In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [3]:
```
df = pd.read_csv('/Users/ethanchoi/Desktop/NBA Prediction Model/Points No Zeros
```

In [4]:
```
df.head()
```

Out[4]:

	Rk	Player	Tm	Season PPG	Last 5 PPG	Last 10 PPG	Opp DR	Season MP	Projected MP Today	Today's Points	...	Unnamed: 19
0	244.0	Aaron Holiday	PHO	6.3	5.2	4.7	114.8	16.2	16.9	10.0	...	NaN
1	406.0	Aaron Nesmith	BOS	3.8	6.0	6.4	108.9	11.0	11.0	5.0	...	NaN
2	492.0	Admiral Schofield	ORL	3.8	7.0	6.1	108.4	12.3	20.6	8.0	...	NaN
3	250.0	Al Horford	BOS	10.2	14.3	10.7	108.9	29.1	29.1	13.0	...	NaN
4	85.0	Alec Burks	NYK	11.7	14.0	15.6	109.9	28.6	28.6	10.0	...	NaN

5 rows × 29 columns

In [5]:
```
df = df[['Season PPG', 'Last 5 PPG', 'Last 10 PPG', 'Opp DR', 'Season MP', 'Pro
```

In [6]:
```
df
```

Out[6]:

	Season PPG	Last 5 PPG	Last 10 PPG	Opp DR	Season MP	Projected MP Today	Today's Points
0	6.3	5.2	4.7	114.8	16.2	16.9	10.0
1	3.8	6.0	6.4	108.9	11.0	11.0	5.0
2	3.8	7.0	6.1	108.4	12.3	20.6	8.0
3	10.2	14.3	10.7	108.9	29.1	29.1	13.0
4	11.7	14.0	15.6	109.9	28.6	28.6	10.0
...	...	...	...	...	...	...	...
600	NaN	NaN	NaN	NaN	NaN	NaN	NaN
601	NaN	NaN	NaN	NaN	NaN	NaN	NaN
602	NaN	NaN	NaN	NaN	NaN	NaN	NaN
603	NaN	NaN	NaN	NaN	NaN	NaN	NaN
604	NaN	NaN	NaN	NaN	NaN	NaN	NaN

605 rows × 7 columns

In [7]:
```
df = df.dropna()
```

In [8]:
```
df
```

Out[8]:

	Season PPG	Last 5 PPG	Last 10 PPG	Opp DR	Season MP	Projected MP Today	Today's Points
0	6.3	5.2	4.7	114.8	16.2	16.9	10.0
1	3.8	6.0	6.4	108.9	11.0	11.0	5.0
2	3.8	7.0	6.1	108.4	12.3	20.6	8.0
3	10.2	14.3	10.7	108.9	29.1	29.1	13.0
4	11.7	14.0	15.6	109.9	28.6	28.6	10.0
...	...	...	...	...	...	...	...
236	4.8	6.2	7.5	106.2	13.2	22.7	5.0
237	4.3	3.5	2.6	110.2	11.7	11.7	4.0
238	7.8	11.8	10.9	109.1	17.9	17.9	8.0
239	6.6	5.0	5.0	112.8	17.0	24.3	5.0
240	8.1	15.4	9.8	106.2	21.7	23.5	18.0

241 rows × 7 columns

In [9]:
```
df.corr()
```

Out[9]:

	Season PPG	Last 5 PPG	Last 10 PPG	Opp DR	Season MP	Projected MP Today	Today's Points
Season PPG	1.000000	0.790133	0.854360	0.144982	0.857432	0.750478	0.442037
Last 5 PPG	0.790133	1.000000	0.942044	0.016307	0.635898	0.600404	0.711569
Last 10 PPG	0.854360	0.942044	1.000000	-0.001126	0.702616	0.640571	0.621075
Opp DR	0.144982	0.016307	-0.001126	1.000000	0.133493	0.077130	0.025930
Season MP	0.857432	0.635898	0.702616	0.133493	1.000000	0.877204	0.337269
Projected MP Today	0.750478	0.600404	0.640571	0.077130	0.877204	1.000000	0.411390
Today's Points	0.442037	0.711569	0.621075	0.025930	0.337269	0.411390	1.000000

In [10]:
```
from sklearn.model_selection import train_test_split
```

In [11]:
```
X = df.drop("Today's Points", axis=1).values
y = df["Today's Points"].values
```

In [12]:
```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random
```

In [13]:
```
X_train.shape
```

Out[13]:
```
(168, 6)
```

In [14]:
```
X_test.shape
```

Out[14]:
```
(73, 6)
```

In [15]:
```
from sklearn.preprocessing import MinMaxScaler
```

In [16]:
```
scaler = MinMaxScaler()
```

In [17]:
```
scaler.fit(X_train)
```

Out[17]:
```
MinMaxScaler()
```

In [18]:
```
X_train = scaler.transform(X_train)
```

In [19]:
```
X_test = scaler.transform(X_test)
```

In [20]:
```
X_train.max()
```

Out[20]:
```
1.0
```

In [21]:
```
X_train.min()
```

Out[21]:
```
0.0
```

In [22]:
```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
```

In [23]:
```
model = Sequential()

model.add(Dense(6,activation='relu'))
model.add(Dense(6,activation='relu'))
model.add(Dense(6,activation='relu'))

model.add(Dense(1))

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

```
2022-09-02 13:32:18.824385: I tensorflow/core/platform/cpu_feature_guard.cc:193] This TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to use the following CPU instructions in performance-critical operations:  AVX2 AVX512F AVX512_VNNI FMA
To enable them in other operations, rebuild TensorFlow with the appropriate compiler flags.
```

In [24]:
```
model.fit(x=X_train, y=y_train, epochs=600, validation_data=(X_test,y_test))
```

```
Epoch 1/600
6/6 [==============================] - 0s 24ms/step - loss: 244.0236 - val_los
s: 207.0749
Epoch 2/600
6/6 [==============================] - 0s 5ms/step - loss: 242.3120 - val_los
s: 205.5760
Epoch 3/600
6/6 [==============================] - 0s 5ms/step - loss: 240.7588 - val_los
s: 204.2442
Epoch 4/600
6/6 [==============================] - 0s 5ms/step - loss: 239.3832 - val_los
s: 203.0833
Epoch 5/600
6/6 [==============================] - 0s 5ms/step - loss: 238.1839 - val_los
s: 202.1187
Epoch 6/600
6/6 [==============================] - 0s 5ms/step - loss: 237.1911 - val_los
s: 201.3313
Epoch 7/600
6/6 [==============================] - 0s 6ms/step - loss: 236.4249 - val_los
s: 200.6529
Epoch 8/600
6/6 [==============================] - 0s 6ms/step - loss: 235.7301 - val_los
s: 200.0319
Epoch 9/600
6/6 [==============================] - 0s 6ms/step - loss: 235.0745 - val_los
s: 199.4463
Epoch 10/600
6/6 [==============================] - 0s 6ms/step - loss: 234.4179 - val_los
s: 198.8385
Epoch 11/600
6/6 [==============================] - 0s 6ms/step - loss: 233.7252 - val_los
s: 198.1667
Epoch 12/600
6/6 [==============================] - 0s 6ms/step - loss: 232.9911 - val_los
s: 197.4274
Epoch 13/600
6/6 [==============================] - 0s 6ms/step - loss: 232.1567 - val_los
s: 196.5988
Epoch 14/600
6/6 [==============================] - 0s 5ms/step - loss: 231.2222 - val_los
s: 195.6873
Epoch 15/600
6/6 [==============================] - 0s 6ms/step - loss: 230.1662 - val_los
s: 194.5683
Epoch 16/600
6/6 [==============================] - 0s 6ms/step - loss: 228.9500 - val_los
s: 193.3068
Epoch 17/600
6/6 [==============================] - 0s 5ms/step - loss: 227.6074 - val_los
s: 191.8801
Epoch 18/600
6/6 [==============================] - 0s 6ms/step - loss: 226.0796 - val_los
s: 190.2861
Epoch 19/600
6/6 [==============================] - 0s 6ms/step - loss: 224.3404 - val_los
s: 188.5462
Epoch 20/600
6/6 [==============================] - 0s 8ms/step - loss: 222.4553 - val_los
s: 186.6041
```

```
Epoch 21/600
6/6 [==============================] - 0s 7ms/step - loss: 220.3524 - val_los
s: 184.4340
Epoch 22/600
6/6 [==============================] - 0s 7ms/step - loss: 218.0277 - val_los
s: 182.0394
Epoch 23/600
6/6 [==============================] - 0s 7ms/step - loss: 215.5692 - val_los
s: 179.3834
Epoch 24/600
6/6 [==============================] - 0s 6ms/step - loss: 212.7513 - val_los
s: 176.5368
Epoch 25/600
6/6 [==============================] - 0s 6ms/step - loss: 209.6946 - val_los
s: 173.4639
Epoch 26/600
6/6 [==============================] - 0s 7ms/step - loss: 206.3822 - val_los
s: 170.0963
Epoch 27/600
6/6 [==============================] - 0s 7ms/step - loss: 202.6914 - val_los
s: 166.5190
Epoch 28/600
6/6 [==============================] - 0s 7ms/step - loss: 198.9998 - val_los
s: 162.6314
Epoch 29/600
6/6 [==============================] - 0s 7ms/step - loss: 194.7363 - val_los
s: 158.6032
Epoch 30/600
6/6 [==============================] - 0s 7ms/step - loss: 190.5120 - val_los
s: 154.3009
Epoch 31/600
6/6 [==============================] - 0s 7ms/step - loss: 185.9210 - val_los
s: 149.6670
Epoch 32/600
6/6 [==============================] - 0s 6ms/step - loss: 181.0684 - val_los
s: 144.9147
Epoch 33/600
6/6 [==============================] - 0s 7ms/step - loss: 175.9937 - val_los
s: 139.9467
Epoch 34/600
6/6 [==============================] - 0s 6ms/step - loss: 170.6801 - val_los
s: 134.8038
Epoch 35/600
6/6 [==============================] - 0s 7ms/step - loss: 165.1782 - val_los
s: 129.5986
Epoch 36/600
6/6 [==============================] - 0s 6ms/step - loss: 159.7726 - val_los
s: 124.1837
Epoch 37/600
6/6 [==============================] - 0s 6ms/step - loss: 154.1507 - val_los
s: 118.6103
Epoch 38/600
6/6 [==============================] - 0s 6ms/step - loss: 147.9060 - val_los
s: 113.1113
Epoch 39/600
6/6 [==============================] - 0s 6ms/step - loss: 141.9912 - val_los
s: 107.4473
Epoch 40/600
6/6 [==============================] - 0s 6ms/step - loss: 135.7983 - val_los
s: 101.7509
```

```
Epoch 41/600
6/6 [==============================] - 0s 7ms/step - loss: 129.7312 - val_los
s: 95.9876
Epoch 42/600
6/6 [==============================] - 0s 6ms/step - loss: 123.5866 - val_los
s: 90.2991
Epoch 43/600
6/6 [==============================] - 0s 6ms/step - loss: 117.2299 - val_los
s: 84.7628
Epoch 44/600
6/6 [==============================] - 0s 6ms/step - loss: 111.5167 - val_los
s: 79.2081
Epoch 45/600
6/6 [==============================] - 0s 7ms/step - loss: 105.1718 - val_los
s: 74.0903
Epoch 46/600
6/6 [==============================] - 0s 6ms/step - loss: 99.6210 - val_loss:
69.0965
Epoch 47/600
6/6 [==============================] - 0s 5ms/step - loss: 94.0929 - val_loss:
64.1784
Epoch 48/600
6/6 [==============================] - 0s 5ms/step - loss: 88.8043 - val_loss:
59.5042
Epoch 49/600
6/6 [==============================] - 0s 8ms/step - loss: 83.3625 - val_loss:
55.2337
Epoch 50/600
6/6 [==============================] - 0s 5ms/step - loss: 78.2330 - val_loss:
51.1144
Epoch 51/600
6/6 [==============================] - 0s 5ms/step - loss: 73.4980 - val_loss:
47.3556
Epoch 52/600
6/6 [==============================] - 0s 5ms/step - loss: 69.0175 - val_loss:
44.0563
Epoch 53/600
6/6 [==============================] - 0s 6ms/step - loss: 64.9923 - val_loss:
41.2606
Epoch 54/600
6/6 [==============================] - 0s 5ms/step - loss: 61.2770 - val_loss:
39.1960
Epoch 55/600
6/6 [==============================] - 0s 6ms/step - loss: 58.3386 - val_loss:
37.6740
Epoch 56/600
6/6 [==============================] - 0s 6ms/step - loss: 55.8414 - val_loss:
36.5991
Epoch 57/600
6/6 [==============================] - 0s 5ms/step - loss: 54.0018 - val_loss:
35.9500
Epoch 58/600
6/6 [==============================] - 0s 5ms/step - loss: 52.7508 - val_loss:
35.6166
Epoch 59/600
6/6 [==============================] - 0s 6ms/step - loss: 51.5625 - val_loss:
35.5237
Epoch 60/600
6/6 [==============================] - 0s 5ms/step - loss: 50.9359 - val_loss:
35.5390
```

```
Epoch 61/600
6/6 [==============================] - 0s 5ms/step - loss: 50.4024 - val_loss:
35.6345
Epoch 62/600
6/6 [==============================] - 0s 5ms/step - loss: 49.9371 - val_loss:
35.7306
Epoch 63/600
6/6 [==============================] - 0s 5ms/step - loss: 49.7122 - val_loss:
35.9208
Epoch 64/600
6/6 [==============================] - 0s 5ms/step - loss: 49.4968 - val_loss:
36.1346
Epoch 65/600
6/6 [==============================] - 0s 5ms/step - loss: 49.2554 - val_loss:
36.2209
Epoch 66/600
6/6 [==============================] - 0s 5ms/step - loss: 49.1473 - val_loss:
36.2959
Epoch 67/600
6/6 [==============================] - 0s 5ms/step - loss: 49.0323 - val_loss:
36.3857
Epoch 68/600
6/6 [==============================] - 0s 6ms/step - loss: 49.0163 - val_loss:
36.6846
Epoch 69/600
6/6 [==============================] - 0s 5ms/step - loss: 48.8493 - val_loss:
36.8524
Epoch 70/600
6/6 [==============================] - 0s 5ms/step - loss: 48.7622 - val_loss:
36.8834
Epoch 71/600
6/6 [==============================] - 0s 5ms/step - loss: 48.7151 - val_loss:
36.8767
Epoch 72/600
6/6 [==============================] - 0s 5ms/step - loss: 48.6678 - val_loss:
37.0074
Epoch 73/600
6/6 [==============================] - 0s 5ms/step - loss: 48.6069 - val_loss:
37.0392
Epoch 74/600
6/6 [==============================] - 0s 5ms/step - loss: 48.5503 - val_loss:
37.0445
Epoch 75/600
6/6 [==============================] - 0s 5ms/step - loss: 48.5066 - val_loss:
36.8866
Epoch 76/600
6/6 [==============================] - 0s 5ms/step - loss: 48.4816 - val_loss:
36.5189
Epoch 77/600
6/6 [==============================] - 0s 5ms/step - loss: 48.4054 - val_loss:
36.4004
Epoch 78/600
6/6 [==============================] - 0s 5ms/step - loss: 48.3834 - val_loss:
36.2270
Epoch 79/600
6/6 [==============================] - 0s 5ms/step - loss: 48.3150 - val_loss:
36.3063
Epoch 80/600
6/6 [==============================] - 0s 5ms/step - loss: 48.2695 - val_loss:
36.3293
```

```
Epoch 81/600
6/6 [==============================] - 0s 5ms/step - loss: 48.2037 - val_loss:
36.1892
Epoch 82/600
6/6 [==============================] - 0s 5ms/step - loss: 48.1700 - val_loss:
36.0715
Epoch 83/600
6/6 [==============================] - 0s 5ms/step - loss: 48.1322 - val_loss:
35.7764
Epoch 84/600
6/6 [==============================] - 0s 5ms/step - loss: 48.0772 - val_loss:
35.7167
Epoch 85/600
6/6 [==============================] - 0s 5ms/step - loss: 48.0350 - val_loss:
35.7194
Epoch 86/600
6/6 [==============================] - 0s 5ms/step - loss: 47.9308 - val_loss:
35.8847
Epoch 87/600
6/6 [==============================] - 0s 5ms/step - loss: 47.8704 - val_loss:
36.0619
Epoch 88/600
6/6 [==============================] - 0s 5ms/step - loss: 47.9564 - val_loss:
36.5577
Epoch 89/600
6/6 [==============================] - 0s 5ms/step - loss: 47.8111 - val_loss:
36.5594
Epoch 90/600
6/6 [==============================] - 0s 5ms/step - loss: 47.7692 - val_loss:
36.4458
Epoch 91/600
6/6 [==============================] - 0s 5ms/step - loss: 47.7147 - val_loss:
36.1914
Epoch 92/600
6/6 [==============================] - 0s 4ms/step - loss: 47.6708 - val_loss:
35.9933
Epoch 93/600
6/6 [==============================] - 0s 5ms/step - loss: 47.6020 - val_loss:
36.1129
Epoch 94/600
6/6 [==============================] - 0s 5ms/step - loss: 47.5706 - val_loss:
36.2708
Epoch 95/600
6/6 [==============================] - 0s 5ms/step - loss: 47.5422 - val_loss:
36.2437
Epoch 96/600
6/6 [==============================] - 0s 5ms/step - loss: 47.4700 - val_loss:
36.0756
Epoch 97/600
6/6 [==============================] - 0s 5ms/step - loss: 47.4225 - val_loss:
35.9700
Epoch 98/600
6/6 [==============================] - 0s 5ms/step - loss: 47.3895 - val_loss:
35.8894
Epoch 99/600
6/6 [==============================] - 0s 5ms/step - loss: 47.3210 - val_loss:
35.8002
Epoch 100/600
6/6 [==============================] - 0s 5ms/step - loss: 47.2883 - val_loss:
35.6667
```

```
Epoch 101/600
6/6 [==============================] - 0s 5ms/step - loss: 47.2299 - val_loss:
35.3969
Epoch 102/600
6/6 [==============================] - 0s 5ms/step - loss: 47.1744 - val_loss:
35.1835
Epoch 103/600
6/6 [==============================] - 0s 5ms/step - loss: 47.1412 - val_loss:
34.9583
Epoch 104/600
6/6 [==============================] - 0s 5ms/step - loss: 47.1042 - val_loss:
34.8332
Epoch 105/600
6/6 [==============================] - 0s 5ms/step - loss: 47.0744 - val_loss:
34.7813
Epoch 106/600
6/6 [==============================] - 0s 5ms/step - loss: 47.0000 - val_loss:
34.8787
Epoch 107/600
6/6 [==============================] - 0s 5ms/step - loss: 46.9330 - val_loss:
35.1474
Epoch 108/600
6/6 [==============================] - 0s 5ms/step - loss: 46.9072 - val_loss:
35.2865
Epoch 109/600
6/6 [==============================] - 0s 5ms/step - loss: 46.9000 - val_loss:
35.3858
Epoch 110/600
6/6 [==============================] - 0s 5ms/step - loss: 46.8492 - val_loss:
35.3781
Epoch 111/600
6/6 [==============================] - 0s 5ms/step - loss: 46.8076 - val_loss:
35.2853
Epoch 112/600
6/6 [==============================] - 0s 5ms/step - loss: 46.7838 - val_loss:
35.3335
Epoch 113/600
6/6 [==============================] - 0s 5ms/step - loss: 46.7274 - val_loss:
35.2285
Epoch 114/600
6/6 [==============================] - 0s 5ms/step - loss: 46.7365 - val_loss:
35.2806
Epoch 115/600
6/6 [==============================] - 0s 5ms/step - loss: 46.6581 - val_loss:
34.9917
Epoch 116/600
6/6 [==============================] - 0s 5ms/step - loss: 46.5944 - val_loss:
34.8711
Epoch 117/600
6/6 [==============================] - 0s 6ms/step - loss: 46.5350 - val_loss:
34.5792
Epoch 118/600
6/6 [==============================] - 0s 6ms/step - loss: 46.5143 - val_loss:
34.2738
Epoch 119/600
6/6 [==============================] - 0s 6ms/step - loss: 46.4662 - val_loss:
34.1412
Epoch 120/600
6/6 [==============================] - 0s 6ms/step - loss: 46.4292 - val_loss:
34.0287
```

```
Epoch 121/600
6/6 [==============================] - 0s 5ms/step - loss: 46.4034 - val_loss:
34.0170
Epoch 122/600
6/6 [==============================] - 0s 5ms/step - loss: 46.3881 - val_loss:
34.2970
Epoch 123/600
6/6 [==============================] - 0s 5ms/step - loss: 46.3507 - val_loss:
34.4505
Epoch 124/600
6/6 [==============================] - 0s 4ms/step - loss: 46.3251 - val_loss:
34.2583
Epoch 125/600
6/6 [==============================] - 0s 5ms/step - loss: 46.2293 - val_loss:
34.3757
Epoch 126/600
6/6 [==============================] - 0s 5ms/step - loss: 46.1868 - val_loss:
34.2727
Epoch 127/600
6/6 [==============================] - 0s 5ms/step - loss: 46.1469 - val_loss:
34.1865
Epoch 128/600
6/6 [==============================] - 0s 5ms/step - loss: 46.1101 - val_loss:
34.0209
Epoch 129/600
6/6 [==============================] - 0s 5ms/step - loss: 46.0703 - val_loss:
34.0064
Epoch 130/600
6/6 [==============================] - 0s 5ms/step - loss: 46.0381 - val_loss:
33.9171
Epoch 131/600
6/6 [==============================] - 0s 5ms/step - loss: 46.0122 - val_loss:
33.8329
Epoch 132/600
6/6 [==============================] - 0s 5ms/step - loss: 45.9797 - val_loss:
34.0871
Epoch 133/600
6/6 [==============================] - 0s 5ms/step - loss: 45.9334 - val_loss:
34.1040
Epoch 134/600
6/6 [==============================] - 0s 4ms/step - loss: 45.8909 - val_loss:
34.2832
Epoch 135/600
6/6 [==============================] - 0s 6ms/step - loss: 45.9519 - val_loss:
34.4198
Epoch 136/600
6/6 [==============================] - 0s 6ms/step - loss: 45.8705 - val_loss:
33.9446
Epoch 137/600
6/6 [==============================] - 0s 6ms/step - loss: 45.7645 - val_loss:
33.6534
Epoch 138/600
6/6 [==============================] - 0s 8ms/step - loss: 45.7285 - val_loss:
33.4323
Epoch 139/600
6/6 [==============================] - 0s 5ms/step - loss: 45.7101 - val_loss:
33.2531
Epoch 140/600
6/6 [==============================] - 0s 5ms/step - loss: 45.6762 - val_loss:
33.1667
```

