRIGHTON-ST. GEORGE | 0.00 | 0.6984 |
| 413 | BUILDING CLASS AT PRESENT\_J4 | 0.00 | 0.6984 |
| 414 | BUILDING CLASS AT TIME OF SALE\_J4 | 0.00 | 0.6984 |
| 415 | NEIGHBORHOOD\_PELHAM GARDENS | 0.00 | 0.7002 |
| 416 | BUILDING CLASS AT PRESENT\_M1 | 0.00 | 0.7021 |
| 417 | NEIGHBORHOOD\_LIVINGSTON | 0.00 | 0.7028 |
| 418 | BUILDING CLASS CATEGORY\_35 INDOOR PUBLIC AND CULTURAL FACILITIES | 0.00 | 0.7057 |
| 419 | BUILDING CLASS AT PRESENT\_D4 | 0.00 | 0.7076 |
| 420 | NEIGHBORHOOD\_NAVY YARD | 0.00 | 0.7131 |
| 421 | BUILDING CLASS AT PRESENT\_S1 | 0.00 | 0.7251 |
| 422 | NEIGHBORHOOD\_BELLE HARBOR | 0.00 | 0.7292 |
| 423 | BUILDING CLASS AT PRESENT\_K7 | 0.00 | 0.7299 |
| 424 | NEIGHBORHOOD\_FLUSHING-NORTH | 0.00 | 0.7390 |
| 425 | NEIGHBORHOOD\_WOODLAWN | 0.00 | 0.7502 |
| 426 | NEIGHBORHOOD\_PORT IVORY | 0.00 | 0.7504 |
| 427 | BUILDING CLASS AT TIME OF SALE\_O2 | 0.00 | 0.7528 |
| 428 | NEIGHBORHOOD\_WINDSOR TERRACE | 0.00 | 0.7561 |
| 429 | NEIGHBORHOOD\_BAYSIDE | 0.00 | 0.7576 |
| 430 | NEIGHBORHOOD\_BRONXDALE | 0.00 | 0.7697 |
| 431 | BUILDING CLASS CATEGORY\_17 CONDOPS | 0.00 | 0.7716 |
| 432 | BUILDING CLASS AT PRESENT\_R9 | 0.00 | 0.7716 |
| 433 | BUILDING CLASS AT TIME OF SALE\_R9 | 0.00 | 0.7716 |
| 434 | NEIGHBORHOOD\_HOLLISWOOD | 0.00 | 0.7719 |
| 435 | NEIGHBORHOOD\_SUNNYSIDE | 0.00 | 0.7830 |
| 436 | BUILDING CLASS AT TIME OF SALE\_A0 | 0.00 | 0.7834 |
| 437 | LOT | 0.00 | 0.7890 |
| 438 | NEIGHBORHOOD\_MANHATTAN BEACH | 0.00 | 0.7893 |
| 439 | BUILDING CLASS AT TIME OF SALE\_M1 | 0.00 | 0.7984 |
| 440 | NEIGHBORHOOD\_GREENPOINT | 0.00 | 0.8127 |
| 441 | NEIGHBORHOOD\_DONGAN HILLS-COLONY | 0.00 | 0.8166 |
| 442 | BUILDING CLASS AT TIME OF SALE\_O8 | 0.00 | 0.8177 |
| 443 | NEIGHBORHOOD\_OAKLAND GARDENS | 0.00 | 0.8265 |
| 444 | NEIGHBORHOOD\_KINGSBRIDGE HTS/UNIV HTS | 0.00 | 0.8280 |
| 445 | BUILDING CLASS AT PRESENT\_I1 | 0.00 | 0.8299 |
| 446 | BUILDING CLASS AT TIME OF SALE\_I1 | 0.00 | 0.8299 |
| 447 | BUILDING CLASS AT PRESENT\_M4 | 0.00 | 0.8299 |
| 448 | BUILDING CLASS AT TIME OF SALE\_M4 | 0.00 | 0.8299 |
| 449 | NEIGHBORHOOD\_COBBLE HILL-WEST | 0.00 | 0.8341 |
| 450 | NEIGHBORHOOD\_MIDTOWN WEST | 0.00 | 0.8448 |
| 451 | BUILDING CLASS AT TIME OF SALE\_M9 | 0.00 | 0.8493 |
| 452 | NEIGHBORHOOD\_WILLIAMSBURG-CENTRAL | 0.00 | 0.8692 |
| 453 | NEIGHBORHOOD\_OCEAN PARKWAY-SOUTH | 0.00 | 0.8705 |
| 454 | NEIGHBORHOOD\_RED HOOK | 0.00 | 0.8718 |
| 455 | BUILDING CLASS AT TIME OF SALE\_I9 | 0.00 | 0.8724 |
| 456 | BUILDING CLASS AT PRESENT\_G0 | 0.00 | 0.8842 |
| 457 | NEIGHBORHOOD\_OCEAN PARKWAY-NORTH | 0.00 | 0.8863 |
| 458 | BUILDING CLASS AT TIME OF SALE\_A3 | 0.00 | 0.8948 |
| 459 | NEIGHBORHOOD\_KEW GARDENS | 0.00 | 0.8983 |
| 460 | NEIGHBORHOOD\_SEAGATE | 0.00 | 0.9008 |
| 461 | NEIGHBORHOOD\_LITTLE NECK | 0.00 | 0.9020 |
| 462 | BUILDING CLASS AT TIME OF SALE\_H3 | 0.00 | 0.9038 |
| 463 | NEIGHBORHOOD\_JAMAICA ESTATES | 0.00 | 0.9314 |
| 464 | BUILDING CLASS AT TIME OF SALE\_G5 | 0.00 | 0.9483 |
| 465 | BUILDING CLASS AT PRESENT\_Z9 | 0.00 | 0.9769 |
| 466 | NEIGHBORHOOD\_EAST TREMONT | 0.00 | 0.9791 |
| 467 | BUILDING CLASS AT PRESENT\_G9 | 0.00 | 0.9844 |
| 468 | BUILDING CLASS AT TIME OF SALE\_V9 | 0.00 | 0.9906 |
| 469 | NEIGHBORHOOD\_WHITESTONE | 0.00 | 0.9936 |
| 470 | BUILDING CLASS AT PRESENT\_W6 | 0.00 | 0.9962 |
| 471 | BUILDING CLASS AT TIME OF SALE\_W6 | 0.00 | 0.9962 |

## Appendix- B: Modeling & Evaluation-Results

* 1. model\_data shape for 100K USD <= SALE PRICE <= 10M USD: (6877, 477)

Linear Regresion results:

