In [1]:
```python
import numpy as np
import seaborn as sns
import pandas as pd
import matplotlib.pyplot as plt
```

In [2]:
```python
df = pd.read_csv("E:\GetFreeCourses.Co-Udemy-Complete Tensorflow 2 and Keras Deep Learning Bootcamp\DATA\kc_hou
```

In [4]:
```python
df.isnull().sum()
```

Out[4]:
```
id               0
date             0
price            0
bedrooms         0
bathrooms        0
sqft_living      0
sqft_lot         0
floors           0
waterfront       0
view             0
condition        0
grade            0
sqft_above       0
sqft_basement    0
yr_built         0
yr_renovated     0
zipcode          0
lat              0
long             0
sqft_living15    0
sqft_lot15       0
dtype: int64
```

In [5]:
```python
df.describe().transpose()
```

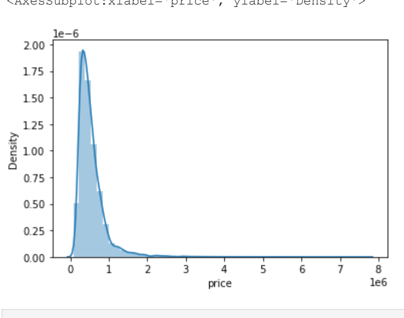
Out[5]:

	count	mean	std	min	25%	50%	75%	max
id	21597.0	4.580474e+09	2.876736e+09	1.000102e+06	2.123049e+09	3.904930e+09	7.308900e+09	9.900000e+09
price	21597.0	5.402966e+05	3.673681e+05	7.800000e+04	3.220000e+05	4.500000e+05	6.450000e+05	7.700000e+06
bedrooms	21597.0	3.373200e+00	9.262989e-01	1.000000e+00	3.000000e+00	3.000000e+00	4.000000e+00	3.300000e+01
bathrooms	21597.0	2.115826e+00	7.689843e-01	5.000000e-01	1.750000e+00	2.250000e+00	2.500000e+00	8.000000e+00
sqft_living	21597.0	2.080322e+03	9.181061e+02	3.700000e+02	1.430000e+03	1.910000e+03	2.550000e+03	1.354000e+04
sqft_lot	21597.0	1.509941e+04	4.141264e+04	5.200000e+02	5.040000e+03	7.618000e+03	1.068500e+04	1.651359e+06
floors	21597.0	1.494096e+00	5.396828e-01	1.000000e+00	1.000000e+00	1.500000e+00	2.000000e+00	3.500000e+00
waterfront	21597.0	7.547345e-03	8.654900e-02	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	1.000000e+00
view	21597.0	2.342918e-01	7.663898e-01	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	4.000000e+00
condition	21597.0	3.409825e+00	6.505456e-01	1.000000e+00	3.000000e+00	3.000000e+00	4.000000e+00	5.000000e+00
grade	21597.0	7.657915e+00	1.173200e+00	3.000000e+00	7.000000e+00	7.000000e+00	8.000000e+00	1.300000e+01
sqft_above	21597.0	1.788597e+03	8.277598e+02	3.700000e+02	1.190000e+03	1.560000e+03	2.210000e+03	9.410000e+03
sqft_basement	21597.0	2.917250e+02	4.426678e+02	0.000000e+00	0.000000e+00	0.000000e+00	5.600000e+02	4.820000e+03
yr_built	21597.0	1.971000e+03	2.937523e+01	1.900000e+03	1.951000e+03	1.975000e+03	1.997000e+03	2.015000e+03
yr_renovated	21597.0	8.446479e+01	4.018214e+02	0.000000e+00	0.000000e+00	0.000000e+00	0.000000e+00	2.015000e+03
zipcode	21597.0	9.807795e+04	5.351307e+01	9.800100e+04	9.803300e+04	9.806500e+04	9.811800e+04	9.819900e+04
lat	21597.0	4.756009e+01	1.385518e-01	4.715590e+01	4.747110e+01	4.757180e+01	4.767800e+01	4.777760e+01
long	21597.0	-1.222140e+02	1.407235e-01	-1.225190e+02	-1.223280e+02	-1.222310e+02	-1.221250e+02	-1.213150e+02
sqft_living15	21597.0	1.986620e+03	6.852305e+02	3.990000e+02	1.490000e+03	1.840000e+03	2.360000e+03	6.210000e+03
sqft_lot15	21597.0	1.275828e+04	2.727444e+04	6.510000e+02	5.100000e+03	7.620000e+03	1.008300e+04	8.712000e+05

In [6]:
```python
sns.distplot(df['price'])
```

```
C:\Users\Aditya Singh\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

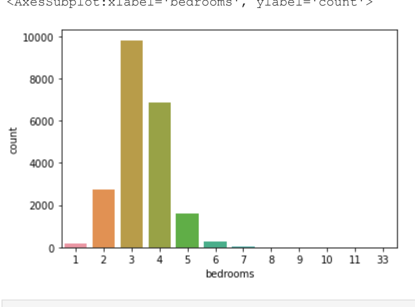
Out[6]: <AxesSubplot:xlabel='price', ylabel='Density'>



In [7]:
```python
sns.countplot(df['bedrooms'])
```

```
C:\Users\Aditya Singh\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWarning: Pass the following variable as a keyword arg: x. From version 0.12, the only valid positional argument will be `data`, and passing other arguments without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

Out[7]: <AxesSubplot:xlabel='bedrooms', ylabel='count'>

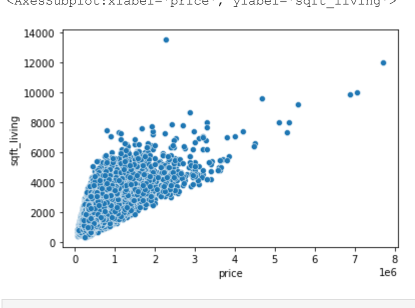


In [11]:
```python
df.corr()['price'].sort_values()
```

Out[11]:
```
zipcode         -0.053402
id              -0.016772
long             0.022036
condition        0.036056
yr_built         0.053953
sqft_lot15       0.082845
sqft_lot         0.089876
yr_renovated     0.126424
floors           0.256804
waterfront       0.266398
lat              0.306692
bedrooms         0.308787
sqft_basement    0.323799
view             0.397370
bathrooms        0.525906
sqft_living15    0.585241
sqft_above       0.605368
grade            0.667951
sqft_living      0.701917
price            1.000000
Name: price, dtype: float64
```

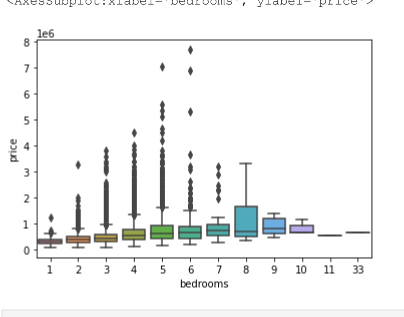
In [12]:
```python
sns.scatterplot(x='price',y='sqft_living',data=df)
```

Out[12]: <AxesSubplot:xlabel='price', ylabel='sqft_living'>



In [13]:
```python
sns.boxplot(x='bedrooms',y='price',data=df)
```

Out[13]: <AxesSubplot:xlabel='bedrooms', ylabel='price'>

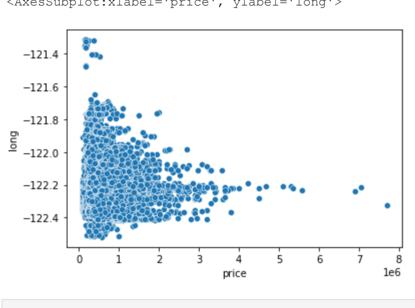


In [15]:
```python
df.columns
```

Out[15]:
```
Index(['id', 'date', 'price', 'bedrooms', 'bathrooms', 'sqft_living',
       'sqft_lot', 'floors', 'waterfront', 'view', 'condition', 'grade',
       'sqft_above', 'sqft_basement', 'yr_built', 'yr_renovated', 'zipcode',
       'lat', 'long', 'sqft_living15', 'sqft_lot15'],
      dtype='object')
```

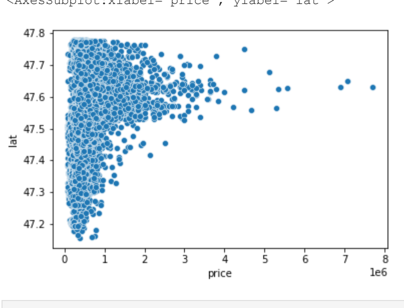
In [16]:
```python
sns.scatterplot(x='price',y='long',data=df)
```

Out[16]: <AxesSubplot:xlabel='price', ylabel='long'>



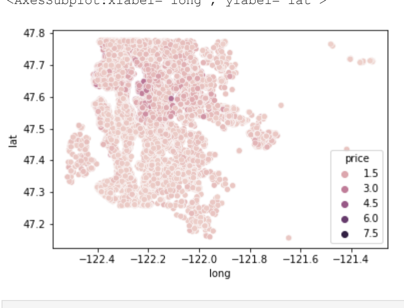
In [17]:
```python
sns.scatterplot(x='price',y='lat',data=df)
```

Out[17]: <AxesSubplot:xlabel='price', ylabel='lat'>



In [19]:
```python
sns.scatterplot(x='long',y='lat',data=df,hue='price')
```

Out[19]: <AxesSubplot:xlabel='long', ylabel='lat'>



In [20]:
```python
df.sort_values('price',ascending=False).head(20)
```

Out[20]:

	id	date	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	...	grade	sqft_above
7245	6762700020	10/13/2014	7700000.0	6	8.00	12050	27600	2.5	0	3	...	13	8570
3910	9808700762	6/11/2014	7060000.0	5	4.50	10040	37325	2.0	1	2	...	11	7680
9245	9208900037	9/19/2014	6890000.0	6	7.75	9890	31374	2.0	0	4	...	13	8860
4407	2470100110	8/4/2014	5570000.0	5	5.75	9200	35069	2.0	0	0	...	13	6200
1446	8907500070	4/13/2015	5350000.0	5	5.00	8000	23985	2.0	0	4	...	12	6720
1313	7558700030	4/13/2015	5300000.0	6	6.00	7390	24829	2.0	1	4	...	12	5000
1162	1247600105	10/20/2014	5110000.0	5	5.25	8010	45517	2.0	1	4	...	12	5990
8085	1924059029	6/17/2014	4670000.0	5	6.75	9640	13068	1.0	1	4	...	12	4820
2624	7738500731	8/15/2014	4500000.0	5	5.50	6640	40014	2.0	1	4	...	12	6350
8629	3835500195	6/18/2014	4490000.0	4	3.00	6430	27517	2.0	0	0	...	12	6430
12358	6065300370	5/6/2015	4210000.0	5	6.00	7440	21540	2.0	0	0	...	12	5550
4145	6447300265	10/14/2014	4000000.0	4	5.50	7080	16573	2.0	0	0	...	12	5760
2083	8106100105	11/14/2014	3850000.0	4	4.25	5770	21300	2.0	1	4	...	11	5770
7028	853200010	7/1/2014	3800000.0	5	5.50	7050	42840	1.0	0	2	...	13	4320
19002	2303900100	9/11/2014	3800000.0	3	4.25	5510	35000	2.0	0	4	...	13	4910
16288	7397300170	5/30/2014	3710000.0	4	3.50	5550	28078	2.0	0	2	...	12	3350
18467	4389201095	5/11/2015	3650000.0	5	3.75	5020	8694	2.0	0	1	...	12	3970
6502	4217402115	4/21/2015	3650000.0	6	4.75	5480	19401	1.5	1	4	...	11	3910
15241	2425049063	9/11/2014	3640000.0	4	3.25	4830	22257	2.0	1	4	...	11	4830
19133	3625049042	10/11/2014	3640000.0	5	6.00	5490	19897	2.0	0	0	...	12	5490

20 rows × 21 columns

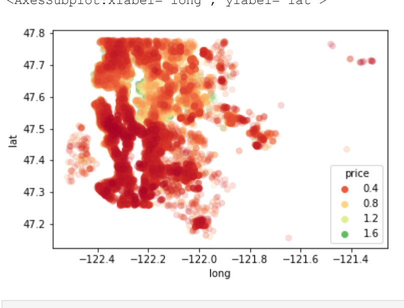
In [22]:
```python
len(df)*0.01
```

Out[22]:
```
215.97
```

In [23]:
```python
non_top_1_perc = df.sort_values('price',ascending=False).iloc[216:]
```

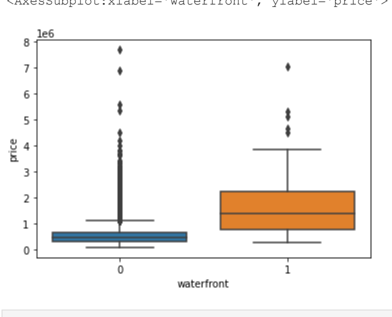
In [28]:
```python
sns.scatterplot(x='long',y='lat',data=non_top_1_perc,edgecolor=None,alpha=0.2,palette='RdYlGn',hue='price')
```

Out[28]: <AxesSubplot:xlabel='long', ylabel='lat'>



In [29]:
```python
sns.boxplot(x='waterfront',y='price',data=df)
```

Out[29]: <AxesSubplot:xlabel='waterfront', ylabel='price'>



In [30]:
```python
df.head()
```

Out[30]:

	id	date	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	...	grade	sqft_above
0	7129300520	10/13/2014	221900.0	3	1.00	1180	5650	1.0	0	0	...	7	1180
1	6414100192	12/9/2014	538000.0	3	2.25	2570	7242	2.0	0	0	...	7	2170
2	5631500400	2/25/2015	180000.0	2	1.00	770	10000	1.0	0	0	...	6	770
3	2487200875	12/9/2014	604000.0	4	3.00	1960	5000	1.0	0	0	...	7	1050
4	1954400510	2/18/2015	510000.0	3	2.00	1680	8080	1.0	0	0	...	8	1680

5 rows × 21 columns

In [31]:
```python
df = df.drop('id',axis=1)
```

In [33]:
```python
df['date'] = pd.to_datetime(df['date'])
```

In [34]:
```python
df['date']
```

Out[34]:
```
0       2014-10-13
1       2014-12-09
2       2015-02-25
3       2014-12-09
4       2015-02-18
           ...
21592   2014-05-21
21593   2015-02-23
21594   2014-06-23
21595   2015-01-16
21596   2014-10-15
Name: date, Length: 21597, dtype: datetime64[ns]
```

In [35]:
```python
df['year'] = df['date'].apply(lambda date: date.year)
df['month'] = df['date'].apply(lambda date: date.month)
```

In [36]:
```python
df.head()
```

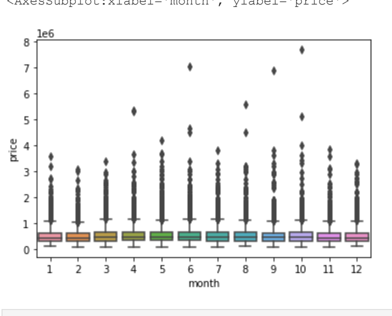
Out[36]:

	date	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	condition	...	sqft_basement	yr_built	yr_renovated
0	2014-10-13	221900.0	3	1.00	1180	5650	1.0	0	0	3	...	0	1955	0
1	2014-12-09	538000.0	3	2.25	2570	7242	2.0	0	0	3	...	400	1951	1991
2	2015-02-25	180000.0	2	1.00	770	10000	1.0	0	0	3	...	0	1933	0
3	2014-12-09	604000.0	4	3.00	1960	5000	1.0	0	0	5	...	910	1965	0
4	2015-02-18	510000.0	3	2.00	1680	8080	1.0	0	0	3	...	0	1987	0

5 rows × 22 columns

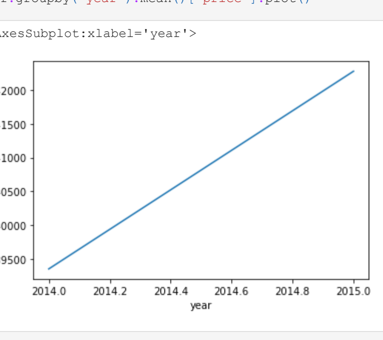
In [37]:
```python
sns.boxplot(x='month',y='price',data=df)
```

Out[37]: <AxesSubplot:xlabel='month', ylabel='price'>



In [40]:
```python
df.groupby('year').mean()['price'].plot()
```

Out[40]: <AxesSubplot:xlabel='year'>



In [41]:
```python
df = df.drop('date',axis=1)
```

In [42]:
```python
df.head()
```

Out[42]:

	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	condition	grade	...	sqft_basement	yr_built	yr_renovated
0	221900.0	3	1.00	1180	5650	1.0	0	0	3	7	...	0	1955	0
1	538000.0	3	2.25	2570	7242	2.0	0	0	3	7	...	400	1951	1991
2	180000.0	2	1.00	770	10000	1.0	0	0	3	6	...	0	1933	0
3	604000.0	4	3.00	1960	5000	1.0	0	0	5	7	...	910	1965	0
4	510000.0	3	2.00	1680	8080	1.0	0	0	3	8	...	0	1987	0

5 rows × 21 columns

In [43]:
```python
#df['zipcode'].value_counts()
```

Out[43]:
```
98103    602
98038    589
98115    583
98052    574
98117    553
        ...
98102    104
98010    100
98024     80
98148     57
98039     50
Name: zipcode, Length: 70, dtype: int64
```

In [44]:
```python
df = df.drop('zipcode',axis=1)
```

In [45]:
```python
df['yr_renovated'].value_counts()
```

Out[45]:
```
0       20683
2014       91
2013       37
2003       36
2005       35
        ...
1951        1
1959        1
1948        1
1954        1
1944        1
Name: yr_renovated, Length: 70, dtype: int64
```

In [46]:
```python
df['sqft_basement'].value_counts()
```

Out[46]:
```
0      13110
600      221
700      218
500      214
800      206
       ...
518        1
374        1
784        1
906        1
248        1
Name: sqft_basement, Length: 306, dtype: int64
```

In [47]:
```python
X = df.drop('price',axis=1).values
y = df['price'].values
```

In [48]:
```python
from sklearn.model_selection import train_test_split
```

In [49]:
```python
X_train, X_test, y_train, y_test = train_test_split( X, y, test_size=0.3, random_state=101)
```

In [50]:
```python
from sklearn.preprocessing import MinMaxScaler
```

In [51]:
```python
scaler = MinMaxScaler()
```

In [52]:
```python
X_train = scaler.fit_transform(X_train)
```

In [53]:
```python
X_test = scaler.transform(X_test)
```

In [55]:
```python
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
```

In [56]:
```python
X_train.shape
```

Out[56]:
```
(15117, 19)
```

In [57]:
```python
model = Sequential()

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

model.add(Dense(1))

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

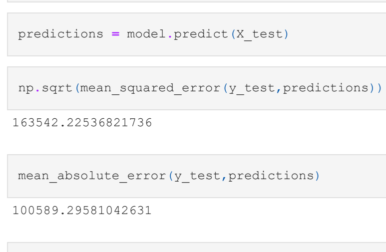
In [58]:
```python
model.fit(x=X_train,y=y_train,validation_data=(X_test,y_test),batch_size=128,epochs=400)
```

```
Epoch 1/400
119/119 [==============================] - 1s 3ms/step - loss: 430237941760.0000 - val_loss: 418905260032.0000
Epoch 2/400
119/119 [==============================] - 0s 2ms/step - loss: 429038174208.0000 - val_loss: 414673928192.0000
Epoch 3/400
119/119 [==============================] - 0s 2ms/step - loss: 411671461888.0000 - val_loss: 374521397248.0000
Epoch 4/400
119/119 [==============================] - 0s 2ms/step - loss: 326383960064.0000 - val_loss: 239924117504.0000
Epoch 5/400
119/119 [==============================] - 0s 2ms/step - loss: 170817617920.0000 - val_loss: 108544974848.0000
Epoch 6/400
119/119 [==============================] - 0s 2ms/step - loss: 101955985408.0000 - val_loss: 94949842944.0000
Epoch 7/400
119/119 [==============================] - 0s 2ms/step - loss: 97290338304.0000 - val_loss: 93438418944.0000
Epoch 8/400
119/119 [==============================] - 0s 2ms/step - loss: 95589294080.0000 - val_loss: 91738996736.0000
Epoch 9/400
119/119 [==============================] - 0s 2ms/step - loss: 93843054592.0000 - val_loss: 90035191808.0000
Epoch 10/400
119/119 [==============================] - 0s 2ms/step - loss: 92043124736.0000 - val_loss: 88400945152.0000
Epoch 11/400
119/119 [==============================] - 0s 3ms/step - loss: 90203299840.0000 - val_loss: 86515138560.0000
Epoch 12/400
119/119 [==============================] - 0s 2ms/step - loss: 88346607616.0000 - val_loss: 84675846144.0000
Epoch 13/400
119/119 [==============================] - 0s 2ms/step - loss: 86332317696.0000 - val_loss: 82760982528.0000
Epoch 14/400
119/119 [==============================] - 0s 2ms/step - loss: 84271890432.0000 - val_loss: 80721895424.0000
Epoch 15/400
119/119 [==============================] - 0s 2ms/step - loss: 82133032960.0000 - val_loss: 78629314560.0000
Epoch 16/400
119/119 [==============================] - 0s 2ms/step - loss: 79921577984.0000 - val_loss: 76509364224.0000
Epoch 17/400
119/119 [==============================] - 0s 2ms/step - loss: 77560569856.0000 - val_loss: 74156548096.0000
Epoch 18/400
119/119 [==============================] - 0s 2ms/step - loss: 75121336320.0000 - val_loss: 71723982848.0000
Epoch 19/400
119/119 [==============================] - 0s 2ms/step - loss: 72610365440.0000 - val_loss: 69361860608.0000
Epoch 20/400
119/119 [==============================] - 0s 2ms/step - loss: 70081994752.0000 - val_loss: 66899132416.0000
Epoch 21/400
119/119 [==============================] - 0s 2ms/step - loss: 67460739072.0000 - val_loss: 64336846848.0000
Epoch 22/400
119/119 [==============================] - 0s 3ms/step - loss: 64938819584.0000 - val_loss: 61940682752.0000
Epoch 23/400
119/119 [==============================] - 0s 2ms/step - loss: 62353698816.0000 - val_loss: 59458887680.0000
Epoch 24/400
119/119 [==============================] - 0s 2ms/step - loss: 60062232576.0000 - val_loss: 57352323072.0000
Epoch 25/400
119/119 [==============================] - 0s 2ms/step - loss: 57920479232.0000 - val_loss: 55353307136.0000
Epoch 26/400
119/119 [==============================] - 0s 3ms/step - loss: 56040759296.0000 - val_loss: 53781909504.0000
Epoch 27/400
119/119 [==============================] - 0s 2ms/step - loss: 54466752512.0000 - val_loss: 52385210368.0000
Epoch 28/400
119/119 [==============================] - 0s 2ms/step - loss: 53199523840.0000 - val_loss: 51218411520.0000
Epoch 29/400
119/119 [==============================] - 0s 2ms/step - loss: 52100587520.0000 - val_loss: 50295189504.0000
Epoch 30/400
119/119 [==============================] - 0s 3ms/step - loss: 51250184192.0000 - val_loss: 49500078080.0000
Epoch 31/400
119/119 [==============================] - 0s 3ms/step - loss: 50424250368.0000 - val_loss: 48910094336.0000
Epoch 32/400
119/119 [==============================] - 0s 2ms/step - loss: 49757634560.0000 - val_loss: 48167546880.0000
Epoch 33/400
119/119 [==============================] - 0s 2ms/step - loss: 49128767488.0000 - val_loss: 47594418176.0000
Epoch 34/400
119/119 [==============================] - 0s 2ms/step - loss: 48518692864.0000 - val_loss: 47080161280.0000
Epoch 35/400
119/119 [==============================] - 0s 2ms/step - loss: 47970938880.0000 - val_loss: 46592471040.0000
Epoch 36/400
119/119 [==============================] - 0s 2ms/step - loss: 47466135552.0000 - val_loss: 46056456192.0000
Epoch 37/400
119/119 [==============================] - 0s 2ms/step - loss: 46958288896.0000 - val_loss: 45581713408.0000
Epoch 38/400
119/119 [==============================] - 0s 2ms/step - loss: 46512766976.0000 - val_loss: 45159469056.0000
Epoch 39/400
119/119 [==============================] - 0s 2ms/step - loss: 46034149376.0000 - val_loss: 44693958656.0000
Epoch 40/400
119/119 [==============================] - 0s 2ms/step - loss: 45629964288.0000 - val_loss: 44336517120.0000
Epoch 41/400
119/119 [==============================] - 0s 2ms/step - loss: 45141438464.0000 - val_loss: 43818090496.0000
Epoch 42/400
119/119 [==============================] - 0s 3ms/step - loss: 44713971712.0000 - val_loss: 43549458432.0000
Epoch 43/400
119/119 [==============================] - 0s 2ms/step - loss: 44448227328.0000 - val_loss: 42990460928.0000
Epoch 44/400
119/119 [==============================] - 0s 2ms/step - loss: 43887087616.0000 - val_loss: 42622767104.0000
Epoch 45/400
119/119 [==============================] - 0s 2ms/step - loss: 43539816448.0000 - val_loss: 42302095360.0000
Epoch 46/400
119/119 [==============================] - 0s 2ms/step - loss: 43170263040.0000 - val_loss: 41943662592.0000
Epoch 47/400
119/119 [==============================] - 0s 2ms/step - loss: 42838970368.0000 - val_loss: 41559441408.0000
Epoch 48/400
119/119 [==============================] - 0s 2ms/step - loss: 42476244992.0000 - val_loss: 41419276288.0000
Epoch 49/400
119/119 [==============================] - 0s 2ms/step - loss: 42214428672.0000 - val_loss: 40878919680.0000
Epoch 50/400
119/119 [==============================] - 0s 2ms/step - loss: 41849425920.0000 - val_loss: 40571584512.0000
Epoch 51/400
119/119 [==============================] - 0s 2ms/step - loss: 41535410176.0000 - val_loss: 40267149312.0000
Epoch 52/400
119/119 [==============================] - 0s 2ms/step - loss: 41258315776.0000 - val_loss: 39951069184.0000
Epoch 53/400
119/119 [==============================] - 0s 2ms/step - loss: 40938622976.0000 - val_loss: 39676792832.0000
Epoch 54/400
119/119 [==============================] - 0s 2ms/step - loss: 40652410880.0000 - val_loss: 39372288000.0000
Epoch 55/400
119/119 [==============================] - 0s 2ms/step - loss: 40364683264.0000 - val_loss: 39083712512.0000
Epoch 56/400
119/119 [==============================] - 0s 2ms/step - loss: 40094629888.0000 - val_loss: 38809612288.0000
Epoch 57/400
119/119 [==============================] - 0s 2ms/step - loss: 39880810496.0000 - val_loss: 38543261696.0000
Epoch 58/400
119/119 [==============================] - 0s 2ms/step - loss: 39598297088.0000 - val_loss: 38286540800.0000
Epoch 59/400
119/119 [==============================] - 0s 2ms/step - loss: 39330451456.0000 - val_loss: 38022897664.0000
Epoch 60/400
119/119 [==============================] - 0s 2ms/step - loss: 39068000256.0000 - val_loss: 37792342016.0000
Epoch 61/400
119/119 [==============================] - 0s 2ms/step - loss: 38843944960.0000 - val_loss: 37531594752.0000
Epoch 62/400
119/119 [==============================] - 0s 2ms/step - loss: 38618480640.0000 - val_loss: 37295853568.0000
Epoch 63/400
119/119 [==============================] - 0s 2ms/step - loss: 38389649408.0000 - val_loss: 37073981440.0000
Epoch 64/400
119/119 [==============================] - 0s 2ms/step - loss: 38197911552.0000 - val_loss: 36860911616.0000
Epoch 65/400
119/119 [==============================] - 0s 2ms/step - loss: 37979688960.0000 - val_loss: 36659113984.0000
Epoch 66/400
119/119 [==============================] - 0s 2ms/step - loss: 37790085120.0000 - val_loss: 36532682752.0000
Epoch 67/400
119/119 [==============================] - 0s 2ms/step - loss: 37609160704.0000 - val_loss: 36297101312.0000
Epoch 68/400
119/119 [==============================] - 0s 2ms/step - loss: 37496635392.0000 - val_loss: 36142010368.0000
Epoch 69/400
119/119 [==============================] - 0s 2ms/step - loss: 37290856448.0000 - val_loss: 36019830784.0000
Epoch 70/400