```
Epoch 141/600
6/6 [==============================] - 0s 5ms/step - loss: 45.6555 - val_loss:
33.0741
Epoch 142/600
6/6 [==============================] - 0s 5ms/step - loss: 45.6066 - val_loss:
33.1599
Epoch 143/600
6/6 [==============================] - 0s 5ms/step - loss: 45.5397 - val_loss:
33.4866
Epoch 144/600
6/6 [==============================] - 0s 6ms/step - loss: 45.4929 - val_loss:
33.7093
Epoch 145/600
6/6 [==============================] - 0s 6ms/step - loss: 45.4979 - val_loss:
33.9010
Epoch 146/600
6/6 [==============================] - 0s 5ms/step - loss: 45.4489 - val_loss:
33.7219
Epoch 147/600
6/6 [==============================] - 0s 6ms/step - loss: 45.3832 - val_loss:
33.3798
Epoch 148/600
6/6 [==============================] - 0s 6ms/step - loss: 45.3546 - val_loss:
33.1801
Epoch 149/600
6/6 [==============================] - 0s 6ms/step - loss: 45.3179 - val_loss:
33.1608
Epoch 150/600
6/6 [==============================] - 0s 5ms/step - loss: 45.2894 - val_loss:
32.9404
Epoch 151/600
6/6 [==============================] - 0s 6ms/step - loss: 45.2503 - val_loss:
32.8262
Epoch 152/600
6/6 [==============================] - 0s 5ms/step - loss: 45.2257 - val_loss:
32.7211
Epoch 153/600
6/6 [==============================] - 0s 5ms/step - loss: 45.1916 - val_loss:
32.6398
Epoch 154/600
6/6 [==============================] - 0s 5ms/step - loss: 45.1588 - val_loss:
32.5506
Epoch 155/600
6/6 [==============================] - 0s 5ms/step - loss: 45.1270 - val_loss:
32.5245
Epoch 156/600
6/6 [==============================] - 0s 6ms/step - loss: 45.0980 - val_loss:
32.4366
Epoch 157/600
6/6 [==============================] - 0s 5ms/step - loss: 45.0701 - val_loss:
32.4698
Epoch 158/600
6/6 [==============================] - 0s 5ms/step - loss: 45.0236 - val_loss:
32.6135
Epoch 159/600
6/6 [==============================] - 0s 5ms/step - loss: 44.9843 - val_loss:
32.5243
Epoch 160/600
6/6 [==============================] - 0s 5ms/step - loss: 44.9332 - val_loss:
32.4579
```

```
Epoch 161/600
6/6 [==============================] - 0s 6ms/step - loss: 44.9015 - val_loss:
32.3585
Epoch 162/600
6/6 [==============================] - 0s 5ms/step - loss: 44.8598 - val_loss:
32.1111
Epoch 163/600
6/6 [==============================] - 0s 5ms/step - loss: 44.8471 - val_loss:
31.9219
Epoch 164/600
6/6 [==============================] - 0s 5ms/step - loss: 44.8426 - val_loss:
31.9439
Epoch 165/600
6/6 [==============================] - 0s 5ms/step - loss: 44.7996 - val_loss:
31.8762
Epoch 166/600
6/6 [==============================] - 0s 5ms/step - loss: 44.7943 - val_loss:
31.8093
Epoch 167/600
6/6 [==============================] - 0s 5ms/step - loss: 44.7095 - val_loss:
32.0666
Epoch 168/600
6/6 [==============================] - 0s 5ms/step - loss: 44.6493 - val_loss:
32.1616
Epoch 169/600
6/6 [==============================] - 0s 5ms/step - loss: 44.6040 - val_loss:
32.2523
Epoch 170/600
6/6 [==============================] - 0s 5ms/step - loss: 44.6231 - val_loss:
32.4996
Epoch 171/600
6/6 [==============================] - 0s 5ms/step - loss: 44.5427 - val_loss:
32.5427
Epoch 172/600
6/6 [==============================] - 0s 5ms/step - loss: 44.5105 - val_loss:
32.7097
Epoch 173/600
6/6 [==============================] - 0s 5ms/step - loss: 44.4831 - val_loss:
32.8491
Epoch 174/600
6/6 [==============================] - 0s 5ms/step - loss: 44.4536 - val_loss:
32.4969
Epoch 175/600
6/6 [==============================] - 0s 5ms/step - loss: 44.3983 - val_loss:
32.2327
Epoch 176/600
6/6 [==============================] - 0s 5ms/step - loss: 44.3617 - val_loss:
32.0836
Epoch 177/600
6/6 [==============================] - 0s 5ms/step - loss: 44.3180 - val_loss:
32.0975
Epoch 178/600
6/6 [==============================] - 0s 5ms/step - loss: 44.2801 - val_loss:
31.9224
Epoch 179/600
6/6 [==============================] - 0s 5ms/step - loss: 44.2735 - val_loss:
31.6134
Epoch 180/600
6/6 [==============================] - 0s 5ms/step - loss: 44.2417 - val_loss:
31.5923
```

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Epoch 181/600
6/6 [==============================] - 0s 5ms/step - loss: 44.1864 - val_loss:
31.7465
Epoch 182/600
6/6 [==============================] - 0s 5ms/step - loss: 44.1843 - val_loss:
32.0802
Epoch 183/600
6/6 [==============================] - 0s 5ms/step - loss: 44.1041 - val_loss:
31.8943
Epoch 184/600
6/6 [==============================] - 0s 5ms/step - loss: 44.1026 - val_loss:
31.6184
Epoch 185/600
6/6 [==============================] - 0s 5ms/step - loss: 44.0376 - val_loss:
31.6552
Epoch 186/600
6/6 [==============================] - 0s 5ms/step - loss: 43.9904 - val_loss:
32.0002
Epoch 187/600
6/6 [==============================] - 0s 5ms/step - loss: 43.9629 - val_loss:
32.2011
Epoch 188/600
6/6 [==============================] - 0s 5ms/step - loss: 43.9417 - val_loss:
32.0675
Epoch 189/600
6/6 [==============================] - 0s 5ms/step - loss: 43.8962 - val_loss:
32.1275
Epoch 190/600
6/6 [==============================] - 0s 5ms/step - loss: 43.8740 - val_loss:
32.0673
Epoch 191/600
6/6 [==============================] - 0s 5ms/step - loss: 43.8334 - val_loss:
31.9402
Epoch 192/600
6/6 [==============================] - 0s 7ms/step - loss: 43.7953 - val_loss:
31.7836
Epoch 193/600
6/6 [==============================] - 0s 6ms/step - loss: 43.7537 - val_loss:
31.5820
Epoch 194/600
6/6 [==============================] - 0s 5ms/step - loss: 43.7268 - val_loss:
31.5148
Epoch 195/600
6/6 [==============================] - 0s 6ms/step - loss: 43.6897 - val_loss:
31.4038
Epoch 196/600
6/6 [==============================] - 0s 5ms/step - loss: 43.6658 - val_loss:
31.2695
Epoch 197/600
6/6 [==============================] - 0s 5ms/step - loss: 43.6338 - val_loss:
31.3645
Epoch 198/600
6/6 [==============================] - 0s 6ms/step - loss: 43.5910 - val_loss:
31.0351
Epoch 199/600
6/6 [==============================] - 0s 5ms/step - loss: 43.5587 - val_loss:
30.8109
Epoch 200/600
6/6 [==============================] - 0s 5ms/step - loss: 43.5384 - val_loss:
30.8037
```

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Epoch 201/600
6/6 [==============================] - 0s 5ms/step - loss: 43.5140 - val_loss:
30.5949
Epoch 202/600
6/6 [==============================] - 0s 5ms/step - loss: 43.4907 - val_loss:
30.4789
Epoch 203/600
6/6 [==============================] - 0s 6ms/step - loss: 43.4645 - val_loss:
30.4126
Epoch 204/600
6/6 [==============================] - 0s 5ms/step - loss: 43.4186 - val_loss:
30.4698
Epoch 205/600
6/6 [==============================] - 0s 6ms/step - loss: 43.3865 - val_loss:
30.4925
Epoch 206/600
6/6 [==============================] - 0s 5ms/step - loss: 43.3803 - val_loss:
30.7164
Epoch 207/600
6/6 [==============================] - 0s 5ms/step - loss: 43.2866 - val_loss:
30.6962
Epoch 208/600
6/6 [==============================] - 0s 5ms/step - loss: 43.2834 - val_loss:
30.8318
Epoch 209/600
6/6 [==============================] - 0s 5ms/step - loss: 43.2272 - val_loss:
30.9754
Epoch 210/600
6/6 [==============================] - 0s 5ms/step - loss: 43.1904 - val_loss:
31.0260
Epoch 211/600
6/6 [==============================] - 0s 5ms/step - loss: 43.1461 - val_loss:
30.8676
Epoch 212/600
6/6 [==============================] - 0s 5ms/step - loss: 43.1473 - val_loss:
30.7702
Epoch 213/600
6/6 [==============================] - 0s 5ms/step - loss: 43.0858 - val_loss:
31.1159
Epoch 214/600
6/6 [==============================] - 0s 6ms/step - loss: 43.0464 - val_loss:
31.2701
Epoch 215/600
6/6 [==============================] - 0s 5ms/step - loss: 43.0978 - val_loss:
31.6168
Epoch 216/600
6/6 [==============================] - 0s 5ms/step - loss: 43.0182 - val_loss:
31.5271
Epoch 217/600
6/6 [==============================] - 0s 5ms/step - loss: 42.9911 - val_loss:
31.5975
Epoch 218/600
6/6 [==============================] - 0s 5ms/step - loss: 42.9502 - val_loss:
31.6724
Epoch 219/600
6/6 [==============================] - 0s 6ms/step - loss: 42.9297 - val_loss:
31.5777
Epoch 220/600
6/6 [==============================] - 0s 5ms/step - loss: 42.8727 - val_loss:
31.3213
```

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Epoch 221/600
6/6 [==============================] - 0s 5ms/step - loss: 42.8337 - val_loss:
31.0474
Epoch 222/600
6/6 [==============================] - 0s 5ms/step - loss: 42.7718 - val_loss:
30.6616
Epoch 223/600
6/6 [==============================] - 0s 5ms/step - loss: 42.7731 - val_loss:
30.3535
Epoch 224/600
6/6 [==============================] - 0s 5ms/step - loss: 42.7030 - val_loss:
30.4552
Epoch 225/600
6/6 [==============================] - 0s 6ms/step - loss: 42.6847 - val_loss:
30.6014
Epoch 226/600
6/6 [==============================] - 0s 5ms/step - loss: 42.6225 - val_loss:
30.5364
Epoch 227/600
6/6 [==============================] - 0s 6ms/step - loss: 42.5993 - val_loss:
30.3873
Epoch 228/600
6/6 [==============================] - 0s 6ms/step - loss: 42.5560 - val_loss:
30.4312
Epoch 229/600
6/6 [==============================] - 0s 5ms/step - loss: 42.4938 - val_loss:
30.6482
Epoch 230/600
6/6 [==============================] - 0s 5ms/step - loss: 42.4791 - val_loss:
30.8167
Epoch 231/600
6/6 [==============================] - 0s 5ms/step - loss: 42.4580 - val_loss:
30.8858
Epoch 232/600
6/6 [==============================] - 0s 6ms/step - loss: 42.4597 - val_loss:
31.1196
Epoch 233/600
6/6 [==============================] - 0s 5ms/step - loss: 42.4106 - val_loss:
31.0253
Epoch 234/600
6/6 [==============================] - 0s 7ms/step - loss: 42.3601 - val_loss:
30.8254
Epoch 235/600
6/6 [==============================] - 0s 6ms/step - loss: 42.3152 - val_loss:
30.6411
Epoch 236/600
6/6 [==============================] - 0s 6ms/step - loss: 42.2542 - val_loss:
30.3335
Epoch 237/600
6/6 [==============================] - 0s 5ms/step - loss: 42.2204 - val_loss:
29.9540
Epoch 238/600
6/6 [==============================] - 0s 6ms/step - loss: 42.2063 - val_loss:
29.7817
Epoch 239/600
6/6 [==============================] - 0s 5ms/step - loss: 42.1781 - val_loss:
29.8206
Epoch 240/600
6/6 [==============================] - 0s 5ms/step - loss: 42.1385 - val_loss:
29.9249
```

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Epoch 241/600
6/6 [==============================] - 0s 6ms/step - loss: 42.1008 - val_loss:
29.9848
Epoch 242/600
6/6 [==============================] - 0s 6ms/step - loss: 42.1783 - val_loss:
30.5239
Epoch 243/600
6/6 [==============================] - 0s 6ms/step - loss: 42.0355 - val_loss:
30.4624
Epoch 244/600
6/6 [==============================] - 0s 6ms/step - loss: 41.9956 - val_loss:
30.4573
Epoch 245/600
6/6 [==============================] - 0s 5ms/step - loss: 41.9626 - val_loss:
30.5387
Epoch 246/600
6/6 [==============================] - 0s 5ms/step - loss: 41.9238 - val_loss:
30.5717
Epoch 247/600
6/6 [==============================] - 0s 5ms/step - loss: 41.8799 - val_loss:
30.3875
Epoch 248/600
6/6 [==============================] - 0s 5ms/step - loss: 41.8270 - val_loss:
30.1169
Epoch 249/600
6/6 [==============================] - 0s 5ms/step - loss: 41.8147 - val_loss:
30.1628
Epoch 250/600
6/6 [==============================] - 0s 5ms/step - loss: 41.7741 - val_loss:
30.0617
Epoch 251/600
6/6 [==============================] - 0s 5ms/step - loss: 41.7432 - val_loss:
29.7908
Epoch 252/600
6/6 [==============================] - 0s 5ms/step - loss: 41.6462 - val_loss:
29.5185
Epoch 253/600
6/6 [==============================] - 0s 5ms/step - loss: 41.6209 - val_loss:
29.2491
Epoch 254/600
6/6 [==============================] - 0s 5ms/step - loss: 41.5908 - val_loss:
29.1418
Epoch 255/600
6/6 [==============================] - 0s 5ms/step - loss: 41.5580 - val_loss:
29.2472
Epoch 256/600
6/6 [==============================] - 0s 5ms/step - loss: 41.5114 - val_loss:
29.2843
Epoch 257/600
6/6 [==============================] - 0s 5ms/step - loss: 41.4895 - val_loss:
29.3127
Epoch 258/600
6/6 [==============================] - 0s 5ms/step - loss: 41.4415 - val_loss:
29.1337
Epoch 259/600
6/6 [==============================] - 0s 5ms/step - loss: 41.4334 - val_loss:
28.9974
Epoch 260/600
6/6 [==============================] - 0s 5ms/step - loss: 41.4443 - val_loss:
29.1960
```

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Epoch 261/600
6/6 [==============================] - 0s 5ms/step - loss: 41.3566 - val_loss:
29.0106
Epoch 262/600
6/6 [==============================] - 0s 5ms/step - loss: 41.2989 - val_loss:
29.1897
Epoch 263/600
6/6 [==============================] - 0s 5ms/step - loss: 41.2965 - val_loss:
29.4506
Epoch 264/600
6/6 [==============================] - 0s 5ms/step - loss: 41.2284 - val_loss:
29.5527
Epoch 265/600
6/6 [==============================] - 0s 5ms/step - loss: 41.1975 - val_loss:
29.7851
Epoch 266/600
6/6 [==============================] - 0s 5ms/step - loss: 41.1943 - val_loss:
30.0835
Epoch 267/600
6/6 [==============================] - 0s 5ms/step - loss: 41.1710 - val_loss:
30.1178
Epoch 268/600
6/6 [==============================] - 0s 5ms/step - loss: 41.1262 - val_loss:
30.0032
Epoch 269/600
6/6 [==============================] - 0s 5ms/step - loss: 41.0890 - val_loss:
29.8458
Epoch 270/600
6/6 [==============================] - 0s 6ms/step - loss: 41.0543 - val_loss:
29.8791
Epoch 271/600
6/6 [==============================] - 0s 5ms/step - loss: 40.9651 - val_loss:
29.4586
Epoch 272/600
6/6 [==============================] - 0s 5ms/step - loss: 40.9770 - val_loss:
28.9337
Epoch 273/600
6/6 [==============================] - 0s 5ms/step - loss: 40.8923 - val_loss:
28.7572
Epoch 274/600
6/6 [==============================] - 0s 5ms/step - loss: 40.8814 - val_loss:
28.5536
Epoch 275/600
6/6 [==============================] - 0s 5ms/step - loss: 40.8335 - val_loss:
28.5547
Epoch 276/600
6/6 [==============================] - 0s 5ms/step - loss: 40.7989 - val_loss:
28.7862
Epoch 277/600
6/6 [==============================] - 0s 5ms/step - loss: 40.7547 - val_loss:
28.4708
Epoch 278/600
6/6 [==============================] - 0s 5ms/step - loss: 40.7751 - val_loss:
28.2087
Epoch 279/600
6/6 [==============================] - 0s 5ms/step - loss: 40.7095 - val_loss:
28.2618
Epoch 280/600
6/6 [==============================] - 0s 5ms/step - loss: 40.6780 - val_loss:
28.0801
```

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Epoch 281/600
6/6 [==============================] - 0s 6ms/step - loss: 40.6430 - val_loss:
27.9690
Epoch 282/600
6/6 [==============================] - 0s 5ms/step - loss: 40.6220 - val_loss:
28.0728
Epoch 283/600
6/6 [==============================] - 0s 5ms/step - loss: 40.5779 - val_loss:
28.2019
Epoch 284/600
6/6 [==============================] - 0s 5ms/step - loss: 40.5087 - val_loss:
28.0801
Epoch 285/600
6/6 [==============================] - 0s 6ms/step - loss: 40.4817 - val_loss:
28.1119
Epoch 286/600
6/6 [==============================] - 0s 6ms/step - loss: 40.4513 - val_loss:
28.2362
Epoch 287/600
6/6 [==============================] - 0s 6ms/step - loss: 40.4011 - val_loss:
28.2851
Epoch 288/600
6/6 [==============================] - 0s 5ms/step - loss: 40.3666 - val_loss:
28.4922
Epoch 289/600
6/6 [==============================] - 0s 5ms/step - loss: 40.3492 - val_loss:
28.5860
Epoch 290/600
6/6 [==============================] - 0s 5ms/step - loss: 40.2954 - val_loss:
28.2796
Epoch 291/600
6/6 [==============================] - 0s 6ms/step - loss: 40.2588 - val_loss:
28.1214
Epoch 292/600
6/6 [==============================] - 0s 5ms/step - loss: 40.2237 - val_loss:
28.2019
Epoch 293/600
6/6 [==============================] - 0s 5ms/step - loss: 40.1746 - val_loss:
28.3965
Epoch 294/600
6/6 [==============================] - 0s 5ms/step - loss: 40.1481 - val_loss:
28.4585
Epoch 295/600
6/6 [==============================] - 0s 5ms/step - loss: 40.1155 - val_loss:
28.7522
Epoch 296/600
6/6 [==============================] - 0s 5ms/step - loss: 40.0663 - val_loss:
28.9101
Epoch 297/600
6/6 [==============================] - 0s 5ms/step - loss: 40.0925 - val_loss:
29.1583
Epoch 298/600
6/6 [==============================] - 0s 5ms/step - loss: 40.0910 - val_loss:
29.1830
Epoch 299/600
6/6 [==============================] - 0s 6ms/step - loss: 39.9434 - val_loss:
28.4384
Epoch 300/600
6/6 [==============================] - 0s 5ms/step - loss: 39.9001 - val_loss:
28.0120
```

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Epoch 301/600
6/6 [==============================] - 0s 6ms/step - loss: 39.9544 - val_loss:
27.4817
Epoch 302/600
6/6 [==============================] - 0s 5ms/step - loss: 39.8524 - val_loss:
27.7240
Epoch 303/600
6/6 [==============================] - 0s 5ms/step - loss: 39.8695 - val_loss:
28.1890
Epoch 304/600
6/6 [==============================] - 0s 5ms/step - loss: 39.7904 - val_loss:
28.2037
Epoch 305/600
6/6 [==============================] - 0s 5ms/step - loss: 39.7968 - val_loss:
28.3566
Epoch 306/600
6/6 [==============================] - 0s 6ms/step - loss: 39.7353 - val_loss:
28.2448
Epoch 307/600
6/6 [==============================] - 0s 6ms/step - loss: 39.7163 - val_loss:
27.9341
Epoch 308/600
6/6 [==============================] - 0s 7ms/step - loss: 39.6554 - val_loss:
27.8312
Epoch 309/600
6/6 [==============================] - 0s 5ms/step - loss: 39.6446 - val_loss:
27.7555
Epoch 310/600
6/6 [==============================] - 0s 5ms/step - loss: 39.5946 - val_loss:
27.9165
Epoch 311/600
6/6 [==============================] - 0s 6ms/step - loss: 39.5574 - val_loss:
27.8948
Epoch 312/600
6/6 [==============================] - 0s 6ms/step - loss: 39.5421 - val_loss:
27.7396
Epoch 313/600
6/6 [==============================] - 0s 5ms/step - loss: 39.5030 - val_loss:
28.1795
Epoch 314/600
6/6 [==============================] - 0s 5ms/step - loss: 39.4795 - val_loss:
28.4553
Epoch 315/600
6/6 [==============================] - 0s 5ms/step - loss: 39.4459 - val_loss:
28.2092
Epoch 316/600
6/6 [==============================] - 0s 5ms/step - loss: 39.4002 - val_loss:
27.9407
Epoch 317/600
6/6 [==============================] - 0s 5ms/step - loss: 39.4260 - val_loss:
27.4370
Epoch 318/600
6/6 [==============================] - 0s 5ms/step - loss: 39.3481 - val_loss:
27.5178
Epoch 319/600
6/6 [==============================] - 0s 5ms/step - loss: 39.2771 - val_loss:
27.6209
Epoch 320/600
6/6 [==============================] - 0s 5ms/step - loss: 39.3105 - val_loss:
28.0383
```

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Epoch 321/600
6/6 [==============================] - 0s 5ms/step - loss: 39.2220 - val_loss:
27.7901
Epoch 322/600
6/6 [==============================] - 0s 5ms/step - loss: 39.2176 - val_loss:
27.3847
Epoch 323/600
6/6 [==============================] - 0s 5ms/step - loss: 39.1424 - val_loss:
27.4793
Epoch 324/600
6/6 [==============================] - 0s 5ms/step - loss: 39.1218 - val_loss:
27.7348
Epoch 325/600
6/6 [==============================] - 0s 5ms/step - loss: 39.1208 - val_loss:
27.5815
Epoch 326/600
6/6 [==============================] - 0s 5ms/step - loss: 39.0822 - val_loss:
27.0717
Epoch 327/600
6/6 [==============================] - 0s 5ms/step - loss: 39.0294 - val_loss:
26.7305
Epoch 328/600
6/6 [==============================] - 0s 5ms/step - loss: 39.0727 - val_loss:
26.4512
Epoch 329/600
6/6 [==============================] - 0s 5ms/step - loss: 39.0211 - val_loss:
26.6775
Epoch 330/600
6/6 [==============================] - 0s 5ms/step - loss: 38.9473 - val_loss:
26.7699
Epoch 331/600
6/6 [==============================] - 0s 5ms/step - loss: 38.8902 - val_loss:
26.9687
Epoch 332/600
6/6 [==============================] - 0s 5ms/step - loss: 38.9110 - val_loss:
27.3085
Epoch 333/600
6/6 [==============================] - 0s 5ms/step - loss: 38.8503 - val_loss:
27.4666
Epoch 334/600
6/6 [==============================] - 0s 5ms/step - loss: 38.8027 - val_loss:
27.6853
Epoch 335/600
6/6 [==============================] - 0s 5ms/step - loss: 38.7851 - val_loss:
27.6052
Epoch 336/600
6/6 [==============================] - 0s 6ms/step - loss: 38.7509 - val_loss:
27.5578
Epoch 337/600
6/6 [==============================] - 0s 5ms/step - loss: 38.7505 - val_loss:
27.5674
Epoch 338/600
6/6 [==============================] - 0s 5ms/step - loss: 38.6777 - val_loss:
27.6106
Epoch 339/600
6/6 [==============================] - 0s 5ms/step - loss: 38.6870 - val_loss:
27.7987
Epoch 340/600
6/6 [==============================] - 0s 5ms/step - loss: 38.6283 - val_loss:
27.8336
```

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Epoch 341/600
6/6 [==============================] - 0s 5ms/step - loss: 38.6091 - val_loss:
27.7896
Epoch 342/600
6/6 [==============================] - 0s 5ms/step - loss: 38.5882 - val_loss:
27.9099
Epoch 343/600
6/6 [==============================] - 0s 5ms/step - loss: 38.5450 - val_loss:
27.8848
Epoch 344/600
6/6 [==============================] - 0s 5ms/step - loss: 38.4912 - val_loss:
27.5843
Epoch 345/600
6/6 [==============================] - 0s 6ms/step - loss: 38.4399 - val_loss:
27.1956
Epoch 346/600
6/6 [==============================] - 0s 9ms/step - loss: 38.4162 - val_loss:
26.8028
Epoch 347/600
6/6 [==============================] - 0s 8ms/step - loss: 38.3491 - val_loss:
26.8014
Epoch 348/600
6/6 [==============================] - 0s 9ms/step - loss: 38.3196 - val_loss:
26.7120
Epoch 349/600
6/6 [==============================] - 0s 5ms/step - loss: 38.3213 - val_loss:
26.7677
Epoch 350/600
6/6 [==============================] - 0s 5ms/step - loss: 38.2587 - val_loss:
26.1105
Epoch 351/600
6/6 [==============================] - 0s 5ms/step - loss: 38.2413 - val_loss:
25.8746
Epoch 352/600
6/6 [==============================] - 0s 5ms/step - loss: 38.2392 - val_loss:
25.8452
Epoch 353/600
6/6 [==============================] - 0s 5ms/step - loss: 38.2346 - val_loss:
25.9818
Epoch 354/600
6/6 [==============================] - 0s 5ms/step - loss: 38.1432 - val_loss:
25.9661
Epoch 355/600
6/6 [==============================] - 0s 5ms/step - loss: 38.1193 - val_loss:
26.0521
Epoch 356/600
6/6 [==============================] - 0s 5ms/step - loss: 38.0845 - val_loss:
26.6732
Epoch 357/600
6/6 [==============================] - 0s 5ms/step - loss: 38.0210 - val_loss:
26.7376
Epoch 358/600
6/6 [==============================] - 0s 5ms/step - loss: 37.9750 - val_loss:
26.8771
Epoch 359/600
6/6 [==============================] - 0s 5ms/step - loss: 37.9445 - val_loss:
26.9530
Epoch 360/600
6/6 [==============================] - 0s 5ms/step - loss: 37.9618 - val_loss:
27.2048
```

```
Epoch 361/600
6/6 [==============================] - 0s 6ms/step - loss: 37.9152 - val_loss:
27.1089
Epoch 362/600
6/6 [==============================] - 0s 5ms/step - loss: 37.8617 - val_loss:
27.1275
Epoch 363/600
6/6 [==============================] - 0s 5ms/step - loss: 37.8771 - val_loss:
26.7983
Epoch 364/600
6/6 [==============================] - 0s 5ms/step - loss: 37.7932 - val_loss:
26.8982
Epoch 365/600
6/6 [==============================] - 0s 6ms/step - loss: 37.7545 - val_loss:
27.0253
Epoch 366/600
6/6 [==============================] - 0s 6ms/step - loss: 37.7488 - val_loss:
26.6207
Epoch 367/600
6/6 [==============================] - 0s 5ms/step - loss: 37.7080 - val_loss:
26.4862
Epoch 368/600
6/6 [==============================] - 0s 5ms/step - loss: 37.6647 - val_loss:
26.3341
Epoch 369/600
6/6 [==============================] - 0s 5ms/step - loss: 37.6854 - val_loss:
26.1367
Epoch 370/600
6/6 [==============================] - 0s 5ms/step - loss: 37.5938 - val_loss:
26.5482
Epoch 371/600
6/6 [==============================] - 0s 5ms/step - loss: 37.5858 - val_loss:
26.7865
Epoch 372/600
6/6 [==============================] - 0s 5ms/step - loss: 37.5690 - val_loss:
27.0274
Epoch 373/600
6/6 [==============================] - 0s 5ms/step - loss: 37.6047 - val_loss:
27.1487
Epoch 374/600
6/6 [==============================] - 0s 5ms/step - loss: 37.5276 - val_loss:
26.3746
Epoch 375/600
6/6 [==============================] - 0s 5ms/step - loss: 37.4453 - val_loss:
26.0856
Epoch 376/600
6/6 [==============================] - 0s 6ms/step - loss: 37.4719 - val_loss:
25.9181
Epoch 377/600
6/6 [==============================] - 0s 5ms/step - loss: 37.4094 - val_loss:
26.5275
Epoch 378/600
6/6 [==============================] - 0s 5ms/step - loss: 37.3740 - val_loss:
26.8281
Epoch 379/600
6/6 [==============================] - 0s 5ms/step - loss: 37.3734 - val_loss:
27.0718
Epoch 380/600
6/6 [==============================] - 0s 5ms/step - loss: 37.3555 - val_loss:
26.7043
```

```
Epoch 381/600
6/6 [==============================] - 0s 5ms/step - loss: 37.2914 - val_loss:
26.5861
Epoch 382/600
6/6 [==============================] - 0s 5ms/step - loss: 37.2628 - val_loss:
26.4302
Epoch 383/600
6/6 [==============================] - 0s 5ms/step - loss: 37.2250 - val_loss:
26.4912
Epoch 384/600
6/6 [==============================] - 0s 5ms/step - loss: 37.2235 - val_loss:
26.3939
Epoch 385/600
6/6 [==============================] - 0s 5ms/step - loss: 37.1356 - val_loss:
25.6618
Epoch 386/600
6/6 [==============================] - 0s 5ms/step - loss: 37.1558 - val_loss:
25.4275
Epoch 387/600
6/6 [==============================] - 0s 5ms/step - loss: 37.1401 - val_loss:
25.6464
Epoch 388/600
6/6 [==============================] - 0s 5ms/step - loss: 37.0763 - val_loss:
25.7299
Epoch 389/600
6/6 [==============================] - 0s 6ms/step - loss: 37.0535 - val_loss:
26.2524
Epoch 390/600
6/6 [==============================] - 0s 5ms/step - loss: 37.0003 - val_loss:
26.4816
Epoch 391/600
6/6 [==============================] - 0s 5ms/step - loss: 37.0481 - val_loss:
26.6436
Epoch 392/600
6/6 [==============================] - 0s 5ms/step - loss: 36.9693 - val_loss:
26.3807
Epoch 393/600
6/6 [==============================] - 0s 6ms/step - loss: 36.9429 - val_loss:
26.1495
Epoch 394/600
6/6 [==============================] - 0s 6ms/step - loss: 36.9017 - val_loss:
25.9966
Epoch 395/600
6/6 [==============================] - 0s 6ms/step - loss: 36.9364 - val_loss:
26.1465
Epoch 396/600
6/6 [==============================] - 0s 5ms/step - loss: 36.8400 - val_loss:
26.0757
Epoch 397/600
6/6 [==============================] - 0s 5ms/step - loss: 36.8050 - val_loss:
26.0827
Epoch 398/600
6/6 [==============================] - 0s 5ms/step - loss: 36.8494 - val_loss:
25.6842
Epoch 399/600
6/6 [==============================] - 0s 5ms/step - loss: 36.7432 - val_loss:
25.5549
Epoch 400/600
6/6 [==============================] - 0s 5ms/step - loss: 36.7321 - val_loss:
25.3682
```

```
Epoch 401/600
6/6 [==============================] - 0s 6ms/step - loss: 36.7023 - val_loss:
24.9192
Epoch 402/600
6/6 [==============================] - 0s 6ms/step - loss: 36.6871 - val_loss:
24.4769
Epoch 403/600
6/6 [==============================] - 0s 6ms/step - loss: 36.8909 - val_loss:
23.9132
Epoch 404/600
6/6 [==============================] - 0s 6ms/step - loss: 36.8727 - val_loss:
24.0037
Epoch 405/600
6/6 [==============================] - 0s 6ms/step - loss: 36.7957 - val_loss:
24.2024
Epoch 406/600
6/6 [==============================] - 0s 6ms/step - loss: 36.6886 - val_loss:
24.6422
Epoch 407/600
6/6 [==============================] - 0s 6ms/step - loss: 36.5729 - val_loss:
25.0721
Epoch 408/600
6/6 [==============================] - 0s 6ms/step - loss: 36.5125 - val_loss:
25.5648
Epoch 409/600
6/6 [==============================] - 0s 6ms/step - loss: 36.4724 - val_loss:
26.1669
Epoch 410/600
6/6 [==============================] - 0s 6ms/step - loss: 36.4565 - val_loss:
26.7450
Epoch 411/600
6/6 [==============================] - 0s 5ms/step - loss: 36.4722 - val_loss:
26.8138
Epoch 412/600
6/6 [==============================] - 0s 5ms/step - loss: 36.4588 - val_loss:
26.6973
Epoch 413/600
6/6 [==============================] - 0s 5ms/step - loss: 36.3944 - val_loss:
26.3912
Epoch 414/600
6/6 [==============================] - 0s 5ms/step - loss: 36.3399 - val_loss:
26.1460
Epoch 415/600
6/6 [==============================] - 0s 6ms/step - loss: 36.3201 - val_loss:
25.6609
Epoch 416/600
6/6 [==============================] - 0s 5ms/step - loss: 36.2636 - val_loss:
25.4728
Epoch 417/600
6/6 [==============================] - 0s 5ms/step - loss: 36.2508 - val_loss:
25.2913
Epoch 418/600
6/6 [==============================] - 0s 5ms/step - loss: 36.2374 - val_loss:
25.1515
Epoch 419/600
6/6 [==============================] - 0s 5ms/step - loss: 36.1924 - val_loss:
25.6553
Epoch 420/600
6/6 [==============================] - 0s 5ms/step - loss: 36.2281 - val_loss:
25.8935
```

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Epoch 421/600
6/6 [==============================] - 0s 6ms/step - loss: 36.1182 - val_loss:
25.4950
Epoch 422/600
6/6 [==============================] - 0s 6ms/step - loss: 36.1059 - val_loss:
25.2902
Epoch 423/600
6/6 [==============================] - 0s 6ms/step - loss: 36.0825 - val_loss:
25.3625
Epoch 424/600
6/6 [==============================] - 0s 6ms/step - loss: 36.0458 - val_loss:
25.4051
Epoch 425/600
6/6 [==============================] - 0s 6ms/step - loss: 36.0177 - val_loss:
25.4421
Epoch 426/600
6/6 [==============================] - 0s 6ms/step - loss: 35.9741 - val_loss:
25.6345
Epoch 427/600
6/6 [==============================] - 0s 5ms/step - loss: 35.9850 - val_loss:
26.0126
Epoch 428/600
6/6 [==============================] - 0s 5ms/step - loss: 35.9461 - val_loss:
25.8966
Epoch 429/600
6/6 [==============================] - 0s 5ms/step - loss: 35.8945 - val_loss:
25.4579
Epoch 430/600
6/6 [==============================] - 0s 5ms/step - loss: 35.9311 - val_loss:
24.7100
Epoch 431/600
6/6 [==============================] - 0s 7ms/step - loss: 35.8934 - val_loss:
24.6413
Epoch 432/600
6/6 [==============================] - 0s 6ms/step - loss: 35.8882 - val_loss:
24.3861
Epoch 433/600
6/6 [==============================] - 0s 6ms/step - loss: 35.8571 - val_loss:
24.6005
Epoch 434/600
6/6 [==============================] - 0s 6ms/step - loss: 35.8964 - val_loss:
25.5532
Epoch 435/600
6/6 [==============================] - 0s 5ms/step - loss: 35.7787 - val_loss:
25.9653
Epoch 436/600
6/6 [==============================] - 0s 5ms/step - loss: 35.7610 - val_loss:
25.4977
Epoch 437/600
6/6 [==============================] - 0s 6ms/step - loss: 35.7210 - val_loss:
25.5781
Epoch 438/600
6/6 [==============================] - 0s 5ms/step - loss: 35.6692 - val_loss:
25.1332
Epoch 439/600
6/6 [==============================] - 0s 6ms/step - loss: 35.6506 - val_loss:
24.5836
Epoch 440/600
6/6 [==============================] - 0s 5ms/step - loss: 35.6973 - val_loss:
24.3156
```

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Epoch 441/600
6/6 [==============================] - 0s 5ms/step - loss: 35.6688 - val_loss:
24.2156
Epoch 442/600
6/6 [==============================] - 0s 5ms/step - loss: 35.6111 - val_loss:
24.4303
Epoch 443/600
6/6 [==============================] - 0s 5ms/step - loss: 35.5659 - val_loss:
24.5787
Epoch 444/600
6/6 [==============================] - 0s 5ms/step - loss: 35.5797 - val_loss:
24.9377
Epoch 445/600
6/6 [==============================] - 0s 6ms/step - loss: 35.4914 - val_loss:
24.6459
Epoch 446/600
6/6 [==============================] - 0s 5ms/step - loss: 35.5319 - val_loss:
24.4542
Epoch 447/600
6/6 [==============================] - 0s 5ms/step - loss: 35.4878 - val_loss:
24.8144
Epoch 448/600
6/6 [==============================] - 0s 5ms/step - loss: 35.4185 - val_loss:
24.9960
Epoch 449/600
6/6 [==============================] - 0s 6ms/step - loss: 35.3671 - val_loss:
24.8832
Epoch 450/600
6/6 [==============================] - 0s 6ms/step - loss: 35.3743 - val_loss:
24.6938
Epoch 451/600
6/6 [==============================] - 0s 5ms/step - loss: 35.3783 - val_loss:
24.9844
Epoch 452/600
6/6 [==============================] - 0s 5ms/step - loss: 35.3021 - val_loss:
24.9998
Epoch 453/600
6/6 [==============================] - 0s 5ms/step - loss: 35.2781 - val_loss:
25.0039
Epoch 454/600
6/6 [==============================] - 0s 5ms/step - loss: 35.2612 - val_loss:
24.9168
Epoch 455/600
6/6 [==============================] - 0s 5ms/step - loss: 35.2191 - val_loss:
25.0822
Epoch 456/600
6/6 [==============================] - 0s 5ms/step - loss: 35.2309 - val_loss:
25.4527
Epoch 457/600
6/6 [==============================] - 0s 5ms/step - loss: 35.1647 - val_loss:
25.3274
Epoch 458/600
6/6 [==============================] - 0s 5ms/step - loss: 35.1355 - val_loss:
25.2342
Epoch 459/600
6/6 [==============================] - 0s 5ms/step - loss: 35.1561 - val_loss:
24.9962
Epoch 460/600
6/6 [==============================] - 0s 5ms/step - loss: 35.0856 - val_loss:
24.8112
```

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Epoch 461/600
6/6 [==============================] - 0s 5ms/step - loss: 35.0674 - val_loss:
24.6420
Epoch 462/600
6/6 [==============================] - 0s 5ms/step - loss: 35.0676 - val_loss:
24.8080
Epoch 463/600
6/6 [==============================] - 0s 5ms/step - loss: 35.0258 - val_loss:
24.8468
Epoch 464/600
6/6 [==============================] - 0s 5ms/step - loss: 34.9910 - val_loss:
24.9484
Epoch 465/600
6/6 [==============================] - 0s 5ms/step - loss: 34.9925 - val_loss:
25.3832
Epoch 466/600
6/6 [==============================] - 0s 5ms/step - loss: 34.9391 - val_loss:
25.2555
Epoch 467/600
6/6 [==============================] - 0s 5ms/step - loss: 34.9815 - val_loss:
24.8491
Epoch 468/600
6/6 [==============================] - 0s 6ms/step - loss: 34.8699 - val_loss:
25.2173
Epoch 469/600
6/6 [==============================] - 0s 6ms/step - loss: 34.8723 - val_loss:
25.3799
Epoch 470/600
6/6 [==============================] - 0s 6ms/step - loss: 34.9469 - val_loss:
25.0029
Epoch 471/600
6/6 [==============================] - 0s 5ms/step - loss: 34.8215 - val_loss:
25.3381
Epoch 472/600
6/6 [==============================] - 0s 5ms/step - loss: 34.7884 - val_loss:
25.6093
Epoch 473/600
6/6 [==============================] - 0s 5ms/step - loss: 34.7998 - val_loss:
25.7078
Epoch 474/600
6/6 [==============================] - 0s 6ms/step - loss: 34.7727 - val_loss:
25.4366
Epoch 475/600
6/6 [==============================] - 0s 5ms/step - loss: 34.7654 - val_loss:
25.2422
Epoch 476/600
6/6 [==============================] - 0s 5ms/step - loss: 34.7116 - val_loss:
25.7242
Epoch 477/600
6/6 [==============================] - 0s 5ms/step - loss: 34.7387 - val_loss:
25.9427
Epoch 478/600
6/6 [==============================] - 0s 5ms/step - loss: 34.6865 - val_loss:
25.3264
Epoch 479/600
6/6 [==============================] - 0s 6ms/step - loss: 34.6164 - val_loss:
25.1737
Epoch 480/600
6/6 [==============================] - 0s 6ms/step - loss: 34.5846 - val_loss:
24.7751
```

```
Epoch 481/600
6/6 [==============================] - 0s 5ms/step - loss: 34.5839 - val_loss:
24.5828
Epoch 482/600
6/6 [==============================] - 0s 5ms/step - loss: 34.5723 - val_loss:
24.6611
Epoch 483/600
6/6 [==============================] - 0s 5ms/step - loss: 34.5442 - val_loss:
24.6047
Epoch 484/600
6/6 [==============================] - 0s 6ms/step - loss: 34.5331 - val_loss:
24.6289
Epoch 485/600
6/6 [==============================] - 0s 6ms/step - loss: 34.5169 - val_loss:
24.3252
Epoch 486/600
6/6 [==============================] - 0s 6ms/step - loss: 34.5278 - val_loss:
24.2731
Epoch 487/600
6/6 [==============================] - 0s 6ms/step - loss: 34.5288 - val_loss:
23.6613
Epoch 488/600
6/6 [==============================] - 0s 5ms/step - loss: 34.5825 - val_loss:
23.2146
Epoch 489/600
6/6 [==============================] - 0s 5ms/step - loss: 34.6369 - val_loss:
23.2776
Epoch 490/600
6/6 [==============================] - 0s 5ms/step - loss: 34.5587 - val_loss:
23.6666
Epoch 491/600
6/6 [==============================] - 0s 5ms/step - loss: 34.4913 - val_loss:
23.8371
Epoch 492/600
6/6 [==============================] - 0s 5ms/step - loss: 34.4714 - val_loss:
24.3052
Epoch 493/600
6/6 [==============================] - 0s 5ms/step - loss: 34.3422 - val_loss:
24.4760
Epoch 494/600
6/6 [==============================] - 0s 5ms/step - loss: 34.3087 - val_loss:
24.5161
Epoch 495/600
6/6 [==============================] - 0s 6ms/step - loss: 34.2882 - val_loss:
24.6221
Epoch 496/600
6/6 [==============================] - 0s 6ms/step - loss: 34.2712 - val_loss:
24.5694
Epoch 497/600
6/6 [==============================] - 0s 6ms/step - loss: 34.2589 - val_loss:
24.7808
Epoch 498/600
6/6 [==============================] - 0s 5ms/step - loss: 34.3101 - val_loss:
25.3897
Epoch 499/600
6/6 [==============================] - 0s 5ms/step - loss: 34.2647 - val_loss:
24.9444
Epoch 500/600
6/6 [==============================] - 0s 5ms/step - loss: 34.1782 - val_loss:
24.8837
```

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Epoch 501/600
6/6 [==============================] - 0s 5ms/step - loss: 34.1597 - val_loss:
24.9759
Epoch 502/600
6/6 [==============================] - 0s 5ms/step - loss: 34.1493 - val_loss:
25.3946
Epoch 503/600
6/6 [==============================] - 0s 5ms/step - loss: 34.1281 - val_loss:
25.6839
Epoch 504/600
6/6 [==============================] - 0s 5ms/step - loss: 34.1290 - val_loss:
25.7314
Epoch 505/600
6/6 [==============================] - 0s 6ms/step - loss: 34.1069 - val_loss:
25.5452
Epoch 506/600
6/6 [==============================] - 0s 6ms/step - loss: 34.0885 - val_loss:
25.1502
Epoch 507/600
6/6 [==============================] - 0s 6ms/step - loss: 34.0497 - val_loss:
25.1316
Epoch 508/600
6/6 [==============================] - 0s 6ms/step - loss: 34.0103 - val_loss:
24.8426
Epoch 509/600
6/6 [==============================] - 0s 6ms/step - loss: 34.0386 - val_loss:
24.5233
Epoch 510/600
6/6 [==============================] - 0s 5ms/step - loss: 33.9884 - val_loss:
24.6410
Epoch 511/600
6/6 [==============================] - 0s 5ms/step - loss: 34.0278 - val_loss:
24.9523
Epoch 512/600
6/6 [==============================] - 0s 5ms/step - loss: 33.9362 - val_loss:
24.9958
Epoch 513/600
6/6 [==============================] - 0s 5ms/step - loss: 33.9252 - val_loss:
25.3171
Epoch 514/600
6/6 [==============================] - 0s 5ms/step - loss: 33.9015 - val_loss:
25.4587
Epoch 515/600
6/6 [==============================] - 0s 5ms/step - loss: 33.8612 - val_loss:
25.0372
Epoch 516/600
6/6 [==============================] - 0s 5ms/step - loss: 33.7948 - val_loss:
24.2146
Epoch 517/600
6/6 [==============================] - 0s 5ms/step - loss: 33.8815 - val_loss:
24.2302
Epoch 518/600
6/6 [==============================] - 0s 6ms/step - loss: 33.8326 - val_loss:
24.5464
Epoch 519/600
6/6 [==============================] - 0s 6ms/step - loss: 33.8214 - val_loss:
24.8372
Epoch 520/600
6/6 [==============================] - 0s 5ms/step - loss: 33.8615 - val_loss:
24.2490
```

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Epoch 521/600
6/6 [==============================] - 0s 6ms/step - loss: 33.8025 - val_loss:
24.1805
Epoch 522/600
6/6 [==============================] - 0s 6ms/step - loss: 33.7809 - val_loss:
24.1786
Epoch 523/600
6/6 [==============================] - 0s 6ms/step - loss: 33.7343 - val_loss:
24.0030
Epoch 524/600
6/6 [==============================] - 0s 6ms/step - loss: 33.7817 - val_loss:
24.2601
Epoch 525/600
6/6 [==============================] - 0s 5ms/step - loss: 33.7046 - val_loss:
24.5330
Epoch 526/600
6/6 [==============================] - 0s 5ms/step - loss: 33.6885 - val_loss:
24.8422
Epoch 527/600
6/6 [==============================] - 0s 5ms/step - loss: 33.6360 - val_loss:
24.9974
Epoch 528/600
6/6 [==============================] - 0s 5ms/step - loss: 33.6096 - val_loss:
25.5885
Epoch 529/600
6/6 [==============================] - 0s 6ms/step - loss: 33.6544 - val_loss:
26.1351
Epoch 530/600
6/6 [==============================] - 0s 5ms/step - loss: 33.6444 - val_loss:
25.8483
Epoch 531/600
6/6 [==============================] - 0s 5ms/step - loss: 33.6264 - val_loss:
25.4938
Epoch 532/600
6/6 [==============================] - 0s 5ms/step - loss: 33.5899 - val_loss:
25.6264
Epoch 533/600
6/6 [==============================] - 0s 5ms/step - loss: 33.5134 - val_loss:
24.9195
Epoch 534/600
6/6 [==============================] - 0s 8ms/step - loss: 33.5117 - val_loss:
24.7534
Epoch 535/600
6/6 [==============================] - 0s 5ms/step - loss: 33.4836 - val_loss:
24.9298
Epoch 536/600
6/6 [==============================] - 0s 6ms/step - loss: 33.4599 - val_loss:
24.8582
Epoch 537/600
6/6 [==============================] - 0s 5ms/step - loss: 33.4468 - val_loss:
24.8449
Epoch 538/600
6/6 [==============================] - 0s 5ms/step - loss: 33.4487 - val_loss:
24.9798
Epoch 539/600
6/6 [==============================] - 0s 5ms/step - loss: 33.4062 - val_loss:
24.5135
Epoch 540/600
6/6 [==============================] - 0s 5ms/step - loss: 33.4737 - val_loss:
23.9840
```

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Epoch 541/600
6/6 [==============================] - 0s 6ms/step - loss: 33.4083 - val_loss:
24.3181
Epoch 542/600
6/6 [==============================] - 0s 6ms/step - loss: 33.3631 - val_loss:
24.8213
Epoch 543/600
6/6 [==============================] - 0s 6ms/step - loss: 33.3483 - val_loss:
25.1051
Epoch 544/600
6/6 [==============================] - 0s 5ms/step - loss: 33.3146 - val_loss:
24.9750
Epoch 545/600
6/6 [==============================] - 0s 5ms/step - loss: 33.3005 - val_loss:
24.9848
Epoch 546/600
6/6 [==============================] - 0s 6ms/step - loss: 33.2716 - val_loss:
24.7639
Epoch 547/600
6/6 [==============================] - 0s 5ms/step - loss: 33.3636 - val_loss:
24.3091
Epoch 548/600
6/6 [==============================] - 0s 5ms/step - loss: 33.2825 - val_loss:
24.2887
Epoch 549/600
6/6 [==============================] - 0s 5ms/step - loss: 33.3079 - val_loss:
24.7589
Epoch 550/600
6/6 [==============================] - 0s 5ms/step - loss: 33.1957 - val_loss:
25.0822
Epoch 551/600
6/6 [==============================] - 0s 6ms/step - loss: 33.2189 - val_loss:
25.2553
Epoch 552/600
6/6 [==============================] - 0s 5ms/step - loss: 33.2955 - val_loss:
24.6662
Epoch 553/600
6/6 [==============================] - 0s 5ms/step - loss: 33.1529 - val_loss:
24.7642
Epoch 554/600
6/6 [==============================] - 0s 5ms/step - loss: 33.1367 - val_loss:
24.7871
Epoch 555/600
6/6 [==============================] - 0s 5ms/step - loss: 33.1270 - val_loss:
24.7482
Epoch 556/600
6/6 [==============================] - 0s 6ms/step - loss: 33.1147 - val_loss:
24.2997
Epoch 557/600
6/6 [==============================] - 0s 6ms/step - loss: 33.2308 - val_loss:
23.9454
Epoch 558/600
6/6 [==============================] - 0s 6ms/step - loss: 33.0538 - val_loss:
24.5907
Epoch 559/600
6/6 [==============================] - 0s 6ms/step - loss: 33.1113 - val_loss:
25.3557
Epoch 560/600
6/6 [==============================] - 0s 6ms/step - loss: 33.0297 - val_loss:
25.5800
```

```
Epoch 561/600
6/6 [==============================] - 0s 6ms/step - loss: 33.0167 - val_loss:
25.5399
Epoch 562/600
6/6 [==============================] - 0s 6ms/step - loss: 33.0123 - val_loss:
25.0684
Epoch 563/600
6/6 [==============================] - 0s 6ms/step - loss: 32.9710 - val_loss:
25.2968
Epoch 564/600
6/6 [==============================] - 0s 6ms/step - loss: 32.9722 - val_loss:
25.2140
Epoch 565/600
6/6 [==============================] - 0s 6ms/step - loss: 32.9310 - val_loss:
24.4550
Epoch 566/600
6/6 [==============================] - 0s 6ms/step - loss: 32.9313 - val_loss:
24.0633
Epoch 567/600
6/6 [==============================] - 0s 6ms/step - loss: 33.0187 - val_loss:
23.9436
Epoch 568/600
6/6 [==============================] - 0s 6ms/step - loss: 32.9860 - val_loss:
24.3475
Epoch 569/600
6/6 [==============================] - 0s 7ms/step - loss: 32.8803 - val_loss:
24.6246
Epoch 570/600
6/6 [==============================] - 0s 6ms/step - loss: 32.8572 - val_loss:
24.7949
Epoch 571/600
6/6 [==============================] - 0s 5ms/step - loss: 32.8315 - val_loss:
25.0172
Epoch 572/600
6/6 [==============================] - 0s 5ms/step - loss: 32.8267 - val_loss:
25.0879
Epoch 573/600
6/6 [==============================] - 0s 5ms/step - loss: 32.7953 - val_loss:
24.9772
Epoch 574/600
6/6 [==============================] - 0s 5ms/step - loss: 32.7986 - val_loss:
24.9077
Epoch 575/600
6/6 [==============================] - 0s 5ms/step - loss: 32.7451 - val_loss:
25.5180
Epoch 576/600
6/6 [==============================] - 0s 5ms/step - loss: 32.8120 - val_loss:
25.9157
Epoch 577/600
6/6 [==============================] - 0s 5ms/step - loss: 32.7082 - val_loss:
25.2471
Epoch 578/600
6/6 [==============================] - 0s 5ms/step - loss: 32.6899 - val_loss:
24.6339
Epoch 579/600
6/6 [==============================] - 0s 5ms/step - loss: 32.7127 - val_loss:
24.6489
Epoch 580/600
6/6 [==============================] - 0s 5ms/step - loss: 32.6997 - val_loss:
24.8711
```

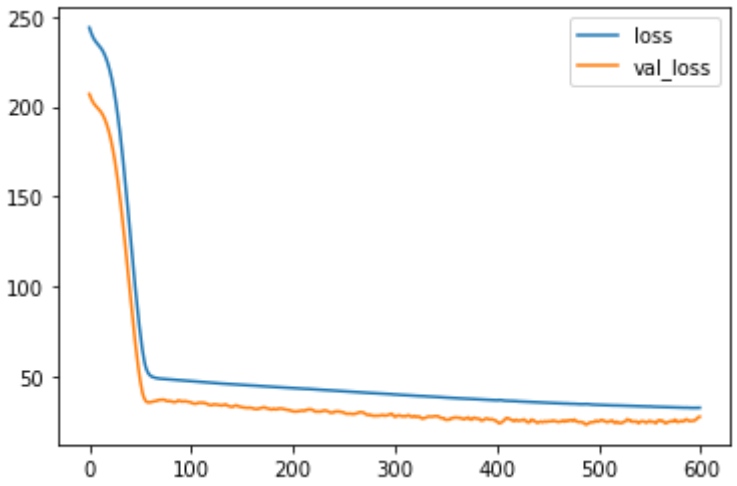
```
Epoch 581/600
6/6 [==============================] - 0s 5ms/step - loss: 32.7063 - val_loss:
25.1902
Epoch 582/600
6/6 [==============================] - 0s 5ms/step - loss: 32.6647 - val_loss:
25.2680
Epoch 583/600
6/6 [==============================] - 0s 5ms/step - loss: 32.6654 - val_loss:
24.9659
Epoch 584/600
6/6 [==============================] - 0s 5ms/step - loss: 32.6285 - val_loss:
24.9589
Epoch 585/600
6/6 [==============================] - 0s 5ms/step - loss: 32.5892 - val_loss:
25.4572
Epoch 586/600
6/6 [==============================] - 0s 6ms/step - loss: 32.5728 - val_loss:
25.8503
Epoch 587/600
6/6 [==============================] - 0s 6ms/step - loss: 32.6449 - val_loss:
26.0946
Epoch 588/600
6/6 [==============================] - 0s 5ms/step - loss: 32.5680 - val_loss:
25.7982
Epoch 589/600
6/6 [==============================] - 0s 5ms/step - loss: 32.5392 - val_loss:
25.5654
Epoch 590/600
6/6 [==============================] - 0s 6ms/step - loss: 32.5496 - val_loss:
25.1137
Epoch 591/600
6/6 [==============================] - 0s 6ms/step - loss: 32.5199 - val_loss:
25.1936
Epoch 592/600
6/6 [==============================] - 0s 6ms/step - loss: 32.4757 - val_loss:
25.2191
Epoch 593/600
6/6 [==============================] - 0s 6ms/step - loss: 32.4683 - val_loss:
25.2692
Epoch 594/600
6/6 [==============================] - 0s 6ms/step - loss: 32.4600 - val_loss:
25.4263
Epoch 595/600
6/6 [==============================] - 0s 6ms/step - loss: 32.4354 - val_loss:
25.4299
Epoch 596/600
6/6 [==============================] - 0s 6ms/step - loss: 32.4111 - val_loss:
25.8767
Epoch 597/600
6/6 [==============================] - 0s 6ms/step - loss: 32.3711 - val_loss:
26.4018
Epoch 598/600
6/6 [==============================] - 0s 6ms/step - loss: 32.4390 - val_loss:
26.8181
Epoch 599/600
6/6 [==============================] - 0s 6ms/step - loss: 32.5215 - val_loss:
27.4669
Epoch 600/600
6/6 [==============================] - 0s 6ms/step - loss: 32.5545 - val_loss:
27.5280
```

Out[24]:
```
<keras.callbacks.History at 0x7fc803264760>
```

In [25]:
```
losses = pd.DataFrame(model.history.history)
```

In [26]:
```
losses.plot()
```

Out[26]:
```
<AxesSubplot:>
```



In [27]:
```
from sklearn.metrics import mean_squared_error, mean_absolute_error,explained_v
```

In [28]:
```
predictions = model.predict(X_test)
```

```
3/3 [==============================] - 0s 1ms/step
```

In [29]:
```
mean_squared_error(y_test,predictions)
```

Out[29]:
```
27.528007555121153
```

In [30]:
```
model.evaluate(X_test, y_test, verbose=0)
```

Out[30]:
```
27.52800750732422
```

In [31]:
```
model.evaluate(X_train, y_train, verbose=0)
```

Out[31]:
```
32.52951431274414
```

In [32]:
```
predictions
```

Out[32]:
```
array([[ 7.4368587],
       [16.573132 ],
       [ 4.823219 ],
       [10.748801 ],
       [11.886495 ],
       [12.440593 ],
       [ 5.865034 ],
       [33.57736  ],
       [12.072029 ],
       [ 6.0924926],
       [ 8.599006 ],
       [ 8.27779  ],
       [10.638844 ],
       [ 9.436835 ],
       [24.328909 ],
       [41.118977 ],
       [14.144462 ],
       [15.1200075],
       [10.645242 ],
       [ 6.150387 ],
       [ 8.168199 ],
       [ 7.9736137],
       [26.406515 ],
       [12.825786 ],
       [ 8.234953 ],
       [ 6.7322507],
       [ 3.5443583],
       [11.82043  ],
       [14.94581  ],
       [26.270552 ],
       [11.966598 ],
       [11.960028 ],
       [12.946995 ],
       [15.603886 ],
       [22.391735 ],
       [10.457132 ],
       [14.476869 ],
       [ 7.867947 ],
       [34.57263  ],
       [14.5824   ],
       [22.445267 ],
       [ 9.720267 ],
       [ 4.372938 ],
       [18.88223  ],
       [17.61492  ],
       [16.771568 ],
       [ 5.9468427],
       [16.225832 ],
       [ 7.4270635],
       [14.738954 ],
       [11.49364  ],
       [ 9.070735 ],
       [ 5.707209 ],
       [ 5.9752088],
       [14.109986 ],
       [16.361387 ],
       [16.354643 ],
       [ 6.7196116],
       [ 9.138942 ],
       [21.948769 ],
```

```
       [34.40492  ],
       [18.591433 ],
       [31.960009 ],
       [ 8.786943 ],
       [ 6.2203383],
       [25.542809 ],
       [15.026489 ],
       [13.879804 ],
       [13.925122 ],
       [14.41505  ],
       [10.66349  ],
       [18.085897 ],
       [ 9.27049  ]], dtype=float32)
```

In [33]:
```
predictions = pd.Series(predictions.reshape(73,))
```

In [34]:
```
predictions
```

Out[34]:
```
0      7.436859
1     16.573132
2      4.823219
3     10.748801
4     11.886495
        ...
68    13.925122
69    14.415050
70    10.663490
71    18.085897
72     9.270490
Length: 73, dtype: float32
```

In [35]:
```
pred_df = pd.DataFrame(y_test,columns=['Test True Y'])
```

In [37]:
```
pred_df=pd.concat([pred_df,predictions],axis=1)
```

In [38]:
```
pred_df.columns = ['Test True Y', 'Model Predictions']
```

In [39]:
```
pred_df
```

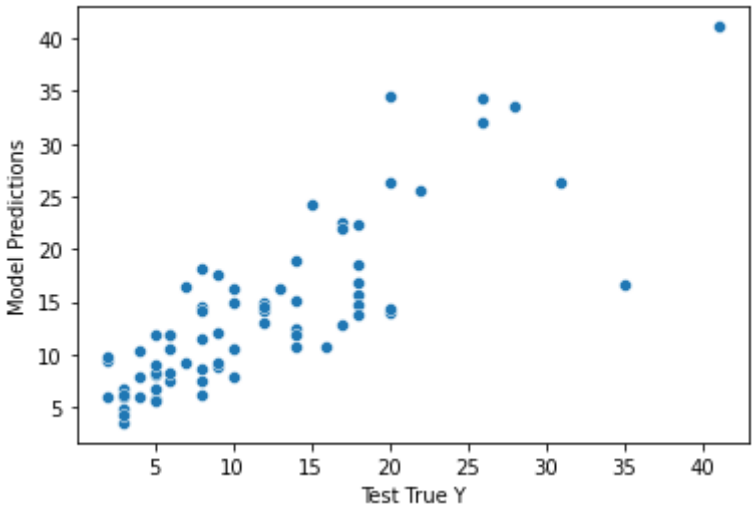
Out[39]:

	Test True Y	Model Predictions
0	6.0	7.436859
1	35.0	16.573132
2	3.0	4.823219
3	14.0	10.748801
4	5.0	11.886495
...	...	...
68	20.0	13.925122
69	20.0	14.415050
70	16.0	10.663490
71	8.0	18.085897
72	9.0	9.270490

73 rows × 2 columns

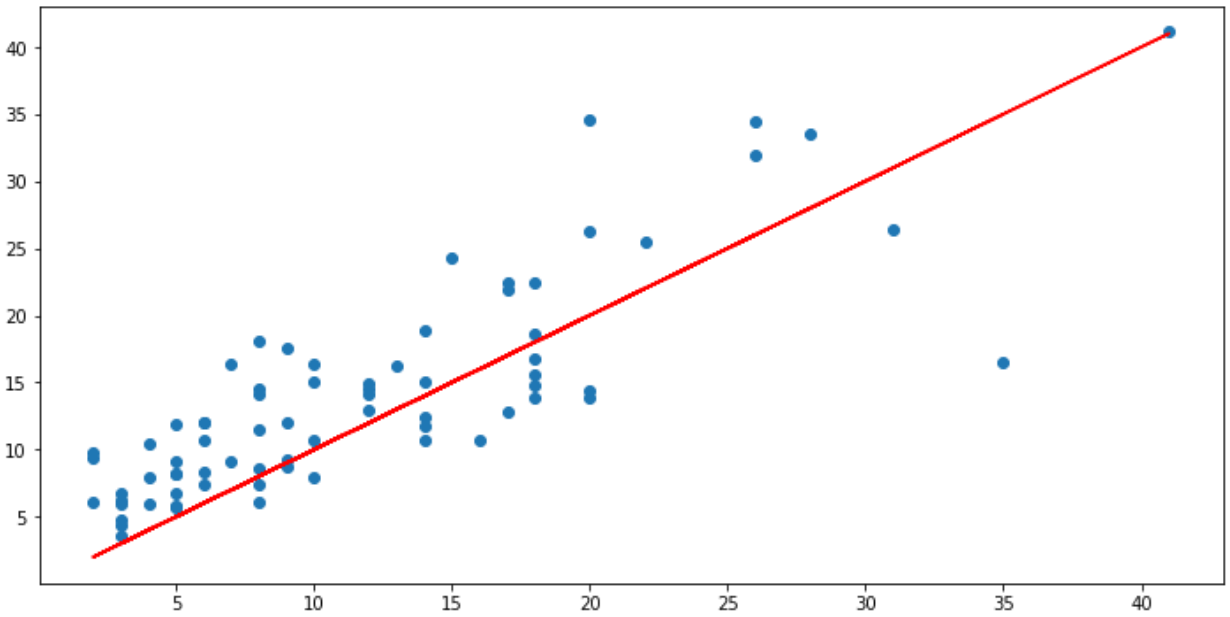
In [40]:
```
sns.scatterplot(x='Test True Y', y='Model Predictions', data=pred_df)
```

Out[40]:
```
<AxesSubplot:xlabel='Test True Y', ylabel='Model Predictions'>
```



In [41]:
```
plt.figure(figsize=(12,6))
plt.scatter(y_test, predictions)
plt.plot(y_test,y_test,'r')
```

Out[41]:
```
[<matplotlib.lines.Line2D at 0x7fc80439ebb0>]
```



In [42]:
```
mean_absolute_error(y_test,predictions)
```

Out[42]:
```
4.140023146590141
```

In [43]:
```
df["Today's Points"].describe()
```

Out[43]:
```
count    241.000000
mean      12.709544
std        8.192900
min        2.000000
25%        7.000000
50%       11.000000
75%       17.000000
max       42.000000
Name: Today's Points, dtype: float64
```

In [44]:
```
explained_variance_score(y_test, predictions)
```

Out[44]:
```
0.6611291472002158
```

In [45]:
```
single_player = df.drop("Today's Points", axis=1).iloc[0]
```

In [47]:
```
single_player = scaler.transform(single_player.values.reshape(-1,6))
```

In [49]:
```
model.predict(single_player)
```

Out[49]:
```
1/1 [==============================] - 0s 31ms/step
array([[7.77626]], dtype=float32)
```

In [50]:
```
df.head()
```

Out[50]:

	Season PPG	Last 5 PPG	Last 10 PPG	Opp DR	Season MP	Projected MP Today	Today's Points
0	6.3	5.2	4.7	114.8	16.2	16.9	10.0
1	3.8	6.0	6.4	108.9	11.0	11.0	5.0
2	3.8	7.0	6.1	108.4	12.3	20.6	8.0
3	10.2	14.3	10.7	108.9	29.1	29.1	13.0
4	11.7	14.0	15.6	109.9	28.6	28.6	10.0

In [ ]: