House Price Prediction

In this notebook, there is house price predicting model to predict the house price by area,bedrooms,bathrooms,stories,mainroad,guestroom,basement,hotwaterheating, airconditioning,parking,prefarea,furnishingstatus .

Importing the packages

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import OneHotEncoder, LabelEncoder
from sklearn.compose import ColumnTransformer
from sklearn.pipeline import Pipeline
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_squared_error
```

```
/opt/conda/lib/python3.10/site-packages/scipy/__init__.py:146:
UserWarning: A NumPy version >=1.16.5 and <1.23.0 is required for this
version of SciPy (detected version 1.23.5
  warnings.warn(f"A NumPy version >={np_minversion} and
<{np_maxversion}"
```

Importing Data

```
data=pd.read_csv("/kaggle/input/housing-prices-dataset/Housing.csv")
df=pd.DataFrame(data)
```

Exploratory Data Analysis

```
df.head()
```

```
      price  area  bedrooms  bathrooms  stories mainroad guestroom
basement  \
0  13300000  7420         4          2        3      yes        no
no
1  12250000  8960         4          4        4      yes        no
no
2  12250000  9960         3          2        2      yes        no
yes
3  12215000  7500         4          2        2      yes        no
```

```
yes
4  11410000  7420         4          1        2      yes       yes
yes

  hotwaterheating airconditioning  parking prefarea furnishingstatus
0              no              yes        2      yes        furnished
1              no              yes        3       no        furnished
2              no               no        2      yes   semi-furnished
3              no              yes        3      yes        furnished
4              no              yes        2       no        furnished

df.describe()

              price          area    bedrooms   bathrooms     stories
\
count  5.450000e+02    545.000000  545.000000  545.000000  545.000000

mean   4.766729e+06   5150.541284    2.965138    1.286239    1.805505

std    1.870440e+06   2170.141023    0.738064    0.502470    0.867492

min    1.750000e+06   1650.000000    1.000000    1.000000    1.000000

25%    3.430000e+06   3600.000000    2.000000    1.000000    1.000000

50%    4.340000e+06   4600.000000    3.000000    1.000000    2.000000

75%    5.740000e+06   6360.000000    3.000000    2.000000    2.000000

max    1.330000e+07  16200.000000    6.000000    4.000000    4.000000


          parking
count  545.000000
mean     0.693578
std      0.861586
min      0.000000
25%      0.000000
50%      0.000000
75%      1.000000
max      3.000000

df.shape

(545, 13)

df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 545 entries, 0 to 544
Data columns (total 13 columns):
 #   Column            Non-Null Count  Dtype
```

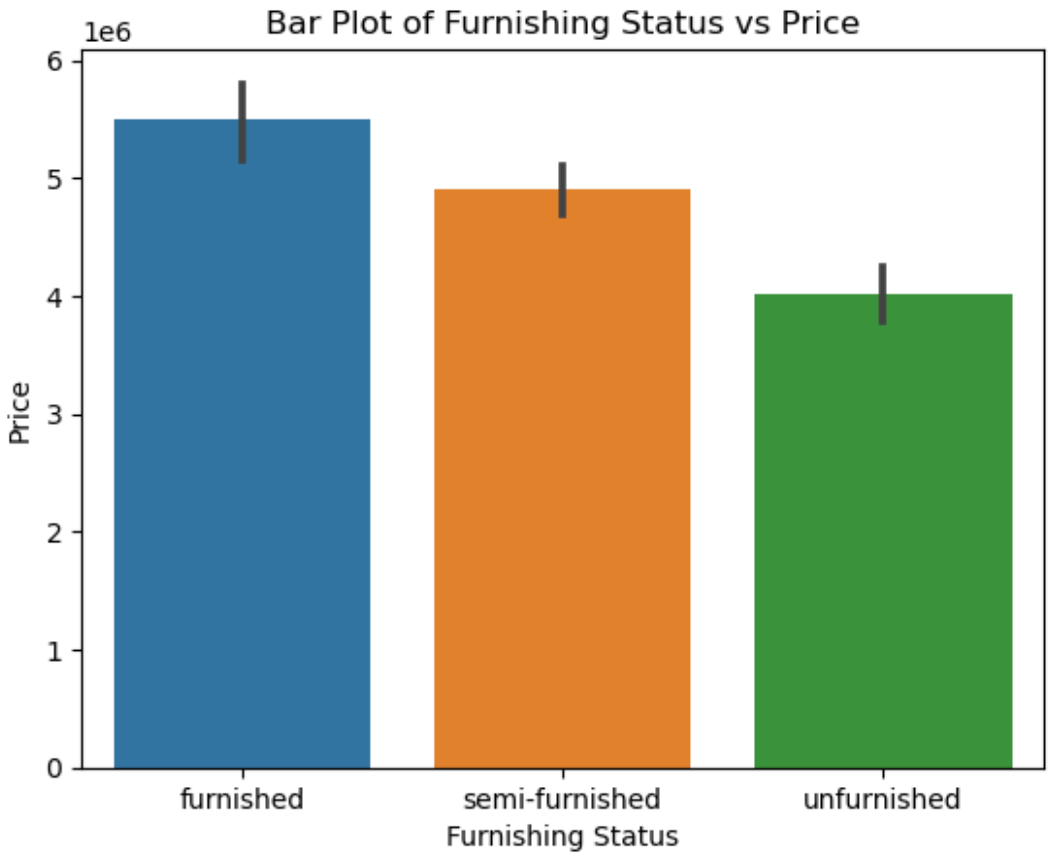
```
---  ------            --------------  -----
 0   price             545 non-null    int64
 1   area              545 non-null    int64
 2   bedrooms          545 non-null    int64
 3   bathrooms         545 non-null    int64
 4   stories           545 non-null    int64
 5   mainroad          545 non-null    object
 6   guestroom         545 non-null    object
 7   basement          545 non-null    object
 8   hotwaterheating   545 non-null    object
 9   airconditioning   545 non-null    object
 10  parking           545 non-null    int64
 11  prefarea          545 non-null    object
 12  furnishingstatus  545 non-null    object
dtypes: int64(6), object(7)
memory usage: 55.5+ KB
```

```
df.nunique()
```

```
price               219
area                284
bedrooms              6
bathrooms             4
stories               4
mainroad              2
guestroom             2
basement              2
hotwaterheating       2
airconditioning       2
parking               4
prefarea              2
furnishingstatus      3
dtype: int64
```

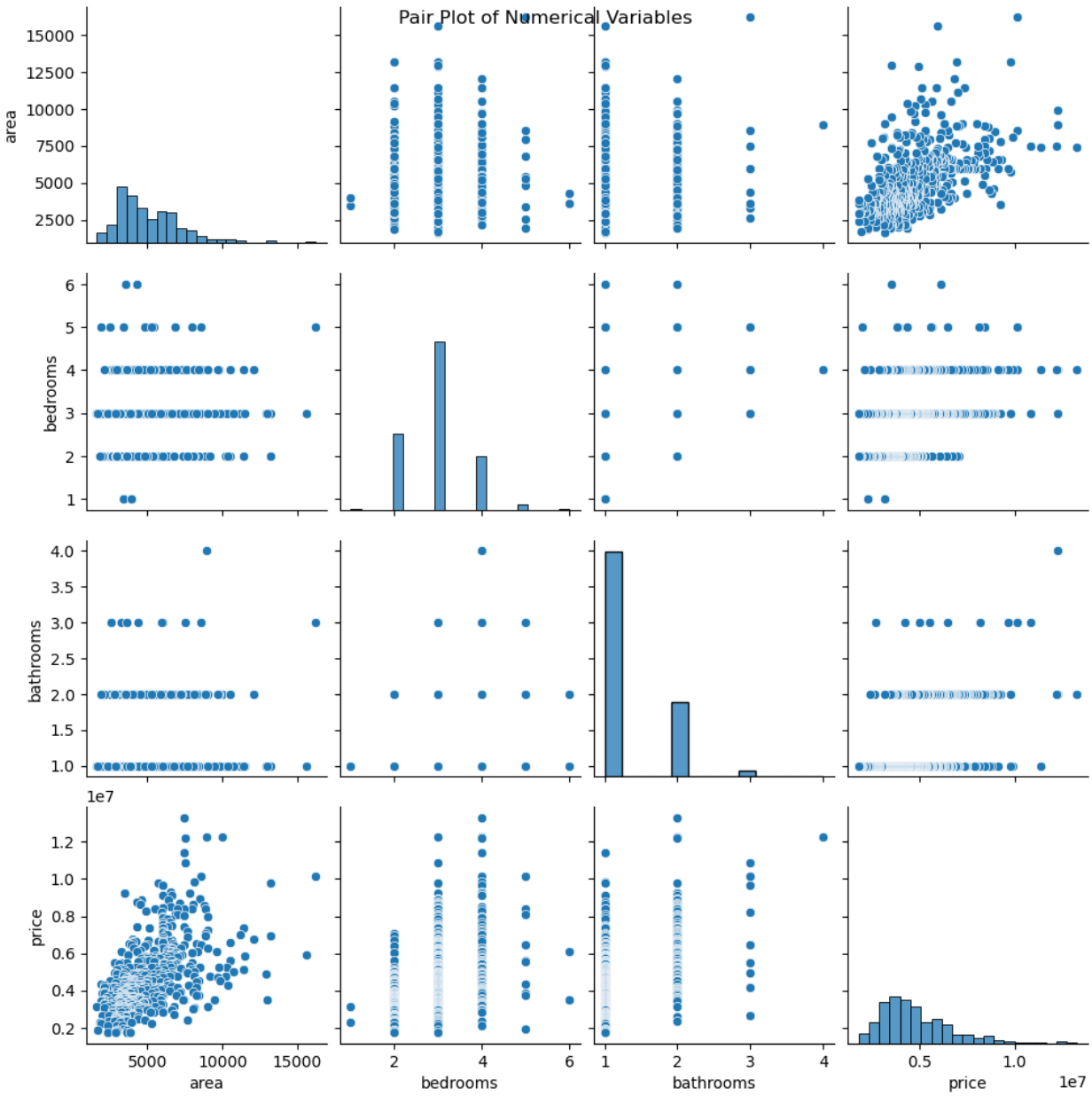
Analysis by charts

```
sns.barplot(x='furnishingstatus', y='price', data=data)
plt.title('Bar Plot of Furnishing Status vs Price')
plt.xlabel('Furnishing Status')
plt.ylabel('Price')
plt.show()
```

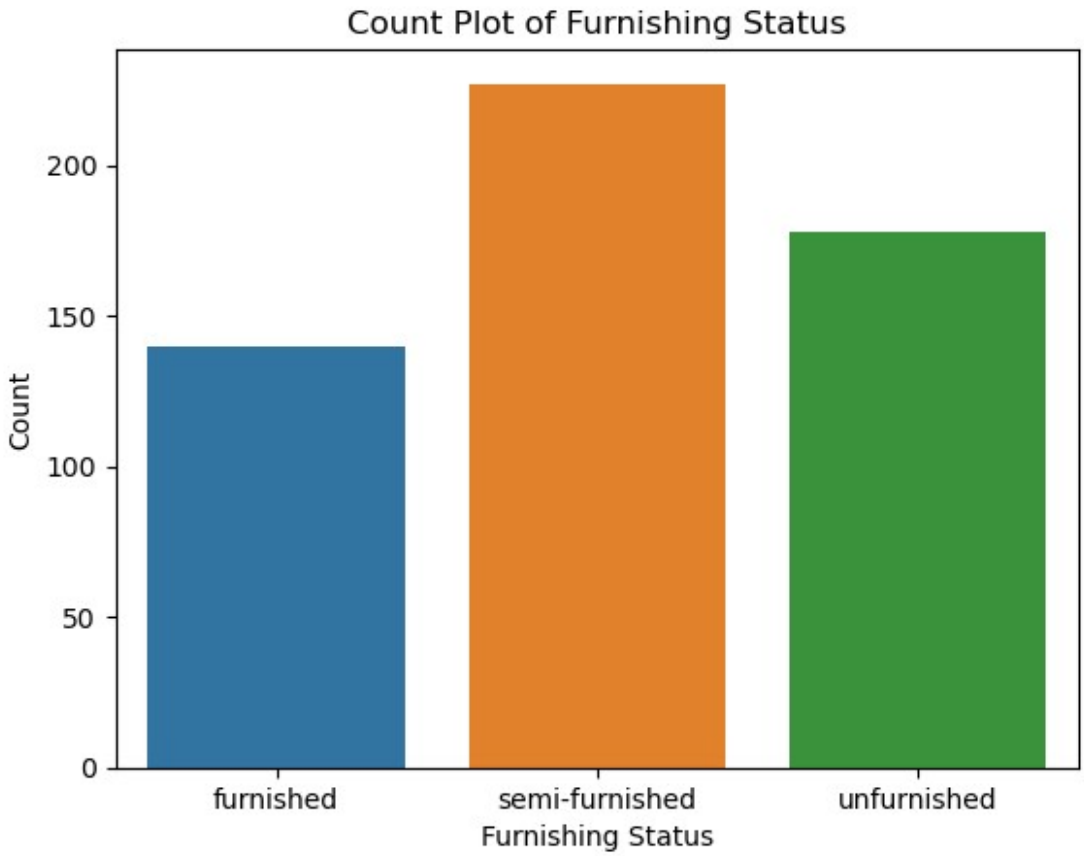



```
sns.pairplot(data, vars=['area', 'bedrooms', 'bathrooms', 'price'])
plt.suptitle('Pair Plot of Numerical Variables')
plt.show()
```

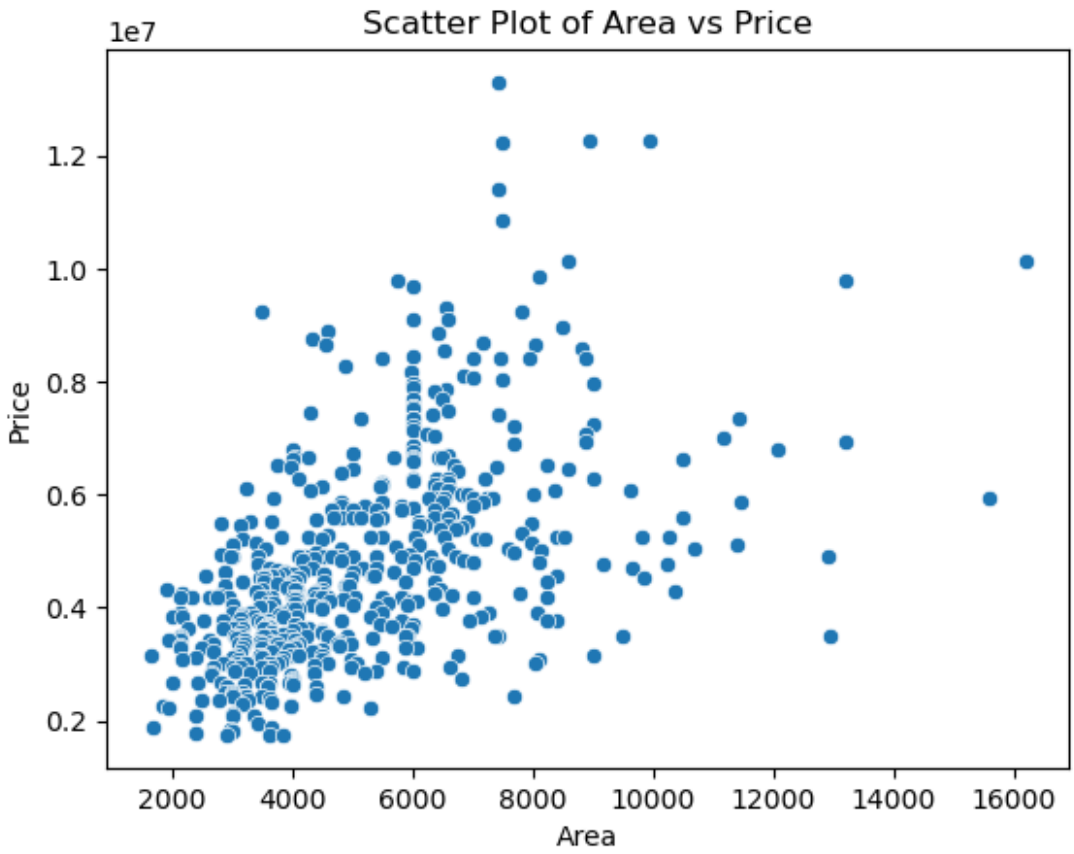
```
/opt/conda/lib/python3.10/site-packages/seaborn/axisgrid.py:118:
UserWarning: The figure layout has changed to tight
  self._figure.tight_layout(*args, **kwargs)
```




```
sns.countplot(x='furnishingstatus', data=data)
plt.title('Count Plot of Furnishing Status')
plt.xlabel('Furnishing Status')
plt.ylabel('Count')
plt.show()
```




```
sns.scatterplot(x='area', y='price', data=data)
plt.title('Scatter Plot of Area vs Price')
plt.xlabel('Area')
plt.ylabel('Price')
plt.show()
```



Correlation between Price and Other Variables

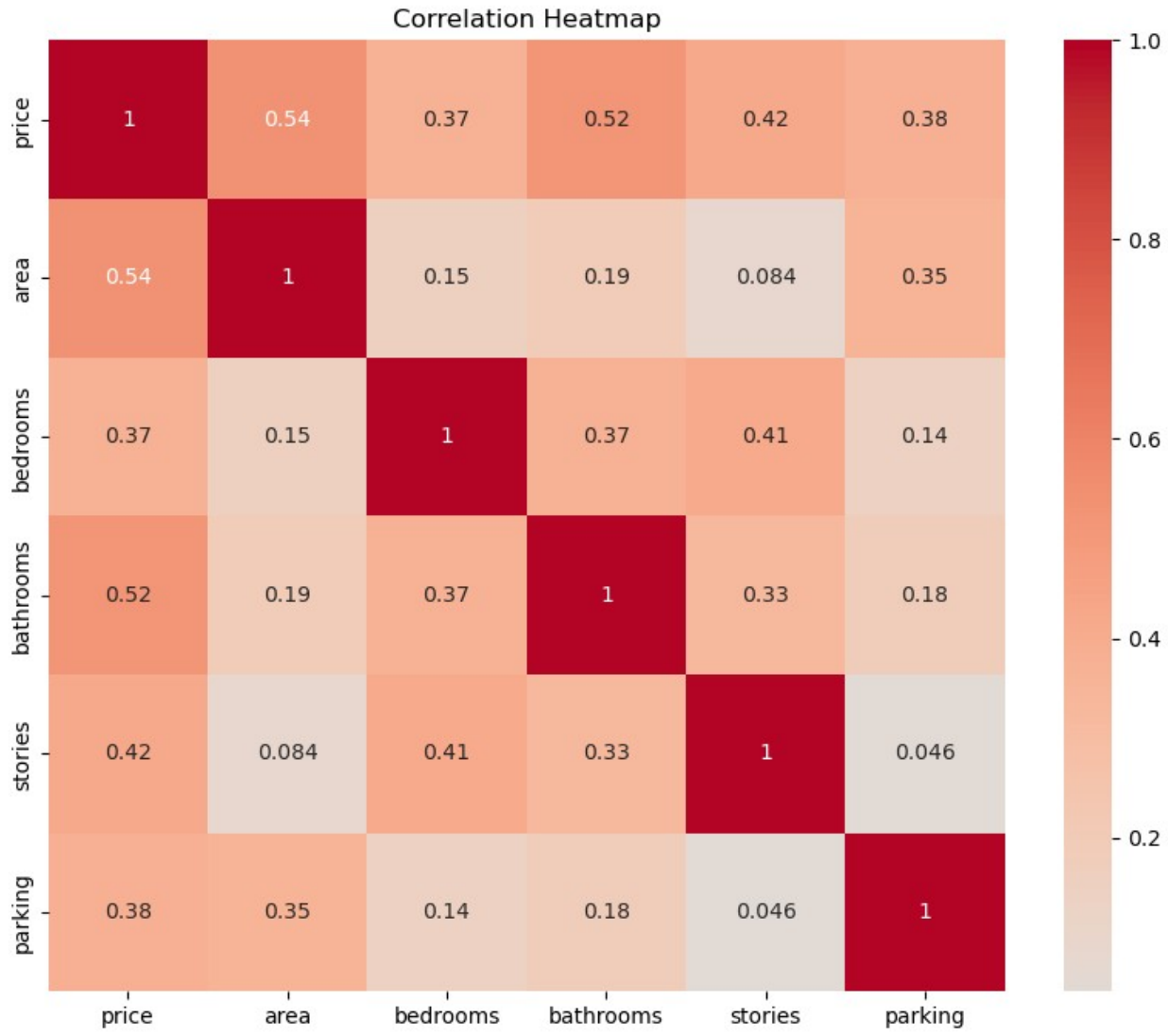
```
correlation_matrix = data.corr(numeric_only=True)
price_correlations =
correlation_matrix['price'].sort_values(ascending=False)
print(price_correlations)
```

```
price        1.000000
area         0.535997
bathrooms    0.517545
stories      0.420712
parking      0.384394
bedrooms     0.366494
Name: price, dtype: float64
```

HeatMap

```
plt.figure(figsize=(10, 8))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', center=0)
```

```
plt.title('Correlation Heatmap')
plt.show()
```



Split the data into training and testing sets

```
# Define features (X) and target (y)
X = df.drop('price', axis=1)
y = df['price']
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.2, random_state=42)
```

Define preprocessing steps

```
categorical_features = ['mainroad', 'guestroom', 'basement',
'hotwaterheating', 'airconditioning', 'prefarea', 'furnishingstatus']

preprocessor = ColumnTransformer(
    transformers=[
        ('cat', OneHotEncoder(drop='first'), categorical_features)
    ])
```

Creating and Training Model

```
# Create a Random Forest regression model
model = RandomForestRegressor(n_estimators=10, max_depth=210,
random_state=42)


# Create a pipeline for preprocessing and modeling
pipeline = Pipeline(steps=[
    ('preprocessor', preprocessor),
    ('model', model)
])


# Train the model
pipeline.fit(X_train, y_train)
```

```
Pipeline(steps=[('preprocessor',
                 ColumnTransformer(transformers=[('cat',

OneHotEncoder(drop='first'),
                                                 ['mainroad',
'guestroom',
                                                  'basement',
                                                  'hotwaterheating',
                                                  'airconditioning',
                                                  'prefarea',

'furnishingstatus'])])),
                ('model',
                 RandomForestRegressor(max_depth=210, n_estimators=10,
                                       random_state=42))])
```

Making Prediction and Calculting Mean Square Error

```
# Make predictions on the test set

y_pred = pipeline.predict(X_test)

# Calculate Mean Squared Error
mse = mean_squared_error(y_test, y_pred)
print(f"Mean Squared Error: {mse}")
```

```
Mean Squared Error: 2795688337109.0913
```

Predict the price for a new house

```
new_house_features = pd.DataFrame({
    'area': [3000],  # Adjust the values based on the new house
    'bedrooms': [2],
    'bathrooms': [1],
    'stories': [1],
    'mainroad': ['yes'],
    'guestroom': ['no'],
    'basement': ['yes'],
    'hotwaterheating': ['no'],
    'airconditioning': ['no'],
    'parking': [2],
    'prefarea': ['yes'],
    'furnishingstatus': ['unfurnished']
})

predicted_price = pipeline.predict(new_house_features)
print(f"Predicted Price for the new house: {predicted_price[0]}")
```

```
Predicted Price for the new house: 4480078.661616161
```