119/119 [==============================] - 0s 2ms/step - loss: 37147619328.0000 - val_loss: 35859865600.0000
Epoch 71/400
119/119 [==============================] - 0s 2ms/step - loss: 37010317312.0000 - val_loss: 35686920192.0000
Epoch 72/400
119/119 [==============================] - 0s 2ms/step - loss: 36858982400.0000 - val_loss: 35788288000.0000
Epoch 73/400
119/119 [==============================] - 0s 2ms/step - loss: 36795604992.0000 - val_loss: 35417075712.0000
Epoch 74/400
119/119 [==============================] - 0s 2ms/step - loss: 36604051456.0000 - val_loss: 35440275456.0000
Epoch 75/400
119/119 [==============================] - 0s 2ms/step - loss: 36486230016.0000 - val_loss: 35178262528.0000
Epoch 76/400
119/119 [==============================] - 0s 2ms/step - loss: 36340670464.0000 - val_loss: 35030740992.0000
Epoch 77/400
119/119 [==============================] - 0s 2ms/step - loss: 36211748864.0000 - val_loss: 34917257216.0000
Epoch 78/400
119/119 [==============================] - 0s 2ms/step - loss: 36155289600.0000 - val_loss: 34808410112.0000
Epoch 79/400
119/119 [==============================] - 0s 3ms/step - loss: 35997458432.0000 - val_loss: 34670342144.0000
Epoch 80/400
119/119 [==============================] - 0s 3ms/step - loss: 35876651008.0000 - val_loss: 34603356160.0000
Epoch 81/400
119/119 [==============================] - 0s 2ms/step - loss: 35822010368.0000 - val_loss: 34485608448.0000
Epoch 82/400
119/119 [==============================] - 0s 2ms/step - loss: 35658088448.0000 - val_loss: 34407305216.0000
Epoch 83/400
119/119 [==============================] - 0s 2ms/step - loss: 35551469568.0000 - val_loss: 34235088896.0000
Epoch 84/400
119/119 [==============================] - 0s 2ms/step - loss: 35458293760.0000 - val_loss: 34164039680.0000
Epoch 85/400
119/119 [==============================] - 0s 2ms/step - loss: 35384041472.0000 - val_loss: 34051487744.0000
Epoch 86/400
119/119 [==============================] - 0s 3ms/step - loss: 35270078464.0000 - val_loss: 33966147584.0000
Epoch 87/400
119/119 [==============================] - 0s 3ms/step - loss: 35224207360.0000 - val_loss: 33877131264.0000
Epoch 88/400
119/119 [==============================] - 0s 2ms/step - loss: 35092791296.0000 - val_loss: 33880735744.0000
Epoch 89/400
119/119 [==============================] - 0s 2ms/step - loss: 35051274240.0000 - val_loss: 33709703168.0000
Epoch 90/400
119/119 [==============================] - 0s 3ms/step - loss: 34942197760.0000 - val_loss: 33653516288.0000
Epoch 91/400
119/119 [==============================] - 0s 3ms/step - loss: 34859208704.0000 - val_loss: 33554278400.0000
Epoch 92/400
119/119 [==============================] - 0s 3ms/step - loss: 34794360832.0000 - val_loss: 33489506304.0000
Epoch 93/400
119/119 [==============================] - 0s 3ms/step - loss: 34729283584.0000 - val_loss: 33418579968.0000
Epoch 94/400
119/119 [==============================] - 0s 2ms/step - loss: 34664841216.0000 - val_loss: 33424463872.0000
Epoch 95/400
119/119 [==============================] - 0s 2ms/step - loss: 34622255104.0000 - val_loss: 33309239296.0000
Epoch 96/400
119/119 [==============================] - 0s 2ms/step - loss: 34637807616.0000 - val_loss: 33216184320.0000
Epoch 97/400
119/119 [==============================] - 0s 2ms/step - loss: 34467688448.0000 - val_loss: 33155020800.0000
Epoch 98/400
119/119 [==============================] - 0s 2ms/step - loss: 34425131008.0000 - val_loss: 33126866944.0000
Epoch 99/400
119/119 [==============================] - 0s 2ms/step - loss: 34372038656.0000 - val_loss: 33027710976.0000
Epoch 100/400
119/119 [==============================] - 0s 2ms/step - loss: 34322554880.0000 - val_loss: 32981024768.0000
Epoch 101/400
119/119 [==============================] - 0s 2ms/step - loss: 34241118208.0000 - val_loss: 32897447936.0000
Epoch 102/400
119/119 [==============================] - 0s 2ms/step - loss: 34178213888.0000 - val_loss: 32885463040.0000
Epoch 103/400
119/119 [==============================] - 0s 2ms/step - loss: 34127482880.0000 - val_loss: 32845836288.0000
Epoch 104/400
119/119 [==============================] - 0s 2ms/step - loss: 34108362752.0000 - val_loss: 32779544576.0000
Epoch 105/400
119/119 [==============================] - 0s 2ms/step - loss: 34013360128.0000 - val_loss: 32699752448.0000
Epoch 106/400
119/119 [==============================] - 0s 2ms/step - loss: 33995397120.0000 - val_loss: 32614019072.0000
Epoch 107/400
119/119 [==============================] - 0s 2ms/step - loss: 33962954752.0000 - val_loss: 32565624832.0000
Epoch 108/400
119/119 [==============================] - 0s 2ms/step - loss: 33897523200.0000 - val_loss: 32503767040.0000
Epoch 109/400
119/119 [==============================] - 0s 2ms/step - loss: 33834084352.0000 - val_loss: 32467081216.0000
Epoch 110/400
119/119 [==============================] - 0s 2ms/step - loss: 33756252160.0000 - val_loss: 32541034496.0000
Epoch 111/400
119/119 [==============================] - 0s 2ms/step - loss: 33773758464.0000 - val_loss: 32422764544.0000
Epoch 112/400
119/119 [==============================] - 0s 2ms/step - loss: 33702567936.0000 - val_loss: 32319725568.0000
Epoch 113/400
119/119 [==============================] - 0s 2ms/step - loss: 33675460608.0000 - val_loss: 32247939072.0000
Epoch 114/400
119/119 [==============================] - 0s 2ms/step - loss: 33611454464.0000 - val_loss: 32224581632.0000
Epoch 115/400
119/119 [==============================] - 0s 2ms/step - loss: 33559099392.0000 - val_loss: 32176996352.0000
Epoch 116/400
119/119 [==============================] - 0s 2ms/step - loss: 33531314176.0000 - val_loss: 32208414720.0000
Epoch 117/400
119/119 [==============================] - 0s 2ms/step - loss: 33526437888.0000 - val_loss: 32066437120.0000
Epoch 118/400
119/119 [==============================] - 0s 2ms/step - loss: 33448003584.0000 - val_loss: 32019447808.0000
Epoch 119/400
119/119 [==============================] - 0s 2ms/step - loss: 33386610688.0000 - val_loss: 32089954304.0000
Epoch 120/400
119/119 [==============================] - 0s 2ms/step - loss: 33376401408.0000 - val_loss: 31928559616.0000
Epoch 121/400
119/119 [==============================] - 0s 2ms/step - loss: 33330409472.0000 - val_loss: 31935225856.0000
Epoch 122/400
119/119 [==============================] - 0s 2ms/step - loss: 33315422208.0000 - val_loss: 31878658048.0000
Epoch 123/400
119/119 [==============================] - 0s 2ms/step - loss: 33231167488.0000 - val_loss: 31874678784.0000
Epoch 124/400
119/119 [==============================] - 0s 2ms/step - loss: 33229471744.0000 - val_loss: 31761926144.0000
Epoch 125/400
119/119 [==============================] - 0s 2ms/step - loss: 33188030464.0000 - val_loss: 31871909888.0000
Epoch 126/400
119/119 [==============================] - 0s 2ms/step - loss: 33132478464.0000 - val_loss: 31671707648.0000
Epoch 127/400
119/119 [==============================] - 0s 2ms/step - loss: 33089050624.0000 - val_loss: 31617937408.0000
Epoch 128/400
119/119 [==============================] - 0s 2ms/step - loss: 33062160384.0000 - val_loss: 31599722496.0000
Epoch 129/400
119/119 [==============================] - 0s 2ms/step - loss: 33009412096.0000 - val_loss: 31543633920.0000
Epoch 130/400
119/119 [==============================] - 0s 2ms/step - loss: 32989325312.0000 - val_loss: 31727181824.0000
Epoch 131/400
119/119 [==============================] - 0s 2ms/step - loss: 32986011648.0000 - val_loss: 31494137856.0000
Epoch 132/400
119/119 [==============================] - 0s 3ms/step - loss: 32994750464.0000 - val_loss: 31413780480.0000
Epoch 133/400
119/119 [==============================] - 0s 2ms/step - loss: 32859990016.0000 - val_loss: 31366604800.0000
Epoch 134/400
119/119 [==============================] - 0s 2ms/step - loss: 32864774144.0000 - val_loss: 31323451392.0000
Epoch 135/400
119/119 [==============================] - 0s 2ms/step - loss: 32826785792.0000 - val_loss: 31286824960.0000
Epoch 136/400
119/119 [==============================] - 0s 2ms/step - loss: 32787875840.0000 - val_loss: 31336249344.0000
Epoch 137/400
119/119 [==============================] - 0s 3ms/step - loss: 32833234944.0000 - val_loss: 31448119296.0000
Epoch 138/400
119/119 [==============================] - 0s 2ms/step - loss: 32737173504.0000 - val_loss: 31203694592.0000
Epoch 139/400
119/119 [==============================] - 0s 2ms/step - loss: 32753700864.0000 - val_loss: 31154513920.0000
Epoch 140/400
119/119 [==============================] - 0s 2ms/step - loss: 32711497728.0000 - val_loss: 31132700672.0000
Epoch 141/400
119/119 [==============================] - 0s 2ms/step - loss: 32638060544.0000 - val_loss: 31170893824.0000
Epoch 142/400
119/119 [==============================] - 0s 2ms/step - loss: 32615323648.0000 - val_loss: 31070724096.0000
Epoch 143/400
119/119 [==============================] - 0s 2ms/step - loss: 32596617216.0000 - val_loss: 31030061056.0000
Epoch 144/400
119/119 [==============================] - 0s 2ms/step - loss: 32576399360.0000 - val_loss: 31033303040.0000
Epoch 145/400
119/119 [==============================] - 0s 2ms/step - loss: 32571441152.0000 - val_loss: 31039592448.0000
Epoch 146/400
119/119 [==============================] - 0s 2ms/step - loss: 32565194752.0000 - val_loss: 30986551296.0000
Epoch 147/400
119/119 [==============================] - 0s 2ms/step - loss: 32484122624.0000 - val_loss: 30914195456.0000
Epoch 148/400
119/119 [==============================] - 0s 2ms/step - loss: 32455940096.0000 - val_loss: 30880581632.0000
Epoch 149/400
119/119 [==============================] - 0s 2ms/step - loss: 32440080384.0000 - val_loss: 30887882752.0000
Epoch 150/400
119/119 [==============================] - 0s 2ms/step - loss: 32438298624.0000 - val_loss: 30867081216.0000
Epoch 151/400
119/119 [==============================] - 0s 2ms/step - loss: 32392273920.0000 - val_loss: 30859053056.0000
Epoch 152/400
119/119 [==============================] - 0s 2ms/step - loss: 32350666752.0000 - val_loss: 30797754368.0000
Epoch 153/400
119/119 [==============================] - 0s 2ms/step - loss: 32318803968.0000 - val_loss: 30795550720.0000
Epoch 154/400
119/119 [==============================] - 0s 2ms/step - loss: 32334798848.0000 - val_loss: 30757038080.0000
Epoch 155/400
119/119 [==============================] - 0s 2ms/step - loss: 32318310400.0000 - val_loss: 30691477504.0000
Epoch 156/400
119/119 [==============================] - 0s 2ms/step - loss: 32282034176.0000 - val_loss: 30625974272.0000
Epoch 157/400
119/119 [==============================] - 0s 2ms/step - loss: 32286656512.0000 - val_loss: 30673084416.0000
Epoch 158/400
119/119 [==============================] - 0s 2ms/step - loss: 32214378496.0000 - val_loss: 30609850368.0000
Epoch 159/400
119/119 [==============================] - 0s 2ms/step - loss: 32221075456.0000 - val_loss: 30566193152.0000
Epoch 160/400
119/119 [==============================] - 0s 2ms/step - loss: 32163510272.0000 - val_loss: 30551238656.0000
Epoch 161/400
119/119 [==============================] - 0s 2ms/step - loss: 32150452224.0000 - val_loss: 30503456768.0000
Epoch 162/400
119/119 [==============================] - 0s 3ms/step - loss: 32139132928.0000 - val_loss: 30481838080.0000
Epoch 163/400
119/119 [==============================] - 0s 2ms/step - loss: 32073435136.0000 - val_loss: 30543095808.0000
Epoch 164/400
119/119 [==============================] - 0s 2ms/step - loss: 32090546176.0000 - val_loss: 30445549568.0000
Epoch 165/400
119/119 [==============================] - 0s 2ms/step - loss: 32060430336.0000 - val_loss: 30462908416.0000
Epoch 166/400
119/119 [==============================] - 0s 2ms/step - loss: 32034048000.0000 - val_loss: 30376527872.0000
Epoch 167/400
119/119 [==============================] - 0s 2ms/step - loss: 31997306880.0000 - val_loss: 30348187648.0000
Epoch 168/400
119/119 [==============================] - 0s 2ms/step - loss: 31978321920.0000 - val_loss: 30350907392.0000
Epoch 169/400
119/119 [==============================] - 0s 3ms/step - loss: 31972913152.0000 - val_loss: 30345957376.0000
Epoch 170/400
119/119 [==============================] - 0s 2ms/step - loss: 31950338048.0000 - val_loss: 30308431872.0000
Epoch 171/400
119/119 [==============================] - 0s 2ms/step - loss: 31926173696.0000 - val_loss: 30332151808.0000
Epoch 172/400
119/119 [==============================] - 0s 2ms/step - loss: 31949936640.0000 - val_loss: 30262886400.0000
Epoch 173/400
119/119 [==============================] - 0s 3ms/step - loss: 31897610240.0000 - val_loss: 30221187072.0000
Epoch 174/400
119/119 [==============================] - 0s 2ms/step - loss: 31886950400.0000 - val_loss: 30211000320.0000
Epoch 175/400
119/119 [==============================] - 0s 2ms/step - loss: 31853430784.0000 - val_loss: 30188152832.0000
Epoch 176/400
119/119 [==============================] - 0s 3ms/step - loss: 31839770624.0000 - val_loss: 30138746880.0000
Epoch 177/400
119/119 [==============================] - 0s 3ms/step - loss: 31829829632.0000 - val_loss: 30136193024.0000
Epoch 178/400
119/119 [==============================] - 0s 2ms/step - loss: 31799111680.0000 - val_loss: 30231541760.0000
Epoch 179/400
119/119 [==============================] - 0s 2ms/step - loss: 31759728640.0000 - val_loss: 30096254976.0000
Epoch 180/400
119/119 [==============================] - 0s 2ms/step - loss: 31726776320.0000 - val_loss: 30070536192.0000
Epoch 181/400
119/119 [==============================] - 0s 2ms/step - loss: 31759423488.0000 - val_loss: 30029713408.0000
Epoch 182/400
119/119 [==============================] - 0s 3ms/step - loss: 31698608128.0000 - val_loss: 30019772416.0000
Epoch 183/400
119/119 [==============================] - 0s 2ms/step - loss: 31701329920.0000 - val_loss: 30011211776.0000
Epoch 184/400
119/119 [==============================] - 0s 2ms/step - loss: 31694180352.0000 - val_loss: 29971271680.0000
Epoch 185/400
119/119 [==============================] - 0s 2ms/step - loss: 31645155328.0000 - val_loss: 29968439296.0000
Epoch 186/400
119/119 [==============================] - 0s 2ms/step - loss: 31676299264.0000 - val_loss: 29912121344.0000
Epoch 187/400
119/119 [==============================] - 0s 2ms/step - loss: 31639607296.0000 - val_loss: 29964320768.0000
Epoch 188/400
119/119 [==============================] - 0s 2ms/step - loss: 31588833280.0000 - val_loss: 29879728128.0000
Epoch 189/400
119/119 [==============================] - 0s 2ms/step - loss: 31580999680.0000 - val_loss: 29853536256.0000
Epoch 190/400
119/119 [==============================] - 0s 2ms/step - loss: 31549476864.0000 - val_loss: 29822146560.0000
Epoch 191/400
119/119 [==============================] - 0s 2ms/step - loss: 31535876096.0000 - val_loss: 29883658240.0000
Epoch 192/400
119/119 [==============================] - 0s 2ms/step - loss: 31505321984.0000 - val_loss: 29823666176.0000
Epoch 193/400
119/119 [==============================] - 0s 2ms/step - loss: 31509882880.0000 - val_loss: 29759244288.0000
Epoch 194/400
119/119 [==============================] - 0s 2ms/step - loss: 31506737152.0000 - val_loss: 29737252864.0000
Epoch 195/400
119/119 [==============================] - 0s 3ms/step - loss: 31474051072.0000 - val_loss: 29760024576.0000
Epoch 196/400
119/119 [==============================] - 0s 2ms/step - loss: 31458652160.0000 - val_loss: 29711325184.0000
Epoch 197/400
119/119 [==============================] - 0s 2ms/step - loss: 31486097408.0000 - val_loss: 29681162240.0000
Epoch 198/400
119/119 [==============================] - 0s 3ms/step - loss: 31444379648.0000 - val_loss: 29677203456.0000
Epoch 199/400
119/119 [==============================] - 0s 2ms/step - loss: 31423424512.0000 - val_loss: 29645131776.0000
Epoch 200/400
119/119 [==============================] - 0s 3ms/step - loss: 31385962496.0000 - val_loss: 29655797760.0000
Epoch 201/400
119/119 [==============================] - 0s 2ms/step - loss: 31444736000.0000 - val_loss: 29655535616.0000
Epoch 202/400
119/119 [==============================] - 0s 2ms/step - loss: 31408453632.0000 - val_loss: 29622304768.0000
Epoch 203/400
119/119 [==============================] - 0s 2ms/step - loss: 31336906752.0000 - val_loss: 29580218368.0000
Epoch 204/400
119/119 [==============================] - 0s 2ms/step - loss: 31368259584.0000 - val_loss: 29563656192.0000
Epoch 205/400
119/119 [==============================] - 0s 2ms/step - loss: 31318077440.0000 - val_loss: 29545811968.0000
Epoch 206/400
119/119 [==============================] - 0s 2ms/step - loss: 31296284672.0000 - val_loss: 29595617280.0000
Epoch 207/400
119/119 [==============================] - 0s 2ms/step - loss: 31302856704.0000 - val_loss: 29530734592.0000
Epoch 208/400
119/119 [==============================] - 0s 2ms/step - loss: 31285813248.0000 - val_loss: 29487611904.0000
Epoch 209/400
119/119 [==============================] - 0s 2ms/step - loss: 31281096704.0000 - val_loss: 29479917568.0000
Epoch 210/400
119/119 [==============================] - 0s 2ms/step - loss: 31248128000.0000 - val_loss: 29498884096.0000
Epoch 211/400
119/119 [==============================] - 0s 2ms/step - loss: 31227768832.0000 - val_loss: 29455128576.0000
Epoch 212/400
119/119 [==============================] - 0s 2ms/step - loss: 31208902656.0000 - val_loss: 29423722496.0000
Epoch 213/400
119/119 [==============================] - 0s 2ms/step - loss: 31204704256.0000 - val_loss: 29394720768.0000
Epoch 214/400
119/119 [==============================] - 0s 2ms/step - loss: 31205541888.0000 - val_loss: 29364471808.0000
Epoch 215/400
119/119 [==============================] - 0s 2ms/step - loss: 31146776576.0000 - val_loss: 29576093696.0000
Epoch 216/400
119/119 [==============================] - 0s 2ms/step - loss: 31186874368.0000 - val_loss: 29342195712.0000
Epoch 217/400
119/119 [==============================] - 0s 2ms/step - loss: 31140749312.0000 - val_loss: 29316460544.0000
Epoch 218/400
119/119 [==============================] - 0s 2ms/step - loss: 31127953408.0000 - val_loss: 29332707328.0000
Epoch 219/400
119/119 [==============================] - 0s 2ms/step - loss: 31128270848.0000 - val_loss: 29323026432.0000
Epoch 220/400
119/119 [==============================] - 0s 2ms/step - loss: 31121594368.0000 - val_loss: 29275371520.0000
Epoch 221/400
119/119 [==============================] - 0s 2ms/step - loss: 31125647360.0000 - val_loss: 29269903360.0000
Epoch 222/400
119/119 [==============================] - 0s 2ms/step - loss: 31092508672.0000 - val_loss: 29222422528.0000
Epoch 223/400
119/119 [==============================] - 0s 2ms/step - loss: 31042416640.0000 - val_loss: 29230180352.0000
Epoch 224/400
119/119 [==============================] - 0s 2ms/step - loss: 31057870848.0000 - val_loss: 29345298432.0000
Epoch 225/400
119/119 [==============================] - 0s 2ms/step - loss: 31009822720.0000 - val_loss: 29375553536.0000
Epoch 226/400
119/119 [==============================] - 0s 2ms/step - loss: 31000385536.0000 - val_loss: 29172416512.0000
Epoch 227/400
119/119 [==============================] - 0s 2ms/step - loss: 31016769536.0000 - val_loss: 29150423040.0000
Epoch 228/400
119/119 [==============================] - 0s 2ms/step - loss: 31023425536.0000 - val_loss: 29172381696.0000
Epoch 229/400
119/119 [==============================] - 0s 2ms/step - loss: 31024570368.0000 - val_loss: 29175527424.0000
Epoch 230/400
119/119 [==============================] - 0s 2ms/step - loss: 31035961344.0000 - val_loss: 29116928000.0000
Epoch 231/400
119/119 [==============================] - 0s 2ms/step - loss: 30975539200.0000 - val_loss: 29099776000.0000
Epoch 232/400
119/119 [==============================] - 0s 2ms/step - loss: 30931783680.0000 - val_loss: 29080033280.0000
Epoch 233/400
119/119 [==============================] - 0s 2ms/step - loss: 31000801280.0000 - val_loss: 29050144768.0000
Epoch 234/400
119/119 [==============================] - 0s 2ms/step - loss: 30935011328.0000 - val_loss: 29017597952.0000
Epoch 235/400
119/119 [==============================] - 0s 2ms/step - loss: 30900058112.0000 - val_loss: 29016526848.0000
Epoch 236/400
119/119 [==============================] - 0s 2ms/step - loss: 30870228992.0000 - val_loss: 28980084736.0000
Epoch 237/400
119/119 [==============================] - 0s 2ms/step - loss: 30878869504.0000 - val_loss: 28990636032.0000
Epoch 238/400
119/119 [==============================] - 0s 2ms/step - loss: 30870597632.0000 - val_loss: 29064253440.0000
Epoch 239/400
119/119 [==============================] - 0s 2ms/step - loss: 30863712256.0000 - val_loss: 28946143232.0000
Epoch 240/400
119/119 [==============================] - 0s 2ms/step - loss: 30835249152.0000 - val_loss: 28930979840.0000
Epoch 241/400
119/119 [==============================] - 0s 2ms/step - loss: 30804957184.0000 - val_loss: 28964792320.0000
Epoch 242/400
119/119 [==============================] - 0s 2ms/step - loss: 30831671296.0000 - val_loss: 28921100288.0000
Epoch 243/400
119/119 [==============================] - 0s 2ms/step - loss: 30849073152.0000 - val_loss: 28901609472.0000
Epoch 244/400
119/119 [==============================] - 0s 2ms/step - loss: 30804310016.0000 - val_loss: 29045151744.0000
Epoch 245/400
119/119 [==============================] - 0s 2ms/step - loss: 30817374208.0000 - val_loss: 28859097088.0000
Epoch 246/400
119/119 [==============================] - 0s 2ms/step - loss: 30785835008.0000 - val_loss: 28839006208.0000
Epoch 247/400
119/119 [==============================] - 0s 2ms/step - loss: 30801569792.0000 - val_loss: 28801601536.0000
Epoch 248/400
119/119 [==============================] - 0s 2ms/step - loss: 30735075328.0000 - val_loss: 28799197184.0000
Epoch 249/400
119/119 [==============================] - 0s 2ms/step - loss: 30745679872.0000 - val_loss: 28849582080.0000
Epoch 250/400
119/119 [==============================] - 0s 2ms/step - loss: 30758526976.0000 - val_loss: 28771768320.0000
Epoch 251/400
119/119 [==============================] - 0s 2ms/step - loss: 30744961024.0000 - val_loss: 28779376640.0000
Epoch 252/400
119/119 [==============================] - 0s 2ms/step - loss: 30725312512.0000 - val_loss: 28831864832.0000
Epoch 253/400
119/119 [==============================] - 0s 2ms/step - loss: 30699573248.0000 - val_loss: 28783138816.0000
Epoch 254/400
119/119 [==============================] - 0s 2ms/step - loss: 30688247808.0000 - val_loss: 28755365888.0000
Epoch 255/400
119/119 [==============================] - 0s 2ms/step - loss: 30689662976.0000 - val_loss: 28734734336.0000
Epoch 256/400
119/119 [==============================] - 0s 3ms/step - loss: 30669144064.0000 - val_loss: 28700592128.0000
Epoch 257/400
119/119 [==============================] - 0s 3ms/step - loss: 30685399040.0000 - val_loss: 28680118272.0000
Epoch 258/400
119/119 [==============================] - 0s 2ms/step - loss: 30646530048.0000 - val_loss: 28641214464.0000
Epoch 259/400
119/119 [==============================] - 0s 2ms/step - loss: 30672576512.0000 - val_loss: 28614969344.0000
Epoch 260/400
119/119 [==============================] - 0s 2ms/step - loss: 30635532288.0000 - val_loss: 28626278400.0000
Epoch 261/400
119/119 [==============================] - 0s 2ms/step - loss: 30610130944.0000 - val_loss: 28627505152.0000
Epoch 262/400
119/119 [==============================] - 0s 2ms/step - loss: 30602305536.0000 - val_loss: 28679065600.0000
Epoch 263/400
119/119 [==============================] - 0s 2ms/step - loss: 30627958784.0000 - val_loss: 28563132416.0000
Epoch 264/400
119/119 [==============================] - 0s 2ms/step - loss: 30614872064.0000 - val_loss: 28586438656.0000
Epoch 265/400
119/119 [==============================] - 0s 2ms/step - loss: 30607212544.0000 - val_loss: 28565129216.0000
Epoch 266/400
119/119 [==============================] - 0s 2ms/step - loss: 30586062848.0000 - val_loss: 28529623040.0000
Epoch 267/400
119/119 [==============================] - 0s 2ms/step - loss: 30569338880.0000 - val_loss: 28559808512.0000
Epoch 268/400
119/119 [==============================] - 0s 2ms/step - loss: 30578683904.0000 - val_loss: 28556234752.0000
Epoch 269/400
119/119 [==============================] - 0s 2ms/step - loss: 30559791104.0000 - val_loss: 28618981376.0000
Epoch 270/400
119/119 [==============================] - 0s 3ms/step - loss: 30603231232.0000 - val_loss: 28513411072.0000
Epoch 271/400
119/119 [==============================] - 0s 2ms/step - loss: 30495834112.0000 - val_loss: 28593000448.0000
Epoch 272/400
119/119 [==============================] - 0s 2ms/step - loss: 30511087616.0000 - val_loss: 28485171200.0000
Epoch 273/400
119/119 [==============================] - 0s 2ms/step - loss: 30518691840.0000 - val_loss: 28438802432.0000
Epoch 274/400
119/119 [==============================] - 0s 2ms/step - loss: 30511935488.0000 - val_loss: 28445368320.0000
Epoch 275/400
119/119 [==============================] - 0s 2ms/step - loss: 30492938240.0000 - val_loss: 28444028928.0000
Epoch 276/400
119/119 [==============================] - 0s 2ms/step - loss: 30508896256.0000 - val_loss: 28404660224.0000
Epoch 277/400
119/119 [==============================] - 0s 2ms/step - loss: 30466791424.0000 - val_loss: 28403290112.0000
Epoch 278/400
119/119 [==============================] - 0s 2ms/step - loss: 30466930688.0000 - val_loss: 28371273728.0000
Epoch 279/400
119/119 [==============================] - 0s 2ms/step - loss: 30437251072.0000 - val_loss: 28348977152.0000
Epoch 280/400
119/119 [==============================] - 0s 2ms/step - loss: 30428954624.0000 - val_loss: 28348131328.0000
Epoch 281/400
119/119 [==============================] - 0s 2ms/step - loss: 30434469888.0000 - val_loss: 28337293312.0000
Epoch 282/400
119/119 [==============================] - 0s 2ms/step - loss: 30400837632.0000 - val_loss: 28353505280.0000
Epoch 283/400
119/119 [==============================] - 0s 2ms/step - loss: 30415063040.0000 - val_loss: 28360757248.0000
Epoch 284/400
119/119 [==============================] - 0s 2ms/step - loss: 30429630464.0000 - val_loss: 28305041408.0000
Epoch 285/400
119/119 [==============================] - 0s 2ms/step - loss: 30385246208.0000 - val_loss: 28299800576.0000
Epoch 286/400
119/119 [==============================] - 0s 2ms/step - loss: 30410647552.0000 - val_loss: 28247687168.0000
Epoch 287/400
119/119 [==============================] - 0s 2ms/step - loss: 30362128384.0000 - val_loss: 28233504768.0000
Epoch 288/400
119/119 [==============================] - 0s 2ms/step - loss: 30340362240.0000 - val_loss: 28251938816.0000
Epoch 289/400
119/119 [==============================] - 0s 2ms/step - loss: 30390575104.0000 - val_loss: 28262789120.0000
Epoch 290/400
119/119 [==============================] - 0s 2ms/step - loss: 30414706688.0000 - val_loss: 28231565312.0000
Epoch 291/400
119/119 [==============================] - 0s 2ms/step - loss: 30332413952.0000 - val_loss: 28204902400.0000
Epoch 292/400
119/119 [==============================] - 0s 2ms/step - loss: 30317019136.0000 - val_loss: 28205076480.0000
Epoch 293/400
119/119 [==============================] - 0s 2ms/step - loss: 30292697088.0000 - val_loss: 28268871680.0000
Epoch 294/400
119/119 [==============================] - 0s 2ms/step - loss: 30306433024.0000 - val_loss: 28201070592.0000
Epoch 295/400
119/119 [==============================] - 0s 2ms/step - loss: 30298062848.0000 - val_loss: 28275877888.0000
Epoch 296/400
119/119 [==============================] - 0s 2ms/step - loss: 30320977920.0000 - val_loss: 28175534080.0000
Epoch 297/400
119/119 [==============================] - 0s 2ms/step - loss: 30351601664.0000 - val_loss: 28191041536.0000
Epoch 298/400
119/119 [==============================] - 0s 2ms/step - loss: 30292281344.0000 - val_loss: 28137265152.0000
Epoch 299/400
119/119 [==============================] - 0s 3ms/step - loss: 30277617664.0000 - val_loss: 28097187840.0000
Epoch 300/400
119/119 [==============================] - 0s 3ms/step - loss: 30246017024.0000 - val_loss: 28181579776.0000
Epoch 301/400
119/119 [==============================] - 0s 2ms/step - loss: 30279786496.0000 - val_loss: 28114909184.0000
Epoch 302/400
119/119 [==============================] - 0s 2ms/step - loss: 30233171968.0000 - val_loss: 28090761216.0000
Epoch 303/400
119/119 [==============================] - 0s 2ms/step - loss: 30250285056.0000 - val_loss: 28099569664.0000
Epoch 304/400
119/119 [==============================] - 0s 3ms/step - loss: 30237620224.0000 - val_loss: 28057858048.0000
Epoch 305/400
119/119 [==============================] - 0s 2ms/step - loss: 30194042880.0000 - val_loss: 28039022592.0000
Epoch 306/400
119/119 [==============================] - 0s 2ms/step - loss: 30191648768.0000 - val_loss: 28032268288.0000
Epoch 307/400
119/119 [==============================] - 0s 2ms/step - loss: 30185742336.0000 - val_loss: 28124559360.0000
Epoch 308/400
119/119 [==============================] - 0s 3ms/step - loss: 30180636672.0000 - val_loss: 28055019520.0000
Epoch 309/400
119/119 [==============================] - 0s 3ms/step - loss: 30171904000.0000 - val_loss: 28105807872.0000
Epoch 310/400
119/119 [==============================] - 0s 2ms/step - loss: 30168944640.0000 - val_loss: 27977576448.0000
Epoch 311/400
119/119 [==============================] - 0s 2ms/step - loss: 30205523968.0000 - val_loss: 27993782272.0000
Epoch 312/400
119/119 [==============================] - 0s 2ms/step - loss: 30124464128.0000 - val_loss: 27943331840.0000
Epoch 313/400
119/119 [==============================] - 0s 2ms/step - loss: 30128740352.0000 - val_loss: 27928811520.0000
Epoch 314/400
119/119 [==============================] - 0s 2ms/step - loss: 30122283008.0000 - val_loss: 27978033152.0000
Epoch 315/400
119/119 [==============================] - 0s 2ms/step - loss: 30132180992.0000 - val_loss: 28001048576.0000
Epoch 316/400
119/119 [==============================] - 0s 3ms/step - loss: 30108624896.0000 - val_loss: 27919048704.0000
Epoch 317/400
119/119 [==============================] - 0s 3ms/step - loss: 30133919744.0000 - val_loss: 27913635840.0000
Epoch 318/400
119/119 [==============================] - 0s 3ms/step - loss: 30097885184.0000 - val_loss: 27890819072.0000
Epoch 319/400
119/119 [==============================] - 0s 3ms/step - loss: 30124136448.0000 - val_loss: 27873570816.0000
Epoch 320/400
119/119 [==============================] - 0s 2ms/step - loss: 30097350656.0000 - val_loss: 27859818496.0000
Epoch 321/400
119/119 [==============================] - 0s 2ms/step - loss: 30050473984.0000 - val_loss: 27898507264.0000
Epoch 322/400
119/119 [==============================] - 0s 2ms/step - loss: 30044512256.0000 - val_loss: 27997036544.0000
Epoch 323/400
119/119 [==============================] - 0s 2ms/step - loss: 30086610944.0000 - val_loss: 27929505792.0000
Epoch 324/400
119/119 [==============================] - 0s 2ms/step - loss: 30039463936.0000 - val_loss: 27821699072.0000
Epoch 325/400
119/119 [==============================] - 0s 2ms/step - loss: 30035087360.0000 - val_loss: 27807840256.0000
Epoch 326/400
119/119 [==============================] - 0s 2ms/step - loss: 29995038720.0000 - val_loss: 27851464704.0000
Epoch 327/400
119/119 [==============================] - 0s 2ms/step - loss: 30020655104.0000 - val_loss: 27830941696.0000
Epoch 328/400
119/119 [==============================] - 0s 2ms/step - loss: 29995644928.0000 - val_loss: 27856594944.0000
Epoch 329/400
119/119 [==============================] - 0s 2ms/step - loss: 30018215936.0000 - val_loss: 27796797440.0000
Epoch 330/400
119/119 [==============================] - 0s 2ms/step - loss: 30022328320.0000 - val_loss: 27765471232.0000
Epoch 331/400
119/119 [==============================] - 0s 2ms/step - loss: 29980561408.0000 - val_loss: 27827609600.0000
Epoch 332/400
119/119 [==============================] - 0s 2ms/step - loss: 29953234944.0000 - val_loss: 27870111744.0000
Epoch 333/400
119/119 [==============================] - 0s 2ms/step - loss: 29969000448.0000 - val_loss: 27835136000.0000
Epoch 334/400
119/119 [==============================] - 0s 2ms/step - loss: 29997975552.0000 - val_loss: 27729678336.0000
Epoch 335/400
119/119 [==============================] - 0s 2ms/step - loss: 29934790656.0000 - val_loss: 27727357952.0000
Epoch 336/400
119/119 [==============================] - 0s 2ms/step - loss: 29978169344.0000 - val_loss: 27750959104.0000
Epoch 337/400
119/119 [==============================] - 0s 2ms/step - loss: 29938915328.0000 - val_loss: 27929344000.0000
Epoch 338/400
119/119 [==============================] - 0s 2ms/step - loss: 29922572288.0000 - val_loss: 27670253568.0000
Epoch 339/400
119/119 [==============================] - 0s 2ms/step - loss: 29930180608.0000 - val_loss: 27679033344.0000
Epoch 340/400
119/119 [==============================] - 0s 2ms/step - loss: 29907083264.0000 - val_loss: 27665641472.0000
Epoch 341/400
119/119 [==============================] - 0s 2ms/step - loss: 29895825408.0000 - val_loss: 27661721600.0000
Epoch 342/400
119/119 [==============================] - 0s 2ms/step - loss: 29904680960.0000 - val_loss: 27642253312.0000
Epoch 343/400
119/119 [==============================] - 0s 2ms/step - loss: 29855981568.0000 - val_loss: 27583995904.0000
Epoch 344/400
119/119 [==============================] - 0s 2ms/step - loss: 29877407744.0000 - val_loss: 27606319104.0000
