

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

```
In [2]: df=pd.read_csv(r"C:\Users\Seth-Ese Joey\Downloads\realtor-data.csv (1)\realtor-data.csv")
df.head()
```

```
Out[2]:
```

	status	price	bed	bath	acre_lot	full_address	street	city	state	zip_code	house_size	sold_date
0	for_sale	105000.0	3.0	2.0	0.12	Sector Yahuecas Título # V84, Adjuntas, PR, 00601	Sector Yahuecas Título # V84	Adjuntas	Puerto Rico	601.0	920.0	NaN
1	for_sale	80000.0	4.0	2.0	0.08	Km 78 9 Carr # 135, Adjuntas, PR, 00601	Km 78 9 Carr # 135	Adjuntas	Puerto Rico	601.0	1527.0	NaN
2	for_sale	67000.0	2.0	1.0	0.15	556G 556-G 16 St, Juana Diaz, PR, 00795	556G 556-G 16 St	Juana Diaz	Puerto Rico	795.0	748.0	NaN
3	for_sale	145000.0	4.0	2.0	0.10	R5 Comunidad El Paraso Calle De Oro R-5 Ponce,...	R5 Comunidad El Paraso Calle De Oro R-5 Ponce	Ponce	Puerto Rico	731.0	1800.0	NaN
4	for_sale	65000.0	6.0	2.0	0.05	14 Navarro, Mayaguez, PR, 00680	14 Navarro	Mayaguez	Puerto Rico	680.0	NaN	NaN

```
In [3]: df.isna().sum()
```

```
Out[3]:
```

status	0
price	0
bed	31163
bath	30291
acre_lot	52060
full_address	0
street	85
city	52
state	0
zip_code	195
house_size	29678
sold_date	127787
dtype: int64	

```
In [4]: df.shape
```

```
Out[4]: (203126, 12)
```

```
In [5]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 203126 entries, 0 to 203125
Data columns (total 12 columns):
#   Column          Non-Null Count  Dtype
---  -
0   status          203126 non-null object
1   price           203126 non-null float64
2   bed             171963 non-null float64
3   bath            172835 non-null float64
4   acre_lot        151066 non-null float64
5   full_address    203126 non-null object
6   street          203041 non-null object
7   city            203074 non-null object
8   state           203126 non-null object
9   zip_code        202931 non-null float64
10  house_size      173448 non-null float64
11  sold_date       75339 non-null object
dtypes: float64(6), object(6)
memory usage: 18.6+ MB
```

DATA CLEANING/FEATURE ENGINEERING/SELECTION

```
In [6]: #A program to fill the nan values using the mode
d=[]
for i in df.columns:
    mode=df[i].mode()
    d.append(mode)
    #putting it in a numpy array
    c=np.array(d)
new_mode=[i[0] for i in c]
#putting 'new_mode' in a dic to match the columns
dic=dict(zip(df.columns,new_mode))
for k,v in dic.items():
    df[k]=df[k].fillna(v)
```

```
In [7]: df.isna().sum()
```

```
Out[7]: status      0
price      0
bed        0
bath       0
acre_lot   0
full_address 0
street     0
city       0
state      0
zip_code   0
house_size 0
sold_date  0
dtype: int64
```

```
In [8]: #change the sold_date from object types to daate times
df['sold_date']=pd.to_datetime(df['sold_date'])
```

```
In [9]: df.head(20)
```

Out[9]:		status	price	bed	bath	acre_lot	full_address	street	city	state	zip_code	house_size	sold_date
	0	for_sale	105000.0	3.0	2.0	0.12	Sector Yahuecas Titulo # V84, Adjuntas, PR, 00601	Sector Yahuecas Titulo # V84	Adjuntas	Puerto Rico	601.0	920.0	2004-06-30
	1	for_sale	80000.0	4.0	2.0	0.08	Km 78 9 Carr # 135, Adjuntas, PR, 00601	Km 78 9 Carr # 135	Adjuntas	Puerto Rico	601.0	1527.0	2004-06-30
	2	for_sale	67000.0	2.0	1.0	0.15	556G 556-G 16 St, Juana Diaz, PR, 00795	556G 556-G 16 St	Juana Diaz	Puerto Rico	795.0	748.0	2004-06-30
	3	for_sale	145000.0	4.0	2.0	0.10	R5 Comunidad El Paraso Calle De Oro R-5 Ponce,...	R5 Comunidad El Paraso Calle De Oro R-5 Ponce	Ponce	Puerto Rico	731.0	1800.0	2004-06-30
	4	for_sale	65000.0	6.0	2.0	0.05	14 Navarro, Mayaguez, PR, 00680	14 Navarro	Mayaguez	Puerto Rico	680.0	1200.0	2004-06-30
	5	for_sale	179000.0	4.0	3.0	0.46	Bo Calabazas San Sebastian, San Sebastian, PR,...	Bo Calabazas San Sebastian	San Sebastian	Puerto Rico	612.0	2520.0	2004-06-30
	6	for_sale	50000.0	3.0	1.0	0.20	49.1 140, Ciales, PR, 00639	49.1 140	Ciales	Puerto Rico	639.0	2040.0	2004-06-30
	7	for_sale	71600.0	3.0	2.0	0.08	3467 St, Ponce, PR, 00731	3467 St	Ponce	Puerto Rico	731.0	1050.0	2004-06-30
	8	for_sale	100000.0	2.0	1.0	0.09	230 Rio De Vida, Ponce, PR, 00730	230 Rio De Vida	Ponce	Puerto Rico	730.0	1092.0	2004-06-30
	9	for_sale	300000.0	5.0	3.0	7.46	Pr 120 Bo Maravilla Sur K M # 335, Las Marias,...	Pr 120 Bo Maravilla Sur K M # 335	Las Marias	Puerto Rico	670.0	5403.0	2004-06-30
	10	for_sale	89000.0	3.0	2.0	13.39	Km 3 4 Solar 457 Sr # 1, Isabela, PR, 00662	Km 3 4 Solar 457 Sr # 1	Isabela	Puerto Rico	662.0	1106.0	2004-06-30
	11	for_sale	150000.0	3.0	2.0	0.08	91 Del Rio, Juana Diaz, PR, 00795	91 Del Rio	Juana Diaz	Puerto Rico	795.0	1045.0	2004-06-30
	12	for_sale	155000.0	3.0	2.0	0.10	Pr, Lares, PR, 00669	Pr	Lares	Puerto Rico	669.0	4161.0	2004-06-30
	13	for_sale	79000.0	5.0	2.0	0.12	90 # A10, Utuado, PR, 00641	90 # A10	Utuado	Puerto Rico	641.0	1620.0	2004-06-30
	14	for_sale	649000.0	5.0	5.0	0.74	F118 Madrid St El Monte Iv Ext # Dev, Ponce, P...	F118 Madrid St El Monte Iv Ext # Dev	Ponce	Puerto Rico	731.0	2677.0	2004-06-30
	15	for_sale	120000.0	3.0	2.0	0.08	10-K Alejandrina St, Yauco, PR, 00698	10-K Alejandrina St	Yauco	Puerto Rico	698.0	1100.0	2004-06-30
	16	for_sale	235000.0	4.0	4.0	0.22	10 Calle Carrau # 3351, Mayaguez, PR, 00680	10 Calle Carrau # 3351	Mayaguez	Puerto Rico	680.0	3450.0	2004-06-30
	17	for_sale	105000.0	3.0	2.0	0.08	DD18 Calle 28, Ponce, PR, 00728	DD18 Calle 28	Ponce	Puerto Rico	728.0	1500.0	2004-06-30
	18	for_sale	575000.0	3.0	2.0	3.88	5.8 Carr 435 Km # 58, San Sebastian, PR, 00685	5.8 Carr 435 Km # 58	San Sebastian	Puerto Rico	685.0	4000.0	2004-06-30
	19	for_sale	140000.0	6.0	3.0	0.25	1 Bo Corcovada, Anasco, PR, 00610	1 Bo Corcovada	Anasco	Puerto Rico	610.0	1230.0	2004-06-30

```
In [10]: #dropping full address column
df.drop('full_address',inplace=True,axis=1)
```

```
In [11]: df.head(10)
```

Out[11]:	status	price	bed	bath	acre_lot	street	city	state	zip_code	house_size	sold_date
0	for_sale	105000.0	3.0	2.0	0.12	Sector Yahuecas Titulo # V84	Adjuntas	Puerto Rico	601.0	920.0	2004-06-30
1	for_sale	80000.0	4.0	2.0	0.08	Km 78 9 Carr # 135	Adjuntas	Puerto Rico	601.0	1527.0	2004-06-30
2	for_sale	67000.0	2.0	1.0	0.15	556G 556-G 16 St	Juana Diaz	Puerto Rico	795.0	748.0	2004-06-30
3	for_sale	145000.0	4.0	2.0	0.10	R5 Comunidad El Paraso Calle De Oro R-5 Ponce	Ponce	Puerto Rico	731.0	1800.0	2004-06-30
4	for_sale	65000.0	6.0	2.0	0.05	14 Navarro	Mayaguez	Puerto Rico	680.0	1200.0	2004-06-30
5	for_sale	179000.0	4.0	3.0	0.46	Bo Calabazas San Sebastian	San Sebastian	Puerto Rico	612.0	2520.0	2004-06-30
6	for_sale	50000.0	3.0	1.0	0.20	49.1 140	Ciales	Puerto Rico	639.0	2040.0	2004-06-30
7	for_sale	71600.0	3.0	2.0	0.08	3467 St	Ponce	Puerto Rico	731.0	1050.0	2004-06-30
8	for_sale	100000.0	2.0	1.0	0.09	230 Rio De Vida	Ponce	Puerto Rico	730.0	1092.0	2004-06-30
9	for_sale	300000.0	5.0	3.0	7.46	Pr 120 Bo Maravilla Sur K M # 335	Las Marias	Puerto Rico	670.0	5403.0	2004-06-30

```

In [12]: from sklearn.ensemble import GradientBoostingRegressor
from catboost import CatBoostRegressor
from sklearn.linear_model import LinearRegression, Lasso, Ridge, BayesianRidge, SGDRegressor, ElasticNet
from sklearn.tree import DecisionTreeRegressor
from sklearn.svm import LinearSVR
from sklearn.neighbors import KNeighborsRegressor
from sklearn.ensemble import RandomForestRegressor

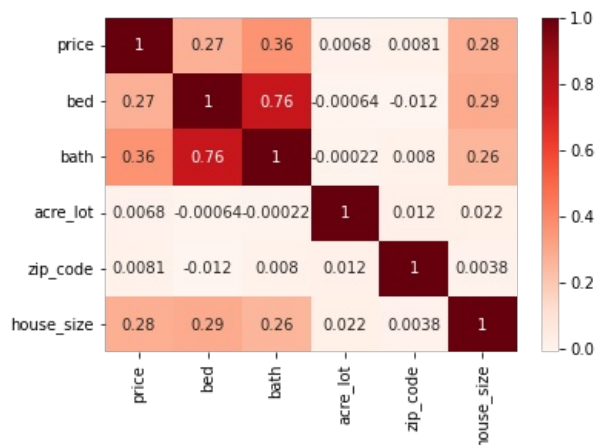
import seaborn as sns
from sklearn import preprocessing
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn import metrics
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
import matplotlib.pyplot as plt
%matplotlib inline

```

```

In [13]: #getting the correlation of the data set
cor = df.corr()
sns.heatmap(cor, annot=True, cmap='Reds')
plt.show()

```



```

In [14]: #Since price is the column for prediction,lets get the column that has absolute correlation
abs(cor['price'])

```

```

Out[14]: price      1.000000
bed        0.273567
bath       0.360476
acre_lot   0.006820
zip_code   0.008087
house_size 0.278668
Name: price, dtype: float64

```

```

In [15]: #column to work with for prediction,dropping street and sold_date
df.drop(columns=['street','sold_date'],inplace=True, axis=1)
df

```

Out[15]:		status	price	bed	bath	acre_lot	city	state	zip_code	house_size
	0	for_sale	105000.0	3.0	2.0	0.12	Adjuntas	Puerto Rico	601.0	920.0
	1	for_sale	80000.0	4.0	2.0	0.08	Adjuntas	Puerto Rico	601.0	1527.0
	2	for_sale	67000.0	2.0	1.0	0.15	Juana Diaz	Puerto Rico	795.0	748.0
	3	for_sale	145000.0	4.0	2.0	0.10	Ponce	Puerto Rico	731.0	1800.0
	4	for_sale	65000.0	6.0	2.0	0.05	Mayaguez	Puerto Rico	680.0	1200.0

	203121	for_sale	1995000.0	1.0	1.0	0.05	Nantucket	Massachusetts	2554.0	700.0
	203122	for_sale	3495000.0	6.0	5.0	1.22	Nantucket	Massachusetts	2554.0	5302.0
	203123	for_sale	2400000.0	3.0	1.0	0.08	Chatham	Massachusetts	2633.0	2328.0
	203124	for_sale	2999000.0	3.0	4.0	0.36	Chatham	Massachusetts	2633.0	2314.0
	203125	for_sale	7800000.0	4.0	4.0	0.91	Chatham	Massachusetts	2633.0	3563.0

203126 rows × 9 columns

```
In [16]: #getting the columns that are numeric
a=df.select_dtypes(include=np.number)
num_cols=a.columns.to_list()
num_cols
```

```
Out[16]: ['price', 'bed', 'bath', 'acre_lot', 'zip_code', 'house_size']
```

```
In [17]: #getting the columns that objects
b=df.select_dtypes(include=np.object)
obj_cols=b.columns.to_list()
obj_cols
```

C:\Users\Seth-Ese Joey\AppData\Local\Temp\ipykernel_9404\3811640652.py:2: DeprecationWarning: `np.object` is a deprecated alias for the builtin `object`. To silence this warning, use `object` by itself. Doing this will not modify any behavior and is safe.
Deprecated in NumPy 1.20; for more details and guidance: <https://numpy.org/devdocs/release/1.20.0-notes.html#deprecations>

```
b=df.select_dtypes(include=np.object)
Out[17]: ['status', 'city', 'state']
```

```
In [18]: df[obj_cols].head()
```

```
Out[18]:
```

	status	city	state
0	for_sale	Adjuntas	Puerto Rico
1	for_sale	Adjuntas	Puerto Rico
2	for_sale	Juana Diaz	Puerto Rico
3	for_sale	Ponce	Puerto Rico
4	for_sale	Mayaguez	Puerto Rico

```
In [19]: #Encoding the objects columns to numeric
LabelEncoder=preprocessing.LabelEncoder()
for i in b.columns:
    b[i]=LabelEncoder.fit_transform(b[i])
b.head()
```

```
Out[19]:
```

	status	city	state
0	0	4	5
1	0	4	5
2	0	301	5
3	0	482	5
4	0	358	5

```
In [20]: #concatinating both the numeric cols and the encoded columns
new_df=pd.concat([b,a],axis=1)
new_df
```

Out[20]:

	status	city	state	price	bed	bath	acre_lot	zip_code	house_size
0	0	4	5	105000.0	3.0	2.0	0.12	601.0	920.0
1	0	4	5	80000.0	4.0	2.0	0.08	601.0	1527.0
2	0	301	5	67000.0	2.0	1.0	0.15	795.0	748.0
3	0	482	5	145000.0	4.0	2.0	0.10	731.0	1800.0
4	0	358	5	65000.0	6.0	2.0	0.05	680.0	1200.0
...
203121	0	397	1	1995000.0	1.0	1.0	0.05	2554.0	700.0
203122	0	397	1	3495000.0	6.0	5.0	1.22	2554.0	5302.0
203123	0	107	1	2400000.0	3.0	1.0	0.08	2633.0	2328.0
203124	0	107	1	2999000.0	3.0	4.0	0.36	2633.0	2314.0
203125	0	107	1	7800000.0	4.0	4.0	0.91	2633.0	3563.0

203126 rows × 9 columns

BUILDING A MODEL WITH LINEAR REGRESSION

In [21]:

```
#Saving the price column in a variable called x, and dropping price column and saving in a variable y
x=new_df['price']
y=new_df.drop(['price'],axis=1)
```

In [22]:

```
#training the data
X_train,X_test,y_train,y_test=train_test_split(y,x,test_size=0.30,random_state=4)
X_train.head()
```

Out[22]:

	status	city	state	bed	bath	acre_lot	zip_code	house_size
180973	0	62	1	4.0	3.0	0.04	2119.0	1850.0
99136	0	440	1	3.0	1.0	1.32	1534.0	1092.0
170314	0	559	1	3.0	1.0	0.23	2145.0	498.0
55890	0	394	1	4.0	3.0	9.75	1258.0	4600.0
128714	0	694	1	4.0	2.0	0.26	1801.0	1800.0

In [23]:

```
y_test
```

Out[23]:

169741	700000.0
103962	1300000.0
190201	419000.0
191926	255800.0
109679	439000.0
...	...
159975	1299999.0
78346	745000.0
192036	1999000.0
155477	1575000.0
138163	499900.0

Name: price, Length: 60938, dtype: float64

In [24]:

```
X_test
```

Out[24]:

	status	city	state	bed	bath	acre_lot	zip_code	house_size
169741	0	151	1	4.0	2.0	0.20	2026.0	2336.0
103962	0	634	1	4.0	4.0	0.21	2453.0	3494.0
190201	0	494	1	3.0	1.0	0.22	2368.0	1220.0
191926	0	215	1	2.0	1.0	0.11	1702.0	880.0
109679	0	62	1	3.0	1.0	0.01	2114.0	542.0
...
159975	0	62	1	12.0	3.0	0.08	2122.0	3720.0
78346	0	35	1	3.0	4.0	0.92	1432.0	1959.0
192036	0	62	1	12.0	6.0	0.10	2135.0	5418.0
155477	0	62	1	2.0	2.0	0.11	2118.0	1643.0
138163	0	276	1	3.0	2.0	0.43	1746.0	1816.0

60938 rows × 8 columns

In [26]:

```
#Using linear regression
```

```
lin_reg=LinearRegression()
lin_reg.fit(X_train,y_train)
lin_reg
```

Out[26]: LinearRegression()

```
In [27]: Training_models = {}
def train_validate_predict(regressor, x_train, y_train, x_test, y_test, index):
    model = regressor
    model.fit(x_train, y_train)

    y_pred = model.predict(x_test)

    acur=model.score(x_train,y_train)
    r2 = r2_score(y_test, y_pred)
    # Training_models[index] = r2
    Training_models[index]=acur
```

```
In [28]: model_list = [LinearRegression, Lasso, Ridge, BayesianRidge, DecisionTreeRegressor, LinearSVR, KNeighborsRegres
    RandomForestRegressor, GradientBoostingRegressor, ElasticNet, SGDRegressor, CatBoostRegressor]
model_names = ['Linear Regression', 'Lasso', 'Ridge', 'Bayesian Ridge', 'Decision Tree Regressor', 'Linear SVR',
    'KNeighbors Regressor', 'Random Forest Regressor', 'Gradient Boosting Regressor', 'Elastic Net',
    'Cat Boost Regressor']

index = 0
for regressor in model_list:
    train_validate_predict(regressor(), X_train, y_train, X_test, y_test, model_names[index])
    index+=1
```

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\svm_base.py:1206: ConvergenceWarning: Liblinear failed to converge, increase the number of iterations.

```
warnings.warn(
Learning rate set to 0.089605
0:   learn: 1369193.9227528   total: 178ms   remaining: 2m 57s
1:   learn: 1315630.1362180   total: 189ms   remaining: 1m 34s
2:   learn: 1268015.6332194   total: 198ms   remaining: 1m 5s
3:   learn: 1222771.9734709   total: 209ms   remaining: 52s
4:   learn: 1178150.4588450   total: 218ms   remaining: 43.4s
5:   learn: 1143329.9435979   total: 228ms   remaining: 37.7s
6:   learn: 1112799.0760799   total: 238ms   remaining: 33.7s
7:   learn: 1081719.0625580   total: 247ms   remaining: 30.7s
8:   learn: 1057711.5804953   total: 257ms   remaining: 28.3s
9:   learn: 1035169.3946497   total: 266ms   remaining: 26.3s
10:  learn: 1014839.6618029   total: 275ms   remaining: 24.8s
11:  learn: 997517.2414193   total: 285ms   remaining: 23.4s
12:  learn: 979972.1650299   total: 293ms   remaining: 22.3s
13:  learn: 960449.6583061   total: 303ms   remaining: 21.3s
14:  learn: 943443.2120326   total: 312ms   remaining: 20.5s
15:  learn: 929745.6806304   total: 321ms   remaining: 19.8s
16:  learn: 914197.3367058   total: 330ms   remaining: 19.1s
17:  learn: 902415.3477014   total: 340ms   remaining: 18.5s
18:  learn: 892110.1357781   total: 349ms   remaining: 18s
19:  learn: 880204.5971371   total: 359ms   remaining: 17.6s
20:  learn: 872008.6431001   total: 369ms   remaining: 17.2s
21:  learn: 861202.4803252   total: 380ms   remaining: 16.9s
22:  learn: 851126.1000873   total: 390ms   remaining: 16.6s
23:  learn: 844987.1897341   total: 400ms   remaining: 16.2s
24:  learn: 836434.5278491   total: 409ms   remaining: 16s
25:  learn: 828575.6557684   total: 419ms   remaining: 15.7s
26:  learn: 822002.9920997   total: 429ms   remaining: 15.5s
27:  learn: 814188.3129201   total: 439ms   remaining: 15.2s
28:  learn: 807324.0449276   total: 451ms   remaining: 15.1s
29:  learn: 803130.5263630   total: 461ms   remaining: 14.9s
30:  learn: 798546.2023904   total: 471ms   remaining: 14.7s
31:  learn: 792292.8931924   total: 481ms   remaining: 14.5s
32:  learn: 787859.6296265   total: 492ms   remaining: 14.4s
33:  learn: 783835.4188869   total: 501ms   remaining: 14.2s
34:  learn: 780105.5779871   total: 511ms   remaining: 14.1s
35:  learn: 773606.4039158   total: 521ms   remaining: 14s
36:  learn: 769563.6587202   total: 532ms   remaining: 13.8s
37:  learn: 766417.9504640   total: 543ms   remaining: 13.8s
38:  learn: 760586.8489052   total: 555ms   remaining: 13.7s
39:  learn: 757829.5372101   total: 565ms   remaining: 13.6s
40:  learn: 755867.4465082   total: 577ms   remaining: 13.5s
41:  learn: 752617.1880914   total: 588ms   remaining: 13.4s
42:  learn: 749382.3988314   total: 598ms   remaining: 13.3s
43:  learn: 744562.2587503   total: 608ms   remaining: 13.2s
44:  learn: 741473.8654819   total: 617ms   remaining: 13.1s
45:  learn: 738102.7960013   total: 631ms   remaining: 13.1s
46:  learn: 733870.4625971   total: 641ms   remaining: 13s
47:  learn: 729990.6042992   total: 653ms   remaining: 12.9s
48:  learn: 725707.5980644   total: 664ms   remaining: 12.9s
49:  learn: 724112.6834489   total: 674ms   remaining: 12.8s
50:  learn: 721217.9360730   total: 684ms   remaining: 12.7s
51:  learn: 717374.1025357   total: 696ms   remaining: 12.7s
52:  learn: 713795.7575037   total: 705ms   remaining: 12.6s
53:  learn: 712271.4244565   total: 714ms   remaining: 12.5s
54:  learn: 711421.3888309   total: 725ms   remaining: 12.4s
```

55:	learn: 707887.6561507	total: 737ms	remaining: 12.4s
56:	learn: 705327.3006363	total: 747ms	remaining: 12.4s
57:	learn: 703496.6422781	total: 757ms	remaining: 12.3s
58:	learn: 702702.8308892	total: 766ms	remaining: 12.2s
59:	learn: 700983.3245323	total: 778ms	remaining: 12.2s
60:	learn: 698289.5800932	total: 788ms	remaining: 12.1s
61:	learn: 695158.2855837	total: 800ms	remaining: 12.1s
62:	learn: 692845.4488962	total: 811ms	remaining: 12.1s
63:	learn: 690837.8550082	total: 822ms	remaining: 12s
64:	learn: 688023.4894298	total: 837ms	remaining: 12s
65:	learn: 686013.6558741	total: 850ms	remaining: 12s
66:	learn: 682632.7296977	total: 864ms	remaining: 12s
67:	learn: 678659.4404721	total: 876ms	remaining: 12s
68:	learn: 676574.5731027	total: 889ms	remaining: 12s
69:	learn: 674469.8321500	total: 900ms	remaining: 12s
70:	learn: 672201.2718860	total: 910ms	remaining: 11.9s
71:	learn: 669080.8102121	total: 921ms	remaining: 11.9s
72:	learn: 666303.9121795	total: 933ms	remaining: 11.8s
73:	learn: 664514.9704102	total: 946ms	remaining: 11.8s
74:	learn: 662984.1724969	total: 958ms	remaining: 11.8s
75:	learn: 661641.3511218	total: 968ms	remaining: 11.8s
76:	learn: 659487.1624113	total: 978ms	remaining: 11.7s
77:	learn: 659219.9242891	total: 987ms	remaining: 11.7s
78:	learn: 657560.0137925	total: 996ms	remaining: 11.6s
79:	learn: 655705.3771697	total: 1.01s	remaining: 11.6s
80:	learn: 653909.3161101	total: 1.01s	remaining: 11.5s
81:	learn: 652472.7038953	total: 1.03s	remaining: 11.5s
82:	learn: 651168.3420057	total: 1.04s	remaining: 11.5s
83:	learn: 649951.8321128	total: 1.05s	remaining: 11.4s
84:	learn: 646827.9449655	total: 1.06s	remaining: 11.4s
85:	learn: 645147.8376193	total: 1.07s	remaining: 11.4s
86:	learn: 643186.7985635	total: 1.08s	remaining: 11.3s
87:	learn: 641370.4401767	total: 1.09s	remaining: 11.3s
88:	learn: 640601.7139965	total: 1.1s	remaining: 11.3s
89:	learn: 637534.3370594	total: 1.11s	remaining: 11.2s
90:	learn: 636562.2649650	total: 1.12s	remaining: 11.2s
91:	learn: 634486.7692284	total: 1.13s	remaining: 11.2s
92:	learn: 633054.5037644	total: 1.14s	remaining: 11.2s
93:	learn: 631918.3274185	total: 1.16s	remaining: 11.1s
94:	learn: 629790.8294664	total: 1.17s	remaining: 11.1s
95:	learn: 627762.3798992	total: 1.18s	remaining: 11.1s
96:	learn: 627140.7615101	total: 1.19s	remaining: 11.1s
97:	learn: 625859.4763747	total: 1.2s	remaining: 11s
98:	learn: 624474.6796243	total: 1.21s	remaining: 11s
99:	learn: 623660.7736395	total: 1.22s	remaining: 10.9s
100:	learn: 622362.9132411	total: 1.23s	remaining: 10.9s
101:	learn: 621495.6529202	total: 1.24s	remaining: 10.9s
102:	learn: 619927.1891485	total: 1.25s	remaining: 10.9s
103:	learn: 619555.1527585	total: 1.26s	remaining: 10.8s
104:	learn: 617823.4545786	total: 1.27s	remaining: 10.8s
105:	learn: 615407.3933210	total: 1.28s	remaining: 10.8s
106:	learn: 614044.5809130	total: 1.29s	remaining: 10.7s
107:	learn: 611848.2612789	total: 1.3s	remaining: 10.7s
108:	learn: 610740.9976679	total: 1.31s	remaining: 10.7s
109:	learn: 608669.5429962	total: 1.32s	remaining: 10.7s
110:	learn: 607361.1367883	total: 1.33s	remaining: 10.7s
111:	learn: 606405.7641468	total: 1.34s	remaining: 10.6s
112:	learn: 605604.8717940	total: 1.35s	remaining: 10.6s
113:	learn: 603964.7528163	total: 1.36s	remaining: 10.6s
114:	learn: 602446.1724273	total: 1.37s	remaining: 10.6s
115:	learn: 601453.4273947	total: 1.38s	remaining: 10.5s
116:	learn: 600555.3973739	total: 1.39s	remaining: 10.5s
117:	learn: 599869.1477970	total: 1.4s	remaining: 10.5s
118:	learn: 597876.8997689	total: 1.41s	remaining: 10.5s
119:	learn: 597049.2665391	total: 1.42s	remaining: 10.4s
120:	learn: 595768.6659120	total: 1.43s	remaining: 10.4s
121:	learn: 594067.4782022	total: 1.45s	remaining: 10.4s
122:	learn: 592355.9225832	total: 1.46s	remaining: 10.4s
123:	learn: 591385.7044541	total: 1.46s	remaining: 10.3s
124:	learn: 590230.1767650	total: 1.48s	remaining: 10.3s
125:	learn: 588817.8976720	total: 1.48s	remaining: 10.3s
126:	learn: 587915.7136812	total: 1.49s	remaining: 10.3s
127:	learn: 587580.6248047	total: 1.5s	remaining: 10.2s
128:	learn: 586135.4844792	total: 1.51s	remaining: 10.2s
129:	learn: 584989.4204610	total: 1.52s	remaining: 10.2s
130:	learn: 583666.4562917	total: 1.53s	remaining: 10.2s
131:	learn: 582869.1719946	total: 1.54s	remaining: 10.2s
132:	learn: 581207.6255864	total: 1.55s	remaining: 10.1s
133:	learn: 579614.1307024	total: 1.56s	remaining: 10.1s
134:	learn: 578983.4925982	total: 1.57s	remaining: 10.1s
135:	learn: 578606.4921737	total: 1.58s	remaining: 10.1s
136:	learn: 576919.5463674	total: 1.59s	remaining: 10.1s
137:	learn: 576030.6212518	total: 1.6s	remaining: 10s
138:	learn: 575003.1822108	total: 1.61s	remaining: 10s
139:	learn: 573996.5883676	total: 1.62s	remaining: 9.97s
140:	learn: 573279.7447129	total: 1.63s	remaining: 9.96s
141:	learn: 571988.9145937	total: 1.65s	remaining: 9.94s
142:	learn: 570818.7840126	total: 1.66s	remaining: 9.92s
143:	learn: 570216.0483655	total: 1.66s	remaining: 9.89s

144:	learn:	568836.3549394	total:	1.67s	remaining:	9.87s
145:	learn:	567812.3277724	total:	1.68s	remaining:	9.85s
146:	learn:	565413.6420891	total:	1.69s	remaining:	9.83s
147:	learn:	564659.9556845	total:	1.7s	remaining:	9.8s
148:	learn:	564026.0650442	total:	1.71s	remaining:	9.78s
149:	learn:	563153.9498930	total:	1.72s	remaining:	9.77s
150:	learn:	561999.6591627	total:	1.73s	remaining:	9.75s
151:	learn:	560806.0700389	total:	1.74s	remaining:	9.73s
152:	learn:	558616.1106641	total:	1.75s	remaining:	9.71s
153:	learn:	557365.3844345	total:	1.76s	remaining:	9.7s
154:	learn:	556208.3413885	total:	1.77s	remaining:	9.68s
155:	learn:	555425.2858489	total:	1.78s	remaining:	9.66s
156:	learn:	554729.1339827	total:	1.8s	remaining:	9.64s
157:	learn:	553793.7973709	total:	1.81s	remaining:	9.63s
158:	learn:	553168.7598192	total:	1.82s	remaining:	9.61s
159:	learn:	551583.5807120	total:	1.83s	remaining:	9.6s
160:	learn:	550633.6597154	total:	1.84s	remaining:	9.59s
161:	learn:	549498.2658127	total:	1.85s	remaining:	9.57s
162:	learn:	547804.2728220	total:	1.86s	remaining:	9.55s
163:	learn:	547137.3810423	total:	1.87s	remaining:	9.53s
164:	learn:	546485.1846712	total:	1.88s	remaining:	9.51s
165:	learn:	545146.6026879	total:	1.89s	remaining:	9.49s
166:	learn:	544679.9233671	total:	1.9s	remaining:	9.47s
167:	learn:	544092.9360726	total:	1.91s	remaining:	9.45s
168:	learn:	543277.1086070	total:	1.92s	remaining:	9.43s
169:	learn:	542796.9814338	total:	1.93s	remaining:	9.42s
170:	learn:	542303.6472415	total:	1.94s	remaining:	9.4s
171:	learn:	541266.2795326	total:	1.95s	remaining:	9.38s
172:	learn:	540413.7960693	total:	1.96s	remaining:	9.36s
173:	learn:	538971.6973157	total:	1.97s	remaining:	9.35s
174:	learn:	537447.2957354	total:	1.98s	remaining:	9.33s
175:	learn:	536748.1322525	total:	1.99s	remaining:	9.31s
176:	learn:	535735.4667786	total:	2s	remaining:	9.29s
177:	learn:	535021.8621315	total:	2.01s	remaining:	9.28s
178:	learn:	534173.7784340	total:	2.02s	remaining:	9.26s
179:	learn:	533676.3922130	total:	2.03s	remaining:	9.24s
180:	learn:	532232.3754888	total:	2.04s	remaining:	9.22s
181:	learn:	531819.5652445	total:	2.05s	remaining:	9.2s
182:	learn:	531130.5744639	total:	2.06s	remaining:	9.18s
183:	learn:	530671.0678019	total:	2.07s	remaining:	9.17s
184:	learn:	529589.5762885	total:	2.08s	remaining:	9.16s
185:	learn:	529074.3820423	total:	2.09s	remaining:	9.14s
186:	learn:	528588.1041086	total:	2.1s	remaining:	9.12s
187:	learn:	527279.2524909	total:	2.11s	remaining:	9.11s
188:	learn:	526958.7449361	total:	2.12s	remaining:	9.09s
189:	learn:	526179.4900923	total:	2.13s	remaining:	9.08s
190:	learn:	525528.1126015	total:	2.14s	remaining:	9.06s
191:	learn:	525054.0038292	total:	2.15s	remaining:	9.04s
192:	learn:	523871.5967874	total:	2.16s	remaining:	9.03s
193:	learn:	522925.7958097	total:	2.17s	remaining:	9.01s
194:	learn:	522339.8630059	total:	2.18s	remaining:	9s
195:	learn:	521370.0391179	total:	2.19s	remaining:	8.98s
196:	learn:	519548.5655376	total:	2.2s	remaining:	8.97s
197:	learn:	519019.4487829	total:	2.21s	remaining:	8.95s
198:	learn:	518109.5199590	total:	2.22s	remaining:	8.94s
199:	learn:	517235.7443967	total:	2.23s	remaining:	8.92s
200:	learn:	516458.5748078	total:	2.24s	remaining:	8.91s
201:	learn:	515707.4043157	total:	2.25s	remaining:	8.89s
202:	learn:	515063.6795226	total:	2.26s	remaining:	8.88s
203:	learn:	514346.1872540	total:	2.27s	remaining:	8.86s
204:	learn:	513530.5532069	total:	2.28s	remaining:	8.85s
205:	learn:	512567.7215454	total:	2.29s	remaining:	8.84s
206:	learn:	511874.5655051	total:	2.3s	remaining:	8.82s
207:	learn:	510363.7493895	total:	2.31s	remaining:	8.81s
208:	learn:	510131.6643303	total:	2.32s	remaining:	8.79s
209:	learn:	509421.4814056	total:	2.33s	remaining:	8.77s
210:	learn:	508851.7885054	total:	2.34s	remaining:	8.76s
211:	learn:	508362.7481968	total:	2.35s	remaining:	8.74s
212:	learn:	507780.0036883	total:	2.36s	remaining:	8.72s
213:	learn:	506463.0365333	total:	2.37s	remaining:	8.71s
214:	learn:	505967.6305143	total:	2.38s	remaining:	8.7s
215:	learn:	505225.5751046	total:	2.39s	remaining:	8.68s
216:	learn:	504281.2262792	total:	2.4s	remaining:	8.67s
217:	learn:	502839.6847351	total:	2.41s	remaining:	8.66s
218:	learn:	502368.7642738	total:	2.42s	remaining:	8.64s
219:	learn:	501879.1573297	total:	2.44s	remaining:	8.63s
220:	learn:	501560.8681669	total:	2.45s	remaining:	8.62s
221:	learn:	501162.3256832	total:	2.46s	remaining:	8.61s
222:	learn:	500677.9554855	total:	2.47s	remaining:	8.59s
223:	learn:	500243.3265303	total:	2.48s	remaining:	8.58s
224:	learn:	499531.8011277	total:	2.49s	remaining:	8.57s
225:	learn:	499111.1812578	total:	2.5s	remaining:	8.56s
226:	learn:	498628.7489411	total:	2.51s	remaining:	8.55s
227:	learn:	498078.1113029	total:	2.52s	remaining:	8.53s
228:	learn:	496931.7041277	total:	2.53s	remaining:	8.53s
229:	learn:	496693.2513783	total:	2.54s	remaining:	8.51s
230:	learn:	496436.4061213	total:	2.55s	remaining:	8.5s
231:	learn:	495804.7002107	total:	2.56s	remaining:	8.49s
232:	learn:	495014.3439975	total:	2.58s	remaining:	8.48s

233:	learn:	494481.0495218	total:	2.58s	remaining:	8.46s
234:	learn:	494014.4026130	total:	2.6s	remaining:	8.45s
235:	learn:	493420.0479470	total:	2.61s	remaining:	8.45s
236:	learn:	493102.8066664	total:	2.62s	remaining:	8.43s
237:	learn:	492780.5750230	total:	2.63s	remaining:	8.42s
238:	learn:	492326.2753397	total:	2.64s	remaining:	8.41s
239:	learn:	491781.2303374	total:	2.65s	remaining:	8.4s
240:	learn:	491563.0474791	total:	2.66s	remaining:	8.39s
241:	learn:	490968.6769292	total:	2.67s	remaining:	8.37s
242:	learn:	490312.8108873	total:	2.68s	remaining:	8.36s
243:	learn:	489806.4241079	total:	2.69s	remaining:	8.35s
244:	learn:	489098.6897264	total:	2.71s	remaining:	8.35s
245:	learn:	488204.2366005	total:	2.72s	remaining:	8.35s
246:	learn:	487776.3571429	total:	2.73s	remaining:	8.34s
247:	learn:	487460.6665340	total:	2.75s	remaining:	8.32s
248:	learn:	487002.5012228	total:	2.76s	remaining:	8.32s
249:	learn:	486045.2889170	total:	2.77s	remaining:	8.31s
250:	learn:	485526.7552567	total:	2.78s	remaining:	8.31s
251:	learn:	484858.0974794	total:	2.8s	remaining:	8.3s
252:	learn:	484002.3124826	total:	2.81s	remaining:	8.29s
253:	learn:	483572.1946636	total:	2.82s	remaining:	8.29s
254:	learn:	483104.1883869	total:	2.83s	remaining:	8.28s
255:	learn:	482618.2512525	total:	2.84s	remaining:	8.27s
256:	learn:	482106.2397520	total:	2.85s	remaining:	8.26s
257:	learn:	481733.4735181	total:	2.86s	remaining:	8.24s
258:	learn:	481207.3257629	total:	2.87s	remaining:	8.22s
259:	learn:	480885.2988049	total:	2.88s	remaining:	8.21s
260:	learn:	480266.3280950	total:	2.9s	remaining:	8.2s
261:	learn:	479908.0946738	total:	2.91s	remaining:	8.19s
262:	learn:	479336.8672018	total:	2.92s	remaining:	8.18s
263:	learn:	479024.0564175	total:	2.93s	remaining:	8.17s
264:	learn:	478383.3705984	total:	2.94s	remaining:	8.16s
265:	learn:	478021.7989089	total:	2.95s	remaining:	8.15s
266:	learn:	477059.0911642	total:	2.96s	remaining:	8.14s
267:	learn:	476648.0191267	total:	2.98s	remaining:	8.13s
268:	learn:	475627.8941646	total:	2.99s	remaining:	8.12s
269:	learn:	475378.8973128	total:	3s	remaining:	8.1s
270:	learn:	474919.8553607	total:	3.01s	remaining:	8.09s
271:	learn:	474630.3907455	total:	3.02s	remaining:	8.08s
272:	learn:	474112.2645671	total:	3.03s	remaining:	8.06s
273:	learn:	473410.3935202	total:	3.04s	remaining:	8.06s
274:	learn:	472999.9957750	total:	3.05s	remaining:	8.05s
275:	learn:	472554.6371906	total:	3.06s	remaining:	8.04s
276:	learn:	471915.0217742	total:	3.08s	remaining:	8.03s
277:	learn:	471688.1044435	total:	3.09s	remaining:	8.02s
278:	learn:	471402.9767313	total:	3.1s	remaining:	8s
279:	learn:	470701.0458993	total:	3.11s	remaining:	8s
280:	learn:	470284.7383092	total:	3.12s	remaining:	7.99s
281:	learn:	469840.6913661	total:	3.13s	remaining:	7.98s
282:	learn:	469460.0241660	total:	3.14s	remaining:	7.97s
283:	learn:	469252.8383979	total:	3.15s	remaining:	7.96s
284:	learn:	468855.6158015	total:	3.17s	remaining:	7.95s
285:	learn:	468116.9368961	total:	3.18s	remaining:	7.93s
286:	learn:	467652.8254730	total:	3.19s	remaining:	7.92s
287:	learn:	467458.1130490	total:	3.2s	remaining:	7.91s
288:	learn:	467029.1918750	total:	3.21s	remaining:	7.89s
289:	learn:	466680.0476101	total:	3.22s	remaining:	7.89s
290:	learn:	466398.7215959	total:	3.23s	remaining:	7.88s
291:	learn:	466145.5734245	total:	3.24s	remaining:	7.87s
292:	learn:	465594.1709662	total:	3.26s	remaining:	7.86s
293:	learn:	465359.7371115	total:	3.27s	remaining:	7.84s
294:	learn:	465107.3809545	total:	3.28s	remaining:	7.83s
295:	learn:	464718.3715079	total:	3.29s	remaining:	7.82s
296:	learn:	464495.0994726	total:	3.29s	remaining:	7.8s
297:	learn:	464363.9212337	total:	3.31s	remaining:	7.79s
298:	learn:	463767.1835124	total:	3.32s	remaining:	7.78s
299:	learn:	463597.9996125	total:	3.33s	remaining:	7.76s
300:	learn:	463230.4610054	total:	3.34s	remaining:	7.75s
301:	learn:	462564.5942022	total:	3.35s	remaining:	7.74s
302:	learn:	462205.2553958	total:	3.36s	remaining:	7.73s
303:	learn:	461682.7950376	total:	3.37s	remaining:	7.72s
304:	learn:	461275.9750401	total:	3.38s	remaining:	7.71s
305:	learn:	461129.8287521	total:	3.39s	remaining:	7.69s
306:	learn:	460916.9561761	total:	3.4s	remaining:	7.68s
307:	learn:	460186.0138770	total:	3.41s	remaining:	7.67s
308:	learn:	459560.4781156	total:	3.42s	remaining:	7.66s
309:	learn:	459097.5604303	total:	3.43s	remaining:	7.64s
310:	learn:	458627.6286130	total:	3.44s	remaining:	7.63s
311:	learn:	458333.2418694	total:	3.45s	remaining:	7.62s
312:	learn:	458095.0722243	total:	3.46s	remaining:	7.6s
313:	learn:	457991.3303988	total:	3.47s	remaining:	7.59s
314:	learn:	457258.7410682	total:	3.48s	remaining:	7.58s
315:	learn:	456959.6652713	total:	3.49s	remaining:	7.57s
316:	learn:	456413.3500600	total:	3.5s	remaining:	7.55s
317:	learn:	455393.0049843	total:	3.52s	remaining:	7.54s
318:	learn:	454786.0806591	total:	3.53s	remaining:	7.53s
319:	learn:	454454.7894865	total:	3.54s	remaining:	7.51s
320:	learn:	454230.3167004	total:	3.55s	remaining:	7.5s
321:	learn:	454056.0164836	total:	3.56s	remaining:	7.49s

322:	learn:	453839.1504408	total:	3.57s	remaining:	7.47s
323:	learn:	453494.0774202	total:	3.58s	remaining:	7.46s
324:	learn:	453257.7619685	total:	3.59s	remaining:	7.45s
325:	learn:	453060.4332342	total:	3.6s	remaining:	7.44s
326:	learn:	452572.1202759	total:	3.61s	remaining:	7.42s
327:	learn:	452289.5879946	total:	3.62s	remaining:	7.41s
328:	learn:	451950.5281267	total:	3.63s	remaining:	7.4s
329:	learn:	451593.6097737	total:	3.64s	remaining:	7.39s
330:	learn:	451299.3945976	total:	3.65s	remaining:	7.37s
331:	learn:	450935.4924467	total:	3.66s	remaining:	7.36s
332:	learn:	450596.8016128	total:	3.67s	remaining:	7.35s
333:	learn:	450095.2461754	total:	3.68s	remaining:	7.34s
334:	learn:	449692.8168716	total:	3.69s	remaining:	7.32s
335:	learn:	449480.6219471	total:	3.7s	remaining:	7.31s
336:	learn:	449043.3973733	total:	3.71s	remaining:	7.3s
337:	learn:	448413.3556171	total:	3.72s	remaining:	7.29s
338:	learn:	448203.8068341	total:	3.73s	remaining:	7.27s
339:	learn:	447669.5365157	total:	3.74s	remaining:	7.27s
340:	learn:	447462.1030511	total:	3.75s	remaining:	7.26s
341:	learn:	447174.6421657	total:	3.77s	remaining:	7.25s
342:	learn:	446919.3129953	total:	3.78s	remaining:	7.24s
343:	learn:	446536.2884930	total:	3.79s	remaining:	7.23s
344:	learn:	446089.1001317	total:	3.8s	remaining:	7.22s
345:	learn:	445776.8234144	total:	3.81s	remaining:	7.2s
346:	learn:	445571.1530354	total:	3.82s	remaining:	7.19s
347:	learn:	445369.1429948	total:	3.83s	remaining:	7.17s
348:	learn:	444930.5728972	total:	3.84s	remaining:	7.16s
349:	learn:	444744.6796507	total:	3.85s	remaining:	7.15s
350:	learn:	444594.9636458	total:	3.86s	remaining:	7.13s
351:	learn:	444354.7066887	total:	3.87s	remaining:	7.12s
352:	learn:	443816.2270066	total:	3.88s	remaining:	7.11s
353:	learn:	443418.0185880	total:	3.89s	remaining:	7.1s
354:	learn:	443289.7757462	total:	3.9s	remaining:	7.08s
355:	learn:	443027.8724615	total:	3.91s	remaining:	7.07s
356:	learn:	442755.9354163	total:	3.92s	remaining:	7.06s
357:	learn:	442372.2889556	total:	3.93s	remaining:	7.05s
358:	learn:	441983.8154660	total:	3.94s	remaining:	7.04s
359:	learn:	441525.2920030	total:	3.95s	remaining:	7.02s
360:	learn:	441328.7141546	total:	3.96s	remaining:	7.01s
361:	learn:	441174.1652128	total:	3.97s	remaining:	7s
362:	learn:	440747.3316517	total:	3.98s	remaining:	6.99s
363:	learn:	440403.5381852	total:	3.99s	remaining:	6.97s
364:	learn:	439951.3971118	total:	4s	remaining:	6.96s
365:	learn:	439817.5638480	total:	4.01s	remaining:	6.95s
366:	learn:	439429.8598626	total:	4.02s	remaining:	6.94s
367:	learn:	439157.4543091	total:	4.03s	remaining:	6.92s
368:	learn:	438711.5330270	total:	4.04s	remaining:	6.91s
369:	learn:	438408.7899026	total:	4.05s	remaining:	6.9s
370:	learn:	437808.4479317	total:	4.07s	remaining:	6.89s
371:	learn:	437538.8882870	total:	4.07s	remaining:	6.88s
372:	learn:	437354.8616315	total:	4.08s	remaining:	6.86s
373:	learn:	436957.9504369	total:	4.09s	remaining:	6.85s
374:	learn:	436080.5766311	total:	4.1s	remaining:	6.84s
375:	learn:	435657.6482942	total:	4.11s	remaining:	6.83s
376:	learn:	435356.4194774	total:	4.12s	remaining:	6.82s
377:	learn:	435215.3897008	total:	4.13s	remaining:	6.8s
378:	learn:	434851.7200883	total:	4.14s	remaining:	6.79s
379:	learn:	434508.1741836	total:	4.15s	remaining:	6.78s
380:	learn:	434291.4230201	total:	4.16s	remaining:	6.76s
381:	learn:	433992.4011356	total:	4.17s	remaining:	6.75s
382:	learn:	433658.5534390	total:	4.18s	remaining:	6.74s
383:	learn:	433384.0093006	total:	4.19s	remaining:	6.73s
384:	learn:	433114.2692130	total:	4.2s	remaining:	6.71s
385:	learn:	433026.2550548	total:	4.21s	remaining:	6.7s
386:	learn:	432803.7192895	total:	4.22s	remaining:	6.69s
387:	learn:	432550.5102593	total:	4.23s	remaining:	6.68s
388:	learn:	432356.6314935	total:	4.24s	remaining:	6.66s
389:	learn:	432100.5444023	total:	4.25s	remaining:	6.65s
390:	learn:	431981.6248410	total:	4.26s	remaining:	6.64s
391:	learn:	431683.3817234	total:	4.27s	remaining:	6.63s
392:	learn:	431345.9892149	total:	4.28s	remaining:	6.61s
393:	learn:	431076.1903633	total:	4.29s	remaining:	6.6s
394:	learn:	430768.6797625	total:	4.3s	remaining:	6.59s
395:	learn:	430580.5770314	total:	4.31s	remaining:	6.58s
396:	learn:	429816.4065873	total:	4.32s	remaining:	6.57s
397:	learn:	429421.8707918	total:	4.33s	remaining:	6.55s
398:	learn:	428666.5394596	total:	4.34s	remaining:	6.54s
399:	learn:	428413.7352333	total:	4.36s	remaining:	6.53s
400:	learn:	428248.3880140	total:	4.37s	remaining:	6.52s
401:	learn:	428004.3033324	total:	4.38s	remaining:	6.51s
402:	learn:	427783.5547512	total:	4.39s	remaining:	6.5s
403:	learn:	427263.9169165	total:	4.4s	remaining:	6.49s
404:	learn:	427030.6859643	total:	4.41s	remaining:	6.48s
405:	learn:	426792.1823354	total:	4.42s	remaining:	6.47s
406:	learn:	426091.9807359	total:	4.43s	remaining:	6.46s
407:	learn:	425840.1670452	total:	4.45s	remaining:	6.45s
408:	learn:	425590.5580260	total:	4.46s	remaining:	6.44s
409:	learn:	425282.6531778	total:	4.47s	remaining:	6.43s
410:	learn:	425009.4352590	total:	4.48s	remaining:	6.42s

411:	learn:	424678.8302373	total:	4.49s	remaining:	6.41s
412:	learn:	424440.8665619	total:	4.5s	remaining:	6.4s
413:	learn:	424188.4327313	total:	4.51s	remaining:	6.39s
414:	learn:	423997.8082228	total:	4.52s	remaining:	6.38s
415:	learn:	423867.1955668	total:	4.53s	remaining:	6.36s
416:	learn:	423473.1301742	total:	4.54s	remaining:	6.35s
417:	learn:	423204.0110970	total:	4.56s	remaining:	6.34s
418:	learn:	422941.0753832	total:	4.57s	remaining:	6.33s
419:	learn:	422786.1051699	total:	4.58s	remaining:	6.32s
420:	learn:	422577.7203826	total:	4.59s	remaining:	6.31s
421:	learn:	422388.6487408	total:	4.6s	remaining:	6.3s
422:	learn:	422177.1493702	total:	4.61s	remaining:	6.29s
423:	learn:	421426.7328760	total:	4.62s	remaining:	6.28s
424:	learn:	421061.7193276	total:	4.63s	remaining:	6.27s
425:	learn:	420699.3032409	total:	4.64s	remaining:	6.26s
426:	learn:	420555.4090435	total:	4.66s	remaining:	6.25s
427:	learn:	420169.7714263	total:	4.67s	remaining:	6.24s
428:	learn:	419483.9348441	total:	4.68s	remaining:	6.23s
429:	learn:	418928.0878882	total:	4.69s	remaining:	6.22s
430:	learn:	418727.5602766	total:	4.7s	remaining:	6.21s
431:	learn:	418178.5070961	total:	4.71s	remaining:	6.2s
432:	learn:	417916.0921128	total:	4.73s	remaining:	6.19s
433:	learn:	417732.8307101	total:	4.74s	remaining:	6.18s
434:	learn:	417346.8477326	total:	4.75s	remaining:	6.17s
435:	learn:	417171.3210316	total:	4.76s	remaining:	6.16s
436:	learn:	417003.6777186	total:	4.77s	remaining:	6.15s
437:	learn:	416720.0472438	total:	4.79s	remaining:	6.14s
438:	learn:	416530.4681053	total:	4.8s	remaining:	6.13s
439:	learn:	416326.5026535	total:	4.81s	remaining:	6.12s
440:	learn:	416122.4645037	total:	4.82s	remaining:	6.11s
441:	learn:	415471.3931488	total:	4.83s	remaining:	6.1s
442:	learn:	415188.4098496	total:	4.85s	remaining:	6.09s
443:	learn:	414903.7938246	total:	4.86s	remaining:	6.08s
444:	learn:	414798.1227965	total:	4.87s	remaining:	6.07s
445:	learn:	414543.0055846	total:	4.88s	remaining:	6.06s
446:	learn:	414437.9419225	total:	4.89s	remaining:	6.05s
447:	learn:	414163.3759672	total:	4.9s	remaining:	6.04s
448:	learn:	413863.6905471	total:	4.91s	remaining:	6.03s
449:	learn:	413651.3909040	total:	4.92s	remaining:	6.02s
450:	learn:	413255.0059682	total:	4.94s	remaining:	6.01s
451:	learn:	412703.0432088	total:	4.95s	remaining:	6s
452:	learn:	412460.2987122	total:	4.96s	remaining:	5.99s
453:	learn:	412175.9642836	total:	4.97s	remaining:	5.98s
454:	learn:	412027.6534468	total:	4.98s	remaining:	5.97s
455:	learn:	411770.4906132	total:	4.99s	remaining:	5.96s
456:	learn:	411614.4148174	total:	5s	remaining:	5.95s
457:	learn:	411467.7594528	total:	5.01s	remaining:	5.93s
458:	learn:	411251.9519255	total:	5.03s	remaining:	5.92s
459:	learn:	410990.2961746	total:	5.04s	remaining:	5.91s
460:	learn:	410785.9105082	total:	5.05s	remaining:	5.9s
461:	learn:	410401.2932986	total:	5.06s	remaining:	5.89s
462:	learn:	410178.5829605	total:	5.07s	remaining:	5.88s
463:	learn:	409937.4220291	total:	5.08s	remaining:	5.87s
464:	learn:	409874.7969570	total:	5.09s	remaining:	5.86s
465:	learn:	409806.7701094	total:	5.1s	remaining:	5.85s
466:	learn:	409705.3752339	total:	5.11s	remaining:	5.83s
467:	learn:	409558.1511448	total:	5.12s	remaining:	5.82s
468:	learn:	409454.3996868	total:	5.13s	remaining:	5.81s
469:	learn:	409278.0853923	total:	5.14s	remaining:	5.8s
470:	learn:	409003.6417752	total:	5.16s	remaining:	5.79s
471:	learn:	408774.3453217	total:	5.17s	remaining:	5.78s
472:	learn:	408291.7009436	total:	5.18s	remaining:	5.77s
473:	learn:	408113.3470855	total:	5.19s	remaining:	5.76s
474:	learn:	407861.0090457	total:	5.2s	remaining:	5.75s
475:	learn:	407443.4991773	total:	5.21s	remaining:	5.74s
476:	learn:	407329.5304590	total:	5.22s	remaining:	5.72s
477:	learn:	407087.9764118	total:	5.23s	remaining:	5.71s
478:	learn:	406898.7946597	total:	5.24s	remaining:	5.7s
479:	learn:	406528.6008379	total:	5.25s	remaining:	5.69s
480:	learn:	406394.3796974	total:	5.27s	remaining:	5.68s
481:	learn:	406289.1025163	total:	5.28s	remaining:	5.67s
482:	learn:	406036.6802168	total:	5.29s	remaining:	5.66s
483:	learn:	405904.3868208	total:	5.3s	remaining:	5.65s
484:	learn:	405733.3174084	total:	5.31s	remaining:	5.64s
485:	learn:	405525.7394153	total:	5.32s	remaining:	5.63s
486:	learn:	405100.0874255	total:	5.33s	remaining:	5.62s
487:	learn:	404871.5263297	total:	5.35s	remaining:	5.61s
488:	learn:	404691.2342200	total:	5.36s	remaining:	5.6s
489:	learn:	404193.1878472	total:	5.37s	remaining:	5.59s
490:	learn:	404125.1175213	total:	5.38s	remaining:	5.58s
491:	learn:	403914.0682741	total:	5.39s	remaining:	5.56s
492:	learn:	403619.7728716	total:	5.4s	remaining:	5.55s
493:	learn:	403393.8823660	total:	5.41s	remaining:	5.54s
494:	learn:	403165.2259733	total:	5.42s	remaining:	5.53s
495:	learn:	402853.3361747	total:	5.43s	remaining:	5.52s
496:	learn:	402710.8516757	total:	5.44s	remaining:	5.51s
497:	learn:	402656.3503263	total:	5.45s	remaining:	5.5s
498:	learn:	402541.7550617	total:	5.46s	remaining:	5.48s
499:	learn:	402390.5102627	total:	5.47s	remaining:	5.47s

500:	learn:	402112.1595072	total:	5.48s	remaining:	5.46s
501:	learn:	401923.5124696	total:	5.49s	remaining:	5.45s
502:	learn:	401593.4419498	total:	5.5s	remaining:	5.44s
503:	learn:	401395.5529005	total:	5.51s	remaining:	5.42s
504:	learn:	401192.1634760	total:	5.52s	remaining:	5.41s
505:	learn:	400909.8829241	total:	5.54s	remaining:	5.4s
506:	learn:	400742.6833652	total:	5.54s	remaining:	5.39s
507:	learn:	400572.4673697	total:	5.55s	remaining:	5.38s
508:	learn:	400386.8194364	total:	5.57s	remaining:	5.37s
509:	learn:	400298.5738124	total:	5.58s	remaining:	5.36s
510:	learn:	399806.7949748	total:	5.59s	remaining:	5.35s
511:	learn:	399623.1794756	total:	5.6s	remaining:	5.33s
512:	learn:	399176.6565539	total:	5.61s	remaining:	5.32s
513:	learn:	399009.0121605	total:	5.62s	remaining:	5.31s
514:	learn:	398794.7521865	total:	5.63s	remaining:	5.3s
515:	learn:	398441.6918936	total:	5.64s	remaining:	5.29s
516:	learn:	398198.4190891	total:	5.65s	remaining:	5.28s
517:	learn:	398060.5834146	total:	5.66s	remaining:	5.27s
518:	learn:	397889.0909848	total:	5.67s	remaining:	5.25s
519:	learn:	397682.4278603	total:	5.68s	remaining:	5.24s
520:	learn:	397538.2136593	total:	5.69s	remaining:	5.23s
521:	learn:	397371.8119410	total:	5.7s	remaining:	5.22s
522:	learn:	397311.0667198	total:	5.71s	remaining:	5.21s
523:	learn:	397091.3119293	total:	5.72s	remaining:	5.2s
524:	learn:	396804.2854854	total:	5.74s	remaining:	5.19s
525:	learn:	396461.3236988	total:	5.75s	remaining:	5.18s
526:	learn:	396324.6528409	total:	5.76s	remaining:	5.17s
527:	learn:	396099.0755399	total:	5.77s	remaining:	5.16s
528:	learn:	395736.6582899	total:	5.78s	remaining:	5.14s
529:	learn:	395617.3478987	total:	5.79s	remaining:	5.13s
530:	learn:	395448.1122823	total:	5.8s	remaining:	5.12s
531:	learn:	395297.6183025	total:	5.81s	remaining:	5.11s
532:	learn:	395100.1165106	total:	5.82s	remaining:	5.1s
533:	learn:	394924.6949879	total:	5.83s	remaining:	5.09s
534:	learn:	394794.4581049	total:	5.84s	remaining:	5.08s
535:	learn:	394645.9216555	total:	5.85s	remaining:	5.06s
536:	learn:	394553.2405980	total:	5.86s	remaining:	5.05s
537:	learn:	394322.8097509	total:	5.87s	remaining:	5.04s
538:	learn:	394230.2778402	total:	5.88s	remaining:	5.03s
539:	learn:	394157.5041642	total:	5.89s	remaining:	5.02s
540:	learn:	394083.4097873	total:	5.9s	remaining:	5s
541:	learn:	393980.6229087	total:	5.91s	remaining:	4.99s
542:	learn:	393781.9103775	total:	5.92s	remaining:	4.98s
543:	learn:	393547.4075351	total:	5.93s	remaining:	4.97s
544:	learn:	393330.3952750	total:	5.94s	remaining:	4.96s
545:	learn:	393075.2531470	total:	5.95s	remaining:	4.95s
546:	learn:	392906.4587147	total:	5.96s	remaining:	4.94s
547:	learn:	392667.4220250	total:	5.97s	remaining:	4.93s
548:	learn:	392501.2722026	total:	5.99s	remaining:	4.92s
549:	learn:	392192.6610029	total:	6s	remaining:	4.91s
550:	learn:	392031.0552669	total:	6.01s	remaining:	4.89s
551:	learn:	391843.5974255	total:	6.02s	remaining:	4.88s
552:	learn:	391750.5917391	total:	6.03s	remaining:	4.87s
553:	learn:	391695.8530455	total:	6.04s	remaining:	4.86s
554:	learn:	391561.4515699	total:	6.04s	remaining:	4.85s
555:	learn:	391028.2197093	total:	6.05s	remaining:	4.83s
556:	learn:	390771.4866722	total:	6.07s	remaining:	4.83s
557:	learn:	390484.1451291	total:	6.08s	remaining:	4.82s
558:	learn:	390309.3117917	total:	6.09s	remaining:	4.8s
559:	learn:	390213.2205350	total:	6.1s	remaining:	4.79s
560:	learn:	389793.1276942	total:	6.11s	remaining:	4.78s
561:	learn:	389633.3015450	total:	6.12s	remaining:	4.77s
562:	learn:	389445.5245660	total:	6.13s	remaining:	4.76s
563:	learn:	389310.1886753	total:	6.14s	remaining:	4.75s
564:	learn:	389208.7074590	total:	6.15s	remaining:	4.74s
565:	learn:	389061.2272839	total:	6.16s	remaining:	4.72s
566:	learn:	388881.5751924	total:	6.17s	remaining:	4.71s
567:	learn:	388787.1897678	total:	6.18s	remaining:	4.7s
568:	learn:	388662.5049799	total:	6.19s	remaining:	4.69s
569:	learn:	388203.5200192	total:	6.2s	remaining:	4.68s
570:	learn:	388027.1702472	total:	6.21s	remaining:	4.67s
571:	learn:	387749.1801156	total:	6.22s	remaining:	4.66s
572:	learn:	387540.0631338	total:	6.23s	remaining:	4.64s
573:	learn:	387381.8120936	total:	6.24s	remaining:	4.63s
574:	learn:	386906.0602260	total:	6.25s	remaining:	4.62s
575:	learn:	386703.3431739	total:	6.26s	remaining:	4.61s
576:	learn:	386636.3770454	total:	6.27s	remaining:	4.6s
577:	learn:	386435.7976296	total:	6.28s	remaining:	4.59s
578:	learn:	386094.0324513	total:	6.29s	remaining:	4.58s
579:	learn:	385996.0236423	total:	6.31s	remaining:	4.57s
580:	learn:	385850.9708960	total:	6.32s	remaining:	4.55s
581:	learn:	385443.3351427	total:	6.33s	remaining:	4.54s
582:	learn:	385254.4268256	total:	6.34s	remaining:	4.53s
583:	learn:	384653.5675541	total:	6.35s	remaining:	4.52s
584:	learn:	384235.2678289	total:	6.36s	remaining:	4.51s
585:	learn:	384046.9463458	total:	6.38s	remaining:	4.5s
586:	learn:	383944.7068699	total:	6.38s	remaining:	4.49s
587:	learn:	383783.3982427	total:	6.4s	remaining:	4.48s
588:	learn:	383684.1095244	total:	6.41s	remaining:	4.47s

589:	learn:	383499.9274672	total:	6.42s	remaining:	4.46s
590:	learn:	383394.9319158	total:	6.43s	remaining:	4.45s
591:	learn:	383314.1727951	total:	6.44s	remaining:	4.44s
592:	learn:	383095.9209628	total:	6.45s	remaining:	4.43s
593:	learn:	382959.1590744	total:	6.46s	remaining:	4.42s
594:	learn:	382648.7086528	total:	6.47s	remaining:	4.41s
595:	learn:	382540.6242737	total:	6.49s	remaining:	4.4s
596:	learn:	382317.4573037	total:	6.5s	remaining:	4.39s
597:	learn:	382155.2241271	total:	6.51s	remaining:	4.38s
598:	learn:	381876.9404717	total:	6.52s	remaining:	4.37s
599:	learn:	381646.4661158	total:	6.54s	remaining:	4.36s
600:	learn:	381340.3212642	total:	6.55s	remaining:	4.35s
601:	learn:	381216.1431681	total:	6.56s	remaining:	4.34s
602:	learn:	381171.3238559	total:	6.57s	remaining:	4.33s
603:	learn:	380986.4645153	total:	6.58s	remaining:	4.31s
604:	learn:	380740.6337822	total:	6.59s	remaining:	4.3s
605:	learn:	380531.2982589	total:	6.6s	remaining:	4.29s
606:	learn:	380136.6026726	total:	6.61s	remaining:	4.28s
607:	learn:	379983.2442279	total:	6.63s	remaining:	4.27s
608:	learn:	379827.9292140	total:	6.63s	remaining:	4.26s
609:	learn:	379619.0355821	total:	6.64s	remaining:	4.25s
610:	learn:	379196.1617533	total:	6.66s	remaining:	4.24s
611:	learn:	378867.3776968	total:	6.67s	remaining:	4.23s
612:	learn:	378773.0654897	total:	6.68s	remaining:	4.22s
613:	learn:	378659.3677578	total:	6.69s	remaining:	4.21s
614:	learn:	378554.3035680	total:	6.71s	remaining:	4.2s
615:	learn:	378392.3229629	total:	6.72s	remaining:	4.19s
616:	learn:	378199.3181238	total:	6.73s	remaining:	4.18s
617:	learn:	378095.2404493	total:	6.74s	remaining:	4.17s
618:	learn:	377970.4199673	total:	6.75s	remaining:	4.15s
619:	learn:	377884.5131841	total:	6.76s	remaining:	4.14s
620:	learn:	377744.6457452	total:	6.78s	remaining:	4.13s
621:	learn:	377559.9205409	total:	6.79s	remaining:	4.12s
622:	learn:	377390.8706797	total:	6.79s	remaining:	4.11s
623:	learn:	377257.5828727	total:	6.81s	remaining:	4.1s
624:	learn:	376977.8368329	total:	6.82s	remaining:	4.09s
625:	learn:	376816.2146262	total:	6.83s	remaining:	4.08s
626:	learn:	376667.3551501	total:	6.84s	remaining:	4.07s
627:	learn:	376512.3142537	total:	6.85s	remaining:	4.06s
628:	learn:	376422.5489190	total:	6.86s	remaining:	4.05s
629:	learn:	376228.8125121	total:	6.87s	remaining:	4.04s
630:	learn:	376133.7526080	total:	6.88s	remaining:	4.03s
631:	learn:	375851.3607495	total:	6.9s	remaining:	4.02s
632:	learn:	375691.6779659	total:	6.91s	remaining:	4s
633:	learn:	375440.5166887	total:	6.92s	remaining:	3.99s
634:	learn:	375205.1553509	total:	6.93s	remaining:	3.98s
635:	learn:	375069.3415299	total:	6.94s	remaining:	3.97s
636:	learn:	374937.6352713	total:	6.95s	remaining:	3.96s
637:	learn:	374679.4166770	total:	6.96s	remaining:	3.95s
638:	learn:	374320.3342446	total:	6.97s	remaining:	3.94s
639:	learn:	374090.5544215	total:	6.99s	remaining:	3.93s
640:	learn:	373973.5742908	total:	7s	remaining:	3.92s
641:	learn:	373723.3402845	total:	7.01s	remaining:	3.91s
642:	learn:	373603.8287028	total:	7.02s	remaining:	3.9s
643:	learn:	373500.6743095	total:	7.04s	remaining:	3.89s
644:	learn:	373312.6600434	total:	7.04s	remaining:	3.88s
645:	learn:	373120.6121114	total:	7.06s	remaining:	3.87s
646:	learn:	372701.1578786	total:	7.07s	remaining:	3.86s
647:	learn:	372474.9515815	total:	7.08s	remaining:	3.85s
648:	learn:	372328.6413641	total:	7.09s	remaining:	3.84s
649:	learn:	372237.8613620	total:	7.11s	remaining:	3.83s
650:	learn:	372056.1556124	total:	7.12s	remaining:	3.81s
651:	learn:	371865.5401080	total:	7.13s	remaining:	3.8s
652:	learn:	371581.3232036	total:	7.14s	remaining:	3.79s
653:	learn:	371391.9581512	total:	7.15s	remaining:	3.78s
654:	learn:	371256.2562495	total:	7.16s	remaining:	3.77s
655:	learn:	370747.8263808	total:	7.17s	remaining:	3.76s
656:	learn:	370604.7006929	total:	7.18s	remaining:	3.75s
657:	learn:	370449.3075764	total:	7.2s	remaining:	3.74s
658:	learn:	370242.1908629	total:	7.21s	remaining:	3.73s
659:	learn:	369996.6237799	total:	7.22s	remaining:	3.72s
660:	learn:	369849.4230943	total:	7.23s	remaining:	3.71s
661:	learn:	369743.2745681	total:	7.24s	remaining:	3.7s
662:	learn:	369547.2607548	total:	7.25s	remaining:	3.69s
663:	learn:	369449.5408881	total:	7.26s	remaining:	3.67s
664:	learn:	369265.2097034	total:	7.28s	remaining:	3.67s
665:	learn:	368957.6614592	total:	7.29s	remaining:	3.65s
666:	learn:	368722.5473102	total:	7.3s	remaining:	3.65s
667:	learn:	368603.3942149	total:	7.31s	remaining:	3.63s
668:	learn:	368422.1769950	total:	7.32s	remaining:	3.62s
669:	learn:	368331.6223894	total:	7.33s	remaining:	3.61s
670:	learn:	367987.5344130	total:	7.34s	remaining:	3.6s
671:	learn:	367553.1075966	total:	7.35s	remaining:	3.59s
672:	learn:	367267.6297298	total:	7.36s	remaining:	3.58s
673:	learn:	367116.1539224	total:	7.37s	remaining:	3.57s
674:	learn:	366927.2050647	total:	7.39s	remaining:	3.56s
675:	learn:	366738.7541617	total:	7.4s	remaining:	3.54s
676:	learn:	366602.1272080	total:	7.41s	remaining:	3.53s
677:	learn:	366493.5480980	total:	7.42s	remaining:	3.52s

678:	learn:	366287.2439890	total:	7.43s	remaining:	3.51s
679:	learn:	366227.1611609	total:	7.44s	remaining:	3.5s
680:	learn:	365961.9548489	total:	7.45s	remaining:	3.49s
681:	learn:	365830.3815147	total:	7.46s	remaining:	3.48s
682:	learn:	365595.7613245	total:	7.47s	remaining:	3.47s
683:	learn:	365396.5037305	total:	7.48s	remaining:	3.46s
684:	learn:	365176.9150224	total:	7.49s	remaining:	3.44s
685:	learn:	364999.3605321	total:	7.5s	remaining:	3.43s
686:	learn:	364817.8323453	total:	7.51s	remaining:	3.42s
687:	learn:	364727.5743859	total:	7.52s	remaining:	3.41s
688:	learn:	364562.8274293	total:	7.54s	remaining:	3.4s
689:	learn:	364326.7511574	total:	7.55s	remaining:	3.39s
690:	learn:	364211.9124691	total:	7.56s	remaining:	3.38s
691:	learn:	364056.4537501	total:	7.57s	remaining:	3.37s
692:	learn:	363912.1328839	total:	7.58s	remaining:	3.36s
693:	learn:	363797.3759031	total:	7.59s	remaining:	3.35s
694:	learn:	363696.7693707	total:	7.6s	remaining:	3.33s
695:	learn:	363618.4487433	total:	7.61s	remaining:	3.32s
696:	learn:	363457.3319124	total:	7.62s	remaining:	3.31s
697:	learn:	363216.7406331	total:	7.63s	remaining:	3.3s
698:	learn:	363104.1797165	total:	7.64s	remaining:	3.29s
699:	learn:	362927.7333383	total:	7.65s	remaining:	3.28s
700:	learn:	362663.8402900	total:	7.67s	remaining:	3.27s
701:	learn:	362472.4675758	total:	7.68s	remaining:	3.26s
702:	learn:	362292.8507478	total:	7.69s	remaining:	3.25s
703:	learn:	362159.1778894	total:	7.71s	remaining:	3.24s
704:	learn:	361929.1043182	total:	7.72s	remaining:	3.23s
705:	learn:	361853.7188453	total:	7.73s	remaining:	3.22s
706:	learn:	361761.9341787	total:	7.74s	remaining:	3.21s
707:	learn:	361648.9901044	total:	7.75s	remaining:	3.2s
708:	learn:	361531.8540215	total:	7.76s	remaining:	3.18s
709:	learn:	361410.8837076	total:	7.77s	remaining:	3.17s
710:	learn:	361236.4075227	total:	7.78s	remaining:	3.16s
711:	learn:	361150.3367994	total:	7.79s	remaining:	3.15s
712:	learn:	360928.4940157	total:	7.8s	remaining:	3.14s
713:	learn:	360729.3832746	total:	7.81s	remaining:	3.13s
714:	learn:	360493.1476347	total:	7.83s	remaining:	3.12s
715:	learn:	360351.4884122	total:	7.83s	remaining:	3.11s
716:	learn:	360173.5129094	total:	7.85s	remaining:	3.1s
717:	learn:	360080.3977639	total:	7.86s	remaining:	3.08s
718:	learn:	359784.1541244	total:	7.87s	remaining:	3.08s
719:	learn:	359610.5989002	total:	7.88s	remaining:	3.06s
720:	learn:	359471.0806635	total:	7.89s	remaining:	3.05s
721:	learn:	359232.6610438	total:	7.91s	remaining:	3.04s
722:	learn:	359078.9764988	total:	7.92s	remaining:	3.03s
723:	learn:	358997.0503570	total:	7.92s	remaining:	3.02s
724:	learn:	358859.2078071	total:	7.94s	remaining:	3.01s
725:	learn:	358752.7188530	total:	7.95s	remaining:	3s
726:	learn:	358372.5413741	total:	7.96s	remaining:	2.99s
727:	learn:	358308.1139295	total:	7.97s	remaining:	2.98s
728:	learn:	358085.5914560	total:	7.98s	remaining:	2.97s
729:	learn:	357935.0716374	total:	7.99s	remaining:	2.96s
730:	learn:	357821.7071785	total:	8s	remaining:	2.94s
731:	learn:	357782.7527345	total:	8.01s	remaining:	2.93s
732:	learn:	357638.2077766	total:	8.02s	remaining:	2.92s
733:	learn:	357506.8452252	total:	8.03s	remaining:	2.91s
734:	learn:	357259.2894863	total:	8.04s	remaining:	2.9s
735:	learn:	357125.0427995	total:	8.05s	remaining:	2.89s
736:	learn:	356937.7476482	total:	8.06s	remaining:	2.88s
737:	learn:	356769.5657335	total:	8.07s	remaining:	2.87s
738:	learn:	356694.9055736	total:	8.09s	remaining:	2.86s
739:	learn:	356513.6855561	total:	8.1s	remaining:	2.85s
740:	learn:	356241.6830872	total:	8.11s	remaining:	2.83s
741:	learn:	356187.8433885	total:	8.12s	remaining:	2.82s
742:	learn:	356066.6786541	total:	8.13s	remaining:	2.81s
743:	learn:	355862.0941084	total:	8.14s	remaining:	2.8s
744:	learn:	355700.1529446	total:	8.15s	remaining:	2.79s
745:	learn:	355484.4635213	total:	8.16s	remaining:	2.78s
746:	learn:	355290.7638271	total:	8.17s	remaining:	2.77s
747:	learn:	355109.0652684	total:	8.18s	remaining:	2.76s
748:	learn:	355053.2553696	total:	8.19s	remaining:	2.75s
749:	learn:	354887.8257784	total:	8.2s	remaining:	2.73s
750:	learn:	354743.1103716	total:	8.21s	remaining:	2.72s
751:	learn:	354581.5163296	total:	8.22s	remaining:	2.71s
752:	learn:	354351.9646032	total:	8.23s	remaining:	2.7s
753:	learn:	354274.8270286	total:	8.24s	remaining:	2.69s
754:	learn:	354098.5843264	total:	8.26s	remaining:	2.68s
755:	learn:	353835.7693109	total:	8.28s	remaining:	2.67s
756:	learn:	353754.5547784	total:	8.28s	remaining:	2.66s
757:	learn:	353687.4130284	total:	8.29s	remaining:	2.65s
758:	learn:	353580.5661785	total:	8.3s	remaining:	2.64s
759:	learn:	353536.1498392	total:	8.32s	remaining:	2.63s
760:	learn:	353362.1450366	total:	8.33s	remaining:	2.62s
761:	learn:	353040.8157530	total:	8.34s	remaining:	2.6s
762:	learn:	352971.6097843	total:	8.35s	remaining:	2.59s
763:	learn:	352905.8717832	total:	8.36s	remaining:	2.58s
764:	learn:	352849.3134774	total:	8.37s	remaining:	2.57s
765:	learn:	352650.4432338	total:	8.38s	remaining:	2.56s
766:	learn:	352406.2250254	total:	8.39s	remaining:	2.55s

767:	learn:	352316.9612365	total:	8.41s	remaining:	2.54s
768:	learn:	352120.7475589	total:	8.42s	remaining:	2.53s
769:	learn:	351988.7419687	total:	8.43s	remaining:	2.52s
770:	learn:	351820.0862197	total:	8.44s	remaining:	2.51s
771:	learn:	351721.4631377	total:	8.45s	remaining:	2.5s
772:	learn:	351467.4249430	total:	8.46s	remaining:	2.49s
773:	learn:	351002.9984795	total:	8.48s	remaining:	2.48s
774:	learn:	350805.7853841	total:	8.49s	remaining:	2.47s
775:	learn:	350678.7224521	total:	8.51s	remaining:	2.46s
776:	learn:	350390.2888433	total:	8.53s	remaining:	2.45s
777:	learn:	349982.6259228	total:	8.54s	remaining:	2.44s
778:	learn:	349767.8357023	total:	8.55s	remaining:	2.43s
779:	learn:	349579.1410966	total:	8.57s	remaining:	2.42s
780:	learn:	349234.9379626	total:	8.58s	remaining:	2.41s
781:	learn:	349098.8140535	total:	8.59s	remaining:	2.4s
782:	learn:	348926.5549072	total:	8.61s	remaining:	2.38s
783:	learn:	348838.3381416	total:	8.62s	remaining:	2.38s
784:	learn:	348751.3941519	total:	8.63s	remaining:	2.36s
785:	learn:	348599.4983759	total:	8.65s	remaining:	2.35s
786:	learn:	348514.9670037	total:	8.66s	remaining:	2.34s
787:	learn:	348437.7154511	total:	8.68s	remaining:	2.33s
788:	learn:	348135.5286433	total:	8.69s	remaining:	2.32s
789:	learn:	348077.7671960	total:	8.7s	remaining:	2.31s
790:	learn:	347884.1768282	total:	8.72s	remaining:	2.3s
791:	learn:	347642.8917206	total:	8.73s	remaining:	2.29s
792:	learn:	347378.5788586	total:	8.75s	remaining:	2.28s
793:	learn:	347260.3613149	total:	8.76s	remaining:	2.27s
794:	learn:	347121.9347986	total:	8.78s	remaining:	2.26s
795:	learn:	346965.9773743	total:	8.79s	remaining:	2.25s
796:	learn:	346804.2833368	total:	8.8s	remaining:	2.24s
797:	learn:	346546.2261008	total:	8.82s	remaining:	2.23s
798:	learn:	346256.2502478	total:	8.84s	remaining:	2.22s
799:	learn:	345985.0448835	total:	8.85s	remaining:	2.21s
800:	learn:	345701.9078768	total:	8.87s	remaining:	2.2s
801:	learn:	345510.2143202	total:	8.88s	remaining:	2.19s
802:	learn:	345315.1498319	total:	8.89s	remaining:	2.18s
803:	learn:	345161.0182678	total:	8.91s	remaining:	2.17s
804:	learn:	344991.1181656	total:	8.92s	remaining:	2.16s
805:	learn:	344846.7530403	total:	8.94s	remaining:	2.15s
806:	learn:	344727.0037011	total:	8.95s	remaining:	2.14s
807:	learn:	344593.6225005	total:	8.96s	remaining:	2.13s
808:	learn:	344530.6849269	total:	8.98s	remaining:	2.12s
809:	learn:	344329.6520763	total:	8.99s	remaining:	2.11s
810:	learn:	344208.0612755	total:	9s	remaining:	2.1s
811:	learn:	344158.5430677	total:	9.02s	remaining:	2.09s
812:	learn:	344035.2883224	total:	9.03s	remaining:	2.08s
813:	learn:	343794.0687317	total:	9.04s	remaining:	2.07s
814:	learn:	343719.7418985	total:	9.06s	remaining:	2.06s
815:	learn:	343496.2203121	total:	9.07s	remaining:	2.04s
816:	learn:	343362.6167186	total:	9.08s	remaining:	2.03s
817:	learn:	343210.9873965	total:	9.1s	remaining:	2.02s
818:	learn:	343137.1763060	total:	9.11s	remaining:	2.01s
819:	learn:	342980.3310775	total:	9.13s	remaining:	2s
820:	learn:	342822.8748551	total:	9.14s	remaining:	1.99s
821:	learn:	342654.8305525	total:	9.16s	remaining:	1.98s
822:	learn:	342386.9924568	total:	9.17s	remaining:	1.97s
823:	learn:	342219.8189253	total:	9.18s	remaining:	1.96s
824:	learn:	342023.2681540	total:	9.2s	remaining:	1.95s
825:	learn:	341829.0419641	total:	9.21s	remaining:	1.94s
826:	learn:	341699.9726097	total:	9.23s	remaining:	1.93s
827:	learn:	341523.0685692	total:	9.24s	remaining:	1.92s
828:	learn:	341243.7649239	total:	9.26s	remaining:	1.91s
829:	learn:	341078.8634574	total:	9.27s	remaining:	1.9s
830:	learn:	340969.5638226	total:	9.28s	remaining:	1.89s
831:	learn:	340812.6474391	total:	9.3s	remaining:	1.88s
832:	learn:	340654.5706939	total:	9.31s	remaining:	1.87s
833:	learn:	340526.9727810	total:	9.32s	remaining:	1.85s
834:	learn:	340444.9541603	total:	9.33s	remaining:	1.84s
835:	learn:	340333.0701148	total:	9.35s	remaining:	1.83s
836:	learn:	340253.5019263	total:	9.36s	remaining:	1.82s
837:	learn:	340145.3328557	total:	9.37s	remaining:	1.81s
838:	learn:	339995.0470941	total:	9.38s	remaining:	1.8s
839:	learn:	339841.9004615	total:	9.39s	remaining:	1.79s
840:	learn:	339695.0236775	total:	9.4s	remaining:	1.78s
841:	learn:	339621.5037016	total:	9.42s	remaining:	1.77s
842:	learn:	339532.6325637	total:	9.43s	remaining:	1.76s
843:	learn:	339435.0004366	total:	9.44s	remaining:	1.75s
844:	learn:	339362.4874221	total:	9.46s	remaining:	1.73s
845:	learn:	339279.3068280	total:	9.47s	remaining:	1.72s
846:	learn:	339218.9396851	total:	9.48s	remaining:	1.71s
847:	learn:	339133.7860214	total:	9.49s	remaining:	1.7s
848:	learn:	338973.9093197	total:	9.5s	remaining:	1.69s
849:	learn:	338872.0838458	total:	9.52s	remaining:	1.68s
850:	learn:	338767.9022367	total:	9.53s	remaining:	1.67s
851:	learn:	338645.4726573	total:	9.54s	remaining:	1.66s
852:	learn:	338436.9136761	total:	9.56s	remaining:	1.65s
853:	learn:	338253.3618098	total:	9.57s	remaining:	1.64s
854:	learn:	338165.1178525	total:	9.59s	remaining:	1.63s
855:	learn:	338108.3710227	total:	9.6s	remaining:	1.61s

856:	learn:	337944.1260020	total:	9.61s	remaining:	1.6s
857:	learn:	337723.4592717	total:	9.63s	remaining:	1.59s
858:	learn:	337575.8343233	total:	9.64s	remaining:	1.58s
859:	learn:	337500.5201014	total:	9.65s	remaining:	1.57s
860:	learn:	337372.6024393	total:	9.66s	remaining:	1.56s
861:	learn:	337230.7243226	total:	9.68s	remaining:	1.55s
862:	learn:	337167.5157902	total:	9.69s	remaining:	1.54s
863:	learn:	337111.7937566	total:	9.7s	remaining:	1.53s
864:	learn:	336985.4411436	total:	9.71s	remaining:	1.51s
865:	learn:	336865.0799428	total:	9.72s	remaining:	1.5s
866:	learn:	336726.3412713	total:	9.74s	remaining:	1.49s
867:	learn:	336676.1097266	total:	9.75s	remaining:	1.48s
868:	learn:	336528.5985890	total:	9.76s	remaining:	1.47s
869:	learn:	336421.8433686	total:	9.77s	remaining:	1.46s
870:	learn:	336255.3304322	total:	9.79s	remaining:	1.45s
871:	learn:	336091.3226988	total:	9.8s	remaining:	1.44s
872:	learn:	336009.8093219	total:	9.81s	remaining:	1.43s
873:	learn:	335826.1417181	total:	9.82s	remaining:	1.42s
874:	learn:	335769.1505745	total:	9.84s	remaining:	1.41s
875:	learn:	335717.7533018	total:	9.85s	remaining:	1.39s
876:	learn:	335544.5647192	total:	9.86s	remaining:	1.38s
877:	learn:	335433.4550935	total:	9.88s	remaining:	1.37s
878:	learn:	335286.2467234	total:	9.89s	remaining:	1.36s
879:	learn:	335191.4039822	total:	9.9s	remaining:	1.35s
880:	learn:	335036.1806064	total:	9.91s	remaining:	1.34s
881:	learn:	334939.6566842	total:	9.93s	remaining:	1.33s
882:	learn:	334776.1207191	total:	9.94s	remaining:	1.32s
883:	learn:	334634.8670276	total:	9.95s	remaining:	1.31s
884:	learn:	334463.8560508	total:	9.96s	remaining:	1.29s
885:	learn:	334253.4844271	total:	9.98s	remaining:	1.28s
886:	learn:	334044.7514390	total:	9.99s	remaining:	1.27s
887:	learn:	333953.0955156	total:	10s	remaining:	1.26s
888:	learn:	333804.0843293	total:	10s	remaining:	1.25s
889:	learn:	333704.4108566	total:	10s	remaining:	1.24s
890:	learn:	333640.1040056	total:	10s	remaining:	1.23s
891:	learn:	333492.2552078	total:	10.1s	remaining:	1.22s
892:	learn:	333427.8284349	total:	10.1s	remaining:	1.21s
893:	learn:	333260.0778948	total:	10.1s	remaining:	1.2s
894:	learn:	333177.2157553	total:	10.1s	remaining:	1.18s
895:	learn:	332953.3865673	total:	10.1s	remaining:	1.17s
896:	learn:	332779.1122791	total:	10.1s	remaining:	1.16s
897:	learn:	332707.2279353	total:	10.1s	remaining:	1.15s
898:	learn:	332573.4850467	total:	10.1s	remaining:	1.14s
899:	learn:	332448.5339909	total:	10.2s	remaining:	1.13s
900:	learn:	332200.2303947	total:	10.2s	remaining:	1.12s
901:	learn:	332098.2974553	total:	10.2s	remaining:	1.1s
902:	learn:	332001.9577410	total:	10.2s	remaining:	1.09s
903:	learn:	331893.7472383	total:	10.2s	remaining:	1.08s
904:	learn:	331676.2818640	total:	10.2s	remaining:	1.07s
905:	learn:	331508.4456761	total:	10.2s	remaining:	1.06s
906:	learn:	331448.1331984	total:	10.2s	remaining:	1.05s
907:	learn:	331361.5989248	total:	10.3s	remaining:	1.04s
908:	learn:	331225.9745479	total:	10.3s	remaining:	1.03s
909:	learn:	331105.0863193	total:	10.3s	remaining:	1.02s
910:	learn:	330975.4799497	total:	10.3s	remaining:	1.01s
911:	learn:	330911.9739556	total:	10.3s	remaining:	995ms
912:	learn:	330750.5464091	total:	10.3s	remaining:	984ms
913:	learn:	330675.2696448	total:	10.3s	remaining:	974ms
914:	learn:	330493.4934520	total:	10.4s	remaining:	962ms
915:	learn:	330433.3162681	total:	10.4s	remaining:	951ms
916:	learn:	330258.6970267	total:	10.4s	remaining:	940ms
917:	learn:	330124.8835969	total:	10.4s	remaining:	929ms
918:	learn:	330054.5681742	total:	10.4s	remaining:	918ms
919:	learn:	329900.8544362	total:	10.4s	remaining:	907ms
920:	learn:	329813.7823965	total:	10.4s	remaining:	896ms
921:	learn:	329673.2203320	total:	10.5s	remaining:	885ms
922:	learn:	329593.5695900	total:	10.5s	remaining:	874ms
923:	learn:	329534.6886332	total:	10.5s	remaining:	863ms
924:	learn:	329445.9104912	total:	10.5s	remaining:	852ms
925:	learn:	329346.1427888	total:	10.5s	remaining:	841ms
926:	learn:	329268.8821073	total:	10.5s	remaining:	829ms
927:	learn:	329050.4461091	total:	10.5s	remaining:	818ms
928:	learn:	328893.7494213	total:	10.6s	remaining:	807ms
929:	learn:	328737.2588102	total:	10.6s	remaining:	796ms
930:	learn:	328650.1723105	total:	10.6s	remaining:	785ms
931:	learn:	328578.4703286	total:	10.6s	remaining:	773ms
932:	learn:	328338.7831957	total:	10.6s	remaining:	762ms
933:	learn:	328152.9867549	total:	10.6s	remaining:	751ms
934:	learn:	328050.0848225	total:	10.6s	remaining:	740ms
935:	learn:	327936.9612170	total:	10.7s	remaining:	729ms
936:	learn:	327687.0981930	total:	10.7s	remaining:	717ms
937:	learn:	327521.0276099	total:	10.7s	remaining:	706ms
938:	learn:	327475.1949549	total:	10.7s	remaining:	695ms
939:	learn:	327425.8370836	total:	10.7s	remaining:	684ms
940:	learn:	327332.2222156	total:	10.7s	remaining:	672ms
941:	learn:	327195.8650309	total:	10.7s	remaining:	661ms
942:	learn:	327098.7981311	total:	10.8s	remaining:	650ms
943:	learn:	327003.9554475	total:	10.8s	remaining:	639ms
944:	learn:	326853.3411514	total:	10.8s	remaining:	627ms

945:	learn:	326707.4721778	total:	10.8s	remaining:	616ms
946:	learn:	326639.1326551	total:	10.8s	remaining:	605ms
947:	learn:	326504.0192818	total:	10.8s	remaining:	594ms
948:	learn:	326361.9672732	total:	10.8s	remaining:	582ms
949:	learn:	326276.6663059	total:	10.8s	remaining:	571ms
950:	learn:	326241.1659005	total:	10.9s	remaining:	560ms
951:	learn:	326127.4400806	total:	10.9s	remaining:	548ms
952:	learn:	326032.5249100	total:	10.9s	remaining:	537ms
953:	learn:	325910.1731706	total:	10.9s	remaining:	526ms
954:	learn:	325783.6013363	total:	10.9s	remaining:	515ms
955:	learn:	325690.8230957	total:	10.9s	remaining:	503ms
956:	learn:	325558.1319543	total:	10.9s	remaining:	492ms
957:	learn:	325446.1517429	total:	11s	remaining:	480ms
958:	learn:	325337.7370848	total:	11s	remaining:	469ms
959:	learn:	325184.2017107	total:	11s	remaining:	458ms
960:	learn:	325070.7885356	total:	11s	remaining:	446ms
961:	learn:	324945.8206806	total:	11s	remaining:	435ms
962:	learn:	324842.3179951	total:	11s	remaining:	424ms
963:	learn:	324707.3283170	total:	11s	remaining:	412ms
964:	learn:	324364.5804630	total:	11.1s	remaining:	401ms
965:	learn:	324195.0565785	total:	11.1s	remaining:	389ms
966:	learn:	324039.9693671	total:	11.1s	remaining:	378ms
967:	learn:	323965.2533026	total:	11.1s	remaining:	367ms
968:	learn:	323882.7808241	total:	11.1s	remaining:	355ms
969:	learn:	323770.7678944	total:	11.1s	remaining:	344ms
970:	learn:	323610.2333276	total:	11.1s	remaining:	333ms
971:	learn:	323577.0740720	total:	11.1s	remaining:	321ms
972:	learn:	323487.3456704	total:	11.2s	remaining:	310ms
973:	learn:	323331.9306269	total:	11.2s	remaining:	298ms
974:	learn:	323230.4767364	total:	11.2s	remaining:	287ms
975:	learn:	323167.5309498	total:	11.2s	remaining:	276ms
976:	learn:	322837.9529727	total:	11.2s	remaining:	264ms
977:	learn:	322709.1468702	total:	11.2s	remaining:	253ms
978:	learn:	322571.4357575	total:	11.2s	remaining:	241ms
979:	learn:	322510.3102603	total:	11.3s	remaining:	230ms
980:	learn:	322369.4023926	total:	11.3s	remaining:	218ms
981:	learn:	322243.1965405	total:	11.3s	remaining:	207ms
982:	learn:	322120.2966573	total:	11.3s	remaining:	195ms
983:	learn:	322060.4734769	total:	11.3s	remaining:	184ms
984:	learn:	321963.1944805	total:	11.3s	remaining:	172ms
985:	learn:	321819.9414428	total:	11.3s	remaining:	161ms
986:	learn:	321732.4300391	total:	11.3s	remaining:	149ms
987:	learn:	321490.9757442	total:	11.4s	remaining:	138ms
988:	learn:	321404.9135019	total:	11.4s	remaining:	126ms
989:	learn:	321350.5999890	total:	11.4s	remaining:	115ms
990:	learn:	321291.1555820	total:	11.4s	remaining:	103ms
991:	learn:	321193.0901034	total:	11.4s	remaining:	92ms
992:	learn:	321030.4908762	total:	11.4s	remaining:	80.5ms
993:	learn:	320929.2884548	total:	11.4s	remaining:	69ms
994:	learn:	320752.6618850	total:	11.4s	remaining:	57.5ms
995:	learn:	320702.7509833	total:	11.5s	remaining:	46ms
996:	learn:	320602.4935905	total:	11.5s	remaining:	34.5ms
997:	learn:	320516.7667011	total:	11.5s	remaining:	23ms
998:	learn:	320463.2956572	total:	11.5s	remaining:	11.5ms
999:	learn:	320380.0132146	total:	11.5s	remaining:	0us

In [29]: *#checking which models has the best accuracy for prediction*

```
Training_models
for k,v in Training_models.items():
    print(f"{k}:{round(v*100,2)}%")
```

```
Linear Regression:18.68%
Lasso:18.68%
Ridge:18.68%
Bayesian Ridge:18.68%
Decision Tree Regressor:99.88%
Linear SVR:-61.77%
KNeighbors Regressor:95.41%
Random Forest Regressor:99.56%
Gradient Boosting Regressor:76.83%
Elastic Net:18.59%
SGD Regressor:-2.703735244173811e+21%
Cat Boost Regressor:94.99%
```

In [30]: *#Using the random forest regressor to train the model because it has the heighest accuracy*

```
RanForest=RandomForestRegressor()
RanForest
```

Out[30]: RandomForestRegressor()

In [31]: X_test.shape

Out[31]: (60938, 8)

In [32]: *#Fitting the the model*

```
radn=RanForest.fit(X_train,y_train)
```

In [33]: pred y=radn.predict(X test)

```
predict_and_actual=pd.DataFrame({'predicted_price':np.around(pred_y),'actual_price':y_test})
predict_and_actual
```

```
Out[33]:
```

	predicted_price	actual_price
169741	700000.0	700000.0
103962	1300000.0	1300000.0
190201	419000.0	419000.0
191926	255800.0	255800.0
109679	433727.0	439000.0
...
159975	1299999.0	1299999.0
78346	745000.0	745000.0
192036	1999000.0	1999000.0
155477	1575000.0	1575000.0
138163	499900.0	499900.0

60938 rows × 2 columns

```
In [63]: # from sklearn.metrics import mean_squared_error
# print(mean_squared_error(pred_y,y_test))
# print(np.sqrt(mean_squared_error(pred_y,y_test)))
```

```
In [49]: m=X_train.columns
pred=[]
for i in range(0,len(m)):
    a=float(input(f'Enter {m[i]}:'))
    pred.append(a)
```

```
Enter status:0
Enter city:55
Enter state:1
Enter bed:2
Enter bath:3
Enter acre_lot:2
Enter zip_code:24.46
Enter house_size:38833
```

```
In [50]: my_prediction=radn.predict([pred])
print(f'predicted value for price is => {my_prediction}')
```

```
predicted value for price is => [1275987.]
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\base.py:450: UserWarning: X does not have valid feature names, but RandomForestRegressor was fitted with feature names
warnings.warn(
```

```
In [ ]:
```

Loading [MathJax]/extensions/Safe.js