Model Performance on Training data

Mean-Squared Error: 595814053656.5806

Root-Mean-Squared Error: 771889.923277005

Rsquare: 0.6792300693862764

Predictions on Test Data:

deviation% residuals y\_pred\_train y\_train

0 -26.521538 -1.152626e+05 5.498626e+05 434600.0

1 12.429187 8.762577e+04 6.173742e+05 705000.0

2 44.776289 6.089575e+05 7.510425e+05 1360000.0

3 -13.846654 -8.654159e+04 7.115416e+05 625000.0

4 0.001767 3.214864e+00 1.819758e+05 181979.0

5 27.938762 2.690503e+05 6.939497e+05 963000.0

6 -11.923327 -6.438596e+04 6.043860e+05 540000.0

7 -37.441196 -1.419021e+06 5.209021e+06 3790000.0

8 -47.961883 -1.270990e+06 3.920990e+06 2650000.0

9 35.213647 1.250084e+05 2.299916e+05 355000.0

Model Performance on Test data

Mean-Squared Error: 1165780012302866.0

Root-Mean-Squared Error: 34143520.79535539

Rsquare: -659.2990051845629

Predictions on Test Data:

deviation% residuals y\_pred\_test y\_test

0 -8.087768 -3.569941e+04 4.770994e+05 441400.0

1 18.716681 2.058835e+05 8.941165e+05 1100000.0

2 20.631039 2.019779e+05 7.770221e+05 979000.0

3 15.297568 7.296940e+04 4.040306e+05 477000.0

4 -15.141165 -1.362705e+05 1.036270e+06 900000.0

5 -17.671929 -1.042644e+05 6.942644e+05 590000.0

6 -103.872306 -1.324372e+06 2.599372e+06 1275000.0

7 -12.912516 -6.843633e+04 5.984363e+05 530000.0

8 -160.103274 -6.083924e+05 9.883924e+05 380000.0

9 11.287104 9.876216e+04 7.762378e+05 875000.0

Ridge-Regression results:

best parameters: {'alpha': 0.1, 'normalize': 'True'}

Model Performance on Training data:

Mean-Squared Error: 596663954982.3667

Root-Mean-Squared Error: 772440.2598145482

Rsquare: 0.6787725058433761

Predictions on Training Data:

deviation% residuals y\_pred\_train y\_train

0 -28.022801 -1.217871e+05 5.563871e+05 434600.0

1 12.891153 9.088263e+04 6.141174e+05 705000.0

2 44.904912 6.107068e+05 7.492932e+05 1360000.0

3 -13.252986 -8.283116e+04 7.078312e+05 625000.0

4 72.253697 1.314866e+05 5.049245e+04 181979.0

5 27.546179 2.652697e+05 6.977303e+05 963000.0

6 -9.341394 -5.044353e+04 5.904435e+05 540000.0

7 -36.528105 -1.384415e+06 5.174415e+06 3790000.0

8 -46.653036 -1.236305e+06 3.886305e+06 2650000.0

9 33.337100 1.183467e+05 2.366533e+05 355000.0

Model Performance on Test data:

Mean-Squared Error: 982245520019.0864

Root-Mean-Squared Error: 991083.0035971187

Rsquare: 0.4436551211455335

Predictions on Test Data:

deviation% residuals y\_pred\_test y\_test

0 -8.599854 -3.795975e+04 4.793598e+05 441400.0

1 19.197741 2.111752e+05 8.888248e+05 1100000.0

2 20.304357 1.987797e+05 7.802203e+05 979000.0

3 15.111723 7.208292e+04 4.049171e+05 477000.0

4 -17.434603 -1.569114e+05 1.056911e+06 900000.0

5 -17.359893 -1.024234e+05 6.924234e+05 590000.0

6 -103.667808 -1.321765e+06 2.596765e+06 1275000.0

7 -12.303972 -6.521105e+04 5.952111e+05 530000.0

8 -159.810459 -6.072797e+05 9.872797e+05 380000.0

9 11.934221 1.044244e+05 7.705756e+05 875000.0

Lasso-Regression results:

best parameters: {'alpha': 100, 'normalize': 'True'}

/home/mahesh\_yerra/anaconda3/lib/python3.6/site-packages/sklearn/linear\_model/coordinate\_descent.py:484: ConvergenceWarning: Objective did not converge. You might want to increase the number of iterations. Fitting data with very small alpha may cause precision problems.

ConvergenceWarning)

Model Performance on Training data:

Mean-Squared Error: 602620646093.4557

Root-Mean-Squared Error: 776286.4459034795

Rsquare: 0.675565586868127

Predictions on Training Data:

deviation% residuals y\_pred\_train y\_train

0 -31.284650 -1.359631e+05 5.705631e+05 434600.0

1 13.488077 9.509094e+04 6.099091e+05 705000.0

2 44.630952 6.069809e+05 7.530191e+05 1360000.0

3 -13.912498 -8.695311e+04 7.119531e+05 625000.0

4 302.230630 5.499963e+05 -3.680173e+05 181979.0

5 26.261799 2.529011e+05 7.100989e+05 963000.0

6 13.894280 7.502911e+04 4.649709e+05 540000.0

7 -34.714097 -1.315664e+06 5.105664e+06 3790000.0

8 -45.470305 -1.204963e+06 3.854963e+06 2650000.0

9 25.204987 8.947770e+04 2.655223e+05 355000.0

Model Performance on Test data:

Mean-Squared Error: 985973464195.0726

Root-Mean-Squared Error: 992961.9651301214

Rsquare: 0.44154360970700346

Predictions on Test Data:

deviation% residuals y\_pred\_test y\_test

0 -9.417477 -4.156874e+04 4.829687e+05 441400.0

1 20.330260 2.236329e+05 8.763671e+05 1100000.0

2 20.604790 2.017209e+05 7.772791e+05 979000.0

3 17.249344 8.227937e+04 3.947206e+05 477000.0

4 -18.169995 -1.635300e+05 1.063530e+06 900000.0

5 -17.111114 -1.009556e+05 6.909556e+05 590000.0

6 -100.862105 -1.285992e+06 2.560992e+06 1275000.0

7 -9.981315 -5.290097e+04 5.829010e+05 530000.0

8 -159.368857 -6.056017e+05 9.856017e+05 380000.0

9 12.200753 1.067566e+05 7.682434e+05 875000.0

Random-Forest results:

Model Performance on Training data:

Mean-Squared Error: 85890465413.07838

Root-Mean-Squared Error: 293070.75154828804

Rsquare: 0.9537589312272019

Predictions on Training Data:

deviation% residuals y\_pred\_train y\_train

0 -7.251157 -31513.53 466113.53 434600.0

1 8.739121 61610.80 643389.20 705000.0

2 10.384782 141233.03 1218766.97 1360000.0

3 10.296000 64350.00 560650.00 625000.0

4 -373.227944 -679196.48 861175.48 181979.0

5 -0.581501 -5599.85 968599.85 963000.0

6 -7.300120 -39420.65 579420.65 540000.0

7 1.597999 60564.17 3729435.83 3790000.0

8 -10.242944 -271438.02 2921438.02 2650000.0

9 -1.811741 -6431.68 361431.68 355000.0

Model Performance on Test data:

Mean-Squared Error: 622451444612.2367

Root-Mean-Squared Error: 788955.9205761984

Rsquare: 0.6474428577298541

Predictions on Test Data:

deviation% residuals y\_pred\_test y\_test

0 -16.428550 -72515.62 513915.62 441400.0

1 21.839157 240230.73 859769.27 1100000.0

2 18.280885 178969.86 800030.14 979000.0

3 -16.406174 -78257.45 555257.45 477000.0

4 13.965028 125685.25 774314.75 900000.0

5 -3.896624 -22990.08 612990.08 590000.0

6 -21.969339 -280109.07 1555109.07 1275000.0

7 -5.892102 -31228.14 561228.14 530000.0

8 -117.557861 -446719.87 826719.87 380000.0

9 43.056571 376745.00 498255.00 875000.0

Gradient-Boost results:

Model Performance on Training data:

Mean-Squared Error: 425687249236.16003

Root-Mean-Squared Error: 652447.1237090098

Rsquare: 0.7708216706829574

Predictions on Training Data:

deviation% residuals y\_pred\_train y\_train

0 -19.797332 -8.603920e+04 5.206392e+05 434600.0

1 37.293509 2.629192e+05 4.420808e+05 705000.0

2 31.196439 4.242716e+05 9.357284e+05 1360000.0

3 -21.345360 -1.334085e+05 7.584085e+05 625000.0

4 -570.229450 -1.037698e+06 1.219677e+06 181979.0

5 6.212833 5.982958e+04 9.031704e+05 963000.0

6 -19.720364 -1.064900e+05 6.464900e+05 540000.0

7 -8.689507 -3.293323e+05 4.119332e+06 3790000.0

8 -30.053201 -7.964098e+05 3.446410e+06 2650000.0

9 -4.578965 -1.625533e+04 3.712553e+05 355000.0

Model Performance on Test data:

Mean-Squared Error: 693893792693.9021

Root-Mean-Squared Error: 833002.8767620806

Rsquare: 0.6069778378560038

Predictions on Test Data:

deviation% residuals y\_pred\_test y\_test

0 -12.442170 -54919.736346 4.963197e+05 441400.0

1 36.833227 405165.500919 6.948345e+05 1100000.0

2 35.616842 348688.882739 6.303111e+05 979000.0

3 -31.810146 -151734.397501 6.287344e+05 477000.0

4 29.633264 266699.378118 6.333006e+05 900000.0

5 0.669065 3947.486353 5.860525e+05 590000.0

6 -13.409035 -170965.192223 1.445965e+06 1275000.0

7 -10.756549 -57009.707929 5.870097e+05 530000.0

8 -99.388666 -377676.931686 7.576769e+05 380000.0

9 25.154606 220102.806149 6.548972e+05 875000.0

Model-Performance Table:

model\_name RMSE Rsquare Train\_RMSE Train\_Rsquare

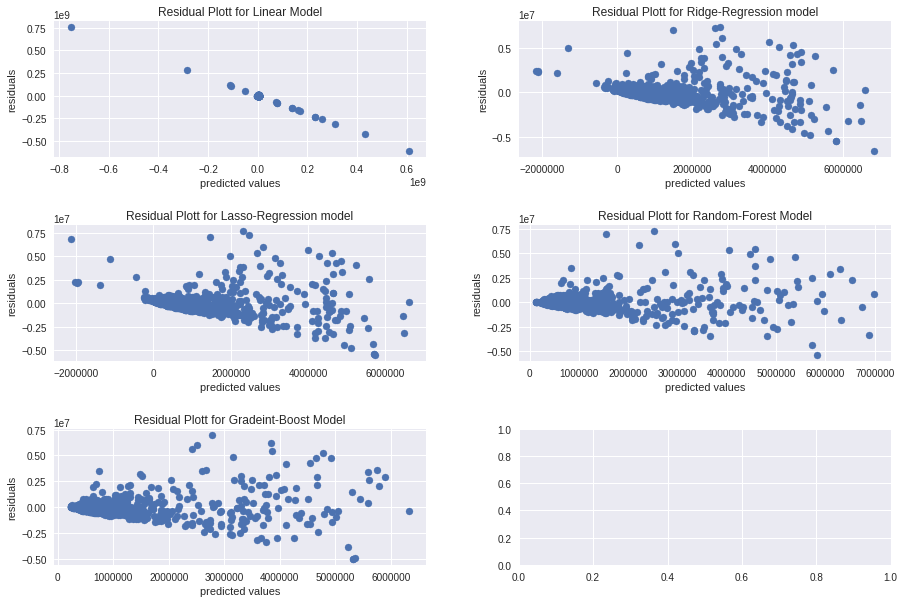
0 Linear 3.414352e+07 -659.299005 771889.923277 0.679230

1 Ridge-Regression 9.910830e+05 0.443655 772440.259815 0.678773

2 Lasso-Regression 9.929620e+05 0.441544 776286.445903 0.675566

3 Random-Forest 7.889559e+05 0.647443 293070.751548 0.953759

4 Gradient-Boost 8.330029e+05 0.606978 652447.123709 0.770822



Model-Coefficients/Estimators:

Linear-Regression Model Coefficients:

[ -1.26726025e+06 -1.38214742e+00 2.77208076e+02 -6.90876684e+02

1.53336362e+06 1.54804236e+06 -1.54469983e+06 4.49437509e+01

1.51148231e+00 2.48156507e+02 8.24893246e+08 2.38302816e-03

-2.50802973e+09 -1.24730464e+02 6.48919302e+01 6.63853964e+01

-4.87311228e+01 3.58330056e+01 2.50802979e+09 2.50802987e+09

2.50802948e+09 1.67065813e+06 -2.10972106e+06 2.00901704e+06

1.89118555e+06 1.68566802e+06 1.42452915e+06 2.65191494e+05

-1.86488057e+06 3.54786956e+05 -1.69139109e+06 1.57149420e+06

-1.65024704e+06 2.07532436e+05 -3.49074553e+05 1.23479491e+06

-1.79704166e+06 2.82099093e+05 2.46755003e+05 7.40212043e+05

3.20258110e+05 1.53321557e+06 6.00950645e+05 -1.58249283e+06

2.87871216e+06 1.82277582e+05 2.05514865e+06 -1.44726244e+05

7.64039187e+04 1.25198942e+06 2.16837297e+05 1.33143248e+06

-1.73391071e+06 1.98140139e+06 -8.10257197e+05 2.75464081e+05

1.84473134e+06 -2.01417826e+06 1.75879722e+05 1.98690522e+06

4.53364433e+05 1.56104804e+06 1.93771832e+06 -5.05239698e+05

1.99276012e+04 1.62645054e+06 -1.68422149e+06 -1.88098390e+06

2.15848428e+05 2.72570461e+04 1.43218302e+06 2.25930866e+06

4.43369131e+06 2.68993802e+06 -1.62597537e+05 2.41682140e+05

1.53014452e+06 6.25992674e+04 -2.12662232e+06 -1.38376871e+06

1.66503782e+06 1.83523455e+06 1.67470142e+06 1.27634315e+06

2.92567898e+06 3.74371303e+05 4.85288210e+04 4.82189922e+05

2.93495105e+04 1.38092504e+06 6.04486823e+04 1.12476322e+06

1.72608256e+06 1.40216797e+06 -1.55009417e+06 1.98725844e+06

8.95527019e+05 2.10660945e+06 1.30015290e+06 5.53298538e+05

1.49040722e+06 5.03005771e+05 -7.21160715e+05 2.10002445e+06

2.59973741e+05 2.02165991e+06 9.06369361e+03 3.08160904e+05

5.07567236e+05 9.15331417e+05 2.03673673e+06 1.70393818e+06

-2.23215614e+06 -2.41438187e+06 -2.51627809e+06 -2.96183563e+06

-1.67922446e+06 1.64240556e+06 1.26049448e+06 1.76883195e+06

9.14950842e+05 -1.60597889e+06 -2.32040065e+06 1.60189567e+06

1.64087299e+06 2.05609943e+06 1.65862979e+06 2.52245051e+05

1.86783850e+06 -1.66577034e+06 -1.84088912e+06 -1.91656267e+06

1.24875616e+06 -2.58045918e+06 -6.72704334e+02 1.86627532e+06

1.95781754e+06 -1.73224203e+06 2.04220328e+05 6.08948844e+05

-5.79834173e+05 2.04654494e+06 1.14762068e+05 1.86964236e+06

1.53312302e+06 -1.89072181e+06 1.48001945e+06 2.05478724e+06

2.99778389e+06 -7.33865112e+05 -6.57636207e+05 4.71998187e+05

8.97406647e+04 -1.39430445e+06 -1.72233929e+06 -1.84359727e+06

-1.63781773e+06 -1.57644440e+06 -8.80907549e+05 6.61275508e+05

1.97819878e+06 -1.01465910e+08 1.74990466e+06 1.98101687e+06

2.08296181e+06 2.17413738e+06 2.08843221e+06 8.40985304e+04

8.17543472e+04 5.85633194e+05 1.67130293e+05 1.46200194e+06

1.03502752e+06 5.11944720e+05 -1.76057285e+06 -1.58956252e+06

-1.67038237e+06 -1.70069084e+06 1.90247793e+06 7.02055298e+05

1.80107797e+06 1.95926036e+06 6.99798160e+05 1.46455571e+06

4.34376280e+05 1.59328563e+06 1.59166116e+06 2.00148685e+06

1.56696196e+06 -1.63383483e+06 1.27293833e+06 1.98192531e+06

1.39446693e+06 1.92648082e+06 2.00282407e+06 -1.72653140e+06

3.55712369e+05 2.07171147e+05 1.21377937e+06 -1.95178603e+05

-1.66825030e+06 1.94869587e+06 1.44994076e+06 1.37806042e+06

-1.47722700e+06 -3.68218233e+05 2.09222401e+06 1.28218283e+06

1.86180260e+06 1.89184980e+06 1.74959230e+06 2.61161201e+05

-1.77062541e+06 1.98939160e+06 1.94692965e+06 1.88149212e+06

-1.85095204e+06 5.70684802e+05 -1.20989363e+05 -9.70679379e+05

-2.33778937e+05 -1.06153705e+06 -8.47524108e+05 -1.73909024e+06

-1.91883688e+06 -8.55694928e+05 1.78662415e+06 -1.85675294e+06

1.99302532e+06 1.80014226e+06 -1.67654768e+06 2.91578874e+05

5.02763236e+05 1.37193387e+06 3.82724743e+05 2.33164036e+06

5.77198649e+05 1.51056257e+06 -1.28496737e+06 2.04171297e+06

1.38020722e+06 9.06101440e+04 1.22095956e+09 1.22133766e+09

1.07762702e+09 1.07796451e+09 5.02727356e+08 5.03106971e+08

1.13190811e+09 7.54639284e+08 5.90433332e+08 5.77256121e+08

2.13463994e+08 3.85637235e+08 2.13043521e+08 5.47595546e+08

2.13429213e+08 -7.96175366e+08 -8.04402545e+08 -6.43074140e+08

-3.56325754e+08 -6.60692451e+08 -7.43692293e+08 -8.03814390e+08

-8.03072132e+08 -6.43430480e+08 -6.82585973e+08 -7.08611240e+08

-6.06538991e+08 -3.04010639e+08 -7.10192128e+08 -4.82047697e+08

-4.82822114e+08 -2.36026182e+07 8.59741645e+06 7.13508786e+06

7.46445363e+06 8.72707794e+07 -8.79809165e+07 -1.13451382e+07

-1.12730960e+07 -8.96930353e+06 -1.04224991e+07 -1.11917082e+07

1.40619685e+08 -1.14576317e+07 -1.11087631e+07 -1.11630117e+07

-1.11380431e+07 -1.10054309e+07 -1.10873723e+07 -4.21307177e+07

-4.17740676e+07 -4.19519334e+07 2.61649695e+07 -4.20577890e+07

2.13484692e+08 -4.25900578e+07 8.72790431e+07 -4.24574497e+07

-4.17619392e+07 -4.40073459e+07 3.09823238e+07 -4.19608163e+07

-4.26564252e+07 -4.01938958e+07 -4.24328511e+07 5.28097930e+07

5.32410118e+07 5.62128515e+07 5.22288768e+07 5.42789028e+07

9.89530236e-10 5.28472601e+07 -8.33375584e+07 5.19874165e+07

-1.12061630e+07 5.11656131e+07 5.30885577e+07 6.15410287e+07

5.16277631e+07 -2.03048234e+08 -2.03821430e+08 5.69743545e+07

5.19391490e+07 5.28441813e+07 -9.31322575e-10 -8.14907253e-10

5.47885721e+07 -1.15539099e+08 2.56113708e-09 -1.01470489e+08

-1.51627793e+08 5.30932742e+07 5.35713650e+07 5.35589388e+07

5.35619263e+07 5.35858963e+07 5.43401479e+07 5.24967219e+07

5.30429509e+07 -9.84083403e+07 -1.01010288e+08 5.27978311e+07

5.32989696e+07 5.33221701e+07 -1.04773790e-09 5.48422338e+07

-5.71401089e+07 -5.83252977e+07 -6.15414852e+07 -5.64413516e+07

-5.70519496e+07 5.36115658e+07 5.33411052e+07 5.26288264e+07

1.04773790e-09 -3.04007419e+08 2.13465851e+08 2.13042555e+08

-1.08209858e+07 -1.07605038e+07 -1.07819975e+07 -4.21508065e+07

-4.15849342e+07 -4.11871559e+07 -4.25471828e+07 -9.85433095e+07

5.40268540e+07 -1.04482066e+08 5.22907226e+07 2.32830644e-10

5.33840008e+07 2.88115313e+08 2.88028185e+08 2.87816831e+08

5.82076609e-10 2.87821792e+08 2.87962377e+08 1.40608114e+08

2.88197744e+08 4.31311539e+08 4.31371689e+08 4.31377487e+08

4.31194190e+08 1.00621798e+09 9.44179383e+07 9.39349780e+07

9.40704666e+07 2.63085440e+07 9.34423541e+07 2.13484692e+08

9.50731730e+07 9.37299026e+07 8.72790431e+07 1.10221823e+08

1.09598792e+08 2.98475707e+08 3.09966005e+07 1.07460753e+08

1.10365509e+08 1.07976721e+08 -1.61172104e+08 -1.62005085e+08

-1.60969409e+08 -1.58155607e+08 -1.60713307e+08 -2.19031603e+08

0.00000000e+00 -2.20831274e+08 -8.33492867e+07 -2.20548882e+08

7.54647232e+08 -1.58842609e+08 -1.60880772e+08 0.00000000e+00

-1.61595249e+08 -1.61446675e+08 -1.60844856e+08 -3.56191672e+08

-5.03072453e+07 -3.08462387e+08 -3.01828999e+08 0.00000000e+00

0.00000000e+00 -2.84265538e+08 -1.15539609e+08 -2.82807038e+08

0.00000000e+00 -1.01470489e+08 -1.51631038e+08 -3.53484718e+08

-1.60232036e+08 -1.60552352e+08 -1.61238505e+08 -1.61017352e+08

-1.61310145e+08 -3.22688158e+08 -3.20270139e+08 -2.55313416e+08

-9.84347897e+07 0.00000000e+00 -1.01009692e+08 -2.55398140e+08

-4.82027261e+08 -5.83236193e+07 -5.83311330e+07 -6.15394783e+07

-5.52556067e+07 -5.70407226e+07 -1.67653676e+08 -1.69787064e+08

-1.68051886e+08 0.00000000e+00 -3.04007419e+08 2.13042555e+08

2.13465851e+08 2.87432582e+08 2.87690936e+08 4.31121344e+08

1.37086988e+08 1.36749981e+08 1.35985289e+08 1.37650878e+08

3.77336556e+08 -3.22306013e+08 3.77208772e+08 3.77214731e+08

-3.20939167e+08 -2.51219389e+08 -9.85398971e+07 -1.04476572e+08

-2.54513743e+08 0.00000000e+00 0.00000000e+00 -4.82812505e+08]

Ridge-Regression Model Coefficients:

[ -4.80275763e+05 -9.33080927e+00 2.59675698e+02 -3.66693324e+02

1.35213534e+06 1.35873530e+06 -1.36203925e+06 4.40472618e+01

5.97660510e-01 2.34730868e+02 3.05228055e+05 2.38960194e-03

-1.26908506e+01 -1.25049129e+02 6.33692582e+01 6.40854146e+01

-4.59380751e+01 3.64474855e+01 7.51842987e+01 1.53118191e+02

-2.41769789e+02 2.83101825e+05 -6.92857288e+05 2.30929417e+05

1.11806665e+05 3.27584441e+05 1.32367562e+05 -2.27445953e+05

-1.32236012e+06 -1.43749367e+05 -1.16206468e+06 2.46371078e+05

-1.12616330e+06 -3.23293867e+05 0.00000000e+00 -1.09846896e+05

-1.28372259e+06 -2.13386367e+05 -2.35206854e+05 1.95124891e+05

-1.78881471e+05 2.07262387e+05 1.15530553e+05 -1.05447547e+06

2.32588040e+06 -3.29785498e+05 2.44538902e+05 -6.92193926e+05

-4.40703648e+05 -5.28482171e+04 -2.68583889e+05 7.80852012e+05

-1.21212743e+06 1.53997398e+05 5.44383219e+05 1.66945227e+06

2.98578061e+06 -4.03769964e+05 -3.49623424e+05 1.43734458e+06

-9.22401508e+04 2.16903699e+05 1.34383407e+05 -2.24254359e+06

-4.64613459e+05 2.63212680e+05 -1.14141186e+06 -1.35513235e+06

-3.18224211e+05 -4.82020815e+05 -3.52745937e+05 4.09007412e+05

3.54411265e+06 2.08147669e+06 0.00000000e+00 -2.57301810e+05

1.39990569e+05 -4.46996298e+05 -1.58975142e+06 5.71220726e+04

2.95375757e+05 5.36638930e+04 3.16257606e+05 2.60680135e+06

3.91372529e+06 -1.27978949e+05 -4.54517127e+05 -3.02897218e+04

-4.74324670e+05 2.49643370e+06 -4.24862352e+05 -6.54158041e+04

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3.66130777e+05 3.00550263e+05 -2.46044536e+04 1.16363132e+05

1.34343682e+05 -4.99171373e+04 6.65649411e+05 2.98258304e+05

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-1.15549227e+06 2.70330169e+05 -5.72002491e+04 4.18276215e+05

-3.56220586e+05 -1.08013044e+06 -9.04960033e+05 2.27856889e+05

3.15616586e+05 6.44634884e+05 3.33534469e+05 -2.45546956e+05

5.23043628e+05 -1.14036152e+06 -1.30194047e+06 -4.96297602e+05

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6.88073617e+05 -3.22840975e+05 -2.83370364e+05 1.32485649e+05

8.32236017e+05 2.25094515e+05 -3.73205985e+05 5.62293965e+04

1.78245416e+05 -1.37652040e+06 1.19677577e+05 2.56022584e+05

4.17325813e+06 6.31965787e+05 6.81895918e+05 -1.52746606e+04

-3.86671237e+05 2.69049279e+04 -1.19755369e+06 -1.32854785e+06

-1.12281219e+06 -1.05683459e+06 5.21294633e+05 1.29176057e+05

1.58275793e+05 -1.00178114e+06 -3.18857857e+04 1.84536072e+05

2.76205099e+05 7.25435192e+05 2.89212146e+05 -4.52091674e+05

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4.96202575e+05 -2.75648649e+04 -1.23479695e+06 -1.01078976e+06

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-1.08462455e+05 2.32802710e+05 2.68070679e+05 1.91850380e+05

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1.02273255e+05 1.56610451e+05 2.40373431e+05 -1.19560723e+06

-1.19779176e+05 -2.92970506e+05 -8.67328509e+04 1.17830707e+06

-1.14870689e+06 1.49520210e+05 1.28545177e+05 7.24243970e+04

-1.75170089e+05 -8.54206337e+05 7.89947136e+05 -2.26979426e+04

4.13060841e+04 9.42930230e+04 3.83406150e+05 -2.76348246e+05

-1.23184754e+06 1.62686096e+05 1.80621169e+05 7.53598715e+04

-2.16876931e+05 2.02184245e+06 1.27767100e+06 4.87857174e+05

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5.67566088e+04 1.81173652e+05 -7.59384556e+05 2.67815595e+05

4.07798407e+03 -4.35024587e+05 -1.35331899e+03 3.77430996e+05

-1.36027132e+05 2.01363710e+05 -1.53316255e+05 2.25987116e+05

1.00202941e+05 1.12684575e+05 1.47302979e+05 1.30615774e+06

-5.44825737e+05 -5.69666764e+05 -9.34739537e+05 1.57822333e+04

-6.63083886e+05 -2.63608187e+05 -4.41087702e+05 2.86300289e+05

-1.57506404e+06 -7.09939574e+05 6.79753805e+05 9.41382033e+04

8.35349593e+05 -2.42918427e+05 -1.07856467e+06 1.51824315e+06

1.71443469e+06 -2.20353787e+05 1.89998931e+04 3.33972784e+05

-4.33555673e+05 2.47157953e+05 9.13454687e+05 -5.24502701e+05

-2.02428635e+05 -5.25157370e+05 9.14760675e+04 -5.34420803e+05

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1.79353562e+06 -6.34547257e+05 -2.97136630e+05 -3.47286443e+05

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5.44283743e+05 3.65048993e+05 3.21896455e+05 2.23588665e+05

-5.44825737e+05 -2.22823349e+05 -5.25157370e+05 -1.15298057e+05

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-2.68282410e+05 1.99057250e+06 -8.46205811e+04 -5.71728141e+05

-1.70822276e+05 2.75229057e+06 -1.10489310e+06 9.38731455e+05

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-3.34890629e+05 -1.78458562e+06 -2.78691385e+05 6.77030392e+06

-1.66270191e+06 -8.79833901e+05 -1.62475007e+06 2.03581645e+06

8.25803265e+03 -3.19488906e+05 0.00000000e+00 0.00000000e+00

1.19761151e+06 -5.60371144e+05 0.00000000e+00 -1.00178114e+06

-2.40950348e+04 -2.63506274e+05 2.36093352e+05 1.46114314e+05

1.21772399e+05 2.04283559e+05 5.13190870e+05 -6.82480784e+05

-3.44068926e+05 2.03342431e+06 -4.32667873e+05 -5.89821968e+05

-1.18736857e+05 5.29923438e+04 0.00000000e+00 1.33666983e+06

4.59790006e+05 -5.86329803e+05 -3.08484336e+06 1.25677111e+06

6.49274988e+05 2.73034577e+05 -1.12786503e+05 -7.62649554e+05

0.00000000e+00 -2.20353787e+05 -6.63083886e+05 -9.34739537e+05

-2.73758615e+04 5.22018370e+04 2.91892985e+04 1.82715921e+05

7.38134811e+05 1.13981101e+06 -1.84420128e+05 1.99554131e+06

6.22152167e+05 -3.55201135e+06 -1.02174858e+06 0.00000000e+00

-4.60956307e+04 4.49621719e+04 -3.47125267e+04 -2.59294227e+05

0.00000000e+00 -2.47262390e+05 -8.55170203e+04 1.79353562e+06

1.24320809e+05 4.68910353e+04 1.03083033e+05 1.16614445e+05

-6.77906134e+04 7.26708613e+04 2.59310531e+05 -2.18790953e+05

-8.02944628e+04 3.21896455e+05 -6.71529036e+05 -5.44825737e+05

8.99952729e+05 -3.63242285e+05 -5.25157370e+05 1.70794157e+06

1.16009960e+06 -4.45093936e+04 -1.94408064e+06 -9.19142001e+05

1.81747997e+06 -5.16140763e+05 -3.31727527e+05 -1.14482422e+06

-1.20265912e+05 2.35601046e+06 7.61567928e+04 1.20608836e+06

0.00000000e+00 -4.60932633e+05 1.46986180e+05 -2.12388098e+05

1.12684575e+05 1.62347570e+06 -7.41202864e+04 0.00000000e+00

-7.95757465e+05 -6.20376185e+05 -3.90835566e+04 -1.57506404e+06

-9.29519930e+05 -2.43219886e+06 2.65177921e+06 0.00000000e+00

0.00000000e+00 -8.84733058e+05 -5.60371144e+05 3.66539534e+05

0.00000000e+00 -1.00178114e+06 -2.40950348e+04 2.74031087e+06

5.01914218e+05 2.01271217e+05 -4.40307132e+05 -2.06294364e+05

-4.97671641e+05 -6.92395911e+05 9.78696200e+05 -7.85502177e+05

2.03342431e+06 0.00000000e+00 -4.32667873e+05 -7.96254364e+05

3.33972784e+05 -5.08448892e+05 -5.86329803e+05 -3.08484336e+06

2.22501001e+06 6.49274988e+05 1.10107426e+06 -8.65961195e+05

8.06615811e+05 0.00000000e+00 -2.20353787e+05 -9.34739537e+05

-6.63083886e+05 -5.95595304e+05 -3.64359461e+05 -1.33461322e+05

2.26448057e+05 -1.03512103e+05 -8.80297557e+05 7.73143836e+05

1.17008732e+05 -7.59710974e+05 -1.46716441e+04 -2.13414740e+03

5.16792547e+05 3.05378667e+06 1.99554131e+06 -3.55201135e+06

2.09265162e+04 0.00000000e+00 0.00000000e+00 -4.33555673e+05]

Lasso-Regression Model Coefficients:

[ -2.52973516e+05 -1.87159158e+01 1.95712553e+02 -1.90065556e+02

-7.05533536e+03 -2.18333847e+03 -1.53686514e+03 4.27918686e+01

-4.06139132e-01 2.27985825e+02 1.57652028e+05 2.39681463e-03

-2.72525150e+00 -1.24651322e+02 6.30739395e+01 5.84859932e+01

-4.11832361e+01 3.47792656e+01 6.28268330e+01 1.52343789e+02

-2.63590634e+02 0.00000000e+00 0.00000000e+00 0.00000000e+00

-2.82671489e+04 1.97167349e+05 6.75899979e+03 -5.74409981e+04

-7.44698360e+05 0.00000000e+00 -6.50710588e+05 7.39234099e+04

-6.04265131e+05 -2.14023268e+05 0.00000000e+00 -3.06673045e+04

-7.99537944e+05 -6.46378793e+04 -2.24769018e+04 2.67110659e+05

-3.25242519e+04 5.07099822e+04 2.42635204e+05 -5.38026449e+05

2.39099623e+06 -1.66044375e+05 0.00000000e+00 -5.16208069e+05

-3.16468324e+05 -0.00000000e+00 -9.33386306e+04 8.51843078e+05

-6.94370766e+05 -0.00000000e+00 1.06770824e+06 2.34798175e+06

3.56471045e+06 3.69489864e+05 -2.11301055e+05 1.51019593e+06

-0.00000000e+00 7.68352566e+04 -0.00000000e+00 -2.28625552e+06

-2.30904466e+05 1.14037652e+05 -5.95984495e+05 -8.30114668e+05

-2.13092372e+05 -3.42731806e+05 -2.90301195e+05 0.00000000e+00

3.48643076e+06 2.06117938e+06 0.00000000e+00 -9.82203339e+04

-1.48774210e+04 -3.15616864e+05 -1.00036017e+06 7.95134265e+05

1.47216826e+05 -2.13171646e+04 2.38749685e+05 3.25402272e+06

4.46134645e+06 8.91416128e+03 -3.20365692e+05 7.75976966e+04

-3.26621676e+05 2.96546842e+06 -2.37430568e+05 -0.00000000e+00

2.63594611e+05 -0.00000000e+00 -4.96019153e+05 4.59186783e+05

4.47819989e+05 0.00000000e+00 -0.00000000e+00 2.05200306e+05

0.00000000e+00 0.00000000e+00 1.27278841e+06 2.29703239e+04

-8.01008432e+04 4.55567742e+04 0.00000000e+00 -1.04611099e+05

2.55179897e+06 3.08474179e+06 0.00000000e+00 2.18234300e+05

-3.68723651e+04 -2.30360205e+05 -2.66813970e+05 -6.67254490e+05

-6.44611849e+05 0.00000000e+00 -1.17032022e+05 0.00000000e+00

-2.08336532e+05 -5.61059277e+05 -9.57834094e+04 5.30732053e+04

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-0.00000000e+00 -1.30843170e+05 0.00000000e+00 -0.00000000e+00

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1.49292630e+06 0.00000000e+00 -1.93726472e+05 -1.02103410e+05

3.09230055e+04 -8.72637882e+05 -0.00000000e+00 0.00000000e+00

4.84462067e+06 1.25330791e+06 1.21256974e+06 1.18707882e+05

-1.34805472e+05 2.28567194e+05 -6.99609762e+05 -8.32084315e+05

-6.47633041e+05 -5.27928399e+05 1.22143664e+06 6.47481666e+04

-0.00000000e+00 -6.65000309e+05 -0.00000000e+00 0.00000000e+00

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3.96106988e+06 -2.47672489e+05 -3.62006547e+03 -1.48991373e+04

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5.97756020e+05 -5.83877392e+06 -1.42138811e+05 0.00000000e+00

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1.63000403e+04 -7.52077625e+05 -0.00000000e+00 -0.00000000e+00

0.00000000e+00 3.55106583e+06 5.15291058e+04 -4.84994213e+03

0.00000000e+00 0.00000000e+00 0.00000000e+00 -2.52346503e+04]

Random Forest-Model estimators:

[DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1106026783, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1450320500, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

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max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

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min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=74067342, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=80115917, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

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min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1700585817, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=2061033840, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1375790332, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

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min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=382266742, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

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min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1470011698, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=969353358, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=2025561715, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=370265412, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

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min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=726436093, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=716644271, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

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max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

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max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

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max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

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max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

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max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1095257522, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

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min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1587429547, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=630787136, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=742945993, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1141906432, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1060570581, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1352556903, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

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min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=2024467656, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1312012422, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=106255929, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

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min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1498880311, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

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min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1181209167, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=125921567, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1916934476, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=830978602, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=336273047, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1329698102, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=2112654263, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1002340526, splitter='best'), DecisionTreeRegressor(criterion='mse', max\_depth=None, max\_features='auto',

max\_leaf\_nodes=None, min\_impurity\_split=1e-07,

min\_samples\_leaf=1, min\_samples\_split=2,

min\_weight\_fraction\_leaf=0.0, presort=False,

random\_state=1251628904, splitter='best')]

Random Forest-Model Feature-Importances:

[ 8.13217203e-02 6.24675235e-02 2.38490506e-02 1.57832199e-01

1.88345967e-02 1.02681124e-02 1.66891485e-02 3.40255195e-02

2.82705362e-01 3.65432146e-02 2.24453167e-03 7.11691665e-02

3.72233492e-03 5.32792027e-03 6.40691070e-03 9.80197434e-03

1.09116101e-02 8.11553212e-03 5.71248537e-03 7.64509826e-03

8.78438123e-03 2.12146404e-07 5.65271594e-04 8.35457972e-08

5.73730709e-07 1.80653578e-06 5.49647769e-05 1.24822896e-05

1.75183751e-05 2.56508709e-04 2.17154775e-06 2.41799690e-06

1.11339100e-04 3.35048964e-04 0.00000000e+00 2.74057871e-06

1.23829144e-04 5.38076717e-04 1.08627919e-06 1.63275535e-04

3.90027790e-04 1.23343878e-06 2.22410694e-04 8.87486875e-05

1.94987009e-03 1.58019577e-04 4.72829946e-08 3.51363362e-06

1.47402864e-04 1.73306629e-07 2.18792849e-05 3.45381304e-04

9.16339035e-07 1.18766810e-08 1.03681946e-04 1.11792721e-04

2.09841736e-05 2.98819434e-04 2.69591316e-04 1.17802897e-03

2.72131495e-05 4.16947203e-05 4.36624100e-07 9.06600489e-09

1.12882111e-05 2.69286440e-04 1.27445672e-06 2.54873776e-06

8.60749752e-04 6.46577849e-06 2.02607613e-05 2.39532891e-06

9.81164797e-05 1.58592356e-05 0.00000000e+00 2.33118954e-05

7.23719129e-06 1.07465431e-04 6.89800935e-05 3.18924415e-04

1.77928719e-04 3.84928968e-07 1.91279736e-05 2.39577754e-05

3.79012512e-05 1.37168466e-03 3.41307299e-05 1.09535065e-03

7.27717974e-05 1.14026949e-04 4.40171845e-06 4.22491305e-08

4.23632112e-04 1.84556045e-05 6.52419957e-05 1.83512264e-03

1.52175841e-03 3.17160812e-08 1.13091897e-07 1.47470083e-04

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3.49538457e-05 1.06408715e-06 0.00000000e+00 2.60067710e-04

8.91844851e-05 1.82119108e-03 1.56662788e-07 7.39106174e-07

1.76445481e-03 5.06026171e-04 9.83751396e-05 1.22052918e-04

4.30106412e-05 1.73087642e-08 3.08611061e-06 1.61683491e-07

2.30794910e-07 1.37409394e-04 9.00713928e-05 4.65071838e-05

9.00359586e-06 2.89044214e-09 1.18730936e-05 1.00276257e-04

7.32710596e-05 6.65530893e-05 5.88081250e-05 7.53627435e-05

8.62039891e-08 1.28654771e-04 0.00000000e+00 5.51831656e-09

8.65591998e-04 1.37805366e-04 4.12146483e-05 7.94039974e-05

2.59585669e-04 3.81292099e-08 7.20208193e-07 8.37178032e-07

4.94011124e-05 7.10533778e-06 4.76234966e-05 2.60879903e-07

3.35476775e-04 2.06896407e-04 1.39062492e-03 1.04885018e-04

2.24156255e-06 5.84105225e-05 1.32531113e-06 1.30718323e-04

1.11426028e-04 3.08938649e-05 2.25137529e-04 1.67232454e-04

1.42723597e-06 4.52466552e-05 1.52142178e-06 3.78235396e-08

2.33144426e-06 1.65408813e-07 2.82455710e-08 2.37855105e-05

1.16330412e-03 4.63095511e-04 1.79608853e-06 6.16477409e-06

2.34461052e-03 5.73633140e-04 2.23960837e-06 4.19486212e-08

1.73770180e-07 1.54585767e-07 9.71384547e-08 7.09814116e-07

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7.45334291e-05 1.15234237e-05 6.44987154e-06 1.41942939e-07

5.47029059e-05 3.25536784e-05 5.17244027e-05 1.80028934e-07

1.25524554e-07 1.14037377e-07 1.07396650e-06 7.18558893e-06

5.63246410e-10 6.98505037e-05 1.14272754e-07 3.12546800e-04

3.38991401e-04 6.46886436e-07 9.58253165e-06 1.47282944e-06

4.87862033e-05 7.01884460e-07 4.36567989e-04 2.24341433e-06

4.31092289e-06 5.01817437e-08 3.13365154e-05 4.29519614e-04

2.50761861e-06 4.47303001e-07 1.86753012e-08 6.45637709e-07

1.21755462e-05 9.15585038e-03 6.51057518e-03 1.41995865e-04

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9.22381798e-05 5.54721261e-04 5.61835966e-08 1.82805845e-06

4.97843193e-07 3.29716451e-05 1.85165989e-04 6.52530658e-05

1.97341152e-03 5.17016047e-03 4.67537097e-04 7.99387476e-05

1.80818393e-04 3.31724611e-06 1.44514178e-05 3.65784895e-08

1.49012746e-04 2.04440883e-05 3.05965692e-04 8.59400157e-04

2.86776839e-04 4.39781013e-04 5.43510832e-04 3.62335248e-04

3.64426559e-05 4.66471684e-06 1.67944699e-03 2.10563321e-02

6.45008578e-07 2.58433566e-03 1.93133710e-05 3.90550173e-04

2.39253234e-06 8.65389031e-04 2.91343390e-03 1.33015910e-04

6.73994549e-05 1.01204275e-04 2.83797657e-04 2.05070152e-04

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2.87937921e-04 2.80791356e-05 5.10727793e-05 4.26179147e-05

2.88922954e-05 9.56086766e-04 6.39716603e-04 6.58976144e-04

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4.14657503e-07 1.52134422e-03 1.87508337e-03 1.44455173e-04

6.37183604e-09 1.36003446e-04 2.93599177e-04 5.04263068e-05

3.15462547e-04 2.63589035e-04 3.29731836e-04 1.37617270e-03

8.44822155e-05 1.98073243e-04 1.19301184e-03 1.33955958e-04

1.49243033e-05 3.64121163e-04 2.30096134e-07 4.45216093e-04

4.55434241e-04 6.50764706e-04 3.01536522e-05 5.24856382e-05

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4.05342769e-06 7.72942336e-05 6.64982745e-05 1.07676153e-03

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5.85245900e-07 7.83396804e-05 0.00000000e+00 0.00000000e+00

1.92059471e-05 6.07328097e-06 0.00000000e+00 6.92550963e-05

6.95427765e-05 4.83291997e-04 1.16659905e-03 6.83637142e-04

4.38281848e-06 5.79957458e-04 3.43194450e-05 2.66589300e-05

4.85765051e-06 2.31808918e-05 2.74529348e-07 2.90276197e-06

1.53248927e-08 3.24899136e-06 0.00000000e+00 2.70154144e-05

1.36373637e-07 7.11773302e-09 8.37984495e-09 2.49147660e-04

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0.00000000e+00 2.60931837e-05 4.99835955e-06 8.78554155e-07

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1.22491291e-04 4.39189401e-04 1.32781968e-03 3.23382997e-04

2.09983936e-04 1.36034992e-03 1.16463456e-04 2.77808804e-06

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4.99708829e-04 1.80572896e-03 1.81405701e-06 7.76738205e-05

3.98499261e-05 1.21950807e-04 2.27614715e-04 2.86478865e-05

1.71866057e-08 1.28987389e-05 4.46731037e-04 6.11765710e-05

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5.64604524e-06 1.71995779e-05 5.58987740e-05 1.33783034e-06

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0.00000000e+00 7.30728353e-05 2.05734588e-05 1.32641237e-07

0.00000000e+00 5.02530498e-05 1.75691278e-05 2.05821203e-04

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6.86762483e-05 4.27120513e-08 6.72210224e-04 5.53791146e-06

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4.09799499e-06 2.47525019e-07 2.53309928e-04 2.18117039e-04

9.41506352e-05 2.65090763e-04 2.11213600e-04 3.02860635e-04

1.84987258e-05 8.55634481e-05 2.13412519e-07 1.08126436e-06

8.56913256e-06 9.70915156e-05 5.18146784e-05 9.01141682e-07

1.96146070e-06 0.00000000e+00 0.00000000e+00 2.58482982e-05]

Gradient Boost-Model estimators:

[[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

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[ DecisionTreeRegressor(criterion='friedman\_mse', max\_depth=3,

max\_features=None, max\_leaf\_nodes=None,

min\_impurity\_split=1e-07, min\_samples\_leaf=1,

min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

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presort='auto',

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min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

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random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

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min\_impurity\_split=1e-07, min\_samples\_leaf=1,

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random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]

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min\_samples\_split=2, min\_weight\_fraction\_leaf=0.0,

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random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

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presort='auto',

random\_state=<mtrand.RandomState object at 0x7f5d9009c870>,

splitter='best')]]

Gradient Boost-Model Feature-Importances:

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3.10262410e-02 4.68275694e-02 9.92016391e-03 3.52268698e-02

1.20004471e-01 2.29374698e-02 1.04012603e-03 7.80455050e-02

8.71203738e-04 1.14832194e-02 1.45329981e-02 3.24674687e-03

9.94531235e-03 1.70955649e-02 3.14478657e-03 1.41852266e-02

2.71082587e-03 0.00000000e+00 3.52874900e-03 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 5.67192956e-03

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5.56012198e-03 2.40978173e-03 0.00000000e+00 0.00000000e+00

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