Epoch 345/400
119/119 [==============================] - 0s 2ms/step - loss: 29833672704.0000 - val_loss: 27597834240.0000
Epoch 346/400
119/119 [==============================] - 0s 2ms/step - loss: 29835296768.0000 - val_loss: 27601432576.0000
Epoch 347/400
119/119 [==============================] - 0s 2ms/step - loss: 29829933056.0000 - val_loss: 27600629760.0000
Epoch 348/400
119/119 [==============================] - 0s 2ms/step - loss: 29827164160.0000 - val_loss: 27625201664.0000
Epoch 349/400
119/119 [==============================] - 0s 2ms/step - loss: 29792120832.0000 - val_loss: 27542898688.0000
Epoch 350/400
119/119 [==============================] - 0s 2ms/step - loss: 29804673024.0000 - val_loss: 27541063680.0000
Epoch 351/400
119/119 [==============================] - 0s 3ms/step - loss: 29777745920.0000 - val_loss: 27578746880.0000
Epoch 352/400
119/119 [==============================] - 0s 2ms/step - loss: 29808633856.0000 - val_loss: 27549706240.0000
Epoch 353/400
119/119 [==============================] - 0s 2ms/step - loss: 29785833472.0000 - val_loss: 27529482240.0000
Epoch 354/400
119/119 [==============================] - 0s 2ms/step - loss: 29766612992.0000 - val_loss: 27561938944.0000
Epoch 355/400
119/119 [==============================] - 0s 2ms/step - loss: 29791107072.0000 - val_loss: 27521779712.0000
Epoch 356/400
119/119 [==============================] - 0s 2ms/step - loss: 29779587072.0000 - val_loss: 27545452544.0000
Epoch 357/400
119/119 [==============================] - 0s 2ms/step - loss: 29755891712.0000 - val_loss: 27471345664.0000
Epoch 358/400
119/119 [==============================] - 0s 3ms/step - loss: 29747441664.0000 - val_loss: 27448975360.0000
Epoch 359/400
119/119 [==============================] - 0s 2ms/step - loss: 29727516672.0000 - val_loss: 27497877504.0000
Epoch 360/400
119/119 [==============================] - 0s 2ms/step - loss: 29710725120.0000 - val_loss: 27471855616.0000
Epoch 361/400
119/119 [==============================] - 0s 2ms/step - loss: 29703954432.0000 - val_loss: 27420530688.0000
Epoch 362/400
119/119 [==============================] - 0s 2ms/step - loss: 29676251136.0000 - val_loss: 27370039296.0000
Epoch 363/400
119/119 [==============================] - 0s 2ms/step - loss: 29671604224.0000 - val_loss: 27431983104.0000
Epoch 364/400
119/119 [==============================] - 0s 3ms/step - loss: 29681836032.0000 - val_loss: 27395997696.0000
Epoch 365/400
119/119 [==============================] - 0s 2ms/step - loss: 29660313600.0000 - val_loss: 27373795328.0000
Epoch 366/400
119/119 [==============================] - 0s 2ms/step - loss: 29649405952.0000 - val_loss: 27446446080.0000
Epoch 367/400
119/119 [==============================] - 0s 2ms/step - loss: 29648267264.0000 - val_loss: 27497302016.0000
Epoch 368/400
119/119 [==============================] - 0s 2ms/step - loss: 29645719552.0000 - val_loss: 27300833280.0000
Epoch 369/400
119/119 [==============================] - 0s 2ms/step - loss: 29627473920.0000 - val_loss: 27293999104.0000
Epoch 370/400
119/119 [==============================] - 0s 2ms/step - loss: 29595586560.0000 - val_loss: 27298617344.0000
Epoch 371/400
119/119 [==============================] - 0s 2ms/step - loss: 29619388416.0000 - val_loss: 27232575488.0000
Epoch 372/400
119/119 [==============================] - 0s 2ms/step - loss: 29593450496.0000 - val_loss: 27391256576.0000
Epoch 373/400
119/119 [==============================] - 0s 2ms/step - loss: 29581123584.0000 - val_loss: 27286466560.0000
Epoch 374/400
119/119 [==============================] - 0s 2ms/step - loss: 29592934400.0000 - val_loss: 27200598016.0000
Epoch 375/400
119/119 [==============================] - 0s 2ms/step - loss: 29606471680.0000 - val_loss: 27254323200.0000
Epoch 376/400
119/119 [==============================] - 0s 2ms/step - loss: 29546606592.0000 - val_loss: 27192866816.0000
Epoch 377/400
119/119 [==============================] - 0s 2ms/step - loss: 29544714240.0000 - val_loss: 27177805824.0000
Epoch 378/400
119/119 [==============================] - 0s 2ms/step - loss: 29520457728.0000 - val_loss: 27140808704.0000
Epoch 379/400
119/119 [==============================] - 0s 2ms/step - loss: 29487427584.0000 - val_loss: 27109748736.0000
Epoch 380/400
119/119 [==============================] - 0s 2ms/step - loss: 29486866432.0000 - val_loss: 27134953472.0000
Epoch 381/400
119/119 [==============================] - 0s 2ms/step - loss: 29446619136.0000 - val_loss: 27080132608.0000
Epoch 382/400
119/119 [==============================] - 0s 2ms/step - loss: 29410377728.0000 - val_loss: 27100665856.0000
Epoch 383/400
119/119 [==============================] - 0s 2ms/step - loss: 29401180160.0000 - val_loss: 27121113088.0000
Epoch 384/400
119/119 [==============================] - 0s 2ms/step - loss: 29403658240.0000 - val_loss: 27011911680.0000
Epoch 385/400
119/119 [==============================] - 0s 2ms/step - loss: 29384507392.0000 - val_loss: 27005440000.0000
Epoch 386/400
119/119 [==============================] - 0s 2ms/step - loss: 29393664000.0000 - val_loss: 26957244416.0000
Epoch 387/400
119/119 [==============================] - 0s 2ms/step - loss: 29372760064.0000 - val_loss: 26945626112.0000
Epoch 388/400
119/119 [==============================] - 0s 3ms/step - loss: 29409544192.0000 - val_loss: 27036338176.0000
Epoch 389/400
119/119 [==============================] - 0s 2ms/step - loss: 29505859584.0000 - val_loss: 26939680768.0000
Epoch 390/400
119/119 [==============================] - 0s 2ms/step - loss: 29357248512.0000 - val_loss: 26967810048.0000
Epoch 391/400
119/119 [==============================] - 0s 2ms/step - loss: 29344528384.0000 - val_loss: 26937419776.0000
Epoch 392/400
119/119 [==============================] - 0s 2ms/step - loss: 29291173888.0000 - val_loss: 26896060416.0000
Epoch 393/400
119/119 [==============================] - 0s 2ms/step - loss: 29299818496.0000 - val_loss: 26910234624.0000
Epoch 394/400
119/119 [==============================] - 0s 2ms/step - loss: 29324566528.0000 - val_loss: 26934685696.0000
Epoch 395/400
119/119 [==============================] - 0s 2ms/step - loss: 29283000320.0000 - val_loss: 26872416256.0000
Epoch 396/400
119/119 [==============================] - 0s 2ms/step - loss: 29319473152.0000 - val_loss: 26866792448.0000
Epoch 397/400
119/119 [==============================] - 0s 2ms/step - loss: 29243617280.0000 - val_loss: 26822770688.0000
Epoch 398/400
119/119 [==============================] - 0s 2ms/step - loss: 29261930496.0000 - val_loss: 26784151552.0000
Epoch 399/400
119/119 [==============================] - 0s 2ms/step - loss: 29203269632.0000 - val_loss: 26794391552.0000
Epoch 400/400
119/119 [==============================] - 0s 2ms/step - loss: 29228584960.0000 - val_loss: 26746060800.0000
```

Out[58]: <keras.callbacks.History at 0x1997cb1ef40>

In [60]:
```
losses = pd.DataFrame(model.history.history)
losses.plot()
```

Out[60]: <AxesSubplot:>



In [61]:
```
from sklearn.metrics import mean_squared_error,mean_absolute_error,explained_variance_score
```

In [62]:
```
predictions = model.predict(X_test)
```

In [64]:
```
np.sqrt(mean_squared_error(y_test,predictions))
```

Out[64]: 163542.22536821736

In [65]:
```
mean_absolute_error(y_test,predictions)
```

Out[65]: 100589.29581042631

In [66]:
```
df['price'].describe()
```

Out[66]:
```
count    2.159700e+04
mean     5.402966e+05
std      3.673681e+05
min      7.800000e+04
25%      3.220000e+05
50%      4.500000e+05
75%      6.450000e+05
max      7.700000e+06
Name: price, dtype: float64
```

In [67]:
```
5.402966e+05
```

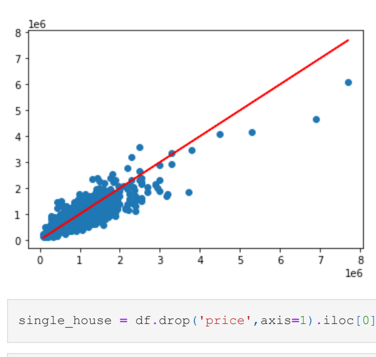
Out[67]: 540296.6

In [68]:
```
explained_variance_score(y_test,predictions)
```

Out[68]: 0.7983204941588697

In [70]:
```
plt.scatter(y_test,predictions)
plt.plot(y_test,y_test,'r')
```

Out[70]: [<matplotlib.lines.Line2D at 0x19902541100>]



In [73]:
```
single_house = df.drop('price',axis=1).iloc[0]
```

In [74]:
```
single_house = scaler.transform(single_house.values.reshape(-1,19))
```

In [75]:

```
model.predict(single_house)
```

Out[75]:

```
array([[286098.25]], dtype=float32)
```

In [76]:

```
df.head(1)
```

Out[76]:

	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfront	view	condition	grade	sqft_above	sqft_basement	yr_built	yr_re
0	221900.0	3	1.0	1180	5650	1.0	0	0	3	7	1180	0	1955	

In [ ]: