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

from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
```

```
from google.colab import files
uploaded = files.upload()
```

Choose files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving Real estate.csv to Real estate (3).csv
```

```
import pandas as pd
import io

filename = list(uploaded.keys())[0]   # get uploaded filename automatically
df = pd.read_csv(io.BytesIO(uploaded[filename]))
df.head()
```

	No	X1 transaction date	X2 house age	X3 distance to the nearest MRT station	X4 number of convenience stores	X5 latitude	X6 longitude	Y house price of unit area
0	1	2012.917	32.0	84.87882	10	24.98298	121.54024	37.9
1	2	2012.917	19.5	306.59470	9	24.98034	121.53951	42.2
2	3	2013.583	13.3	561.98450	5	24.98746	121.54391	47.3
3	4	2013.500	13.3	561.98450	5	24.98746	121.54391	54.8
4	5	2012.833	5.0	390.56840	5	24.97937	121.54245	43.1

```
df.info()
df.describe()
df.isnull().sum()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 414 entries, 0 to 413
Data columns (total 8 columns):
 #   Column                                  Non-Null Count  Dtype  
---  ------                                  --------------  -----  
 0   No                                      414 non-null    int64  
 1   X1 transaction date                     414 non-null    float64
 2   X2 house age                            414 non-null    float64
 3   X3 distance to the nearest MRT station  414 non-null    float64
 4   X4 number of convenience stores         414 non-null    int64  
 5   X5 latitude                             414 non-null    float64
 6   X6 longitude                            414 non-null    float64
 7   Y house price of unit area              414 non-null    float64
dtypes: float64(6), int64(2)
memory usage: 26.0 KB
```

	0
No	0
X1 transaction date	0
X2 house age	0
X3 distance to the nearest MRT station	0
X4 number of convenience stores	0
X5 latitude	0
X6 longitude	0
Y house price of unit area	0

dtype: int64

```
# Fill numeric missing values with median
df.fillna(df.median(), inplace=True)

# Fill categorical missing values with mode
```

```
for col in df.select_dtypes(include='object'):
    df[col].fillna(df[col].mode()[0], inplace=True)
```

```
df = pd.get_dummies(df, drop_first=True)
df.head()
```

	No	X1 transaction date	X2 house age	X3 distance to the nearest MRT station	X4 number of convenience stores	X5 latitude	X6 longitude	Y house price of unit area
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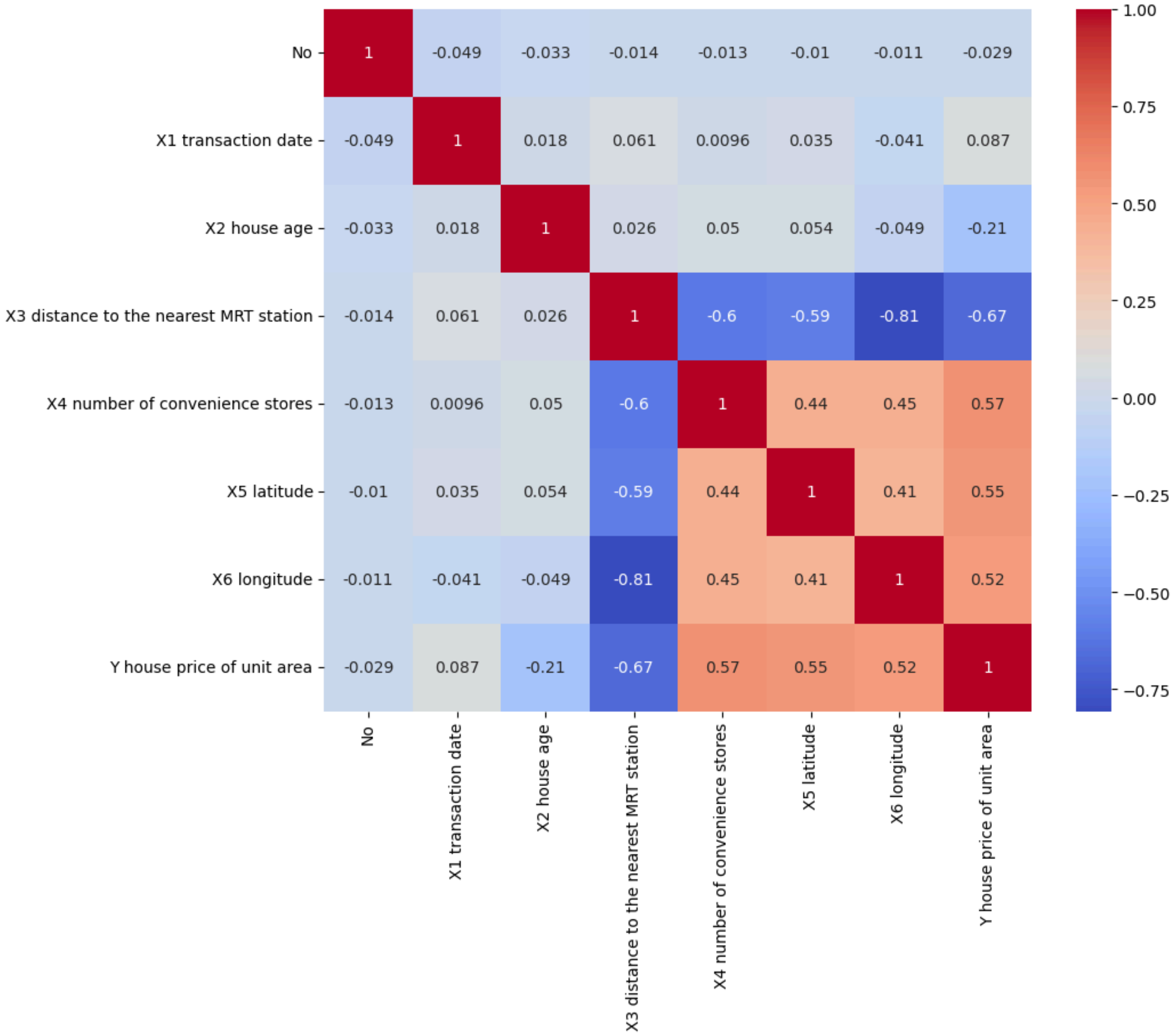
```
plt.figure(figsize=(10,8))
sns.heatmap(df.corr(), annot=True, cmap='coolwarm')
plt.show()
```



```
X = df.drop(['Y house price of unit area'], axis=1)
y = df['Y house price of unit area']

from sklearn.model_selection import train_test_split

X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.2, random_state=42
)
```

```
from sklearn.linear_model import LinearRegression

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

```
▾ LinearRegression ⓘ ?
LinearRegression()
```

```
y_pred = model.predict(X_test)
y_pred[:5]     # show first 5 predictions
```

```
array([47.04645871, 40.40783016, 43.37463978, 39.20600382, 26.62817953])
```

```
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
import numpy as np

mae = mean_absolute_error(y_test, y_pred)
mse = mean_squared_error(y_test, y_pred)
rmse = np.sqrt(mse)
r2 = r2_score(y_test, y_pred)

print("MAE:", mae)
print("MSE:", mse)
print("RMSE:", rmse)
print("R2 Score:", r2)
```

```
MAE: 5.418035098629173
MSE: 54.60196067337693
RMSE: 7.389313951469171
R2 Score: 0.6745228670350882
```