

## ASSIGNMENT2

```
import pandas as pd
import numpy as np
import random as rnd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Activation
from tensorflow.keras.optimizers import Adam
from sklearn.metrics import
mean_squared_error, mean_absolute_error, explained_variance_score
from sklearn.metrics import classification_report, confusion_matrix
```

```
ds=pd.read_csv("/dataset.csv")
print(ds.info())
```

```
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 14620 entries, 0 to 14619
```

```
Data columns (total 23 columns):
```

#	Column	Non-Null Count	Dtype
0	id	14620 non-null	int64
1	Date	14620 non-null	int64
2	number of bedrooms	14620 non-null	int64
3	number of bathrooms	14620 non-null	float64
4	living area	14620 non-null	int64
5	lot area	14620 non-null	int64
6	number of floors	14620 non-null	float64
7	waterfront present	14620 non-null	int64
8	number of views	14620 non-null	int64
9	condition of the house	14620 non-null	int64
10	grade of the house	14620 non-null	int64
11	Area of the house(excluding basement)	14620 non-null	int64
12	Area of the basement	14620 non-null	int64
13	Built Year	14620 non-null	int64
14	Renovation Year	14620 non-null	int64
15	Postal Code	14620 non-null	int64
16	Lattitude	14620 non-null	float64
17	Longitude	14620 non-null	float64
18	living_area_renov	14620 non-null	int64
19	lot_area_renov	14620 non-null	int64
20	Number of schools nearby	14620 non-null	int64
21	Distance from the airport	14620 non-null	int64
22	Price	14620 non-null	int64

```
dtypes: float64(4), int64(19)
```

memory usage: 2.6 MB  
None

## 1. Preprocessing the dataset:

```
cols = ['id', 'Date']  
ds= ds.drop(cols, axis=1)  
print(ds.info())
```

```
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 14620 entries, 0 to 14619  
Data columns (total 21 columns):
```

#	Column	Non-Null Count	Dtype
0	number of bedrooms	14620 non-null	int64
1	number of bathrooms	14620 non-null	float64
2	living area	14620 non-null	int64
3	lot area	14620 non-null	int64
4	number of floors	14620 non-null	float64
5	waterfront present	14620 non-null	int64
6	number of views	14620 non-null	int64
7	condition of the house	14620 non-null	int64
8	grade of the house	14620 non-null	int64
9	Area of the house(excluding basement)	14620 non-null	int64
10	Area of the basement	14620 non-null	int64
11	Built Year	14620 non-null	int64
12	Renovation Year	14620 non-null	int64
13	Postal Code	14620 non-null	int64
14	Lattitude	14620 non-null	float64
15	Longitude	14620 non-null	float64
16	living_area_renov	14620 non-null	int64
17	lot_area_renov	14620 non-null	int64
18	Number of schools nearby	14620 non-null	int64
19	Distance from the airport	14620 non-null	int64
20	Price	14620 non-null	int64

```
dtypes: float64(4), int64(17)  
memory usage: 2.3 MB  
None
```

```
ds.isnull().sum()
```

number of bedrooms	0
number of bathrooms	0
living area	0
lot area	0
number of floors	0
waterfront present	0
number of views	0
condition of the house	0
grade of the house	0

Area of the house(excluding basement)	0
Area of the basement	0
Built Year	0
Renovation Year	0
Postal Code	0
Lattitude	0
Longitude	0
living_area_renov	0
lot_area_renov	0
Number of schools nearby	0
Distance from the airport	0
Price	0

dtype: int64

### Price correlation

- This allow us to explore labels that are highly correlated to the price.
- Living area looks like a highly correlated label to the price, as well as grade of the house , rea of the house(excluding basement), living\_area\_renov and number of bathrooms .

```
price_corr = ds.corr()['Price'].sort_values(ascending=False)
print(price_corr)
```

Price	1.000000
living area	0.712169
grade of the house	0.671814
Area of the house(excluding basement)	0.615220
living_area_renov	0.584924
number of bathrooms	0.531735
number of views	0.395973
Area of the basement	0.330202
number of bedrooms	0.308460
Lattitude	0.297490
waterfront present	0.263687
number of floors	0.262732
Renovation Year	0.133173
lot area	0.081992
lot_area_renov	0.075535
Built Year	0.050307
condition of the house	0.041376
Longitude	0.024414
Number of schools nearby	0.009890
Distance from the airport	0.003804
Postal Code	-0.115908

Name: Price, dtype: float64

### Scaling and train test split

```
X = ds.drop(['Price'],axis=1)
y = ds['Price']
```

```

X_train, X_test, y_train, y_test =
train_test_split(X,y,test_size=0.3,random_state=101)

print(X_train.shape)
print(X_test.shape)
print(y_train.shape)
print(y_test.shape)

(10234, 20)
(4386, 20)
(10234,)
(4386,)

```

### Normalizing / scaling the data

```

scaler = MinMaxScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
print('Max: ',X_train.max())
print('Min: ', X_train.min())

Max:  1.0000000000000002
Min:  0.0

```

## 2. ANN Model

```

model = Sequential()

# input layer
model.add(Dense(19,activation='relu'))

# hidden layers
model.add(Dense(19,activation='relu'))
model.add(Dense(19,activation='relu'))
model.add(Dense(19,activation='relu'))

# output layer
model.add(Dense(1))

model.compile(optimizer='adam',loss='mse')

```

## 3. Test the Model

```

model.fit(x=X_train,y=y_train.values,
          validation_data=(X_test,y_test.values),
          batch_size=128,epochs=400)

Epoch 1/400
80/80 [=====] - 3s 10ms/step - loss:
425403187200.0000 - val_loss: 425768124416.0000

```

Epoch 2/400  
80/80 [=====] - 0s 3ms/step - loss:  
425294266368.0000 - val\_loss: 425419767808.0000  
Epoch 3/400  
80/80 [=====] - 0s 3ms/step - loss:  
423905132544.0000 - val\_loss: 422135300096.0000  
Epoch 4/400  
80/80 [=====] - 0s 3ms/step - loss:  
416035897344.0000 - val\_loss: 407354900480.0000  
Epoch 5/400  
80/80 [=====] - 0s 3ms/step - loss:  
389201100800.0000 - val\_loss: 365021233152.0000  
Epoch 6/400  
80/80 [=====] - 0s 3ms/step - loss:  
326818496512.0000 - val\_loss: 281625853952.0000  
Epoch 7/400  
80/80 [=====] - 0s 3ms/step - loss:  
230063849472.0000 - val\_loss: 178150637568.0000  
Epoch 8/400  
80/80 [=====] - 0s 3ms/step - loss:  
142482046976.0000 - val\_loss: 116310745088.0000  
Epoch 9/400  
80/80 [=====] - 0s 3ms/step - loss:  
108288155648.0000 - val\_loss: 104359870464.0000  
Epoch 10/400  
80/80 [=====] - 0s 3ms/step - loss:  
103473643520.0000 - val\_loss: 102754140160.0000  
Epoch 11/400  
80/80 [=====] - 0s 3ms/step - loss:  
102116835328.0000 - val\_loss: 101509603328.0000  
Epoch 12/400  
80/80 [=====] - 0s 3ms/step - loss:  
100827406336.0000 - val\_loss: 100306722816.0000  
Epoch 13/400  
80/80 [=====] - 0s 3ms/step - loss:  
99521462272.0000 - val\_loss: 99018924032.0000  
Epoch 14/400  
80/80 [=====] - 0s 3ms/step - loss:  
98201747456.0000 - val\_loss: 97760829440.0000  
Epoch 15/400  
80/80 [=====] - 0s 3ms/step - loss:  
96832233472.0000 - val\_loss: 96462266368.0000  
Epoch 16/400  
80/80 [=====] - 0s 3ms/step - loss:  
95454076928.0000 - val\_loss: 95161442304.0000  
Epoch 17/400  
80/80 [=====] - 1s 8ms/step - loss:  
94047862784.0000 - val\_loss: 93747412992.0000  
Epoch 18/400  
80/80 [=====] - 1s 7ms/step - loss:

92615344128.0000 - val\_loss: 92364865536.0000  
Epoch 19/400  
80/80 [=====] - 1s 6ms/step - loss:  
91134844928.0000 - val\_loss: 90938834944.0000  
Epoch 20/400  
80/80 [=====] - 0s 3ms/step - loss:  
89630801920.0000 - val\_loss: 89468870656.0000  
Epoch 21/400  
80/80 [=====] - 0s 3ms/step - loss:  
88083046400.0000 - val\_loss: 87962681344.0000  
Epoch 22/400  
80/80 [=====] - 0s 3ms/step - loss:  
86459572224.0000 - val\_loss: 86446071808.0000  
Epoch 23/400  
80/80 [=====] - 0s 3ms/step - loss:  
84841136128.0000 - val\_loss: 84804771840.0000  
Epoch 24/400  
80/80 [=====] - 0s 3ms/step - loss:  
83157082112.0000 - val\_loss: 83180339200.0000  
Epoch 25/400  
80/80 [=====] - 0s 3ms/step - loss:  
81400201216.0000 - val\_loss: 81519869952.0000  
Epoch 26/400  
80/80 [=====] - 0s 3ms/step - loss:  
79641575424.0000 - val\_loss: 79766585344.0000  
Epoch 27/400  
80/80 [=====] - 0s 3ms/step - loss:  
77827383296.0000 - val\_loss: 77987586048.0000  
Epoch 28/400  
80/80 [=====] - 0s 3ms/step - loss:  
75918417920.0000 - val\_loss: 76208988160.0000  
Epoch 29/400  
80/80 [=====] - 0s 3ms/step - loss:  
74035191808.0000 - val\_loss: 74340933632.0000  
Epoch 30/400  
80/80 [=====] - 0s 3ms/step - loss:  
72107311104.0000 - val\_loss: 72523472896.0000  
Epoch 31/400  
80/80 [=====] - 0s 3ms/step - loss:  
70201663488.0000 - val\_loss: 70618251264.0000  
Epoch 32/400  
80/80 [=====] - 0s 3ms/step - loss:  
68178833408.0000 - val\_loss: 68764565504.0000  
Epoch 33/400  
80/80 [=====] - 0s 3ms/step - loss:  
66258706432.0000 - val\_loss: 66901012480.0000  
Epoch 34/400  
80/80 [=====] - 0s 3ms/step - loss:  
64372150272.0000 - val\_loss: 65125421056.0000  
Epoch 35/400

80/80 [=====] - 0s 3ms/step - loss:  
62512431104.0000 - val\_loss: 63481999360.0000  
Epoch 36/400  
80/80 [=====] - 0s 4ms/step - loss:  
60817182720.0000 - val\_loss: 61790793728.0000  
Epoch 37/400  
80/80 [=====] - 0s 5ms/step - loss:  
59180265472.0000 - val\_loss: 60288331776.0000  
Epoch 38/400  
80/80 [=====] - 0s 5ms/step - loss:  
57700200448.0000 - val\_loss: 58958188544.0000  
Epoch 39/400  
80/80 [=====] - 0s 5ms/step - loss:  
56376258560.0000 - val\_loss: 57769959424.0000  
Epoch 40/400  
80/80 [=====] - 0s 5ms/step - loss:  
55250436096.0000 - val\_loss: 56791367680.0000  
Epoch 41/400  
80/80 [=====] - 0s 5ms/step - loss:  
54226677760.0000 - val\_loss: 55793868800.0000  
Epoch 42/400  
80/80 [=====] - 0s 5ms/step - loss:  
53345234944.0000 - val\_loss: 55031902208.0000  
Epoch 43/400  
80/80 [=====] - 0s 4ms/step - loss:  
52572635136.0000 - val\_loss: 54299967488.0000  
Epoch 44/400  
80/80 [=====] - 0s 3ms/step - loss:  
51849379840.0000 - val\_loss: 53678571520.0000  
Epoch 45/400  
80/80 [=====] - 0s 3ms/step - loss:  
51259727872.0000 - val\_loss: 53049479168.0000  
Epoch 46/400  
80/80 [=====] - 0s 3ms/step - loss:  
50698354688.0000 - val\_loss: 52519776256.0000  
Epoch 47/400  
80/80 [=====] - 0s 3ms/step - loss:  
50221285376.0000 - val\_loss: 52050993152.0000  
Epoch 48/400  
80/80 [=====] - 0s 3ms/step - loss:  
49751683072.0000 - val\_loss: 51707813888.0000  
Epoch 49/400  
80/80 [=====] - 0s 3ms/step - loss:  
49309294592.0000 - val\_loss: 51152650240.0000  
Epoch 50/400  
80/80 [=====] - 0s 3ms/step - loss:  
48922107904.0000 - val\_loss: 50739281920.0000  
Epoch 51/400  
80/80 [=====] - 0s 3ms/step - loss:  
48464158720.0000 - val\_loss: 50391130112.0000

Epoch 52/400  
80/80 [=====] - 0s 3ms/step - loss:  
48172175360.0000 - val\_loss: 49938427904.0000  
Epoch 53/400  
80/80 [=====] - 0s 3ms/step - loss:  
47846158336.0000 - val\_loss: 49659928576.0000  
Epoch 54/400  
80/80 [=====] - 0s 3ms/step - loss:  
47472877568.0000 - val\_loss: 49293225984.0000  
Epoch 55/400  
80/80 [=====] - 0s 3ms/step - loss:  
47149178880.0000 - val\_loss: 48901545984.0000  
Epoch 56/400  
80/80 [=====] - 0s 3ms/step - loss:  
46837129216.0000 - val\_loss: 48541433856.0000  
Epoch 57/400  
80/80 [=====] - 0s 3ms/step - loss:  
46557270016.0000 - val\_loss: 48232058880.0000  
Epoch 58/400  
80/80 [=====] - 0s 3ms/step - loss:  
46226112512.0000 - val\_loss: 47916072960.0000  
Epoch 59/400  
80/80 [=====] - 0s 3ms/step - loss:  
45954281472.0000 - val\_loss: 47609147392.0000  
Epoch 60/400  
80/80 [=====] - 0s 3ms/step - loss:  
45672820736.0000 - val\_loss: 47274131456.0000  
Epoch 61/400  
80/80 [=====] - 0s 3ms/step - loss:  
45367934976.0000 - val\_loss: 46999879680.0000  
Epoch 62/400  
80/80 [=====] - 0s 3ms/step - loss:  
45080268800.0000 - val\_loss: 46674841600.0000  
Epoch 63/400  
80/80 [=====] - 0s 3ms/step - loss:  
44843257856.0000 - val\_loss: 46393028608.0000  
Epoch 64/400  
80/80 [=====] - 0s 3ms/step - loss:  
44566933504.0000 - val\_loss: 46131310592.0000  
Epoch 65/400  
80/80 [=====] - 0s 3ms/step - loss:  
44336414720.0000 - val\_loss: 45822517248.0000  
Epoch 66/400  
80/80 [=====] - 0s 3ms/step - loss:  
44097155072.0000 - val\_loss: 45561397248.0000  
Epoch 67/400  
80/80 [=====] - 0s 3ms/step - loss:  
43833683968.0000 - val\_loss: 45264900096.0000  
Epoch 68/400  
80/80 [=====] - 0s 3ms/step - loss:



43583598592.0000 - val\_loss: 44983508992.0000  
Epoch 69/400  
80/80 [=====] - 0s 3ms/step - loss:  
43323576320.0000 - val\_loss: 44721598464.0000  
Epoch 70/400  
80/80 [=====] - 0s 3ms/step - loss:  
43108810752.0000 - val\_loss: 44462280704.0000  
Epoch 71/400  
80/80 [=====] - 0s 3ms/step - loss:  
42834583552.0000 - val\_loss: 44182675456.0000  
Epoch 72/400  
80/80 [=====] - 0s 3ms/step - loss:  
42621329408.0000 - val\_loss: 43961020416.0000  
Epoch 73/400  
80/80 [=====] - 0s 3ms/step - loss:  
42386776064.0000 - val\_loss: 43691425792.0000  
Epoch 74/400  
80/80 [=====] - 0s 3ms/step - loss:  
42145366016.0000 - val\_loss: 43408392192.0000  
Epoch 75/400  
80/80 [=====] - 0s 3ms/step - loss:  
41933312000.0000 - val\_loss: 43175034880.0000  
Epoch 76/400  
80/80 [=====] - 0s 3ms/step - loss:  
41701109760.0000 - val\_loss: 42941923328.0000  
Epoch 77/400  
80/80 [=====] - 0s 3ms/step - loss:  
41476587520.0000 - val\_loss: 42687389696.0000  
Epoch 78/400  
80/80 [=====] - 0s 3ms/step - loss:  
41304842240.0000 - val\_loss: 42451390464.0000  
Epoch 79/400  
80/80 [=====] - 0s 3ms/step - loss:  
41065803776.0000 - val\_loss: 42211147776.0000  
Epoch 80/400  
80/80 [=====] - 0s 3ms/step - loss:  
40852463616.0000 - val\_loss: 41998512128.0000  
Epoch 81/400  
80/80 [=====] - 0s 3ms/step - loss:  
40622088192.0000 - val\_loss: 41758728192.0000  
Epoch 82/400  
80/80 [=====] - 0s 5ms/step - loss:  
40436805632.0000 - val\_loss: 41541275648.0000  
Epoch 83/400  
80/80 [=====] - 0s 5ms/step - loss:  
40309936128.0000 - val\_loss: 41323872256.0000  
Epoch 84/400  
80/80 [=====] - 0s 5ms/step - loss:  
40080400384.0000 - val\_loss: 41140465664.0000  
Epoch 85/400

80/80 [=====] - 0s 4ms/step - loss:  
39887441920.0000 - val\_loss: 40934637568.0000  
Epoch 86/400  
80/80 [=====] - 0s 6ms/step - loss:  
39712161792.0000 - val\_loss: 40729858048.0000  
Epoch 87/400  
80/80 [=====] - 0s 6ms/step - loss:  
39536529408.0000 - val\_loss: 40522297344.0000  
Epoch 88/400  
80/80 [=====] - 0s 5ms/step - loss:  
39350849536.0000 - val\_loss: 40345722880.0000  
Epoch 89/400  
80/80 [=====] - 0s 3ms/step - loss:  
39232139264.0000 - val\_loss: 40144060416.0000  
Epoch 90/400  
80/80 [=====] - 0s 3ms/step - loss:  
39004684288.0000 - val\_loss: 39946592256.0000  
Epoch 91/400  
80/80 [=====] - 0s 3ms/step - loss:  
38828929024.0000 - val\_loss: 39749386240.0000  
Epoch 92/400  
80/80 [=====] - 0s 3ms/step - loss:  
38706188288.0000 - val\_loss: 39549812736.0000  
Epoch 93/400  
80/80 [=====] - 0s 3ms/step - loss:  
38493036544.0000 - val\_loss: 39350255616.0000  
Epoch 94/400  
80/80 [=====] - 0s 3ms/step - loss:  
38347763712.0000 - val\_loss: 39218249728.0000  
Epoch 95/400  
80/80 [=====] - 0s 3ms/step - loss:  
38131617792.0000 - val\_loss: 39041064960.0000  
Epoch 96/400  
80/80 [=====] - 0s 3ms/step - loss:  
37976809472.0000 - val\_loss: 38886117376.0000  
Epoch 97/400  
80/80 [=====] - 0s 3ms/step - loss:  
37850267648.0000 - val\_loss: 38673260544.0000  
Epoch 98/400  
80/80 [=====] - 0s 3ms/step - loss:  
37679554560.0000 - val\_loss: 38456553472.0000  
Epoch 99/400  
80/80 [=====] - 0s 3ms/step - loss:  
37570539520.0000 - val\_loss: 38287552512.0000  
Epoch 100/400  
80/80 [=====] - 0s 3ms/step - loss:  
37407801344.0000 - val\_loss: 38092533760.0000  
Epoch 101/400  
80/80 [=====] - 0s 3ms/step - loss:  
37216333824.0000 - val\_loss: 37934694400.0000

Epoch 102/400  
80/80 [=====] - 0s 3ms/step - loss:  
37091069952.0000 - val\_loss: 37770878976.0000  
Epoch 103/400  
80/80 [=====] - 0s 3ms/step - loss:  
36907823104.0000 - val\_loss: 37599739904.0000  
Epoch 104/400  
80/80 [=====] - 0s 3ms/step - loss:  
36783173632.0000 - val\_loss: 37430177792.0000  
Epoch 105/400  
80/80 [=====] - 0s 3ms/step - loss:  
36648144896.0000 - val\_loss: 37290287104.0000  
Epoch 106/400  
80/80 [=====] - 0s 3ms/step - loss:  
36483006464.0000 - val\_loss: 37101867008.0000  
Epoch 107/400  
80/80 [=====] - 0s 3ms/step - loss:  
36345634816.0000 - val\_loss: 36972576768.0000  
Epoch 108/400  
80/80 [=====] - 0s 3ms/step - loss:  
36225040384.0000 - val\_loss: 36824244224.0000  
Epoch 109/400  
80/80 [=====] - 0s 3ms/step - loss:  
36088029184.0000 - val\_loss: 36786151424.0000  
Epoch 110/400  
80/80 [=====] - 0s 3ms/step - loss:  
35984220160.0000 - val\_loss: 36553678848.0000  
Epoch 111/400  
80/80 [=====] - 0s 3ms/step - loss:  
35844677632.0000 - val\_loss: 36394885120.0000  
Epoch 112/400  
80/80 [=====] - 0s 4ms/step - loss:  
35726340096.0000 - val\_loss: 36246474752.0000  
Epoch 113/400  
80/80 [=====] - 0s 3ms/step - loss:  
35620040704.0000 - val\_loss: 36124581888.0000  
Epoch 114/400  
80/80 [=====] - 0s 3ms/step - loss:  
35500253184.0000 - val\_loss: 35974909952.0000  
Epoch 115/400  
80/80 [=====] - 0s 3ms/step - loss:  
35360673792.0000 - val\_loss: 35852488704.0000  
Epoch 116/400  
80/80 [=====] - 0s 3ms/step - loss:  
35265781760.0000 - val\_loss: 35768840192.0000  
Epoch 117/400  
80/80 [=====] - 0s 3ms/step - loss:  
35137040384.0000 - val\_loss: 35642982400.0000  
Epoch 118/400  
80/80 [=====] - 0s 3ms/step - loss:

35080261632.0000 - val\_loss: 35496214528.0000  
Epoch 119/400  
80/80 [=====] - 0s 3ms/step - loss:  
34945761280.0000 - val\_loss: 35363680256.0000  
Epoch 120/400  
80/80 [=====] - 0s 3ms/step - loss:  
34836537344.0000 - val\_loss: 35252486144.0000  
Epoch 121/400  
80/80 [=====] - 0s 3ms/step - loss:  
34732261376.0000 - val\_loss: 35147485184.0000  
Epoch 122/400  
80/80 [=====] - 0s 4ms/step - loss:  
34611150848.0000 - val\_loss: 35083513856.0000  
Epoch 123/400  
80/80 [=====] - 0s 3ms/step - loss:  
34528296960.0000 - val\_loss: 34924875776.0000  
Epoch 124/400  
80/80 [=====] - 0s 3ms/step - loss:  
34444382208.0000 - val\_loss: 34814894080.0000  
Epoch 125/400  
80/80 [=====] - 0s 3ms/step - loss:  
34364198912.0000 - val\_loss: 34709966848.0000  
Epoch 126/400  
80/80 [=====] - 0s 6ms/step - loss:  
34297436160.0000 - val\_loss: 34592833536.0000  
Epoch 127/400  
80/80 [=====] - 0s 5ms/step - loss:  
34162384896.0000 - val\_loss: 34543763456.0000  
Epoch 128/400  
80/80 [=====] - 0s 6ms/step - loss:  
34090680320.0000 - val\_loss: 34405629952.0000  
Epoch 129/400  
80/80 [=====] - 0s 5ms/step - loss:  
34022672384.0000 - val\_loss: 34335211520.0000  
Epoch 130/400  
80/80 [=====] - 0s 6ms/step - loss:  
33897920512.0000 - val\_loss: 34206142464.0000  
Epoch 131/400  
80/80 [=====] - 0s 4ms/step - loss:  
33862940672.0000 - val\_loss: 34131382272.0000  
Epoch 132/400  
80/80 [=====] - 0s 5ms/step - loss:  
33744513024.0000 - val\_loss: 34029189120.0000  
Epoch 133/400  
80/80 [=====] - 0s 3ms/step - loss:  
33672615936.0000 - val\_loss: 33959434240.0000  
Epoch 134/400  
80/80 [=====] - 0s 3ms/step - loss:  
33595303936.0000 - val\_loss: 33852252160.0000  
Epoch 135/400

80/80 [=====] - 0s 3ms/step - loss:  
33491212288.0000 - val\_loss: 33786241024.0000  
Epoch 136/400  
80/80 [=====] - 0s 3ms/step - loss:  
33436702720.0000 - val\_loss: 33692078080.0000  
Epoch 137/400  
80/80 [=====] - 0s 3ms/step - loss:  
33346340864.0000 - val\_loss: 33650497536.0000  
Epoch 138/400  
80/80 [=====] - 0s 4ms/step - loss:  
33301069824.0000 - val\_loss: 33554788352.0000  
Epoch 139/400  
80/80 [=====] - 0s 3ms/step - loss:  
33216163840.0000 - val\_loss: 33444530176.0000  
Epoch 140/400  
80/80 [=====] - 0s 3ms/step - loss:  
33139372032.0000 - val\_loss: 33363208192.0000  
Epoch 141/400  
80/80 [=====] - 0s 4ms/step - loss:  
33102755840.0000 - val\_loss: 33287561216.0000  
Epoch 142/400  
80/80 [=====] - 0s 4ms/step - loss:  
32997941248.0000 - val\_loss: 33305030656.0000  
Epoch 143/400  
80/80 [=====] - 0s 3ms/step - loss:  
32934443008.0000 - val\_loss: 33220831232.0000  
Epoch 144/400  
80/80 [=====] - 0s 3ms/step - loss:  
32857808896.0000 - val\_loss: 33062621184.0000  
Epoch 145/400  
80/80 [=====] - 0s 3ms/step - loss:  
32797933568.0000 - val\_loss: 33013262336.0000  
Epoch 146/400  
80/80 [=====] - 0s 3ms/step - loss:  
32747421696.0000 - val\_loss: 32924215296.0000  
Epoch 147/400  
80/80 [=====] - 0s 4ms/step - loss:  
32684695552.0000 - val\_loss: 32852813824.0000  
Epoch 148/400  
80/80 [=====] - 0s 3ms/step - loss:  
32637347840.0000 - val\_loss: 32773908480.0000  
Epoch 149/400  
80/80 [=====] - 0s 3ms/step - loss:  
32609521664.0000 - val\_loss: 32748949504.0000  
Epoch 150/400  
80/80 [=====] - 0s 3ms/step - loss:  
32489240576.0000 - val\_loss: 32662550528.0000  
Epoch 151/400  
80/80 [=====] - 0s 3ms/step - loss:  
32436310016.0000 - val\_loss: 32603613184.0000

Epoch 152/400  
80/80 [=====] - 0s 3ms/step - loss:  
32352391168.0000 - val\_loss: 32502607872.0000  
Epoch 153/400  
80/80 [=====] - 0s 3ms/step - loss:  
32313184256.0000 - val\_loss: 32458653696.0000  
Epoch 154/400  
80/80 [=====] - 0s 3ms/step - loss:  
32239781888.0000 - val\_loss: 32395177984.0000  
Epoch 155/400  
80/80 [=====] - 0s 3ms/step - loss:  
32180877312.0000 - val\_loss: 32313036800.0000  
Epoch 156/400  
80/80 [=====] - 0s 3ms/step - loss:  
32105021440.0000 - val\_loss: 32261611520.0000  
Epoch 157/400  
80/80 [=====] - 0s 3ms/step - loss:  
32065470464.0000 - val\_loss: 32185106432.0000  
Epoch 158/400  
80/80 [=====] - 0s 3ms/step - loss:  
32023957504.0000 - val\_loss: 32173096960.0000  
Epoch 159/400  
80/80 [=====] - 0s 3ms/step - loss:  
31976130560.0000 - val\_loss: 32075413504.0000  
Epoch 160/400  
80/80 [=====] - 0s 3ms/step - loss:  
31941615616.0000 - val\_loss: 32007847936.0000  
Epoch 161/400  
80/80 [=====] - 0s 3ms/step - loss:  
31846774784.0000 - val\_loss: 31935721472.0000  
Epoch 162/400  
80/80 [=====] - 0s 3ms/step - loss:  
31803846656.0000 - val\_loss: 31906048000.0000  
Epoch 163/400  
80/80 [=====] - 0s 3ms/step - loss:  
31704440832.0000 - val\_loss: 31825053696.0000  
Epoch 164/400  
80/80 [=====] - 0s 3ms/step - loss:  
31683448832.0000 - val\_loss: 31771252736.0000  
Epoch 165/400  
80/80 [=====] - 0s 3ms/step - loss:  
31682510848.0000 - val\_loss: 31754858496.0000  
Epoch 166/400  
80/80 [=====] - 0s 3ms/step - loss:  
31602628608.0000 - val\_loss: 31720787968.0000  
Epoch 167/400  
80/80 [=====] - 0s 4ms/step - loss:  
31545176064.0000 - val\_loss: 31609876480.0000  
Epoch 168/400  
80/80 [=====] - 0s 3ms/step - loss:

31502995456.0000 - val\_loss: 31564003328.0000  
Epoch 169/400  
80/80 [=====] - 0s 5ms/step - loss:  
31496087552.0000 - val\_loss: 31509731328.0000  
Epoch 170/400  
80/80 [=====] - 0s 5ms/step - loss:  
31389892608.0000 - val\_loss: 31458338816.0000  
Epoch 171/400  
80/80 [=====] - 0s 5ms/step - loss:  
31407165440.0000 - val\_loss: 31447732224.0000  
Epoch 172/400  
80/80 [=====] - 0s 5ms/step - loss:  
31307720704.0000 - val\_loss: 31360468992.0000  
Epoch 173/400  
80/80 [=====] - 0s 5ms/step - loss:  
31260878848.0000 - val\_loss: 31309615104.0000  
Epoch 174/400  
80/80 [=====] - 0s 5ms/step - loss:  
31214022656.0000 - val\_loss: 31258322944.0000  
Epoch 175/400  
80/80 [=====] - 0s 5ms/step - loss:  
31132905472.0000 - val\_loss: 31252748288.0000  
Epoch 176/400  
80/80 [=====] - 0s 3ms/step - loss:  
31115192320.0000 - val\_loss: 31183874048.0000  
Epoch 177/400  
80/80 [=====] - 0s 3ms/step - loss:  
31085916160.0000 - val\_loss: 31119294464.0000  
Epoch 178/400  
80/80 [=====] - 0s 3ms/step - loss:  
31029391360.0000 - val\_loss: 31081719808.0000  
Epoch 179/400  
80/80 [=====] - 0s 3ms/step - loss:  
31001518080.0000 - val\_loss: 31033708544.0000  
Epoch 180/400  
80/80 [=====] - 0s 3ms/step - loss:  
30963916800.0000 - val\_loss: 30994903040.0000  
Epoch 181/400  
80/80 [=====] - 0s 3ms/step - loss:  
30906042368.0000 - val\_loss: 30938126336.0000  
Epoch 182/400  
80/80 [=====] - 0s 3ms/step - loss:  
30902329344.0000 - val\_loss: 30938806272.0000  
Epoch 183/400  
80/80 [=====] - 0s 3ms/step - loss:  
30851674112.0000 - val\_loss: 30873051136.0000  
Epoch 184/400  
80/80 [=====] - 0s 3ms/step - loss:  
30779305984.0000 - val\_loss: 30802649088.0000  
Epoch 185/400

80/80 [=====] - 0s 3ms/step - loss:  
30781587456.0000 - val\_loss: 30761824256.0000  
Epoch 186/400  
80/80 [=====] - 0s 3ms/step - loss:  
30721951744.0000 - val\_loss: 30723921920.0000  
Epoch 187/400  
80/80 [=====] - 0s 3ms/step - loss:  
30701066240.0000 - val\_loss: 30686433280.0000  
Epoch 188/400  
80/80 [=====] - 0s 3ms/step - loss:  
30648295424.0000 - val\_loss: 30646052864.0000  
Epoch 189/400  
80/80 [=====] - 0s 3ms/step - loss:  
30604021760.0000 - val\_loss: 30589233152.0000  
Epoch 190/400  
80/80 [=====] - 0s 4ms/step - loss:  
30569719808.0000 - val\_loss: 30555863040.0000  
Epoch 191/400  
80/80 [=====] - 0s 3ms/step - loss:  
30525218816.0000 - val\_loss: 30516383744.0000  
Epoch 192/400  
80/80 [=====] - 0s 3ms/step - loss:  
30487988224.0000 - val\_loss: 30481317888.0000  
Epoch 193/400  
80/80 [=====] - 0s 3ms/step - loss:  
30447673344.0000 - val\_loss: 30484727808.0000  
Epoch 194/400  
80/80 [=====] - 0s 3ms/step - loss:  
30461149184.0000 - val\_loss: 30387218432.0000  
Epoch 195/400  
80/80 [=====] - 0s 3ms/step - loss:  
30404730880.0000 - val\_loss: 30346856448.0000  
Epoch 196/400  
80/80 [=====] - 0s 3ms/step - loss:  
30376075264.0000 - val\_loss: 30381363200.0000  
Epoch 197/400  
80/80 [=====] - 0s 3ms/step - loss:  
30352701440.0000 - val\_loss: 30285580288.0000  
Epoch 198/400  
80/80 [=====] - 0s 3ms/step - loss:  
30296651776.0000 - val\_loss: 30250856448.0000  
Epoch 199/400  
80/80 [=====] - 0s 3ms/step - loss:  
30261815296.0000 - val\_loss: 30227263488.0000  
Epoch 200/400  
80/80 [=====] - 0s 3ms/step - loss:  
30207352832.0000 - val\_loss: 30172323840.0000  
Epoch 201/400  
80/80 [=====] - 0s 3ms/step - loss:  
30195304448.0000 - val\_loss: 30118154240.0000



Epoch 202/400  
80/80 [=====] - 0s 3ms/step - loss:  
30144614400.0000 - val\_loss: 30078484480.0000  
Epoch 203/400  
80/80 [=====] - 0s 4ms/step - loss:  
30121234432.0000 - val\_loss: 30040905728.0000  
Epoch 204/400  
80/80 [=====] - 0s 3ms/step - loss:  
30078208000.0000 - val\_loss: 30007914496.0000  
Epoch 205/400  
80/80 [=====] - 0s 3ms/step - loss:  
30043973632.0000 - val\_loss: 30012166144.0000  
Epoch 206/400  
80/80 [=====] - 0s 3ms/step - loss:  
30020374528.0000 - val\_loss: 29905817600.0000  
Epoch 207/400  
80/80 [=====] - 0s 3ms/step - loss:  
29998895104.0000 - val\_loss: 29888264192.0000  
Epoch 208/400  
80/80 [=====] - 0s 3ms/step - loss:  
29958901760.0000 - val\_loss: 29834448896.0000  
Epoch 209/400  
80/80 [=====] - 0s 3ms/step - loss:  
29896910848.0000 - val\_loss: 29810812928.0000  
Epoch 210/400  
80/80 [=====] - 0s 3ms/step - loss:  
29894117376.0000 - val\_loss: 29760258048.0000  
Epoch 211/400  
80/80 [=====] - 0s 4ms/step - loss:  
29885769728.0000 - val\_loss: 29738934272.0000  
Epoch 212/400  
80/80 [=====] - 0s 5ms/step - loss:  
29834254336.0000 - val\_loss: 29713985536.0000  
Epoch 213/400  
80/80 [=====] - 0s 5ms/step - loss:  
29811161088.0000 - val\_loss: 29670549504.0000  
Epoch 214/400  
80/80 [=====] - 0s 5ms/step - loss:  
29769027584.0000 - val\_loss: 29716033536.0000  
Epoch 215/400  
80/80 [=====] - 0s 5ms/step - loss:  
29766942720.0000 - val\_loss: 29627901952.0000  
Epoch 216/400  
80/80 [=====] - 0s 5ms/step - loss:  
29743423488.0000 - val\_loss: 29601050624.0000  
Epoch 217/400  
80/80 [=====] - 0s 6ms/step - loss:  
29713350656.0000 - val\_loss: 29550972928.0000  
Epoch 218/400  
80/80 [=====] - 0s 5ms/step - loss:

29685039104.0000 - val\_loss: 29576142848.0000  
Epoch 219/400  
80/80 [=====] - 0s 6ms/step - loss:  
29660536832.0000 - val\_loss: 29484468224.0000  
Epoch 220/400  
80/80 [=====] - 0s 4ms/step - loss:  
29611757568.0000 - val\_loss: 29455040512.0000  
Epoch 221/400  
80/80 [=====] - 0s 3ms/step - loss:  
29615560704.0000 - val\_loss: 29427015680.0000  
Epoch 222/400  
80/80 [=====] - 0s 4ms/step - loss:  
29593389056.0000 - val\_loss: 29411063808.0000  
Epoch 223/400  
80/80 [=====] - 1s 7ms/step - loss:  
29583632384.0000 - val\_loss: 29378844672.0000  
Epoch 224/400  
80/80 [=====] - 0s 3ms/step - loss:  
29569495040.0000 - val\_loss: 29372377088.0000  
Epoch 225/400  
80/80 [=====] - 1s 6ms/step - loss:  
29578002432.0000 - val\_loss: 29333448704.0000  
Epoch 226/400  
80/80 [=====] - 0s 3ms/step - loss:  
29496010752.0000 - val\_loss: 29313282048.0000  
Epoch 227/400  
80/80 [=====] - 0s 3ms/step - loss:  
29464961024.0000 - val\_loss: 29287327744.0000  
Epoch 228/400  
80/80 [=====] - 1s 7ms/step - loss:  
29455454208.0000 - val\_loss: 29242779648.0000  
Epoch 229/400  
80/80 [=====] - 0s 4ms/step - loss:  
29421060096.0000 - val\_loss: 29219307520.0000  
Epoch 230/400  
80/80 [=====] - 0s 3ms/step - loss:  
29409099776.0000 - val\_loss: 29206398976.0000  
Epoch 231/400  
80/80 [=====] - 0s 3ms/step - loss:  
29361420288.0000 - val\_loss: 29177702400.0000  
Epoch 232/400  
80/80 [=====] - 0s 3ms/step - loss:  
29393317888.0000 - val\_loss: 29143801856.0000  
Epoch 233/400  
80/80 [=====] - 0s 3ms/step - loss:  
29322547200.0000 - val\_loss: 29119076352.0000  
Epoch 234/400  
80/80 [=====] - 0s 3ms/step - loss:  
29343803392.0000 - val\_loss: 29172099072.0000  
Epoch 235/400

80/80 [=====] - 0s 3ms/step - loss:  
29297612800.0000 - val\_loss: 29117855744.0000  
Epoch 236/400  
80/80 [=====] - 0s 4ms/step - loss:  
29243668480.0000 - val\_loss: 29098747904.0000  
Epoch 237/400  
80/80 [=====] - 0s 3ms/step - loss:  
29232691200.0000 - val\_loss: 29040527360.0000  
Epoch 238/400  
80/80 [=====] - 0s 3ms/step - loss:  
29209186304.0000 - val\_loss: 29003206656.0000  
Epoch 239/400  
80/80 [=====] - 0s 3ms/step - loss:  
29195597824.0000 - val\_loss: 28974780416.0000  
Epoch 240/400  
80/80 [=====] - 0s 3ms/step - loss:  
29163520000.0000 - val\_loss: 28969367552.0000  
Epoch 241/400  
80/80 [=====] - 0s 3ms/step - loss:  
29157115904.0000 - val\_loss: 28931543040.0000  
Epoch 242/400  
80/80 [=====] - 0s 3ms/step - loss:  
29135538176.0000 - val\_loss: 28954609664.0000  
Epoch 243/400  
80/80 [=====] - 0s 4ms/step - loss:  
29107257344.0000 - val\_loss: 28890847232.0000  
Epoch 244/400  
80/80 [=====] - 0s 3ms/step - loss:  
29089521664.0000 - val\_loss: 28925814784.0000  
Epoch 245/400  
80/80 [=====] - 0s 3ms/step - loss:  
29073727488.0000 - val\_loss: 29028302848.0000  
Epoch 246/400  
80/80 [=====] - 0s 3ms/step - loss:  
29031620608.0000 - val\_loss: 28825939968.0000  
Epoch 247/400  
80/80 [=====] - 0s 4ms/step - loss:  
29014761472.0000 - val\_loss: 28821202944.0000  
Epoch 248/400  
80/80 [=====] - 0s 3ms/step - loss:  
29047033856.0000 - val\_loss: 28810549248.0000  
Epoch 249/400  
80/80 [=====] - 0s 4ms/step - loss:  
29007515648.0000 - val\_loss: 28768694272.0000  
Epoch 250/400  
80/80 [=====] - 0s 4ms/step - loss:  
28966854656.0000 - val\_loss: 28772182016.0000  
Epoch 251/400  
80/80 [=====] - 0s 4ms/step - loss:  
29042251776.0000 - val\_loss: 28738457600.0000

Epoch 252/400  
80/80 [=====] - 0s 4ms/step - loss:  
28960296960.0000 - val\_loss: 28702435328.0000  
Epoch 253/400  
80/80 [=====] - 0s 6ms/step - loss:  
28935667712.0000 - val\_loss: 28680202240.0000  
Epoch 254/400  
80/80 [=====] - 0s 6ms/step - loss:  
28867710976.0000 - val\_loss: 28653762560.0000  
Epoch 255/400  
80/80 [=====] - 0s 5ms/step - loss:  
28863414272.0000 - val\_loss: 28655353856.0000  
Epoch 256/400  
80/80 [=====] - 0s 5ms/step - loss:  
28859316224.0000 - val\_loss: 28644302848.0000  
Epoch 257/400  
80/80 [=====] - 0s 4ms/step - loss:  
28842248192.0000 - val\_loss: 28608188416.0000  
Epoch 258/400  
80/80 [=====] - 0s 5ms/step - loss:  
28815585280.0000 - val\_loss: 28618407936.0000  
Epoch 259/400  
80/80 [=====] - 0s 5ms/step - loss:  
28849954816.0000 - val\_loss: 28578732032.0000  
Epoch 260/400  
80/80 [=====] - 0s 3ms/step - loss:  
28780744704.0000 - val\_loss: 28596453376.0000  
Epoch 261/400  
80/80 [=====] - 0s 3ms/step - loss:  
28790188032.0000 - val\_loss: 28550938624.0000  
Epoch 262/400  
80/80 [=====] - 0s 3ms/step - loss:  
28739747840.0000 - val\_loss: 28572991488.0000  
Epoch 263/400  
80/80 [=====] - 0s 4ms/step - loss:  
28744679424.0000 - val\_loss: 28496519168.0000  
Epoch 264/400  
80/80 [=====] - 0s 4ms/step - loss:  
28707291136.0000 - val\_loss: 28465620992.0000  
Epoch 265/400  
80/80 [=====] - 0s 4ms/step - loss:  
28772931584.0000 - val\_loss: 28477456384.0000  
Epoch 266/400  
80/80 [=====] - 0s 4ms/step - loss:  
28699117568.0000 - val\_loss: 28461197312.0000  
Epoch 267/400  
80/80 [=====] - 0s 4ms/step - loss:  
28634087424.0000 - val\_loss: 28390293504.0000  
Epoch 268/400  
80/80 [=====] - 0s 3ms/step - loss:

28685649920.0000 - val\_loss: 28394371072.0000  
Epoch 269/400  
80/80 [=====] - 0s 4ms/step - loss:  
28670898176.0000 - val\_loss: 28382164992.0000  
Epoch 270/400  
80/80 [=====] - 0s 3ms/step - loss:  
28620779520.0000 - val\_loss: 28365015040.0000  
Epoch 271/400  
80/80 [=====] - 0s 3ms/step - loss:  
28581939200.0000 - val\_loss: 28330565632.0000  
Epoch 272/400  
80/80 [=====] - 0s 3ms/step - loss:  
28558362624.0000 - val\_loss: 28304216064.0000  
Epoch 273/400  
80/80 [=====] - 0s 3ms/step - loss:  
28581224448.0000 - val\_loss: 28290592768.0000  
Epoch 274/400  
80/80 [=====] - 0s 4ms/step - loss:  
28532086784.0000 - val\_loss: 28268365824.0000  
Epoch 275/400  
80/80 [=====] - 0s 3ms/step - loss:  
28497215488.0000 - val\_loss: 28304259072.0000  
Epoch 276/400  
80/80 [=====] - 0s 3ms/step - loss:  
28507594752.0000 - val\_loss: 28303716352.0000  
Epoch 277/400  
80/80 [=====] - 0s 3ms/step - loss:  
28494712832.0000 - val\_loss: 28233228288.0000  
Epoch 278/400  
80/80 [=====] - 0s 3ms/step - loss:  
28446853120.0000 - val\_loss: 28383383552.0000  
Epoch 279/400  
80/80 [=====] - 0s 4ms/step - loss:  
28444223488.0000 - val\_loss: 28174422016.0000  
Epoch 280/400  
80/80 [=====] - 0s 3ms/step - loss:  
28417552384.0000 - val\_loss: 28285210624.0000  
Epoch 281/400  
80/80 [=====] - 0s 3ms/step - loss:  
28450463744.0000 - val\_loss: 28150622208.0000  
Epoch 282/400  
80/80 [=====] - 0s 3ms/step - loss:  
28477368320.0000 - val\_loss: 28263419904.0000  
Epoch 283/400  
80/80 [=====] - 0s 4ms/step - loss:  
28435456000.0000 - val\_loss: 28141283328.0000  
Epoch 284/400  
80/80 [=====] - 0s 4ms/step - loss:  
28374065152.0000 - val\_loss: 28092870656.0000  
Epoch 285/400

80/80 [=====] - 0s 4ms/step - loss:  
28358404096.0000 - val\_loss: 28077193216.0000  
Epoch 286/400  
80/80 [=====] - 0s 4ms/step - loss:  
28343805952.0000 - val\_loss: 28128882688.0000  
Epoch 287/400  
80/80 [=====] - 0s 3ms/step - loss:  
28355026944.0000 - val\_loss: 28077201408.0000  
Epoch 288/400  
80/80 [=====] - 0s 3ms/step - loss:  
28301760512.0000 - val\_loss: 28039155712.0000  
Epoch 289/400  
80/80 [=====] - 0s 3ms/step - loss:  
28280449024.0000 - val\_loss: 28161595392.0000  
Epoch 290/400  
80/80 [=====] - 0s 3ms/step - loss:  
28309901312.0000 - val\_loss: 28008759296.0000  
Epoch 291/400  
80/80 [=====] - 0s 3ms/step - loss:  
28297719808.0000 - val\_loss: 27993456640.0000  
Epoch 292/400  
80/80 [=====] - 0s 3ms/step - loss:  
28259358720.0000 - val\_loss: 27994976256.0000  
Epoch 293/400  
80/80 [=====] - 0s 3ms/step - loss:  
28311111680.0000 - val\_loss: 27960993792.0000  
Epoch 294/400  
80/80 [=====] - 0s 3ms/step - loss:  
28239818752.0000 - val\_loss: 27939465216.0000  
Epoch 295/400  
80/80 [=====] - 0s 4ms/step - loss:  
28199882752.0000 - val\_loss: 27983052800.0000  
Epoch 296/400  
80/80 [=====] - 0s 5ms/step - loss:  
28183312384.0000 - val\_loss: 27912552448.0000  
Epoch 297/400  
80/80 [=====] - 0s 5ms/step - loss:  
28189214720.0000 - val\_loss: 27904671744.0000  
Epoch 298/400  
80/80 [=====] - 0s 5ms/step - loss:  
28160225280.0000 - val\_loss: 27924994048.0000  
Epoch 299/400  
80/80 [=====] - 0s 5ms/step - loss:  
28166344704.0000 - val\_loss: 27868057600.0000  
Epoch 300/400  
80/80 [=====] - 0s 6ms/step - loss:  
28117577728.0000 - val\_loss: 27850113024.0000  
Epoch 301/400  
80/80 [=====] - 0s 4ms/step - loss:  
28169158656.0000 - val\_loss: 27901388800.0000

Epoch 302/400  
80/80 [=====] - 0s 4ms/step - loss:  
28114575360.0000 - val\_loss: 27829659648.0000  
Epoch 303/400  
80/80 [=====] - 0s 3ms/step - loss:  
28133046272.0000 - val\_loss: 27797633024.0000  
Epoch 304/400  
80/80 [=====] - 0s 3ms/step - loss:  
28086140928.0000 - val\_loss: 27806732288.0000  
Epoch 305/400  
80/80 [=====] - 0s 3ms/step - loss:  
28068294656.0000 - val\_loss: 27769069568.0000  
Epoch 306/400  
80/80 [=====] - 0s 3ms/step - loss:  
28041406464.0000 - val\_loss: 27786821632.0000  
Epoch 307/400  
80/80 [=====] - 0s 3ms/step - loss:  
28068081664.0000 - val\_loss: 27752587264.0000  
Epoch 308/400  
80/80 [=====] - 0s 3ms/step - loss:  
28042033152.0000 - val\_loss: 27732727808.0000  
Epoch 309/400  
80/80 [=====] - 0s 3ms/step - loss:  
28033544192.0000 - val\_loss: 27769724928.0000  
Epoch 310/400  
80/80 [=====] - 0s 3ms/step - loss:  
28001118208.0000 - val\_loss: 27711389696.0000  
Epoch 311/400  
80/80 [=====] - 0s 3ms/step - loss:  
27954470912.0000 - val\_loss: 27763128320.0000  
Epoch 312/400  
80/80 [=====] - 0s 3ms/step - loss:  
28002789376.0000 - val\_loss: 27688052736.0000  
Epoch 313/400  
80/80 [=====] - 0s 3ms/step - loss:  
27943213056.0000 - val\_loss: 27751337984.0000  
Epoch 314/400  
80/80 [=====] - 0s 3ms/step - loss:  
27954432000.0000 - val\_loss: 27702167552.0000  
Epoch 315/400  
80/80 [=====] - 0s 3ms/step - loss:  
27930982400.0000 - val\_loss: 27665524736.0000  
Epoch 316/400  
80/80 [=====] - 0s 3ms/step - loss:  
27920652288.0000 - val\_loss: 27628507136.0000  
Epoch 317/400  
80/80 [=====] - 0s 3ms/step - loss:  
27898966016.0000 - val\_loss: 27618117632.0000  
Epoch 318/400  
80/80 [=====] - 0s 3ms/step - loss:

27869661184.0000 - val\_loss: 27611834368.0000  
Epoch 319/400  
80/80 [=====] - 0s 3ms/step - loss:  
27878107136.0000 - val\_loss: 27627601920.0000  
Epoch 320/400  
80/80 [=====] - 0s 3ms/step - loss:  
27866214400.0000 - val\_loss: 27582865408.0000  
Epoch 321/400  
80/80 [=====] - 0s 3ms/step - loss:  
27852443648.0000 - val\_loss: 27561324544.0000  
Epoch 322/400  
80/80 [=====] - 0s 3ms/step - loss:  
27862611968.0000 - val\_loss: 27566776320.0000  
Epoch 323/400  
80/80 [=====] - 0s 3ms/step - loss:  
27851864064.0000 - val\_loss: 27528648704.0000  
Epoch 324/400  
80/80 [=====] - 0s 3ms/step - loss:  
27781568512.0000 - val\_loss: 27514279936.0000  
Epoch 325/400  
80/80 [=====] - 0s 3ms/step - loss:  
27796119552.0000 - val\_loss: 27523479552.0000  
Epoch 326/400  
80/80 [=====] - 0s 3ms/step - loss:  
27769755648.0000 - val\_loss: 27542929408.0000  
Epoch 327/400  
80/80 [=====] - 0s 3ms/step - loss:  
27752599552.0000 - val\_loss: 27496568832.0000  
Epoch 328/400  
80/80 [=====] - 0s 3ms/step - loss:  
27757072384.0000 - val\_loss: 27463796736.0000  
Epoch 329/400  
80/80 [=====] - 0s 3ms/step - loss:  
27745525760.0000 - val\_loss: 27455492096.0000  
Epoch 330/400  
80/80 [=====] - 0s 3ms/step - loss:  
27712802816.0000 - val\_loss: 27432126464.0000  
Epoch 331/400  
80/80 [=====] - 0s 3ms/step - loss:  
27706970112.0000 - val\_loss: 27427321856.0000  
Epoch 332/400  
80/80 [=====] - 0s 3ms/step - loss:  
27708659712.0000 - val\_loss: 27422550016.0000  
Epoch 333/400  
80/80 [=====] - 0s 3ms/step - loss:  
27703918592.0000 - val\_loss: 27395829760.0000  
Epoch 334/400  
80/80 [=====] - 0s 4ms/step - loss:  
27718737920.0000 - val\_loss: 27434008576.0000  
Epoch 335/400



80/80 [=====] - 0s 3ms/step - loss:  
27713069056.0000 - val\_loss: 27528681472.0000  
Epoch 336/400  
80/80 [=====] - 0s 3ms/step - loss:  
27631167488.0000 - val\_loss: 27432841216.0000  
Epoch 337/400  
80/80 [=====] - 0s 4ms/step - loss:  
27621255168.0000 - val\_loss: 27353876480.0000  
Epoch 338/400  
80/80 [=====] - 0s 3ms/step - loss:  
27629522944.0000 - val\_loss: 27336574976.0000  
Epoch 339/400  
80/80 [=====] - 0s 4ms/step - loss:  
27603120128.0000 - val\_loss: 27345620992.0000  
Epoch 340/400  
80/80 [=====] - 0s 5ms/step - loss:  
27606388736.0000 - val\_loss: 27331604480.0000  
Epoch 341/400  
80/80 [=====] - 0s 5ms/step - loss:  
27635671040.0000 - val\_loss: 27290195968.0000  
Epoch 342/400  
80/80 [=====] - 0s 6ms/step - loss:  
27580186624.0000 - val\_loss: 27281461248.0000  
Epoch 343/400  
80/80 [=====] - 0s 5ms/step - loss:  
27587041280.0000 - val\_loss: 27302690816.0000  
Epoch 344/400  
80/80 [=====] - 0s 5ms/step - loss:  
27574198272.0000 - val\_loss: 27449458688.0000  
Epoch 345/400  
80/80 [=====] - 0s 6ms/step - loss:  
27547686912.0000 - val\_loss: 27255844864.0000  
Epoch 346/400  
80/80 [=====] - 0s 5ms/step - loss:  
27557578752.0000 - val\_loss: 27254163456.0000  
Epoch 347/400  
80/80 [=====] - 0s 4ms/step - loss:  
27524325376.0000 - val\_loss: 27285465088.0000  
Epoch 348/400  
80/80 [=====] - 0s 3ms/step - loss:  
27539922944.0000 - val\_loss: 27222046720.0000  
Epoch 349/400  
80/80 [=====] - 0s 3ms/step - loss:  
27494944768.0000 - val\_loss: 27246055424.0000  
Epoch 350/400  
80/80 [=====] - 0s 3ms/step - loss:  
27490195456.0000 - val\_loss: 27268374528.0000  
Epoch 351/400  
80/80 [=====] - 0s 4ms/step - loss:  
27532660736.0000 - val\_loss: 27193012224.0000

Epoch 352/400  
80/80 [=====] - 0s 4ms/step - loss: 27476799488.0000 - val\_loss: 27227035648.0000  
Epoch 353/400  
80/80 [=====] - 0s 3ms/step - loss: 27457914880.0000 - val\_loss: 27171182592.0000  
Epoch 354/400  
80/80 [=====] - 0s 4ms/step - loss: 27428894720.0000 - val\_loss: 27154401280.0000  
Epoch 355/400  
80/80 [=====] - 0s 3ms/step - loss: 27449268224.0000 - val\_loss: 27133296640.0000  
Epoch 356/400  
80/80 [=====] - 0s 3ms/step - loss: 27463600128.0000 - val\_loss: 27151489024.0000  
Epoch 357/400  
80/80 [=====] - 0s 3ms/step - loss: 27381968896.0000 - val\_loss: 27098562560.0000  
Epoch 358/400  
80/80 [=====] - 0s 4ms/step - loss: 27392958464.0000 - val\_loss: 27141169152.0000  
Epoch 359/400  
80/80 [=====] - 0s 3ms/step - loss: 27376658432.0000 - val\_loss: 27078162432.0000  
Epoch 360/400  
80/80 [=====] - 0s 3ms/step - loss: 27372695552.0000 - val\_loss: 27104204800.0000  
Epoch 361/400  
80/80 [=====] - 0s 3ms/step - loss: 27416438784.0000 - val\_loss: 27056326656.0000  
Epoch 362/400  
80/80 [=====] - 0s 4ms/step - loss: 27357796352.0000 - val\_loss: 27028674560.0000  
Epoch 363/400  
80/80 [=====] - 0s 3ms/step - loss: 27361372160.0000 - val\_loss: 27062620160.0000  
Epoch 364/400  
80/80 [=====] - 0s 3ms/step - loss: 27344226304.0000 - val\_loss: 27024889856.0000  
Epoch 365/400  
80/80 [=====] - 0s 4ms/step - loss: 27337670656.0000 - val\_loss: 27005032448.0000  
Epoch 366/400  
80/80 [=====] - 0s 3ms/step - loss: 27313483776.0000 - val\_loss: 26977978368.0000  
Epoch 367/400  
80/80 [=====] - 0s 3ms/step - loss: 27334246400.0000 - val\_loss: 26965360640.0000  
Epoch 368/400  
80/80 [=====] - 0s 3ms/step - loss:

27309301760.0000 - val\_loss: 26958440448.0000  
Epoch 369/400  
80/80 [=====] - 0s 3ms/step - loss:  
27302531072.0000 - val\_loss: 26952392704.0000  
Epoch 370/400  
80/80 [=====] - 0s 3ms/step - loss:  
27235936256.0000 - val\_loss: 26944075776.0000  
Epoch 371/400  
80/80 [=====] - 0s 4ms/step - loss:  
27267293184.0000 - val\_loss: 26964729856.0000  
Epoch 372/400  
80/80 [=====] - 0s 3ms/step - loss:  
27224002560.0000 - val\_loss: 26940293120.0000  
Epoch 373/400  
80/80 [=====] - 0s 3ms/step - loss:  
27232598016.0000 - val\_loss: 26899939328.0000  
Epoch 374/400  
80/80 [=====] - 0s 3ms/step - loss:  
27204947968.0000 - val\_loss: 26894043136.0000  
Epoch 375/400  
80/80 [=====] - 0s 3ms/step - loss:  
27186802688.0000 - val\_loss: 26879436800.0000  
Epoch 376/400  
80/80 [=====] - 0s 3ms/step - loss:  
27214192640.0000 - val\_loss: 26963142656.0000  
Epoch 377/400  
80/80 [=====] - 0s 4ms/step - loss:  
27177052160.0000 - val\_loss: 26933413888.0000  
Epoch 378/400  
80/80 [=====] - 0s 3ms/step - loss:  
27220035584.0000 - val\_loss: 26868475904.0000  
Epoch 379/400  
80/80 [=====] - 0s 4ms/step - loss:  
27174723584.0000 - val\_loss: 26917996544.0000  
Epoch 380/400  
80/80 [=====] - 0s 3ms/step - loss:  
27151546368.0000 - val\_loss: 26815150080.0000  
Epoch 381/400  
80/80 [=====] - 0s 3ms/step - loss:  
27132725248.0000 - val\_loss: 26846494720.0000  
Epoch 382/400  
80/80 [=====] - 0s 3ms/step - loss:  
27115974656.0000 - val\_loss: 26764005376.0000  
Epoch 383/400  
80/80 [=====] - 0s 5ms/step - loss:  
27104976896.0000 - val\_loss: 26743373824.0000  
Epoch 384/400  
80/80 [=====] - 0s 4ms/step - loss:  
27086532608.0000 - val\_loss: 26719928320.0000  
Epoch 385/400

80/80 [=====] - 0s 4ms/step - loss:  
27075225600.0000 - val\_loss: 26707517440.0000  
Epoch 386/400  
80/80 [=====] - 0s 5ms/step - loss:  
27065556992.0000 - val\_loss: 26693154816.0000  
Epoch 387/400  
80/80 [=====] - 0s 5ms/step - loss:  
27055626240.0000 - val\_loss: 26700824576.0000  
Epoch 388/400  
80/80 [=====] - 0s 6ms/step - loss:  
27048753152.0000 - val\_loss: 26733662208.0000  
Epoch 389/400  
80/80 [=====] - 0s 5ms/step - loss:  
27010177024.0000 - val\_loss: 26678208512.0000  
Epoch 390/400  
80/80 [=====] - 0s 6ms/step - loss:  
27014107136.0000 - val\_loss: 26650503168.0000  
Epoch 391/400  
80/80 [=====] - 0s 4ms/step - loss:  
27031418880.0000 - val\_loss: 26641815552.0000  
Epoch 392/400  
80/80 [=====] - 0s 3ms/step - loss:  
26991888384.0000 - val\_loss: 26701058048.0000  
Epoch 393/400  
80/80 [=====] - 0s 3ms/step - loss:  
26996484096.0000 - val\_loss: 26610440192.0000  
Epoch 394/400  
80/80 [=====] - 0s 3ms/step - loss:  
26989029376.0000 - val\_loss: 26600521728.0000  
Epoch 395/400  
80/80 [=====] - 0s 3ms/step - loss:  
26964744192.0000 - val\_loss: 26584885248.0000  
Epoch 396/400  
80/80 [=====] - 0s 3ms/step - loss:  
26977986560.0000 - val\_loss: 26590046208.0000  
Epoch 397/400  
80/80 [=====] - 0s 3ms/step - loss:  
26927601664.0000 - val\_loss: 26558267392.0000  
Epoch 398/400  
80/80 [=====] - 0s 3ms/step - loss:  
26916550656.0000 - val\_loss: 26539294720.0000  
Epoch 399/400  
80/80 [=====] - 0s 3ms/step - loss:  
26939013120.0000 - val\_loss: 26531196928.0000  
Epoch 400/400  
80/80 [=====] - 0s 4ms/step - loss:  
26888589312.0000 - val\_loss: 26544144384.0000

<keras.callbacks.History at 0x7faa802329b0>

```

single_house = ds.drop('Price',axis=1).iloc[0]
print(f'Features of new house:\n{single_house}')
single_house = scaler.transform(single_house.values.reshape(-1, 20))
print('\nPrediction Price:',model.predict(single_house)[0,0])
print('\nOriginal Price:',ds.iloc[0]['Price'])

```

Features of new house:

number of bedrooms	5.0000
number of bathrooms	2.5000
living area	3650.0000
lot area	9050.0000
number of floors	2.0000
waterfront present	0.0000
number of views	4.0000
condition of the house	5.0000
grade of the house	10.0000
Area of the house(excluding basement)	3370.0000
Area of the basement	280.0000
Built Year	1921.0000
Renovation Year	0.0000
Postal Code	122003.0000
Lattitude	52.8645
Longitude	-114.5570
living_area_renov	2880.0000
lot_area_renov	5400.0000
Number of schools nearby	2.0000
Distance from the airport	58.0000
Name: 0, dtype: float64	
1/1 [=====] - 0s 119ms/step	

Prediction Price: 1566205.6

Original Price: 2380000.0

/usr/local/lib/python3.10/dist-packages/sklearn/base.py:439:

UserWarning: X does not have valid feature names, but MinMaxScaler was fitted with feature names

warnings.warn(