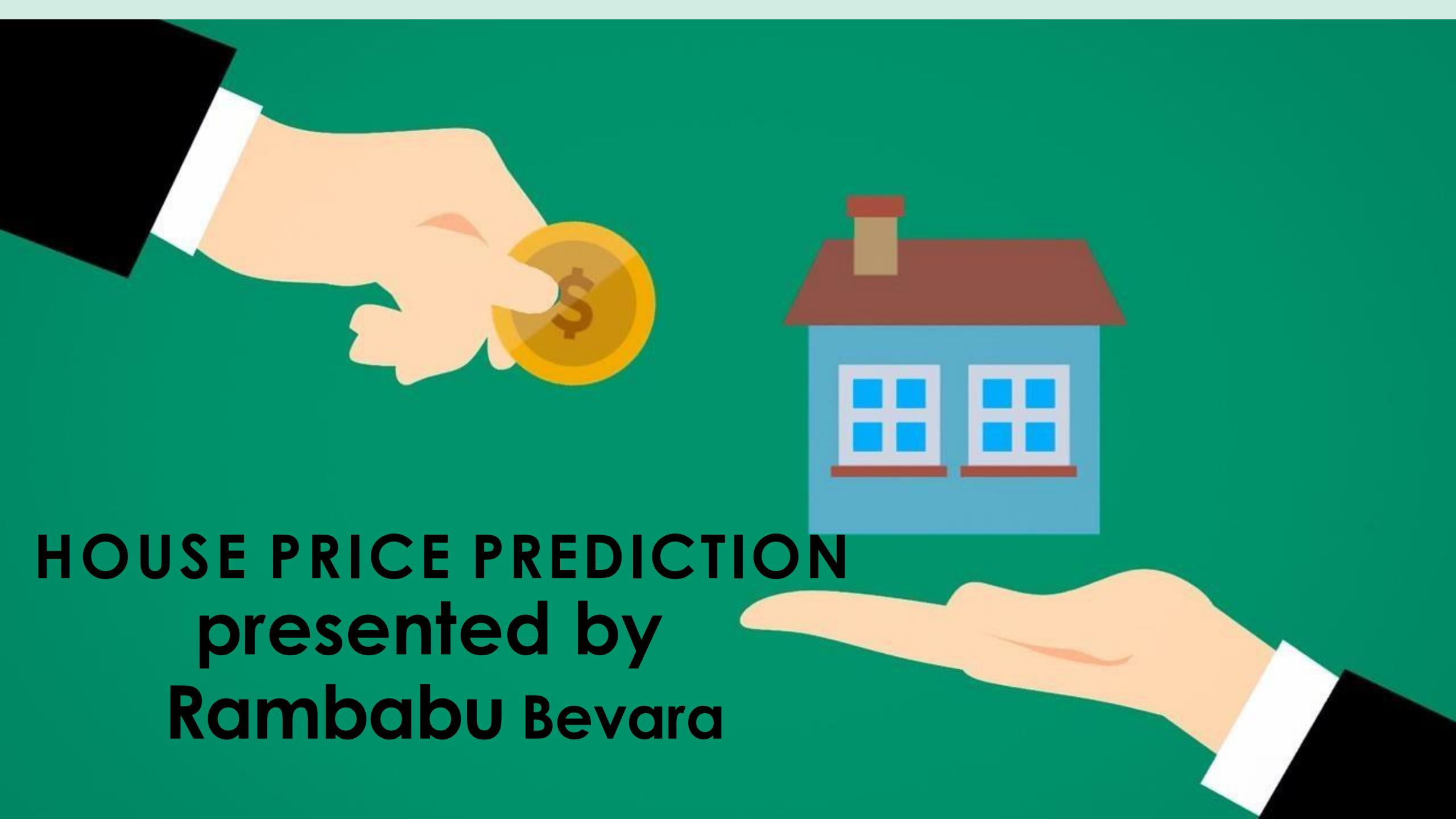


HOUSE PRICE PREDICTION

presented by

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OUTLINE

- Introduction
- Problem statement
- Dataset & Cleaning
- Feature Engineering
- Outliers Detection & Filling
- One Hot Encoding
- Model Creation
- Output

INTRODUCTION

- This Project ,we have built a machine learning model to predict the house prices of an dataset from cities in india.
- This project will very helpful for the real estate market.
- Our model can be used by both house sellers and house buyers.
- Multiple Linear Regression algorithm is used to creat a model with great accuracy score
- We will aplly Lasso & Ridge models to find out the most optimum model with Maximum R-squared value.

PROBLEM STATEMENT

- Real estate is not only the key sector of the national economy, but also one of the citizen's major concerns.
- With increasing demand of housing ,prices of houses are also going up.
- Delivering precise forecasts for housing market prices is essential to address this growing challenge.
- Establishing fair and well-founded property valuations is crucial for restoring transparency and building consumer confidence, particularly in markets like India where trust is paramount.

SPECIFICATIONS

- This project aims to forecast housing prices in ₹ by analyzing key attributes.
- The predictive model is built using a dataset specifically containing some cities in India housing market data.
- We employ machine learning techniques to develop this forecasting tool.
- Specifically, the model is trained and evaluated using the Multiple Linear Regression algorithm and Ridge & Lasso .

DATASET

- The dataset is about House price Prediction
- Its contains 187531 rows × 21 columns
- The columns are : [Index, Title, Description, Amount (in rupees), Price (in rupees), location, Carpet Area, Status, Floor, Transaction, Furnishing, facing, overlooking, Society, Bathroom, Balcony, Car Parking, Ownership, Super Area, Dimensions, Plot Area]
- We have used a total of 9 features to train our machine learning model

DATA LOADING

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+ X ☰ 📁 ► ■ C ➡ Code ▾ JupyterLab ☰ Python [conda env:base] * ⚙️

```
import matplotlib.pyplot as plt
import seaborn as sns
```

[2]: house=pd.read_csv("C://Users//nisha//Downloads//house_prices.csv (1)//house_prices.csv")
house

[2]:

Index	Title	Description	Amount(in rupees)	Price (in rupees)	location	Carpet Area	Status	Floor	Transaction	...	facing	overlooking	Society	Bathroom	Ba
0	1 BHK Ready to Occupy Flat for sale in Srushti...	Bhiwandi, Thane has an attractive 1 BHK Flat f...	42 Lac	6000.0	thane	500 sqft	Ready to Move	10 out of 11	Resale	...	NaN	NaN	Srushti Siddhi Mangal Murti Complex	1	
1	2 BHK Ready to Occupy Flat for	One can find this stunning 2 BHK flat for	98 Lac	13799.0	thane	473 sqft	Ready to Move	3 out of 22	Resale	...	East	Garden/Park	Dosti Vihar	2	

DATA CLEANING

- The core purpose of data cleaning is to uncover and remove inaccuracies and repeated data points, ensuring the dataset is trustworthy and precise.
- This task is commonly performed with the help of the popular Python library, pandas.
- At the outset, columns irrelevant to predicting the final price are excluded from the Dataset
- Any rows containing missing information in one or more fields are eliminated to preserve data quality.
- Columns mixing textual and numerical data are cleaned by converting all values into integers for consistency.

➤ Checking null values

```
[5]: house.isnull().mean()*100
```

```
[5]:
```

Index	0.000000
Title	0.000000
Description	1.612000
Amount(in rupees)	0.000000
Price (in rupees)	9.419776
location	0.000000
Carpet Area	43.018488
Status	0.327946
Floor	3.773776
Transaction	0.044259
Furnishing	1.544811
facing	37.451408
overlooking	43.425354
Society	58.485264
Bathroom	0.441527
Balcony	26.094352
Car Parking	55.114621
Ownership	34.936624

```
8]: house['Title']=house['Title'].str[:5]
```

```
9]: house['Title']=house['Title'].replace({' Apar':1,'> 10 ':10,' Buil':3,' Stud':11})  
house
```

```
9]:
```

	Title	Amount(in rupees)	location	Floor	Transaction	Furnishing	facing	Bathroom	Balcony
0	1 BHK	42 Lac	thane	10 out of 11	Resale	Unfurnished	NaN	1	2
1	2 BHK	98 Lac	thane	3 out of 22	Resale	Semi-Furnished	East	2	NaN
2	2 BHK	1.40 Cr	thane	10 out of 29	Resale	Unfurnished	East	2	NaN
3	1 BHK	25 Lac	thane	1 out of 3	Resale	Unfurnished	NaN	1	1
4	2 BHK	1.60 Cr	thane	20 out of 42	Resale	Unfurnished	West	2	NaN
...

➤ Extracting data & replacing

```
11]: house['BHK'] = house['Title'].str.extract(r'(\d+)', expand=False)  
house['BHK'] = pd.to_numeric(house['BHK'], errors='coerce')  
house
```

```
11]:
```

	Title	Amount(in rupees)	location	Floor	Transaction	Furnishing	facing	Bathroom	Balcony	BHK
0	1 BHK	42 Lac	thane	10 out of 11	Resale	Unfurnished	NaN	1	2	1.0
1	2 BHK	98 Lac	thane	3 out of 22	Resale	Semi-Furnished	East	2	NaN	2.0
2	2 BHK	1.40 Cr	thane	10 out of 29	Resale	Unfurnished	East	2	NaN	2.0

FEATURE ENGINEERING

- Feature engineering involves leveraging expert knowledge to derive meaningful attributes from unprocessed data using data mining methods. These crafted features play a crucial role in boosting the effectiveness of machine learning models. In essence, feature engineering can be viewed as a practical application of machine learning principles.
- To streamline our dataset, dimensionality reduction techniques are applied to eliminate less significant data points, focusing on those most relevant for predicting house prices.

➤ Filling Null values and converting data types ➤ Code for convert values

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```

house['Amount(in rupees)'].fillna(house['Amount(in rupees)'].median(),inplace=True)
house['Amount(in rupees)']=pd.to_numeric(house['Amount(in rupees)'],errors='coerce')

##2.Extracting & converting to_numeric Floor
# Extract leading number from the floor string
house['Floor']=house['Floor'].astype(str)
house['Floor'] = house['Floor'].str.extract(r'(\d+)')
house['Floor'] = pd.to_numeric(house['Floor'], errors='coerce')
house['Floor'].fillna(house['Floor'].median(), inplace=True)

3.## filling Null values of Location with mode
house['location'].fillna(house['location'].mode()[0],inplace=True)

4.##Filling Null values of Transaction with mode
house['Transaction'].fillna(house['Transaction'].mode()[0],inplace=True)

##5.Filling Null Values Of Furnishing with mode
house['Furnishing'].fillna(house['Furnishing'].mode()[0],inplace=True)

##7.Filling Null Values of Bathrooms with Mode & Converting this into numeric
house['Bathroom'].fillna(house['Bathroom'].mode()[0],inplace=True)
house['Bathroom']=pd.to_numeric(house['Bathroom'],errors='coerce')

##8.Filing Null Values Of Balcony with Mode
house['Balcony'].fillna(house['Balcony'].mode()[0],inplace=True)
house['Balcony']=pd.to_numeric(house['Balcony'],errors='coerce')

##9.Fiulling Null VALues of BHK with Mode
house['BHK'].fillna(house['BHK'].mode()[0],inplace=True)

house['facing'].fillna(house['facing'].mode()[0],inplace=True)

```

```
[13]: def convert(val):
    val=val.strip()
    if 'Lac' in val:
        return float(val.replace('Lac','')).strip())*1e5
    elif 'Cr' in val:
        return float(val.replace('Cr','')).strip())*1e7
    else:
        return None
```

```
[14]: house['Amount(in rupees)']=house['Amount(in rupees)'].apply(convert)
```

DETECTING OUTLIERS & FILLING

- Once an outlier is identified, attempt to correct the error if feasible; if not, exclude that data point from the dataset.
- Our dataset revealed inconsistencies in the relationships among certain attribute values.
- Consequently, such anomalous records are removed to ensure data integrity.
- Scatter plots serve as a visual tool to spot additional outliers, which are also eliminated from the dataset.

➤ Checking Outliers & filling

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A set of small, light-gray navigation icons typically found in presentation software like Beamer. From left to right, they include: a square with a diagonal line, a plus sign, a double minus sign, a square with a circle inside, a square with a diagonal line, a double right arrow, a single right arrow, a double left arrow, a single left arrow, the word "Code", and a downward-pointing triangle.

JupyterLab  Python [conda env:base] *    

```
[18]: q1=house['BHK'].quantile(0.25)
       q2=house['BHK'].quantile(0.75)
       iqr=q2-q1
       upper=q2+(1.5)*iqr
       lower=q1-(1.5)*iqr
       upper,lower
```

[18]: (4.5, 0.5)

```
[19]: mde=house['BHK'].median()
       house['BHK']=house['BHK'].apply(lambda x:mde if x <lower or x >upper else x)
```

```
[20]: house.boxplot(column='Amount(in rupees)')  
plt.show()
```

```
[22]: q1=house['Amount(in rupees)'].quantile(0.25)
      q2=house['Amount(in rupees)'].quantile(0.75)
      iqr=q2-q1
      upper=q2+(1.5)*iqr
      lower=q1-(1.5)*iqr
      upper,lower
```

[22]: (28990000.0, -9650000.0)

```
[23]: mde=house['Amount(in rupees)'].median()
```

➤ Filling Null values and converting datatypes

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Code ▾

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```
[69]: house['Balcony']=house['Balcony'].fillna(0).astype(int)
house['Balcony']=house['Balcony'].fillna(house['Balcony'].mean()).round().astype(int)
house
```

```
[69]:
```

	Amount(in rupees)	location	Floor	Transaction	Furnishing	facing	Bathroom	Balcony	BHK
0	4200000.0	thane	10.0	Resale	Unfurnished	East	1.0	2	1.0
1	9800000.0	thane	3.0	Resale	Semi-Furnished	East	2.0	2	2.0

```
[71]: house['Bathroom']=house['Bathroom'].fillna(0).astype(int)
house['Bathroom']=house['Bathroom'].fillna(house['Bathroom'].mean()).round().astype(int)
house
```

```
[71]:
```

	Amount(in rupees)	location	Floor	Transaction	Furnishing	facing	Bathroom	Balcony	BHK
0	4200000.0	thane	10.0	Resale	Unfurnished	East	1	2	1.0
1	9800000.0	thane	3.0	Resale	Semi-Furnished	East	2	2	2.0

➤ ONE HOT CODING

- This approach transforms categorical data into numerical format, making it suitable for machine learning models.
- In our dataset, the categorical feature we focus on is "location."
- We applied one hot encoding to convert each location into a numeric representation.

➤ ONE HOT CODING

```
[41]: x=house[['Floor','location',
             'Transaction', 'Furnishing', 'Bathroom', 'Balcony','BHK']]
y=house['Amount(in rupees)']

[42]: house['location'].unique()

[42]: array(['thane', 'other', 'mumbai', 'ahmedabad', 'bangalore', 'chennai',
           'gurgaon', 'hyderabad', 'jaipur', 'kolkata', 'new-delhi', 'noida',
           'pune', 'bhiwadi', 'chandigarh', 'faridabad', 'goa',
           'greater-noida', 'kochi', 'mohali', 'ranchi', 'surat', 'vadodara',
           'visakhapatnam', 'zirakpur'], dtype=object)

[102]: x=x['location_encoded'] = house['location'].map(house.groupby('location')['Amount(in rupees)'].mean())
      x
```

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```
[108]: cat=x.select_dtypes(exclude='number')
       num=x.select_dtypes(include='number')

[110]: cat_x=pd.get_dummies(cat)
       cat_x
```

	Transaction_New Property	Transaction_Other	Transaction_Rent/Lease	Transaction_Resale	Furnishing_Furnished	Furnishing_Semi- Furnished	Furnishing_Unfurnished	facing_East	facing
0	False	False	False	True	False	False	True	True	True
1	False	False	False	True	False	True	False	True	True

➤ MODEL BUILDING

- **Modeling involves training a machine learning algorithm to accurately forecast labels based on input features.**
- **We applied the Linear Regression technique for both training and evaluating our model.**
- **Our model achieved an accuracy of 100%, reflecting strong predictive performance.**

model training

```
[129]: from sklearn.linear_model import LinearRegression, Ridge, Lasso  
from sklearn.metrics import mean_squared_error, r2_score
```

```
[131]: model=LinearRegression()  
model.fit(x_train,y_train)
```

```
[131]: ▾ LinearRegression ⓘ ⓘ  
LinearRegression()
```

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[142]: `print('Test Mean squared error :',mean_squared_error(y_test,test_pred))`

Test Mean squared error : 2.7900281376731636e-13

[144]: `print('Train Mean squared error :',mean_squared_error(y_train,train_pred))`

Train Mean squared error : 2.805622538822866e-13

[146]: `print('Test R2 error :',r2_score(y_test,test_pred))`

Test R2 error : 1.0

[148]: `print('Train R2 error :',r2_score(y_train,train_pred))`

Train R2 error : 1.0

[134]: `test_pred=model.predict(x_test)`

test_pred

[134]: `array([12100000.00000015, 7200000.00000045, 14999999.9999998 , ... , 5100000.0000002 , 7799999.99999993, 6400000.00000052])`

[136]: `y_test`

[136]:

94353	12100000.0
20969	7200000.0
90081	15000000.0
160714	4420000.0
80704	7800000.0

...

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JupyterLab ▾ ⚙ Python [conda env:base] * ○ ▾

Ridge Model

```
[151]: ridge_model=Ridge(alpha=0.1)
ridge_model.fit(x_train,y_train)
```

```
C:\Users\nisha\anaconda3\Lib\site-packages\sklearn\linear_model\_ridge.py:216: LinAlgWarning: Ill-conditioned matrix (rcond=1.66969e-20):
result may not be accurate.
    return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T
```

```
[151]: ▾ Ridge ⓘ ⓘ
Ridge(alpha=0.1)
```

```
[153]: ridge_test=ridge_model.predict(x_test)
ridge_train=ridge_model.predict(x_train)
```

```
[155]: print('Ridge Model of MSE of train :',mean_squared_error(y_train,ridge_train))
```

```
Ridge Model of MSE of train : 2.114008490639501e-11
```

```
[159]: print('Ridge model of R2 of train :',r2_score(y_train,ridge_train))
```

```
Ridge model of R2 of train : 1.0
```

```
[161]: print('Ridge Model of R2 of test :',r2_score(y_test,ridge_test))
```

```
Ridge Model of R2 of test : 1.0
```

Lasso model

```
[ ]: Lasso_model=Lasso(alpha=0.1)
Lasso_model.fit(x_train,y_train)

[ ]: Lasso_test=Lasso_model.predict(x_test)
Lasso_train=Lasso_model.predict(x_train)

[ ]: print('Lasso Model of MSE of train :',mean_squared_error(y_train,Lasso_train))

[ ]: print('Lasso Model of MSE of test:',mean_squared_error(y_test,Lasso_test))
Lasso(alpha=0.1)

[166]: Lasso_test=Lasso_model.predict(x_test)
Lasso_train=Lasso_model.predict(x_train)

[168]: print('Lasso Model of MSE of train :',mean_squared_error(y_train,Lasso_train))
Lasso Model of MSE of train : 1.3580493466373543e-14

[170]: print('Lasso Model of MSE of test:',mean_squared_error(y_test,Lasso_test))
Lasso Model of MSE of test: 1.3522017256084456e-14

[172]: print('Lasso model of R2 of train :',r2_score(y_train,Lasso_train))
Lasso model of R2 of train : 1.0

[174]: print('Lasso model of R2 of test :',r2_score(y_test,Lasso_test))
Lasso model of R2 of test : 1.0
```

➤ OUTPUT

- We created a function to predict the house price.
- Using Linear Regression & Lasso & Ridge Completed Building Prediction .
- When we pass the values into our function,it will predict house price for us.
- Where we got R-Squared value as 100% Accuracy.
- The Mean Squared error also in good .
- In real world it's Rare to come this type of values .
- It's a good fit.

```

import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

house=pd.read_csv("C://Users//nisha//Downloads//house_prices.csv
(1)//house_prices.csv")
house

      Index          Title \
0           0  1 BHK Ready to Occupy Flat for sale in Srushti...
1           1  2 BHK Ready to Occupy Flat for sale in Dosti V...
2           2  2 BHK Ready to Occupy Flat for sale in Sunrise...
3           3    1 BHK Ready to Occupy Flat for sale Kasheli...
4           4  2 BHK Ready to Occupy Flat for sale in TenX Ha...
...
187526  187526  3 BHK Ready to Occupy Flat for sale in Bollywo...
187527  187527  3 BHK Ready to Occupy Flat for sale in Sushma ...
187528  187528  3 BHK Ready to Occupy Flat for sale in Bollywo...
187529  187529  2 BHK Ready to Occupy Flat for sale in Friends...
187530  187530  3 BHK Ready to Occupy Flat for sale in Affinit...

      Description Amount(in
rupees) \
0   Bhiwandi, Thane has an attractive 1 BHK Flat f...      42
Lac
1   One can find this stunning 2 BHK flat for sale...     98
Lac
2   Up for immediate sale is a 2 BHK apartment in ... 1.40 Cr
3   This beautiful 1 BHK Flat is available for sal...     25
Lac
4   This lovely 2 BHK Flat in Pokhran Road, Thane ... 1.60 Cr
...
...
187526  This magnificent 3 BHK Flat is available for s...     63
Lac
187527  Have a look at this immaculate 3 BHK flat for ...     55
Lac
187528  Gazipur, Zirakpur has an appealing 3 BHK flat ...     76
Lac
187529  Up for immediate sale is a 2 BHK apartment in ...     30
Lac
187530  This exquisite 3 BHK Flat is offered for sale ... 1.18 Cr

      Price (in rupees)  location Carpet Area          Status
Floor \
0            6000.0       thane     500 sqft  Ready to Move  10 out

```


187526	Bollywood Esencia	3	3	1
Covered				
187527	Sushma Urban Views	3	NaN	1
Covered				
187528	Bollywood Esencia	3	2	1
Covered,				
187529	Friends Enclave	2	NaN	
Nan				
187530	Affinity Greens	4	4	1
Covered				
	Ownership Super Area Dimensions Plot Area			
0	NaN	NaN	NaN	NaN
1	Freehold	NaN	NaN	NaN
2	Freehold	NaN	NaN	NaN
3	NaN	NaN	NaN	NaN
4	Co-operative Society	NaN	NaN	NaN
...
187526	Freehold	1953 sqft	NaN	NaN
187527	NaN	1680 sqft	NaN	NaN
187528	Freehold	NaN	NaN	NaN
187529	NaN	709 sqft	NaN	NaN
187530	Freehold	1915 sqft	NaN	NaN

[187531 rows x 21 columns]

house.columns

```
Index(['Index', 'Title', 'Description', 'Amount(in rupees)',  
       'Price (in rupees)', 'location', 'Carpet Area', 'Status',  
'Floor',  
       'Transaction', 'Furnishing', 'facing', 'overlooking',  
'Society',  
       'Bathroom', 'Balcony', 'Car Parking', 'Ownership', 'Super  
Area',  
       'Dimensions', 'Plot Area'],  
      dtype='object')
```

house.info()

```
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 187531 entries, 0 to 187530  
Data columns (total 21 columns):  
 #   Column           Non-Null Count  Dtype     
---  --    
 0   Index            187531 non-null  int64    
 1   Title             187531 non-null  object    
 2   Description        184508 non-null  object    
 3   Amount(in rupees)  187531 non-null  object    
 4   Price (in rupees)  169866 non-null  float64
```

```
5   location           187531 non-null  object
6   Carpet Area        106858 non-null  object
7   Status              186916 non-null  object
8   Floor               180454 non-null  object
9   Transaction         187448 non-null  object
10  Furnishing          184634 non-null  object
11  facing              117298 non-null  object
12  overlooking          106095 non-null  object
13  Society              77853 non-null  object
14  Bathroom             186703 non-null  object
15  Balcony              138596 non-null  object
16  Car Parking           84174 non-null  object
17  Ownership             122014 non-null  object
18  Super Area            79846 non-null  object
19  Dimensions            0 non-null    float64
20  Plot Area             0 non-null    float64
dtypes: float64(3), int64(1), object(17)
memory usage: 30.0+ MB
```

```
house.isnull().mean()*100
```

```
Index           0.000000
Title           0.000000
Description     1.612000
Amount(in rupees) 0.000000
Price (in rupees) 9.419776
location         0.000000
Carpet Area     43.018488
Status           0.327946
Floor             3.773776
Transaction      0.044259
Furnishing       1.544811
facing            37.451408
overlooking       43.425354
Society           58.485264
Bathroom          0.441527
Balcony           26.094352
Car Parking        55.114621
Ownership          34.936624
Super Area         57.422506
Dimensions         100.000000
Plot Area          100.000000
dtype: float64
```

```
house.shape
```

```
(187531, 21)
```

```
## Dropping columns
```

```
house.drop(['Index', 'Price (in
```

```
rupees)', 'Description', 'Status', 'overlooking', 'Car  
Parking', 'Society', 'Dimensions', 'Ownership', 'Carpet Area', 'Super  
Area', 'Plot Area'], axis=1, inplace=True)
```

```
house['Title']=house['Title'].str[:5]
```

```
house['Title']=house['Title'].replace({' Apar':1, '> 10 ':10,  
'Buil':3, ' Stud':11})
```

```
house
```

	Title	Amount(in rupees)	location	Floor	Transaction
0	1 BHK	42 Lac	thane	10 out of 11	Resale
1	2 BHK	98 Lac	thane	3 out of 22	Resale
2	2 BHK	1.40 Cr	thane	10 out of 29	Resale
3	1 BHK	25 Lac	thane	1 out of 3	Resale
4	2 BHK	1.60 Cr	thane	20 out of 42	Resale
...
187526	3 BHK	63 Lac	zirakpur	2 out of 4	New Property
187527	3 BHK	55 Lac	zirakpur	4 out of 6	Resale
187528	3 BHK	76 Lac	zirakpur	1 out of 3	Resale
187529	2 BHK	30 Lac	zirakpur	2 out of 2	Resale
187530	3 BHK	1.18 Cr	zirakpur	5 out of 13	Resale

	Furnishing	facing	Bathroom	Balcony
0	Unfurnished	NaN	1	2
1	Semi-Furnished	East	2	NaN
2	Unfurnished	East	2	NaN
3	Unfurnished	NaN	1	1
4	Unfurnished	West	2	NaN
...
187526	Semi-Furnished	East	3	3
187527	Unfurnished	North - East	3	NaN
187528	Furnished	East	3	2
187529	Semi-Furnished	NaN	2	NaN
187530	Semi-Furnished	North - East	4	4

```
[187531 rows x 9 columns]
```

```
house['Title'].unique()
```

```

array(['1 BHK', '2 BHK', '3 BHK', '4 BHK', '5 BHK', 11, '6 BHK', 1,
       '8 BHK', '7 BHK', 10, '9 BHK', '10 BH', 3], dtype=object)

house['BHK'] = house['Title'].str.extract(r'(\d+)', expand=False)
house['BHK'] = pd.to_numeric(house['BHK'], errors='coerce')
house

      Title Amount(in rupees) location        Floor Transaction
\0      1 BHK      42 Lac     thane  10 out of 11      Resale
1      2 BHK      98 Lac     thane   3 out of 22      Resale
2      2 BHK      1.40 Cr    thane  10 out of 29      Resale
3      1 BHK      25 Lac     thane   1 out of 3      Resale
4      2 BHK      1.60 Cr    thane  20 out of 42      Resale
...
187526 3 BHK      63 Lac  zirakpur   2 out of 4  New Property
187527 3 BHK      55 Lac  zirakpur   4 out of 6      Resale
187528 3 BHK      76 Lac  zirakpur   1 out of 3      Resale
187529 2 BHK      30 Lac  zirakpur   2 out of 2      Resale
187530 3 BHK      1.18 Cr zirakpur   5 out of 13      Resale

      Furnishing      facing Bathroom Balcony  BHK
0      Unfurnished      NaN      1      2  1.0
1      Semi-Furnished    East      2      NaN  2.0
2      Unfurnished    East      2      NaN  2.0
3      Unfurnished      NaN      1      1  1.0
4      Unfurnished    West      2      NaN  2.0
...
187526  Semi-Furnished    East      3      3  3.0
187527  Unfurnished  North - East      3      NaN  3.0
187528  Furnished      East      3      2  3.0
187529  Semi-Furnished      NaN      2      NaN  2.0
187530  Semi-Furnished  North - East      4      4  3.0

[187531 rows x 10 columns]

house.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 187531 entries, 0 to 187530

```

```

Data columns (total 10 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   Title            187531 non-null   object  
 1   Amount(in rupees) 187531 non-null   object  
 2   location          187531 non-null   object  
 3   Floor             180454 non-null   object  
 4   Transaction       187448 non-null   object  
 5   Furnishing        184634 non-null   object  
 6   facing            117298 non-null   object  
 7   Bathroom           186703 non-null   object  
 8   Balcony           138596 non-null   object  
 9   BHK               186578 non-null   float64 
dtypes: float64(1), object(9)
memory usage: 14.3+ MB

def convert(val):
    val=val.strip()
    if 'Lac' in val:
        return float(val.replace('Lac','')).strip()*1e5
    elif 'Cr' in val:
        return float(val.replace('Cr','')).strip()*1e7
    else:
        return None

house[ 'Amount(in rupees)' ]=house[ 'Amount(in rupees)' ].apply(convert)

house

      Title  Amount(in rupees)  location        Floor  Transaction
\ 0     1 BHK        4200000.0    thane  10 out of 11      Resale
  1     2 BHK        9800000.0    thane   3 out of 22      Resale
  2     2 BHK       14000000.0    thane  10 out of 29      Resale
  3     1 BHK        2500000.0    thane   1 out of 3      Resale
  4     2 BHK       16000000.0    thane  20 out of 42      Resale
  ...
  ...
  ...
  187526  3 BHK       6300000.0  zirakpur  2 out of 4  New Property
  187527  3 BHK       5500000.0  zirakpur  4 out of 6      Resale
  187528  3 BHK       7600000.0  zirakpur  1 out of 3      Resale
  187529  2 BHK       3000000.0  zirakpur  2 out of 2      Resale

```

```
187530 3 BHK           11800000.0 zirakpur 5 out of 13 Resale
```

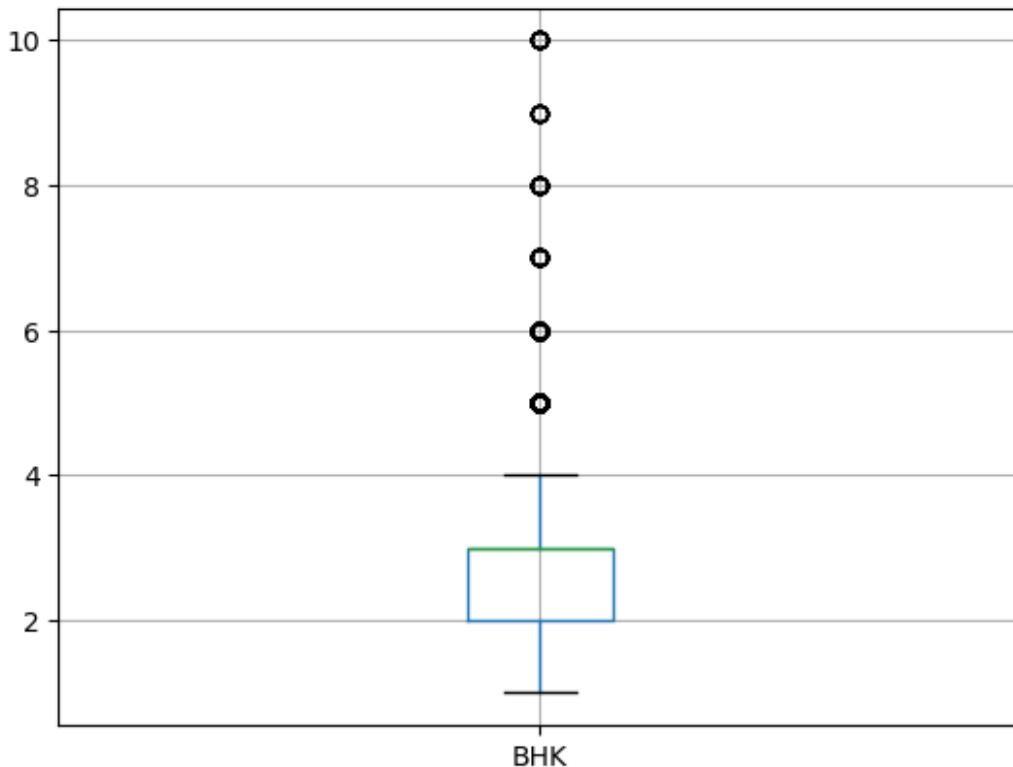
```
          Furnishing      facing Bathroom Balcony BHK
0     Unfurnished       NaN      1        2   1.0
1  Semi-Furnished      East     2        NaN   2.0
2     Unfurnished      East     2        NaN   2.0
3     Unfurnished       NaN      1        1   1.0
4     Unfurnished      West     2        NaN   2.0
...
187526  Semi-Furnished      East     3        3   3.0
187527     Unfurnished  North - East     3        NaN   3.0
187528      Furnished      East     3        2   3.0
187529  Semi-Furnished       NaN      2        NaN   2.0
187530  Semi-Furnished  North - East     4        4   3.0
```

```
[187531 rows x 10 columns]
```

```
house['Amount(in rupees)'].nunique()
```

```
1559
```

```
house.boxplot(column='BHK')
plt.show()
```



```

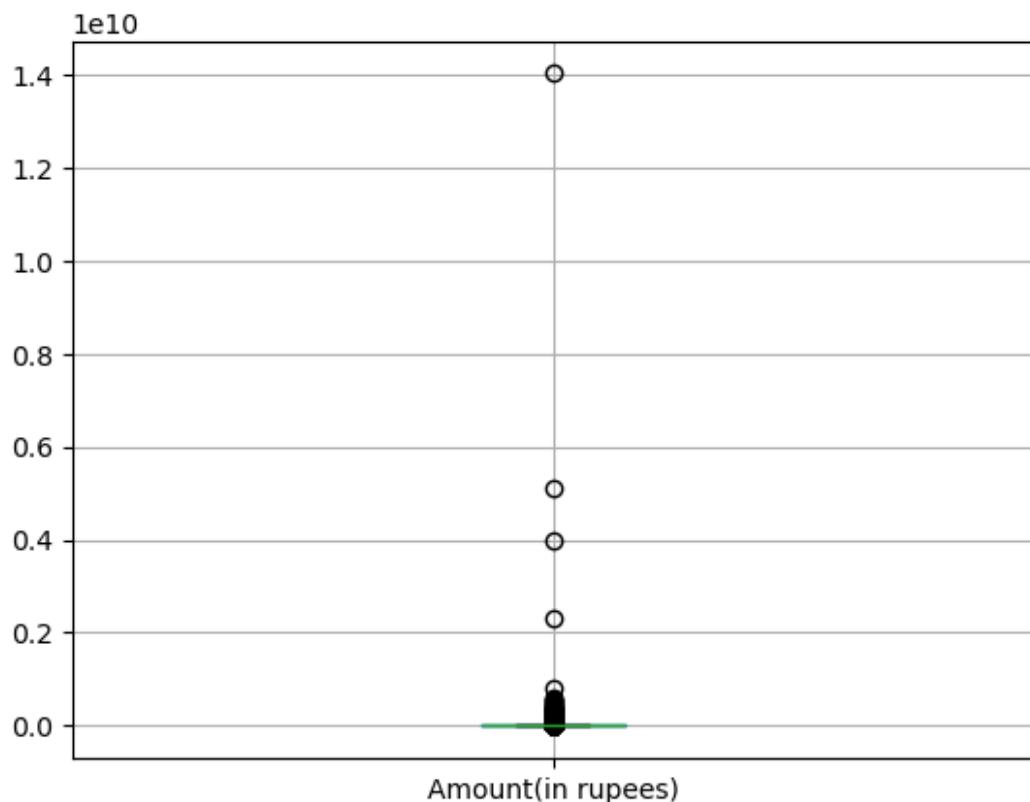
q1=house['BHK'].quantile(0.25)
q2=house['BHK'].quantile(0.75)
iqr=q2-q1
upper=q2+(1.5)*iqr
lower=q1-(1.5)*iqr
upper,lower

(4.5, 0.5)

mde=house['BHK'].median()
house['BHK']=house['BHK'].apply(lambda x:mde if x <lower or x >upper
else x )

house.boxplot(column='Amount(in rupees)')
plt.show()

```



```

house['Amount(in rupees)'].describe()

count    1.778470e+05
mean     1.198134e+07
std      3.943827e+07
min      1.000000e+05
25%     4.840000e+06
50%     7.800000e+06
75%     1.450000e+07

```

```

max      1.400300e+10
Name: Amount(in rupees), dtype: float64

q1=house['Amount(in rupees)'].quantile(0.25)
q2=house['Amount(in rupees)'].quantile(0.75)
iqr=q2-q1
upper=q2+(1.5)*iqr
lower=q1-(1.5)*iqr
upper,lower

(28990000.0, -9650000.0)

mde=house['Amount(in rupees)'].median()
house['Amount(in rupees)']=house['Amount(in rupees)'].apply(lambda
x:mde if x <lower or x >upper else x )

house.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 187531 entries, 0 to 187530
Data columns (total 10 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   Title            187531 non-null   object  
 1   Amount(in rupees) 177847 non-null   float64 
 2   location          187531 non-null   object  
 3   Floor             180454 non-null   object  
 4   Transaction       187448 non-null   object  
 5   Furnishing        184634 non-null   object  
 6   facing            117298 non-null   object  
 7   Bathroom           186703 non-null   object  
 8   Balcony            138596 non-null   object  
 9   BHK               186578 non-null   float64 
dtypes: float64(2), object(8)
memory usage: 14.3+ MB

house.isnull().mean()*100

Title           0.000000
Amount(in rupees) 5.163946
location         0.000000
Floor            3.773776
Transaction      0.044259
Furnishing       1.544811
facing           37.451408
Bathroom          0.441527
Balcony          26.094352
BHK              0.508183
dtype: float64

house.columns

```

```

Index(['Title', 'Amount(in rupees)', 'location', 'Floor',
       'Transaction',
       'Furnishing', 'facing', 'Bathroom', 'Balcony', 'BHK'],
      dtype='object')

1.## converting 'Amount(in rupees)' to numeric & filing Null values
with median
house['Amount(in rupees)'].fillna(house['Amount(in
rupees)').median(),inplace=True)
house['Amount(in rupees)']=pd.to_numeric(house['Amount(in
rupees)'),errors='coerce')

##2.Extracting & converting to_numeric Floor
# Extract leading number from the floor string
house['Floor']=house['Floor'].astype(str)
house['Floor'] = house['Floor'].str.extract(r'(\d+)')
house['Floor'] = pd.to_numeric(house['Floor'], errors='coerce')
house['Floor'].fillna(house['Floor'].median(), inplace=True)

3.## filling Null values of Location with mode
house['location'].fillna(house['location'].mode()[0],inplace=True)

4.##Filling Null values of Transaction with mode
house['Transaction'].fillna(house['Transaction'].mode()
[0],inplace=True)

##5.Filling Null Values Of Furnishing with mode
house['Furnishing'].fillna(house['Furnishing'].mode()[0],inplace=True)

##7.Filling Null Values of Bathrooms with Mode & Converting this into
numeric
house['Bathroom'].fillna(house['Bathroom'].mode()[0],inplace=True)
house['Bathroom']=pd.to_numeric(house['Bathroom'],errors='coerce')

##8.Filing Null Values Of Balcony with Mode
house['Balcony'].fillna(house['Balcony'].mode()[0],inplace=True)
house['Balcony']=pd.to_numeric(house['Balcony'],errors='coerce')

##9.Fiulling Null VAlues of BHK with Mode
house['BHK'].fillna(house['BHK'].mode()[0],inplace=True)

house['facing'].fillna(house['facing'].mode()[0],inplace=True)

C:\Users\nisha\AppData\Local\Temp\ipykernel_2572\2565815676.py:2:
FutureWarning: A value is trying to be set on a copy of a DataFrame or
Series through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never
work because the intermediate object on which we are setting values
always behaves as a copy.

For example, when doing 'df[col].method(value, inplace=True)', try

```

```
using 'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value) instead, to perform the operation inplace on the original object.
```

```
house['Amount(in rupees)'].fillna(house['Amount(in rupees)'].median(), inplace=True)
C:\Users\nisha\AppData\Local\Temp\ipykernel_2572\2565815676.py:10:
FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting values always behaves as a copy.
```

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value) instead, to perform the operation inplace on the original object.

```
house['Floor'].fillna(house['Floor'].median(), inplace=True)
C:\Users\nisha\AppData\Local\Temp\ipykernel_2572\2565815676.py:13:
FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting values always behaves as a copy.
```

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value) instead, to perform the operation inplace on the original object.

```
house['location'].fillna(house['location'].mode()[0], inplace=True)
C:\Users\nisha\AppData\Local\Temp\ipykernel_2572\2565815676.py:16:
FutureWarning: A value is trying to be set on a copy of a DataFrame or Series through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on which we are setting values always behaves as a copy.
```

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value) instead, to perform the operation inplace on the original object.

```
house['Transaction'].fillna(house['Transaction'].mode()[0], inplace=True)
```

```
C:\Users\nisha\AppData\Local\Temp\ipykernel_2572\2565815676.py:19:  
FutureWarning: A value is trying to be set on a copy of a DataFrame or  
Series through chained assignment using an inplace method.  
The behavior will change in pandas 3.0. This inplace method will never  
work because the intermediate object on which we are setting values  
always behaves as a copy.
```

For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.

```
house['Furnishing'].fillna(house['Furnishing'].mode()  
[0],inplace=True)  
C:\Users\nisha\AppData\Local\Temp\ipykernel_2572\2565815676.py:22:  
FutureWarning: A value is trying to be set on a copy of a DataFrame or  
Series through chained assignment using an inplace method.  
The behavior will change in pandas 3.0. This inplace method will never  
work because the intermediate object on which we are setting values  
always behaves as a copy.
```

For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.

```
house['Bathroom'].fillna(house['Bathroom'].mode()[0],inplace=True)  
C:\Users\nisha\AppData\Local\Temp\ipykernel_2572\2565815676.py:26:  
FutureWarning: A value is trying to be set on a copy of a DataFrame or  
Series through chained assignment using an inplace method.  
The behavior will change in pandas 3.0. This inplace method will never  
work because the intermediate object on which we are setting values  
always behaves as a copy.
```

For example, when doing 'df[col].method(value, inplace=True)', try
using 'df.method({col: value}, inplace=True)' or df[col] =
df[col].method(value) instead, to perform the operation inplace on the
original object.

```
house['Balcony'].fillna(house['Balcony'].mode()[0],inplace=True)  
C:\Users\nisha\AppData\Local\Temp\ipykernel_2572\2565815676.py:30:  
FutureWarning: A value is trying to be set on a copy of a DataFrame or  
Series through chained assignment using an inplace method.  
The behavior will change in pandas 3.0. This inplace method will never  
work because the intermediate object on which we are setting values  
always behaves as a copy.
```

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value) instead, to perform the operation inplace on the original object.

```
house['BHK'].fillna(house['BHK'].mode()[0],inplace=True)
C:\Users\nisha\AppData\Local\Temp\ipykernel_2572\2565815676.py:32:
FutureWarning: A value is trying to be set on a copy of a DataFrame or
Series through chained assignment using an inplace method.
The behavior will change in pandas 3.0. This inplace method will never
work because the intermediate object on which we are setting values
always behaves as a copy.
```

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)' or df[col] = df[col].method(value) instead, to perform the operation inplace on the original object.

```
house['facing'].fillna(house['facing'].mode()[0],inplace=True)
house.drop(['Title'],inplace=True,axis=1)

house
```

	Amount(in rupees)	location	Floor	Transaction	
Furnishing \					
0	4200000.0	thane	10.0	Resale	
Unfurnished					
1	9800000.0	thane	3.0	Resale	Semi-
Furnished					
2	14000000.0	thane	10.0	Resale	
Unfurnished					
3	2500000.0	thane	1.0	Resale	
Unfurnished					
4	16000000.0	thane	20.0	Resale	
Unfurnished					
...
...					
187526	6300000.0	zirakpur	2.0	New Property	Semi-
Furnished					
187527	5500000.0	zirakpur	4.0	Resale	
Unfurnished					
187528	7600000.0	zirakpur	1.0	Resale	
Furnished					
187529	3000000.0	zirakpur	2.0	Resale	Semi-
Furnished					
187530	11800000.0	zirakpur	5.0	Resale	Semi-
Furnished					

	facing	Bathroom	Balcony	BHK
0	East	1	2	1.0
1	East	2	2	2.0
2	East	2	2	2.0
3	East	1	1	1.0
4	West	2	2	2.0
...
187526	East	3	3	3.0
187527	North - East	3	2	3.0
187528	East	3	2	3.0
187529	East	2	2	2.0
187530	North - East	4	4	3.0

[187531 rows x 9 columns]

```
house.duplicated().sum()
129323
```

```
house.isnull().mean()*100
```

	Amount(in rupees)	location	Floor	Transaction	Furnishing	facing	Bathroom	Balcony	BHK
Amount(in rupees)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
location	0.0								
Floor	0.0								
Transaction	0.0								
Furnishing	0.0								
facing	0.0								
Bathroom	0.0								
Balcony	0.0								
BHK	0.0								

dtype: float64

```
house['Amount(in rupees)'].describe()
```

	count	mean	std	min	25%	50%	75%	max
Amount(in rupees)	1.875310e+05	9.023123e+06	5.955705e+06	1.000000e+05	5.000000e+06	7.800000e+06	1.140000e+07	2.890000e+07

Name: Amount(in rupees), dtype: float64

```
loc=house['location'].value_counts()
cl=loc[loc >=1000].index
house['location']=house['location'].map(lambda x:x if x in cl else
'other')
house
```

	Amount(in rupees)	location	Floor	Transaction
Furnishing \				
0	4200000.0	thane	10.0	Resale
Unfurnished				
1	9800000.0	thane	3.0	Resale Semi-
Furnished				
2	14000000.0	thane	10.0	Resale
Unfurnished				
3	2500000.0	thane	1.0	Resale
Unfurnished				
4	16000000.0	thane	20.0	Resale
Unfurnished				
...
...				
187526	6300000.0	zirakpur	2.0	New Property Semi-
Furnished				
187527	5500000.0	zirakpur	4.0	Resale
Unfurnished				
187528	7600000.0	zirakpur	1.0	Resale
Furnished				
187529	3000000.0	zirakpur	2.0	Resale Semi-
Furnished				
187530	11800000.0	zirakpur	5.0	Resale Semi-
Furnished				
	facing	Bathroom	Balcony	BHK
0	East	1	2	1.0
1	East	2	2	2.0
2	East	2	2	2.0
3	East	1	1	1.0
4	West	2	2	2.0
...
187526	East	3	3	3.0
187527	North - East	3	2	3.0
187528	East	3	2	3.0
187529	East	2	2	2.0
187530	North - East	4	4	3.0

[187531 rows x 9 columns]

```
house['location'].value_counts()
house['location'].nunique()
```

25

```
house['Balcony']=house['Balcony'].fillna(0).astype(int)
house['Balcony']=house['Balcony'].fillna(house['Balcony'].mean()).round().astype(int)
house
```

	Amount(in rupees)	location	Floor	Transaction
Furnishing \				
0	4200000.0	thane	10.0	Resale
Unfurnished				
1	9800000.0	thane	3.0	Resale Semi-
Furnished				
2	14000000.0	thane	10.0	Resale
Unfurnished				
3	2500000.0	thane	1.0	Resale
Unfurnished				
4	16000000.0	thane	20.0	Resale
Unfurnished				
...
...				
187526	6300000.0	zirakpur	2.0	New Property Semi-
Furnished				
187527	5500000.0	zirakpur	4.0	Resale
Unfurnished				
187528	7600000.0	zirakpur	1.0	Resale
Furnished				
187529	3000000.0	zirakpur	2.0	Resale Semi-
Furnished				
187530	11800000.0	zirakpur	5.0	Resale Semi-
Furnished				
	facing	Bathroom	Balcony	BHK
0	East	1	2	1.0
1	East	2	2	2.0
2	East	2	2	2.0
3	East	1	1	1.0
4	West	2	2	2.0
...
187526	East	3	3	3.0
187527	North - East	3	2	3.0
187528	East	3	2	3.0
187529	East	2	2	2.0
187530	North - East	4	4	3.0

[187531 rows x 9 columns]

```
house['Bathroom']=house['Bathroom'].fillna(0).astype(int)
house['Bathroom']=house['Bathroom'].fillna(house['Bathroom'].mean()).round().astype(int)
house
```

	Amount(in rupees)	location	Floor	Transaction
Furnishing \				
0	4200000.0	thane	10.0	Resale
Unfurnished				
1	9800000.0	thane	3.0	Resale Semi-

```

Furnished
2           14000000.0      thane   10.0      Resale
Unfurnished
3           2500000.0       thane    1.0      Resale
Unfurnished
4           16000000.0      thane   20.0      Resale
Unfurnished
...
...
187526      6300000.0      zirakpur  2.0  New Property  Semi-
Furnished
187527      5500000.0      zirakpur  4.0      Resale
Unfurnished
187528      7600000.0      zirakpur  1.0      Resale
Furnished
187529      3000000.0      zirakpur  2.0      Resale  Semi-
Furnished
187530      11800000.0     zirakpur  5.0      Resale  Semi-
Furnished

```

	facing	Bathroom	Balcony	BHK
0	East	1	2	1.0
1	East	2	2	2.0
2	East	2	2	2.0
3	East	1	1	1.0
4	West	2	2	2.0
...
187526	East	3	3	3.0
187527	North - East	3	2	3.0
187528	East	3	2	3.0
187529	East	2	2	2.0
187530	North - East	4	4	3.0

[187531 rows x 9 columns]

```

house['Balcony'].unique()

array([2, 1, 3, 4, 0, 6, 5])

house['Balcony'] = house['Balcony'].map(lambda x: '6' if int(x) > 5
else str(x))
house['Balcony']=house['Balcony'].astype(int)
house

```

Furnishing \	Amount(in rupees)	location	Floor	Transaction
0	4200000.0	thane	10.0	Resale
Unfurnished	9800000.0	thane	3.0	Resale Semi-
Furnished				

2	14000000.0	thane	10.0	Resale	
Unfurnished					
3	2500000.0	thane	1.0	Resale	
Unfurnished					
4	16000000.0	thane	20.0	Resale	
Unfurnished					
...	
..					
187526	6300000.0	zirakpur	2.0	New Property	Semi-
Furnished					
187527	5500000.0	zirakpur	4.0	Resale	
Unfurnished					
187528	7600000.0	zirakpur	1.0	Resale	
Furnished					
187529	3000000.0	zirakpur	2.0	Resale	Semi-
Furnished					
187530	11800000.0	zirakpur	5.0	Resale	Semi-
Furnished					

	facing	Bathroom	Balcony	BHK
0	East	1	2	1.0
1	East	2	2	2.0
2	East	2	2	2.0
3	East	1	1	1.0
4	West	2	2	2.0
...
187526	East	3	3	3.0
187527	North - East	3	2	3.0
187528	East	3	2	3.0
187529	East	2	2	2.0
187530	North - East	4	4	3.0

[187531 rows x 9 columns]

house.isnull().sum()

Amount(in rupees)	0
location	0
Floor	0
Transaction	0
Furnishing	0
facing	0
Bathroom	0
Balcony	0
BHK	0

dtype: int64

```
x=house[['Floor','location',
          'Transaction', 'Furnishing', 'Bathroom', 'Balcony', 'BHK']]
y=house['Amount(in rupees)']
```

```
house['location'].unique()

array(['thane', 'other', 'mumbai', 'ahmedabad', 'bangalore',
'chennai',
       'gurgaon', 'hyderabad', 'jaipur', 'kolkata', 'new-delhi',
'noida',
       'pune', 'bhiwadi', 'chandigarh', 'faridabad', 'goa',
'greater-noida', 'kochi', 'mohali', 'ranchi', 'surat',
'vedodara',
       'visakhapatnam', 'zirakpur'], dtype=object)

x=x['location_encoded'] =
house['location'].map(house.groupby('location')['Amount(in
rupees)'].mean())
x

-----
-----
RecursionError                               Traceback (most recent call
last)
File ~\anaconda3\Lib\site-packages\IPython\core\formatters.py:711, in
PlainTextFormatter.__call__(self, obj)
    704 stream = StringIO()
    705 printer = pretty.RepresentationPrinter(stream, self.verbose,
    706     self.max_width, self.newline,
    707     max_seq_length=self.max_seq_length,
    708     singleton_pprinters=self.singleton_printers,
    709     type_pprinters=self.type_printers,
    710     deferred_pprinters=self.deferred_printers)
--> 711 printer.pretty(obj)
    712 printer.flush()
    713 return stream.getvalue()

File ~\anaconda3\Lib\site-packages\IPython\lib\pretty.py:419, in
RepresentationPrinter.pretty(self, obj)
    408             return meth(obj, self, cycle)
    409         if (
    410             cls is not object
    411             # check if cls defines __repr__
(...),
    417             and callable(_safe_getattr(cls,
"__repr__", None))
    418         ):
--> 419             return _repr_pprint(obj, self, cycle)
    421     return _default_pprint(obj, self, cycle)
    422 finally:

File ~\anaconda3\Lib\site-packages\IPython\lib\pretty.py:787, in
_repr_pprint(obj, p, cycle)
    785 """A pprint that just redirects to the normal repr
```

```
function."""
    786 # Find newlines and replace them with p.break_()
--> 787 output = repr(obj)
    788 lines = output.splitlines()
    789 with p.group():

File ~/anaconda3\Lib\site-packages\pandas\core\series.py:1784, in
Series.__repr__(self)
    1782 # pylint: disable=invalid-repr-returned
    1783 repr_params = fmt.get_series_repr_params()
-> 1784 return self.to_string(**repr_params)

File ~/anaconda3\Lib\site-packages\pandas\core\series.py:1883, in
Series.to_string(self, buf, na_rep, float_format, header, index,
length, dtype, name, max_rows, min_rows)
1831 """
1832 Render a string representation of the Series.
1833
1834
1869 '0      1\\n1      2\\n2      3'
1870 """
1871 formatter = fmt.SeriesFormatter(
1872     self,
1873     name=name,
1874
1881     max_rows=max_rows,
1882 )
-> 1883 result = formatter.to_string()
1885 # catch contract violations
1886 if not isinstance(result, str):

File ~/anaconda3\Lib\site-packages\pandas\io\formats\format.py:320, in
SeriesFormatter.to_string(self)
    318 else:
    319     fmt_index = index._format_flat(include_name=True)
--> 320 fmt_values = self._get_formatted_values()
    322 if self.is_truncated_vertically:
    323     n_header_rows = 0

File ~/anaconda3\Lib\site-packages\pandas\io\formats\format.py:297, in
SeriesFormatter._get_formatted_values(self)
    296 def _get_formatted_values(self) -> list[str]:
--> 297     return format_array(
    298         self.tr_series._values,
    299         None,
    300         float_format=self.float_format,
    301         na_rep=self.na_rep,
    302         leading_space=self.index,
    303     )
```

```
File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1161, in format_array(values, formatter, float_format, na_rep, digits, space, justify, decimal, leading_space, quoting, fallback_formatter)
 1145     digits = get_option("display.precision")
 1147     fmt_obj = fmt_klass(
 1148         values,
 1149         digits=digits,
 1150         ...)
 1158     fallback_formatter=fallback_formatter,
 1159 )
-> 1161 return fmt_obj.get_result()

File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1194, in _GenericArrayFormatter.get_result(self)
 1193 def get_result(self) -> list[str]:
-> 1194     fmt_values = self._format_strings()
 1195     return _make_fixed_width(fmt_values, self.justify)

File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1259, in _GenericArrayFormatter._format_strings(self)
 1257 for i, v in enumerate(vals):
 1258     if (not is_float_type[i] or self.formatter is not None)
and leading_space:
-> 1259         fmt_values.append(f" {_format(v)}")
 1260     elif is_float_type[i]:
 1261         fmt_values.append(float_format(v))

File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1234, in _GenericArrayFormatter._format_strings.<locals>._format(x)
 1232     return self.na_rep
 1233 elif isinstance(x, PandasObject):
-> 1234     return str(x)
 1235 elif isinstance(x, StringDtype):
 1236     return repr(x)

File ~\anaconda3\Lib\site-packages\pandas\core\series.py:1784, in Series.__repr__(self)
 1782 # pylint: disable=invalid-repr-returned
 1783 repr_params = fmt.get_series_repr_params()
-> 1784 return self.to_string(**repr_params)

File ~\anaconda3\Lib\site-packages\pandas\core\series.py:1883, in Series.to_string(self, buf, na_rep, float_format, header, index, length, dtype, name, max_rows, min_rows)
 1831 """
 1832 Render a string representation of the Series.
 1833
 1834
 1869 '0      1\\n1      2\\n2      3'
 1870 """
```

```
1871 formatter = fmt.SeriesFormatter(  
1872     self,  
1873     name=name,  
1874     (...)  
1875     max_rows=max_rows,  
1876     )  
-> 1877 result = formatter.to_string()  
1878 # catch contract violations  
1879 if not isinstance(result, str):  
  
File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:320, in  
SeriesFormatter.to_string(self)  
    318 else:  
    319     fmt_index = index._format_flat(include_name=True)  
--> 320 fmt_values = self._get_formatted_values()  
    321 if self.is_truncated_vertically:  
    322     n_header_rows = 0  
  
File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:297, in  
SeriesFormatter._get_formatted_values(self)  
    296 def _get_formatted_values(self) -> list[str]:  
--> 297     return format_array(  
    298         self.tr_series._values,  
    299         None,  
    300         float_format=self.float_format,  
    301         na_rep=self.na_rep,  
    302         leading_space=self.index,  
    303     )  
  
File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1161,  
in format_array(values, formatter, float_format, na_rep, digits,  
space, justify, decimal, leading_space, quoting, fallback_formatter)  
    1145     digits = get_option("display.precision")  
    1146     fmt_obj = fmt_klass(  
    1147         values,  
    1148         digits=digits,  
    1149         (...)  
    1150         fallback_formatter=fallback_formatter,  
    1151     )  
-> 1152     return fmt_obj.get_result()  
  
File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1194,  
in _GenericArrayFormatter.get_result(self)  
    1193 def get_result(self) -> list[str]:  
-> 1194     fmt_values = self._format_strings()  
    1195     return _make_fixed_width(fmt_values, self.justify)  
  
File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1259,  
in _GenericArrayFormatter._format_strings(self)  
    1257 for i, v in enumerate(vals):
```

```
1258     if (not is_float_type[i] or self.formatter is not None)
and leading_space:
-> 1259         fmt_values.append(f" {_format(v)}")
1260     elif is_float_type[i]:
1261         fmt_values.append(float_format(v))

File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1234,
in _GenericArrayFormatter._format_strings.<locals>._format(x)
1232     return self.na_rep
1233 elif isinstance(x, PandasObject):
-> 1234     return str(x)
1235 elif isinstance(x, StringDtype):
1236     return repr(x)

[... skipping similar frames: Series.__repr__ at line 1784 (368
times), _GenericArrayFormatter._format_strings.<locals>._format at
line 1234 (367 times), _GenericArrayFormatter._format_strings at line
1259 (367 times), SeriesFormatter._get_formatted_values at line 297
(367 times), format_array at line 1161 (367 times),
_GenericArrayFormatter.get_result at line 1194 (367 times),
Series.to_string at line 1883 (367 times), SeriesFormatter.to_string
at line 320 (367 times)]
```

```
File ~\anaconda3\Lib\site-packages\pandas\core\series.py:1883, in
Series.to_string(self, buf, na_rep, float_format, header, index,
length, dtype, name, max_rows, min_rows)
1831 """
1832 Render a string representation of the Series.
1833
(...)
```

```
1869 '0    1\\n1    2\\n2    3'
1870 """
1871 formatter = fmt.SeriesFormatter(
1872     self,
1873     name=name,
(...)
```

```
1881     max_rows=max_rows,
1882 )
-> 1883 result = formatter.to_string()
1885 # catch contract violations
1886 if not isinstance(result, str):
```

```
File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:320, in
SeriesFormatter.to_string(self)
318 else:
319     fmt_index = index._format_flat(include_name=True)
--> 320 fmt_values = self._get_formatted_values()
322 if self.is_truncated_vertically:
323     n_header_rows = 0
```

```
File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:297, in
SeriesFormatter._get_formatted_values(self)
  296 def _get_formatted_values(self) -> list[str]:
--> 297     return format_array(
 298         self.tr_series._values,
 299         None,
300         float_format=self.float_format,
301         na_rep=self.na_rep,
302         leading_space=self.index,
303     )

File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1161,
in format_array(values, formatter, float_format, na_rep, digits,
space, justify, decimal, leading_space, quoting, fallback_formatter)
1145     digits = get_option("display.precision")
1147 fmt_obj = fmt_klass(
1148     values,
1149     digits=digits,
(...),
1158     fallback_formatter=fallback_formatter,
1159 )
-> 1161 return fmt_obj.get_result()

File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1194,
in _GenericArrayFormatter.get_result(self)
  1193 def get_result(self) -> list[str]:
-> 1194     fmt_values = self._format_strings()
  1195     return _make_fixed_width(fmt_values, self.justify)

File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1259,
in _GenericArrayFormatter._format_strings(self)
  1257 for i, v in enumerate(vals):
  1258     if (not is_float_type[i] or self.formatter is not None)
and leading_space:
-> 1259         fmt_values.append(f" {_format(v)}")
  1260     elif is_float_type[i]:
  1261         fmt_values.append(float_format(v))

File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:1234,
in _GenericArrayFormatter._format_strings.<locals>._format(x)
  1232     return self.na_rep
  1233 elif isinstance(x, PandasObject):
-> 1234     return str(x)
  1235 elif isinstance(x, StringDtype):
  1236     return repr(x)

File ~\anaconda3\Lib\site-packages\pandas\core\series.py:1784, in
Series.__repr__(self)
1782 # pylint: disable=invalid-repr-returned
1783 repr_params = fmt.get_series_repr_params()
```

```
-> 1784 return self.to_string(**repr_params)

File ~\anaconda3\Lib\site-packages\pandas\core\series.py:1871, in
Series.to_string(self, buf, na_rep, float_format, header, index,
length, dtype, name, max_rows, min_rows)
1818 def to_string(
1819     self,
1820     buf: FilePath | WriteBuffer[str] | None = None,
1821     ...
1822     min_rows: int | None = None,
1823 ) -> str | None:
1824     """
1825     Render a string representation of the Series.
1826
1827     ...
1828
1829     '0      1\\n1      2\\n2      3'
1830     """
-> 1871     formatter = fmt.SeriesFormatter(
1872         self,
1873         name=name,
1874         length=length,
1875         header=header,
1876         index=index,
1877         dtype=dtype,
1878         na_rep=na_rep,
1879         float_format=float_format,
1880         min_rows=min_rows,
1881         max_rows=max_rows,
1882     )
1883     result = formatter.to_string()
1885 # catch contract violations

File ~\anaconda3\Lib\site-packages\pandas\io\formats\format.py:223, in
SeriesFormatter.__init__(self, series, length, header, index, na_rep,
name, float_format, dtype, max_rows, min_rows)
221 self.float_format = float_format
222 self.dtype = dtype
--> 223 self.adj = printing.get_adjustment()
225 self._chk_truncate()

File ~\anaconda3\Lib\site-packages\pandas\io\formats\printing.py:572,
in get_adjustment()
570     return _EastAsianTextAdjustment()
571 else:
--> 572     return _TextAdjustment()

File ~\anaconda3\Lib\site-packages\pandas\io\formats\printing.py:508,
in _TextAdjustment.__init__(self)
507 def __init__(self) -> None:
--> 508     self.encoding = get_option("display.encoding")
```

```

File ~\anaconda3\Lib\site-packages\pandas\_config\config.py:274, in
CallableDynamicDoc.__call__(self, *args, **kwds)
    273 def __call__(self, *args, **kwds) -> T:
--> 274     return self.__func__(*args, **kwds)

File ~\anaconda3\Lib\site-packages\pandas\_config\config.py:146, in
_get_option(pat, silent)
    145 def _get_option(pat: str, silent: bool = False) -> Any:
--> 146     key = _get_single_key(pat, silent)
    148     # walk the nested dict
    149     root, k = _get_root(key)

File ~\anaconda3\Lib\site-packages\pandas\_config\config.py:138, in
_get_single_key(pat, silent)
    135 key = keys[0]
    137 if not silent:
--> 138     _warn_if_deprecated(key)
    140 key = _translate_key(key)
    142 return key

File ~\anaconda3\Lib\site-packages\pandas\_config\config.py:696, in
_warn_if_deprecated(key)
    688 def _warn_if_deprecated(key: str) -> bool:
    689     """
    690         Checks if `key` is a deprecated option and if so, prints a
warning.
    691
    (...)

    694     bool - True if `key` is deprecated, False otherwise.
    695     """
--> 696     d = _get_DEPRECATED_OPTION(key)
    697     if d:
    698         if d.msg:

RecursionError: maximum recursion depth exceeded

x=house.drop('location',axis=1,inplace=False)
x

      Amount(in rupees)  Floor Transaction        Furnishing
facing \
0           4200000.0   10.0       Resale      Unfurnished
East
1           9800000.0    3.0       Resale  Semi-Furnished
East
2          14000000.0   10.0       Resale      Unfurnished
East
3          2500000.0     1.0       Resale      Unfurnished
East

```

```
4           16000000.0   20.0      Resale    Unfurnished  
West  
...  
...  
187526       6300000.0    2.0  New Property  Semi-Furnished  
East  
187527       5500000.0    4.0      Resale    Unfurnished  North  
- East  
187528       7600000.0    1.0      Resale    Furnished  
East  
187529       3000000.0    2.0      Resale    Semi-Furnished  
East  
187530       11800000.0   5.0      Resale    Semi-Furnished  North  
- East
```

	Bathroom	Balcony	BHK
0	1	2	1.0
1	2	2	2.0
2	2	2	2.0
3	1	1	1.0
4	2	2	2.0
...
187526	3	3	3.0
187527	3	2	3.0
187528	3	2	3.0
187529	2	2	2.0
187530	4	4	3.0

```
[187531 rows x 8 columns]
```

```
house['location']=x['location']
```

```
-----  
-----  
KeyError                                  Traceback (most recent call  
last)  
File ~\anaconda3\Lib\site-packages\pandas\core\indexes\base.py:3805,  
in Index.get_loc(self, key)  
 3804 try:  
-> 3805     return self._engine.get_loc(casted_key)  
 3806 except KeyError as err:
```

```
File index.pyx:167, in pandas._libs.index.IndexEngine.get_loc()
```

```
File index.pyx:196, in pandas._libs.index.IndexEngine.get_loc()
```

```
File pandas\\_libs\\hashtable_class_helper.pxi:7081, in  
pandas._libs.hashtable.PyObjectHashTable.get_item()
```

```
File pandas\\_libs\\hashtable_class_helper.pxi:7089, in
```

```
pandas._libs.hashtable.PyObjectHashTable.get_item()

KeyError: 'location'

The above exception was the direct cause of the following exception:

KeyError Traceback (most recent call
last)
Cell In[104], line 1
----> 1 house['location']=x['location']

File ~/anaconda3\Lib\site-packages\pandas\core\series.py:1121, in
Series.__getitem__(self, key)
    1118     return self._values[key]
    1120 elif key_is_scalar:
-> 1121     return self._get_value(key)
    1123 # Convert generator to list before going through hashable part
    1124 # (We will iterate through the generator there to check for
slices)
    1125 if is_iterator(key):

File ~/anaconda3\Lib\site-packages\pandas\core\series.py:1237, in
Series._get_value(self, label, takeable)
    1234     return self._values[label]
    1236 # Similar to Index.get_value, but we do not fall back to
positional
-> 1237 loc = self.index.get_loc(label)
    1239 if is_integer(loc):
    1240     return self._values[loc]

File ~/anaconda3\Lib\site-packages\pandas\core\indexes\base.py:3812,
in Index.get_loc(self, key)
    3807     if isinstance(casted_key, slice) or (
    3808         isinstance(casted_key, abc.Iterable)
    3809         and any(isinstance(x, slice) for x in casted_key)
    3810     ):
    3811         raise InvalidIndexError(key)
-> 3812     raise KeyError(key) from err
    3813 except TypeError:
    3814     # If we have a listlike key, _check_indexing_error will
raise
    3815     # InvalidIndexError. Otherwise we fall through and re-
raise
    3816     # the TypeError.
    3817     self._check_indexing_error(key)

KeyError: 'location'
```

```

cat=x.select_dtypes(exclude='number')
num=x.select_dtypes(include='number')

cat_x=pd.get_dummies(cat)
cat_x

      Transaction_New  Property  Transaction_Other
Transaction_Rent/Lease \
0                         False        False
False
1                         False        False
False
2                         False        False
False
3                         False        False
False
4                         False        False
False
...
...
187526                      True        False
False
187527                      False        False
False
187528                      False        False
False
187529                      False        False
False
187530                      False        False
False

      Transaction_Resale  Furnishing_Furnished  Furnishing_Semi-
Furnished \
0                         True        False
False
1                         True        False
True
2                         True        False
False
3                         True        False
False
4                         True        False
False
...
...
187526                      False        False
True
187527                      True        False
False
187528                      True         True

```

```

False
187529          True           False
True
187530          True           False
True

      Furnishing_Unfurnished facing_East   facing_North \
0                  True        True        False
1                 False        True        False
2                  True        True        False
3                  True        True        False
4                  True       False        False
...
187526          ...        True        False
187527          True       False        False
187528          False       True        False
187529          False       True        False
187530          False       False        False

      facing_North - East   facing_North - West   facing_South \
0                  False        False        False
1                  False        False        False
2                  False        False        False
3                  False        False        False
4                  False        False        False
...
187526          ...        False        False        False
187527          True       False        False
187528          False       False        False
187529          False       False        False
187530          True       False        False

      facing_South - East   facing_South - West   facing_West
0                  False        False        False
1                  False        False        False
2                  False        False        False
3                  False        False        False
4                  False        False        True
...
187526          ...        False        False        False
187527          False       False        False
187528          False       False        False
187529          False       False        False
187530          False       False        False

[187531 rows x 15 columns]

cat_x

```

	Transaction_New	Property	Transaction_Other
Transaction_Rent/Lease \			
0	False	False	
False			
1	False	False	
False			
2	False	False	
False			
3	False	False	
False			
4	False	False	
False			
...	
...			
187526	True	False	
False			
187527	False	False	
False			
187528	False	False	
False			
187529	False	False	
False			
187530	False	False	
False			
Furnished \	Transaction_Resale	Furnishing_Furnished	Furnishing_Semi-
0	True	False	
False			
1	True	False	
True			
2	True	False	
False			
3	True	False	
False			
4	True	False	
False			
...	
...			
187526	False	False	
True			
187527	True	False	
False			
187528	True	True	
False			
187529	True	False	
True			
187530	True	False	
True			

```

Furnishing_Unfurnished facing_East facing_North \
0 True True False
1 False True False
2 True True False
3 True True False
4 True False False
...
187526 ... ...
187527 ... ...
187528 ... ...
187529 ... ...
187530 ... ...

facing_North - East facing_North - West facing_South \
0 False False False
1 False False False
2 False False False
3 False False False
4 False False False
...
187526 ... ...
187527 ... ...
187528 ... ...
187529 ... ...
187530 ... ...

facing_South - East facing_South -West facing_West
0 False False False
1 False False False
2 False False False
3 False False False
4 False False True
...
187526 ... ...
187527 ... ...
187528 ... ...
187529 ... ...
187530 ... ...

[187531 rows x 15 columns]

```

```
cat_x.describe()
```

	Transaction_New	Property	Transaction_Other
Transaction_Rent/Lease \ count	187531	187531	
187531 unique	2	2	
2			

```

top False False
False
freq 144966 186822
187529

    Transaction_Resale Furnishing_Furnished Furnishing_Semi-
Furnished \
count 187531 187531
187531
unique 2 2
2
top True False
False
freq 144255 167369
96316

    Furnishing_Unfurnished facing_East facing_North facing_North -
East \
count 187531 187531 187531
187531
unique 2 2 2
2
top False True False
False
freq 111377 124974 170998
163311

    facing_North - West facing_South facing_South - East \
count 187531 187531 187531
187531
unique 2 2 2
2
top False False False
freq 183688 182837 184909

    facing_South -West facing_West
count 187531 187531
187531
unique 2 2
2
top False False
freq 185460 178957

x=pd.concat([cat_x,num],axis=1)
x

    Transaction_New Property Transaction_Other
Transaction_Rent/Lease \
0 False False
False
1 False False
False
2 False False
False

```

3	False	False	
False			
4	False	False	
False			
...	
...			
187526	True	False	
False			
187527	False	False	
False			
187528	False	False	
False			
187529	False	False	
False			
187530	False	False	
False			
Furnished \			
0	True	False	
False			
1	True	False	
True			
2	True	False	
False			
3	True	False	
False			
4	True	False	
False			
...	
...			
187526	False	False	
True			
187527	True	False	
False			
187528	True	True	
False			
187529	True	False	
True			
187530	True	False	
True			
Furnishing_Unfurnished \			
0	True	True	False
1	False	True	False
2	True	True	False
3	True	True	False
4	True	False	False
...

187526	False	True	False		
187527	True	False	False		
187528	False	True	False		
187529	False	True	False		
187530	False	False	False		
	facing_North - East	facing_North - West	facing_South \		
0	False	False	False		
1	False	False	False		
2	False	False	False		
3	False	False	False		
4	False	False	False		
...		
187526	False	False	False		
187527	True	False	False		
187528	False	False	False		
187529	False	False	False		
187530	True	False	False		
	facing_South - East	facing_South - West	facing_West \		
0	False	False	False		
1	False	False	False		
2	False	False	False		
3	False	False	False		
4	False	False	True		
...		
187526	False	False	False		
187527	False	False	False		
187528	False	False	False		
187529	False	False	False		
187530	False	False	False		
	Amount(in rupees)	Floor	Bathroom	Balcony	BHK
0	4200000.0	10.0	1	2	1.0
1	9800000.0	3.0	2	2	2.0
2	14000000.0	10.0	2	2	2.0
3	2500000.0	1.0	1	1	1.0
4	16000000.0	20.0	2	2	2.0
...
187526	6300000.0	2.0	3	3	3.0
187527	5500000.0	4.0	3	2	3.0
187528	7600000.0	1.0	3	2	3.0
187529	3000000.0	2.0	2	2	2.0
187530	11800000.0	5.0	4	4	3.0

[187531 rows x 20 columns]

```

from sklearn.model_selection import train_test_split

x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.1,random_state=7)

y_train

9680      5100000.0
169371    15500000.0
54600     12500000.0
105030    2500000.0
101109    3100000.0
...
66455     3500000.0
53459     8500000.0
10742     5000000.0
49689     6900000.0
61615     7800000.0
Name: Amount(in rupees), Length: 168777, dtype: float64

print(x_train.shape,x_test.shape,y_train.shape,y_test.shape)
(168777, 20) (18754, 20) (168777,) (18754,)

```

model training

```

from sklearn.linear_model import LinearRegression,Ridge,Lasso
from sklearn.metrics import mean_squared_error,r2_score

model=LinearRegression()
model.fit(x_train,y_train)

LinearRegression()

```

model testing

```

test_pred=model.predict(x_test)
test_pred

array([12100000.00000015,  7200000.00000045, 14999999.9999998 , ...,
       5100000.0000002 ,  7799999.99999993,  6400000.00000052])

y_test

94353      12100000.0
20969      7200000.0
90081      15000000.0
160714     4420000.0
80704      7800000.0
...
33483      7800000.0

```

```

3148      6500000.0
87503     5100000.0
20526     7800000.0
25629     6400000.0
Name: Amount(in rupees), Length: 18754, dtype: float64

train_pred=model.predict(x_train)
train_pred

array([ 5100000.00000017, 15499999.99999926, 12499999.99999952, ...,
       5000000.0000002 , 6900000.00000039, 7800000.0000006 ])

(y_train)

9680      5100000.0
169371    15500000.0
54600     12500000.0
105030    2500000.0
101109    3100000.0
...
66455     3500000.0
53459     8500000.0
10742     5000000.0
49689     6900000.0
61615     7800000.0
Name: Amount(in rupees), Length: 168777, dtype: float64

print('Test Mean squared
error :',mean_squared_error(y_test,test_pred))

Test Mean squared error : 2.7900281376731636e-13

print('Train Mean squared
error :',mean_squared_error(y_train,train_pred))

Train Mean squared error : 2.805622538822866e-13

print('Test R2 error :',r2_score(y_test,test_pred))

Test R2 error : 1.0

print('Train R2 error :',r2_score(y_train,train_pred))

Train R2 error : 1.0

```

Ridge Model

```

ridge_model=Ridge(alpha=0.1)
ridge_model.fit(x_train,y_train)

C:\Users\nisha\anaconda3\Lib\site-packages\sklearn\linear_model\
_ridge.py:216: LinAlgWarning: Ill-conditioned matrix (rcond=1.66969e-

```

```

20): result may not be accurate.
    return linalg.solve(A, Xy, assume_a="pos", overwrite_a=True).T

Ridge(alpha=0.1)

ridge_test=ridge_model.predict(x_test)
ridge_train=ridge_model.predict(x_train)

print('Ridge Model of MSE of
train :',mean_squared_error(y_train,ridge_train))

Ridge Model of MSE of train : 2.114008490639501e-11

print('Ridge Model of MSE of
test :',mean_squared_error(y_test,ridge_test))

Ridge Model of MSE of test : 1.4487198345135523e-11

print('Ridge model of R2 of train :',r2_score(y_train,ridge_train))

Ridge model of R2 of train : 1.0

print('Ridge Model of R2 of test :',r2_score(y_test,ridge_test))

Ridge Model of R2 of test : 1.0

```

Lasso model

```

Lasso_model=Lasso(alpha=0.1)
Lasso_model.fit(x_train,y_train)

Lasso(alpha=0.1)

Lasso_test=Lasso_model.predict(x_test)
Lasso_train=Lasso_model.predict(x_train)

print('Lasso Model of MSE of
train :',mean_squared_error(y_train,Lasso_train))

Lasso Model of MSE of train : 1.3580493466373543e-14

print('Lasso Model of MSE of
test:',mean_squared_error(y_test,Lasso_test))

Lasso Model of MSE of test: 1.3522017256084456e-14

print('Lasso model of R2 of train :',r2_score(y_train,Lasso_train))

Lasso model of R2 of train : 1.0

print('Lasso model of R2 of test :',r2_score(y_test,Lasso_test))

Lasso model of R2 of test : 1.0

```

```
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
x_scaled = scaler.fit_transform(x)
x_scaled

from sklearn.linear_model import Lasso
from sklearn.model_selection import GridSearchCV

alphas = [0.0001, 0.001, 0.01, 0.1, 1, 10]
grid = GridSearchCV(Lasso(), param_grid={'alpha': alphas}, cv=5)
grid.fit(x_train, y_train)

print("Best alpha:", grid.best_params_)
print("Train R^2:", grid.score(x_train, y_train))
print("Test R^2:", grid.score(x_test, y_test))
```