In [48]:
```
import pandas as pd
import tensorflow as tf
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from tensorflow.keras import layers, models

parp_data = pd.read_csv('parp_merged.csv')
mtor_data = pd.read_csv('mtor_merged.csv')
akt_data = pd.read_csv('akt_merged.csv')

parp_data = parp_data.drop(columns=['Drug Name'])
mtor_data = mtor_data.drop(columns=['Drug Name'])
akt_data = akt_data.drop(columns=['Drug Name'])

parp_train, parp_test = train_test_split(parp_data, test_size=0.2, random_state=42)
mtor_train, mtor_test = train_test_split(mtor_data, test_size=0.2, random_state=42)
akt_train, akt_test = train_test_split(akt_data, test_size=0.2, random_state=42)
akt_data
```

Out[48]:

	MaxEStateIndex	MinEStateIndex	MaxAbsEStateIndex	MinAbsEStateIndex	qed	MolWt	Heav
0	8.925933	-4.110077	8.925933	0.082105	0.396777	397.482	
1	13.792375	-4.510532	13.792375	0.184711	0.261050	551.654	
2	14.768705	-4.825164	14.768705	0.095096	0.476889	428.924	
3	14.145721	-11.220062	14.145721	0.218475	0.225291	558.536	
4	14.768705	-4.825164	14.768705	0.095096	0.476889	428.924	
5	14.621491	-4.218123	14.621491	0.161900	0.571782	463.793	
6	12.683225	-3.525434	12.683225	0.030695	0.468068	407.477	
7	8.589972	-3.674320	8.589972	0.198014	0.692988	313.788	

8 rows × 2257 columns

In [49]:
```
train_data = pd.concat([parp_train, mtor_train, akt_train])
test_data = pd.concat([parp_test, mtor_test, akt_test])

train_features = train_data.drop(columns=['Z Score'])
train_labels = train_data['Z Score']
test_features = test_data.drop(columns=['Z Score'])
test_labels = test_data['Z Score']

scaler = StandardScaler()

train_features = scaler.fit_transform(train_features)
test_features = scaler.transform(test_features)

train_features = train_features.reshape(-1, 2256, 1)
test_features = test_features.reshape(-1, 2256, 1)
```

In [50]:
```
model = models.Sequential()
model.add(layers.Conv1D(32, 3, activation='relu', input_shape=(2256, 1)))
model.add(layers.MaxPooling1D(2))
model.add(layers.Conv1D(64, 3, activation='relu'))
model.add(layers.MaxPooling1D(2))
model.add(layers.Flatten())
model.add(layers.Dense(64, activation='relu'))
model.add(layers.Dense(1))

model.compile(optimizer='adam',
              loss='mse',
              metrics=['mae'])
```

In [51]:
```
epochs = 250

train_features = train_features.reshape(-1, 2256, 1)
test_features = test_features.reshape(-1, 2256, 1)


history = model.fit(train_features, train_labels, epochs=epochs, validation_data=(test
```

```
Epoch 1/250
1/1 [==============================] - 1s 700ms/step - loss: 2.5182 - mae: 1.4397 - v
al_loss: 34.6663 - val_mae: 5.8408
Epoch 2/250
1/1 [==============================] - 0s 59ms/step - loss: 41.8726 - mae: 6.3057 - v
al_loss: 0.9013 - val_mae: 0.8576
Epoch 3/250
1/1 [==============================] - 0s 63ms/step - loss: 1.1829 - mae: 1.0117 - va
l_loss: 1.9185 - val_mae: 1.2831
Epoch 4/250
1/1 [==============================] - 0s 57ms/step - loss: 2.1960 - mae: 1.3506 - va
l_loss: 1.9203 - val_mae: 1.2822
Epoch 5/250
1/1 [==============================] - 0s 53ms/step - loss: 2.2766 - mae: 1.3649 - va
l_loss: 1.9207 - val_mae: 1.2823
Epoch 6/250
1/1 [==============================] - 0s 50ms/step - loss: 2.2760 - mae: 1.3644 - va
l_loss: 1.9208 - val_mae: 1.2823
Epoch 7/250
1/1 [==============================] - 0s 50ms/step - loss: 2.2761 - mae: 1.3645 - va
l_loss: 1.9206 - val_mae: 1.2823
Epoch 8/250
1/1 [==============================] - 0s 50ms/step - loss: 2.2759 - mae: 1.3644 - va
l_loss: 1.9201 - val_mae: 1.2821
Epoch 9/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2754 - mae: 1.3642 - va
l_loss: 1.9195 - val_mae: 1.2819
Epoch 10/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2748 - mae: 1.3640 - va
l_loss: 1.9188 - val_mae: 1.2816
Epoch 11/250
1/1 [==============================] - 0s 50ms/step - loss: 2.2740 - mae: 1.3637 - va
l_loss: 1.9179 - val_mae: 1.2812
Epoch 12/250
1/1 [==============================] - 0s 50ms/step - loss: 2.2731 - mae: 1.3633 - va
l_loss: 1.9169 - val_mae: 1.2808
Epoch 13/250
1/1 [==============================] - 0s 50ms/step - loss: 2.2720 - mae: 1.3630 - va
l_loss: 1.9158 - val_mae: 1.2804
Epoch 14/250
1/1 [==============================] - 0s 50ms/step - loss: 2.2708 - mae: 1.3625 - va
l_loss: 1.9146 - val_mae: 1.2799
Epoch 15/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2695 - mae: 1.3621 - va
l_loss: 1.9133 - val_mae: 1.2794
Epoch 16/250
1/1 [==============================] - 0s 47ms/step - loss: 2.2682 - mae: 1.3616 - va
l_loss: 1.9120 - val_mae: 1.2789
Epoch 17/250
1/1 [==============================] - 0s 48ms/step - loss: 2.2667 - mae: 1.3610 - va
l_loss: 1.9106 - val_mae: 1.2784
Epoch 18/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2652 - mae: 1.3605 - va
l_loss: 1.9091 - val_mae: 1.2778
Epoch 19/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2637 - mae: 1.3599 - va
l_loss: 1.9076 - val_mae: 1.2772
Epoch 20/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2620 - mae: 1.3593 - va
l_loss: 1.9060 - val_mae: 1.2766
```

```
Epoch 21/250
1/1 [==============================] - 0s 48ms/step - loss: 2.2604 - mae: 1.3587 - va
l_loss: 1.9044 - val_mae: 1.2759
Epoch 22/250
1/1 [==============================] - 0s 47ms/step - loss: 2.2586 - mae: 1.3581 - va
l_loss: 1.9027 - val_mae: 1.2753
Epoch 23/250
1/1 [==============================] - 0s 48ms/step - loss: 2.2569 - mae: 1.3574 - va
l_loss: 1.9010 - val_mae: 1.2746
Epoch 24/250
1/1 [==============================] - 0s 53ms/step - loss: 2.2551 - mae: 1.3567 - va
l_loss: 1.8993 - val_mae: 1.2739
Epoch 25/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2532 - mae: 1.3561 - va
l_loss: 1.8975 - val_mae: 1.2732
Epoch 26/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2513 - mae: 1.3554 - va
l_loss: 1.8957 - val_mae: 1.2725
Epoch 27/250
1/1 [==============================] - 0s 48ms/step - loss: 2.2494 - mae: 1.3547 - va
l_loss: 1.8939 - val_mae: 1.2718
Epoch 28/250
1/1 [==============================] - 0s 48ms/step - loss: 2.2475 - mae: 1.3539 - va
l_loss: 1.8920 - val_mae: 1.2711
Epoch 29/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2455 - mae: 1.3532 - va
l_loss: 1.8902 - val_mae: 1.2704
Epoch 30/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2435 - mae: 1.3525 - va
l_loss: 1.8883 - val_mae: 1.2696
Epoch 31/250
1/1 [==============================] - 0s 54ms/step - loss: 2.2415 - mae: 1.3517 - va
l_loss: 1.8864 - val_mae: 1.2689
Epoch 32/250
1/1 [==============================] - 0s 50ms/step - loss: 2.2395 - mae: 1.3510 - va
l_loss: 1.8845 - val_mae: 1.2681
Epoch 33/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2375 - mae: 1.3502 - va
l_loss: 1.8825 - val_mae: 1.2674
Epoch 34/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2354 - mae: 1.3495 - va
l_loss: 1.8806 - val_mae: 1.2666
Epoch 35/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2333 - mae: 1.3487 - va
l_loss: 1.8786 - val_mae: 1.2658
Epoch 36/250
1/1 [==============================] - 0s 47ms/step - loss: 2.2312 - mae: 1.3479 - va
l_loss: 1.8766 - val_mae: 1.2650
Epoch 37/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2291 - mae: 1.3471 - va
l_loss: 1.8746 - val_mae: 1.2642
Epoch 38/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2270 - mae: 1.3463 - va
l_loss: 1.8726 - val_mae: 1.2634
Epoch 39/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2248 - mae: 1.3456 - va
l_loss: 1.8706 - val_mae: 1.2626
Epoch 40/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2227 - mae: 1.3448 - va
l_loss: 1.8686 - val_mae: 1.2618
```

```
Epoch 41/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2205 - mae: 1.3440 - va
l_loss: 1.8665 - val_mae: 1.2610
Epoch 42/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2184 - mae: 1.3431 - va
l_loss: 1.8645 - val_mae: 1.2602
Epoch 43/250
1/1 [==============================] - 0s 50ms/step - loss: 2.2162 - mae: 1.3423 - va
l_loss: 1.8624 - val_mae: 1.2594
Epoch 44/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2140 - mae: 1.3415 - va
l_loss: 1.8604 - val_mae: 1.2586
Epoch 45/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2118 - mae: 1.3407 - va
l_loss: 1.8583 - val_mae: 1.2578
Epoch 46/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2096 - mae: 1.3399 - va
l_loss: 1.8562 - val_mae: 1.2569
Epoch 47/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2074 - mae: 1.3391 - va
l_loss: 1.8542 - val_mae: 1.2561
Epoch 48/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2052 - mae: 1.3382 - va
l_loss: 1.8521 - val_mae: 1.2553
Epoch 49/250
1/1 [==============================] - 0s 52ms/step - loss: 2.2030 - mae: 1.3374 - va
l_loss: 1.8500 - val_mae: 1.2545
Epoch 50/250
1/1 [==============================] - 0s 49ms/step - loss: 2.2007 - mae: 1.3366 - va
l_loss: 1.8479 - val_mae: 1.2536
Epoch 51/250
1/1 [==============================] - 0s 49ms/step - loss: 2.1985 - mae: 1.3357 - va
l_loss: 1.8458 - val_mae: 1.2528
Epoch 52/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1963 - mae: 1.3349 - va
l_loss: 1.8437 - val_mae: 1.2519
Epoch 53/250
1/1 [==============================] - 0s 54ms/step - loss: 2.1940 - mae: 1.3340 - va
l_loss: 1.8416 - val_mae: 1.2511
Epoch 54/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1918 - mae: 1.3332 - va
l_loss: 1.8395 - val_mae: 1.2502
Epoch 55/250
1/1 [==============================] - 0s 47ms/step - loss: 2.1895 - mae: 1.3324 - va
l_loss: 1.8373 - val_mae: 1.2494
Epoch 56/250
1/1 [==============================] - 0s 46ms/step - loss: 2.1873 - mae: 1.3315 - va
l_loss: 1.8352 - val_mae: 1.2486
Epoch 57/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1850 - mae: 1.3307 - va
l_loss: 1.8331 - val_mae: 1.2477
Epoch 58/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1827 - mae: 1.3298 - va
l_loss: 1.8310 - val_mae: 1.2468
Epoch 59/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1805 - mae: 1.3290 - va
l_loss: 1.8288 - val_mae: 1.2460
Epoch 60/250
1/1 [==============================] - 0s 47ms/step - loss: 2.1782 - mae: 1.3281 - va
l_loss: 1.8267 - val_mae: 1.2451
```

```
Epoch 61/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1759 - mae: 1.3272 - va
l_loss: 1.8246 - val_mae: 1.2443
Epoch 62/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1736 - mae: 1.3264 - va
l_loss: 1.8224 - val_mae: 1.2434
Epoch 63/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1714 - mae: 1.3255 - va
l_loss: 1.8203 - val_mae: 1.2426
Epoch 64/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1691 - mae: 1.3247 - va
l_loss: 1.8181 - val_mae: 1.2417
Epoch 65/250
1/1 [==============================] - 0s 46ms/step - loss: 2.1668 - mae: 1.3238 - va
l_loss: 1.8160 - val_mae: 1.2408
Epoch 66/250
1/1 [==============================] - 0s 46ms/step - loss: 2.1645 - mae: 1.3229 - va
l_loss: 1.8139 - val_mae: 1.2400
Epoch 67/250
1/1 [==============================] - 0s 46ms/step - loss: 2.1622 - mae: 1.3221 - va
l_loss: 1.8117 - val_mae: 1.2391
Epoch 68/250
1/1 [==============================] - 0s 47ms/step - loss: 2.1599 - mae: 1.3212 - va
l_loss: 1.8096 - val_mae: 1.2382
Epoch 69/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1576 - mae: 1.3203 - va
l_loss: 1.8074 - val_mae: 1.2374
Epoch 70/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1554 - mae: 1.3195 - va
l_loss: 1.8053 - val_mae: 1.2365
Epoch 71/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1531 - mae: 1.3186 - va
l_loss: 1.8031 - val_mae: 1.2356
Epoch 72/250
1/1 [==============================] - 0s 49ms/step - loss: 2.1508 - mae: 1.3177 - va
l_loss: 1.8010 - val_mae: 1.2348
Epoch 73/250
1/1 [==============================] - 0s 46ms/step - loss: 2.1485 - mae: 1.3169 - va
l_loss: 1.7988 - val_mae: 1.2339
Epoch 74/250
1/1 [==============================] - 0s 46ms/step - loss: 2.1462 - mae: 1.3160 - va
l_loss: 1.7966 - val_mae: 1.2330
Epoch 75/250
1/1 [==============================] - 0s 47ms/step - loss: 2.1439 - mae: 1.3151 - va
l_loss: 1.7945 - val_mae: 1.2321
Epoch 76/250
1/1 [==============================] - 0s 51ms/step - loss: 2.1416 - mae: 1.3142 - va
l_loss: 1.7923 - val_mae: 1.2313
Epoch 77/250
1/1 [==============================] - 0s 47ms/step - loss: 2.1393 - mae: 1.3134 - va
l_loss: 1.7902 - val_mae: 1.2304
Epoch 78/250
1/1 [==============================] - 0s 47ms/step - loss: 2.1370 - mae: 1.3125 - va
l_loss: 1.7880 - val_mae: 1.2295
Epoch 79/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1347 - mae: 1.3116 - va
l_loss: 1.7858 - val_mae: 1.2286
Epoch 80/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1324 - mae: 1.3107 - va
l_loss: 1.7837 - val_mae: 1.2277
```

```
Epoch 81/250
1/1 [==============================] - 0s 48ms/step - loss: 2.1301 - mae: 1.3099 - va
l_loss: 1.7815 - val_mae: 1.2269
Epoch 82/250
1/1 [==============================] - 0s 46ms/step - loss: 2.1278 - mae: 1.3090 - va
l_loss: 1.7794 - val_mae: 1.2260
Epoch 83/250
1/1 [==============================] - 0s 47ms/step - loss: 2.1254 - mae: 1.3081 - va
l_loss: 1.7772 - val_mae: 1.2251
Epoch 84/250
1/1 [==============================] - 0s 47ms/step - loss: 2.1231 - mae: 1.3072 - va
l_loss: 1.7750 - val_mae: 1.2242
Epoch 85/250
1/1 [==============================] - 0s 47ms/step - loss: 2.1208 - mae: 1.3063 - va
l_loss: 1.7729 - val_mae: 1.2233
Epoch 86/250
1/1 [==============================] - 0s 47ms/step - loss: 2.1185 - mae: 1.3054 - va
l_loss: 1.7707 - val_mae: 1.2225
Epoch 87/250
1/1 [==============================] - 0s 50ms/step - loss: 2.1162 - mae: 1.3046 - va
l_loss: 1.7686 - val_mae: 1.2216
Epoch 88/250
1/1 [==============================] - 0s 52ms/step - loss: 2.1139 - mae: 1.3037 - va
l_loss: 1.7664 - val_mae: 1.2207
Epoch 89/250
1/1 [==============================] - 0s 50ms/step - loss: 2.1116 - mae: 1.3028 - va
l_loss: 1.7642 - val_mae: 1.2198
Epoch 90/250
1/1 [==============================] - 0s 50ms/step - loss: 2.1093 - mae: 1.3019 - va
l_loss: 1.7621 - val_mae: 1.2189
Epoch 91/250
1/1 [==============================] - 0s 50ms/step - loss: 2.1070 - mae: 1.3010 - va
l_loss: 1.7599 - val_mae: 1.2180
Epoch 92/250
1/1 [==============================] - 0s 49ms/step - loss: 2.1047 - mae: 1.3001 - va
l_loss: 1.7578 - val_mae: 1.2171
Epoch 93/250
1/1 [==============================] - 0s 47ms/step - loss: 2.1024 - mae: 1.2993 - va
l_loss: 1.7556 - val_mae: 1.2163
Epoch 94/250
1/1 [==============================] - 0s 46ms/step - loss: 2.1001 - mae: 1.2984 - va
l_loss: 1.7534 - val_mae: 1.2154
Epoch 95/250
1/1 [==============================] - 0s 46ms/step - loss: 2.0978 - mae: 1.2975 - va
l_loss: 1.7513 - val_mae: 1.2145
Epoch 96/250
1/1 [==============================] - 0s 45ms/step - loss: 2.0955 - mae: 1.2966 - va
l_loss: 1.7491 - val_mae: 1.2136
Epoch 97/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0932 - mae: 1.2957 - va
l_loss: 1.7470 - val_mae: 1.2127
Epoch 98/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0909 - mae: 1.2948 - va
l_loss: 1.7448 - val_mae: 1.2118
Epoch 99/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0886 - mae: 1.2939 - va
l_loss: 1.7427 - val_mae: 1.2109
Epoch 100/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0863 - mae: 1.2930 - va
l_loss: 1.7405 - val_mae: 1.2100
```

```
Epoch 101/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0840 - mae: 1.2921 - va
l_loss: 1.7383 - val_mae: 1.2091
Epoch 102/250
1/1 [==============================] - 0s 48ms/step - loss: 2.0816 - mae: 1.2912 - va
l_loss: 1.7362 - val_mae: 1.2082
Epoch 103/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0793 - mae: 1.2904 - va
l_loss: 1.7340 - val_mae: 1.2074
Epoch 104/250
1/1 [==============================] - 0s 46ms/step - loss: 2.0770 - mae: 1.2895 - va
l_loss: 1.7319 - val_mae: 1.2065
Epoch 105/250
1/1 [==============================] - 0s 46ms/step - loss: 2.0747 - mae: 1.2886 - va
l_loss: 1.7297 - val_mae: 1.2056
Epoch 106/250
1/1 [==============================] - 0s 48ms/step - loss: 2.0724 - mae: 1.2877 - va
l_loss: 1.7276 - val_mae: 1.2047
Epoch 107/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0701 - mae: 1.2868 - va
l_loss: 1.7254 - val_mae: 1.2038
Epoch 108/250
1/1 [==============================] - 0s 52ms/step - loss: 2.0678 - mae: 1.2859 - va
l_loss: 1.7233 - val_mae: 1.2029
Epoch 109/250
1/1 [==============================] - 0s 49ms/step - loss: 2.0656 - mae: 1.2850 - va
l_loss: 1.7211 - val_mae: 1.2020
Epoch 110/250
1/1 [==============================] - 0s 49ms/step - loss: 2.0633 - mae: 1.2841 - va
l_loss: 1.7190 - val_mae: 1.2011
Epoch 111/250
1/1 [==============================] - 0s 49ms/step - loss: 2.0610 - mae: 1.2832 - va
l_loss: 1.7168 - val_mae: 1.2002
Epoch 112/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0587 - mae: 1.2823 - va
l_loss: 1.7147 - val_mae: 1.1993
Epoch 113/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0564 - mae: 1.2814 - va
l_loss: 1.7125 - val_mae: 1.1984
Epoch 114/250
1/1 [==============================] - 0s 48ms/step - loss: 2.0541 - mae: 1.2805 - va
l_loss: 1.7104 - val_mae: 1.1975
Epoch 115/250
1/1 [==============================] - 0s 48ms/step - loss: 2.0518 - mae: 1.2796 - va
l_loss: 1.7082 - val_mae: 1.1966
Epoch 116/250
1/1 [==============================] - 0s 51ms/step - loss: 2.0495 - mae: 1.2787 - va
l_loss: 1.7061 - val_mae: 1.1957
Epoch 117/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0472 - mae: 1.2778 - va
l_loss: 1.7040 - val_mae: 1.1948
Epoch 118/250
1/1 [==============================] - 0s 49ms/step - loss: 2.0449 - mae: 1.2769 - va
l_loss: 1.7018 - val_mae: 1.1939
Epoch 119/250
1/1 [==============================] - 0s 50ms/step - loss: 2.0426 - mae: 1.2760 - va
l_loss: 1.6997 - val_mae: 1.1930
Epoch 120/250
1/1 [==============================] - 0s 49ms/step - loss: 2.0403 - mae: 1.2751 - va
l_loss: 1.6975 - val_mae: 1.1921
```

```
Epoch 121/250
1/1 [==============================] - 0s 48ms/step - loss: 2.0381 - mae: 1.2743 - va
l_loss: 1.6954 - val_mae: 1.1912
Epoch 122/250
1/1 [==============================] - 0s 62ms/step - loss: 2.0358 - mae: 1.2734 - va
l_loss: 1.6933 - val_mae: 1.1903
Epoch 123/250
1/1 [==============================] - 0s 50ms/step - loss: 2.0335 - mae: 1.2725 - va
l_loss: 1.6911 - val_mae: 1.1894
Epoch 124/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0312 - mae: 1.2716 - va
l_loss: 1.6890 - val_mae: 1.1886
Epoch 125/250
1/1 [==============================] - 0s 49ms/step - loss: 2.0289 - mae: 1.2707 - va
l_loss: 1.6869 - val_mae: 1.1877
Epoch 126/250
1/1 [==============================] - 0s 48ms/step - loss: 2.0266 - mae: 1.2698 - va
l_loss: 1.6847 - val_mae: 1.1868
Epoch 127/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0244 - mae: 1.2689 - va
l_loss: 1.6826 - val_mae: 1.1859
Epoch 128/250
1/1 [==============================] - 0s 49ms/step - loss: 2.0221 - mae: 1.2680 - va
l_loss: 1.6805 - val_mae: 1.1850
Epoch 129/250
1/1 [==============================] - 0s 49ms/step - loss: 2.0198 - mae: 1.2671 - va
l_loss: 1.6783 - val_mae: 1.1841
Epoch 130/250
1/1 [==============================] - 0s 49ms/step - loss: 2.0175 - mae: 1.2662 - va
l_loss: 1.6762 - val_mae: 1.1832
Epoch 131/250
1/1 [==============================] - 0s 49ms/step - loss: 2.0153 - mae: 1.2653 - va
l_loss: 1.6741 - val_mae: 1.1823
Epoch 132/250
1/1 [==============================] - 0s 50ms/step - loss: 2.0130 - mae: 1.2644 - va
l_loss: 1.6720 - val_mae: 1.1814
Epoch 133/250
1/1 [==============================] - 0s 48ms/step - loss: 2.0107 - mae: 1.2635 - va
l_loss: 1.6698 - val_mae: 1.1805
Epoch 134/250
1/1 [==============================] - 0s 48ms/step - loss: 2.0084 - mae: 1.2626 - va
l_loss: 1.6677 - val_mae: 1.1796
Epoch 135/250
1/1 [==============================] - 0s 47ms/step - loss: 2.0062 - mae: 1.2617 - va
l_loss: 1.6656 - val_mae: 1.1787
Epoch 136/250
1/1 [==============================] - 0s 49ms/step - loss: 2.0039 - mae: 1.2608 - va
l_loss: 1.6635 - val_mae: 1.1778
Epoch 137/250
1/1 [==============================] - 0s 48ms/step - loss: 2.0016 - mae: 1.2599 - va
l_loss: 1.6614 - val_mae: 1.1769
Epoch 138/250
1/1 [==============================] - 0s 52ms/step - loss: 1.9994 - mae: 1.2590 - va
l_loss: 1.6592 - val_mae: 1.1760
Epoch 139/250
1/1 [==============================] - 0s 56ms/step - loss: 1.9971 - mae: 1.2581 - va
l_loss: 1.6571 - val_mae: 1.1751
Epoch 140/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9949 - mae: 1.2572 - va
l_loss: 1.6550 - val_mae: 1.1742
```

```
Epoch 141/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9926 - mae: 1.2563 - va
l_loss: 1.6529 - val_mae: 1.1733
Epoch 142/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9903 - mae: 1.2554 - va
l_loss: 1.6508 - val_mae: 1.1724
Epoch 143/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9881 - mae: 1.2545 - va
l_loss: 1.6487 - val_mae: 1.1715
Epoch 144/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9858 - mae: 1.2536 - va
l_loss: 1.6466 - val_mae: 1.1706
Epoch 145/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9836 - mae: 1.2527 - va
l_loss: 1.6445 - val_mae: 1.1697
Epoch 146/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9813 - mae: 1.2518 - va
l_loss: 1.6424 - val_mae: 1.1688
Epoch 147/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9791 - mae: 1.2509 - va
l_loss: 1.6403 - val_mae: 1.1679
Epoch 148/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9768 - mae: 1.2500 - va
l_loss: 1.6382 - val_mae: 1.1670
Epoch 149/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9746 - mae: 1.2491 - va
l_loss: 1.6361 - val_mae: 1.1661
Epoch 150/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9723 - mae: 1.2482 - va
l_loss: 1.6340 - val_mae: 1.1652
Epoch 151/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9701 - mae: 1.2473 - va
l_loss: 1.6319 - val_mae: 1.1643
Epoch 152/250
1/1 [==============================] - 0s 50ms/step - loss: 1.9678 - mae: 1.2464 - va
l_loss: 1.6298 - val_mae: 1.1634
Epoch 153/250
1/1 [==============================] - 0s 50ms/step - loss: 1.9656 - mae: 1.2455 - va
l_loss: 1.6277 - val_mae: 1.1625
Epoch 154/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9634 - mae: 1.2446 - va
l_loss: 1.6256 - val_mae: 1.1616
Epoch 155/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9611 - mae: 1.2437 - va
l_loss: 1.6235 - val_mae: 1.1607
Epoch 156/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9589 - mae: 1.2428 - va
l_loss: 1.6214 - val_mae: 1.1598
Epoch 157/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9566 - mae: 1.2419 - va
l_loss: 1.6194 - val_mae: 1.1589
Epoch 158/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9544 - mae: 1.2410 - va
l_loss: 1.6173 - val_mae: 1.1580
Epoch 159/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9522 - mae: 1.2401 - va
l_loss: 1.6152 - val_mae: 1.1571
Epoch 160/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9499 - mae: 1.2392 - va
l_loss: 1.6131 - val_mae: 1.1562
```

```
Epoch 161/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9477 - mae: 1.2383 - va
l_loss: 1.6110 - val_mae: 1.1553
Epoch 162/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9455 - mae: 1.2374 - va
l_loss: 1.6089 - val_mae: 1.1544
Epoch 163/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9433 - mae: 1.2365 - va
l_loss: 1.6069 - val_mae: 1.1535
Epoch 164/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9410 - mae: 1.2356 - va
l_loss: 1.6048 - val_mae: 1.1526
Epoch 165/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9388 - mae: 1.2347 - va
l_loss: 1.6027 - val_mae: 1.1517
Epoch 166/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9366 - mae: 1.2338 - va
l_loss: 1.6007 - val_mae: 1.1508
Epoch 167/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9344 - mae: 1.2329 - va
l_loss: 1.5986 - val_mae: 1.1499
Epoch 168/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9322 - mae: 1.2320 - va
l_loss: 1.5965 - val_mae: 1.1490
Epoch 169/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9300 - mae: 1.2311 - va
l_loss: 1.5945 - val_mae: 1.1481
Epoch 170/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9277 - mae: 1.2302 - va
l_loss: 1.5924 - val_mae: 1.1472
Epoch 171/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9255 - mae: 1.2293 - va
l_loss: 1.5903 - val_mae: 1.1463
Epoch 172/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9233 - mae: 1.2284 - va
l_loss: 1.5883 - val_mae: 1.1454
Epoch 173/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9211 - mae: 1.2275 - va
l_loss: 1.5862 - val_mae: 1.1445
Epoch 174/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9189 - mae: 1.2266 - va
l_loss: 1.5842 - val_mae: 1.1436
Epoch 175/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9167 - mae: 1.2257 - va
l_loss: 1.5821 - val_mae: 1.1427
Epoch 176/250
1/1 [==============================] - 0s 49ms/step - loss: 1.9145 - mae: 1.2248 - va
l_loss: 1.5801 - val_mae: 1.1418
Epoch 177/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9123 - mae: 1.2239 - va
l_loss: 1.5780 - val_mae: 1.1409
Epoch 178/250
1/1 [==============================] - 0s 51ms/step - loss: 1.9101 - mae: 1.2230 - va
l_loss: 1.5760 - val_mae: 1.1400
Epoch 179/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9079 - mae: 1.2221 - va
l_loss: 1.5739 - val_mae: 1.1391
Epoch 180/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9057 - mae: 1.2212 - va
l_loss: 1.5719 - val_mae: 1.1382
```

```
Epoch 181/250
1/1 [==============================] - 0s 47ms/step - loss: 1.9035 - mae: 1.2203 - va
l_loss: 1.5698 - val_mae: 1.1373
Epoch 182/250
1/1 [==============================] - 0s 48ms/step - loss: 1.9013 - mae: 1.2194 - va
l_loss: 1.5678 - val_mae: 1.1364
Epoch 183/250
1/1 [==============================] - 0s 48ms/step - loss: 1.8991 - mae: 1.2185 - va
l_loss: 1.5657 - val_mae: 1.1355
Epoch 184/250
1/1 [==============================] - 0s 48ms/step - loss: 1.8970 - mae: 1.2176 - va
l_loss: 1.5637 - val_mae: 1.1346
Epoch 185/250
1/1 [==============================] - 0s 47ms/step - loss: 1.8948 - mae: 1.2167 - va
l_loss: 1.5617 - val_mae: 1.1337
Epoch 186/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8926 - mae: 1.2158 - va
l_loss: 1.5596 - val_mae: 1.1328
Epoch 187/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8904 - mae: 1.2149 - va
l_loss: 1.5576 - val_mae: 1.1319
Epoch 188/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8882 - mae: 1.2140 - va
l_loss: 1.5556 - val_mae: 1.1310
Epoch 189/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8861 - mae: 1.2131 - va
l_loss: 1.5535 - val_mae: 1.1301
Epoch 190/250
1/1 [==============================] - 0s 48ms/step - loss: 1.8839 - mae: 1.2122 - va
l_loss: 1.5515 - val_mae: 1.1292
Epoch 191/250
1/1 [==============================] - 0s 48ms/step - loss: 1.8817 - mae: 1.2114 - va
l_loss: 1.5495 - val_mae: 1.1283
Epoch 192/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8795 - mae: 1.2105 - va
l_loss: 1.5475 - val_mae: 1.1274
Epoch 193/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8774 - mae: 1.2096 - va
l_loss: 1.5454 - val_mae: 1.1265
Epoch 194/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8752 - mae: 1.2087 - va
l_loss: 1.5434 - val_mae: 1.1257
Epoch 195/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8730 - mae: 1.2078 - va
l_loss: 1.5414 - val_mae: 1.1248
Epoch 196/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8709 - mae: 1.2069 - va
l_loss: 1.5394 - val_mae: 1.1239
Epoch 197/250
1/1 [==============================] - 0s 46ms/step - loss: 1.8687 - mae: 1.2060 - va
l_loss: 1.5374 - val_mae: 1.1230
Epoch 198/250
1/1 [==============================] - 0s 48ms/step - loss: 1.8665 - mae: 1.2051 - va
l_loss: 1.5354 - val_mae: 1.1221
Epoch 199/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8644 - mae: 1.2042 - va
l_loss: 1.5334 - val_mae: 1.1212
Epoch 200/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8622 - mae: 1.2033 - va
l_loss: 1.5314 - val_mae: 1.1203
```

```
Epoch 201/250
1/1 [==============================] - 0s 48ms/step - loss: 1.8601 - mae: 1.2024 - va
l_loss: 1.5294 - val_mae: 1.1194
Epoch 202/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8579 - mae: 1.2015 - va
l_loss: 1.5273 - val_mae: 1.1185
Epoch 203/250
1/1 [==============================] - 0s 58ms/step - loss: 1.8558 - mae: 1.2006 - va
l_loss: 1.5253 - val_mae: 1.1176
Epoch 204/250
1/1 [==============================] - 0s 59ms/step - loss: 1.8536 - mae: 1.1997 - va
l_loss: 1.5233 - val_mae: 1.1167
Epoch 205/250
1/1 [==============================] - 0s 55ms/step - loss: 1.8515 - mae: 1.1988 - va
l_loss: 1.5214 - val_mae: 1.1158
Epoch 206/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8493 - mae: 1.1979 - va
l_loss: 1.5194 - val_mae: 1.1149
Epoch 207/250
1/1 [==============================] - 0s 50ms/step - loss: 1.8472 - mae: 1.1970 - va
l_loss: 1.5174 - val_mae: 1.1140
Epoch 208/250
1/1 [==============================] - 0s 51ms/step - loss: 1.8450 - mae: 1.1961 - va
l_loss: 1.5154 - val_mae: 1.1131
Epoch 209/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8429 - mae: 1.1952 - va
l_loss: 1.5134 - val_mae: 1.1122
Epoch 210/250
1/1 [==============================] - 0s 49ms/step - loss: 1.8408 - mae: 1.1943 - va
l_loss: 1.5114 - val_mae: 1.1113
Epoch 211/250
1/1 [==============================] - 0s 51ms/step - loss: 1.8386 - mae: 1.1934 - va
l_loss: 1.5094 - val_mae: 1.1104
Epoch 212/250
1/1 [==============================] - 0s 53ms/step - loss: 1.8365 - mae: 1.1925 - va
l_loss: 1.5074 - val_mae: 1.1095
Epoch 213/250
1/1 [==============================] - 0s 52ms/step - loss: 1.8344 - mae: 1.1917 - va
l_loss: 1.5054 - val_mae: 1.1086
Epoch 214/250
1/1 [==============================] - 0s 50ms/step - loss: 1.8322 - mae: 1.1908 - va
l_loss: 1.5035 - val_mae: 1.1078
Epoch 215/250
1/1 [==============================] - 0s 50ms/step - loss: 1.8301 - mae: 1.1899 - va
l_loss: 1.5015 - val_mae: 1.1069
Epoch 216/250
1/1 [==============================] - 0s 50ms/step - loss: 1.8280 - mae: 1.1890 - va
l_loss: 1.4995 - val_mae: 1.1060
Epoch 217/250
1/1 [==============================] - 0s 51ms/step - loss: 1.8259 - mae: 1.1881 - va
l_loss: 1.4975 - val_mae: 1.1051
Epoch 218/250
1/1 [==============================] - 0s 51ms/step - loss: 1.8238 - mae: 1.1872 - va
l_loss: 1.4956 - val_mae: 1.1042
Epoch 219/250
1/1 [==============================] - 0s 50ms/step - loss: 1.8216 - mae: 1.1863 - va
l_loss: 1.4936 - val_mae: 1.1033
Epoch 220/250
1/1 [==============================] - 0s 51ms/step - loss: 1.8195 - mae: 1.1854 - va
l_loss: 1.4916 - val_mae: 1.1024
```

```
Epoch 221/250
1/1 [==============================] - 0s 52ms/step - loss: 1.8174 - mae: 1.1845 - va
l_loss: 1.4897 - val_mae: 1.1015
Epoch 222/250
1/1 [==============================] - 0s 54ms/step - loss: 1.8153 - mae: 1.1836 - va
l_loss: 1.4877 - val_mae: 1.1006
Epoch 223/250
1/1 [==============================] - 0s 52ms/step - loss: 1.8132 - mae: 1.1827 - va
l_loss: 1.4857 - val_mae: 1.0997
Epoch 224/250
1/1 [==============================] - 0s 55ms/step - loss: 1.8111 - mae: 1.1818 - va
l_loss: 1.4838 - val_mae: 1.0988
Epoch 225/250
1/1 [==============================] - 0s 52ms/step - loss: 1.8090 - mae: 1.1809 - va
l_loss: 1.4818 - val_mae: 1.0979
Epoch 226/250
1/1 [==============================] - 0s 48ms/step - loss: 1.8069 - mae: 1.1801 - va
l_loss: 1.4799 - val_mae: 1.0971
Epoch 227/250
1/1 [==============================] - 0s 51ms/step - loss: 1.8048 - mae: 1.1792 - va
l_loss: 1.4779 - val_mae: 1.0962
Epoch 228/250
1/1 [==============================] - 0s 53ms/step - loss: 1.8027 - mae: 1.1783 - va
l_loss: 1.4760 - val_mae: 1.0953
Epoch 229/250
1/1 [==============================] - 0s 59ms/step - loss: 1.8006 - mae: 1.1774 - va
l_loss: 1.4740 - val_mae: 1.0944
Epoch 230/250
1/1 [==============================] - 0s 49ms/step - loss: 1.7985 - mae: 1.1765 - va
l_loss: 1.4721 - val_mae: 1.0935
Epoch 231/250
1/1 [==============================] - 0s 48ms/step - loss: 1.7964 - mae: 1.1756 - va
l_loss: 1.4701 - val_mae: 1.0926
Epoch 232/250
1/1 [==============================] - 0s 46ms/step - loss: 1.7943 - mae: 1.1747 - va
l_loss: 1.4682 - val_mae: 1.0917
Epoch 233/250
1/1 [==============================] - 0s 47ms/step - loss: 1.7922 - mae: 1.1738 - va
l_loss: 1.4662 - val_mae: 1.0908
Epoch 234/250
1/1 [==============================] - 0s 47ms/step - loss: 1.7901 - mae: 1.1729 - va
l_loss: 1.4643 - val_mae: 1.0899
Epoch 235/250
1/1 [==============================] - 0s 46ms/step - loss: 1.7880 - mae: 1.1720 - va
l_loss: 1.4623 - val_mae: 1.0890
Epoch 236/250
1/1 [==============================] - 0s 46ms/step - loss: 1.7859 - mae: 1.1712 - va
l_loss: 1.4604 - val_mae: 1.0882
Epoch 237/250
1/1 [==============================] - 0s 45ms/step - loss: 1.7838 - mae: 1.1703 - va
l_loss: 1.4585 - val_mae: 1.0873
Epoch 238/250
1/1 [==============================] - 0s 45ms/step - loss: 1.7818 - mae: 1.1694 - va
l_loss: 1.4565 - val_mae: 1.0864
Epoch 239/250
1/1 [==============================] - 0s 46ms/step - loss: 1.7797 - mae: 1.1685 - va
l_loss: 1.4546 - val_mae: 1.0855
Epoch 240/250
1/1 [==============================] - 0s 46ms/step - loss: 1.7776 - mae: 1.1676 - va
l_loss: 1.4527 - val_mae: 1.0846
```

```
Epoch 241/250
1/1 [==============================] - 0s 46ms/step - loss: 1.7755 - mae: 1.1667 - va
l_loss: 1.4508 - val_mae: 1.0837
Epoch 242/250
1/1 [==============================] - 0s 47ms/step - loss: 1.7735 - mae: 1.1658 - va
l_loss: 1.4488 - val_mae: 1.0828
Epoch 243/250
1/1 [==============================] - 0s 47ms/step - loss: 1.7714 - mae: 1.1649 - va
l_loss: 1.4469 - val_mae: 1.0819
Epoch 244/250
1/1 [==============================] - 0s 46ms/step - loss: 1.7693 - mae: 1.1640 - va
l_loss: 1.4450 - val_mae: 1.0810
Epoch 245/250
1/1 [==============================] - 0s 45ms/step - loss: 1.7673 - mae: 1.1632 - va
l_loss: 1.4431 - val_mae: 1.0802
Epoch 246/250
1/1 [==============================] - 0s 46ms/step - loss: 1.7652 - mae: 1.1623 - va
l_loss: 1.4412 - val_mae: 1.0793
Epoch 247/250
1/1 [==============================] - 0s 48ms/step - loss: 1.7631 - mae: 1.1614 - va
l_loss: 1.4392 - val_mae: 1.0784
Epoch 248/250
1/1 [==============================] - 0s 49ms/step - loss: 1.7611 - mae: 1.1605 - va
l_loss: 1.4373 - val_mae: 1.0775
Epoch 249/250
1/1 [==============================] - 0s 47ms/step - loss: 1.7590 - mae: 1.1596 - va
l_loss: 1.4354 - val_mae: 1.0766
Epoch 250/250
1/1 [==============================] - 0s 45ms/step - loss: 1.7570 - mae: 1.1587 - va
l_loss: 1.4335 - val_mae: 1.0757
```

In [52]:

```
evaluation = model.evaluate(test_features, test_labels)
print("Evaluation Loss:", evaluation[0])
print("Evaluation MAE:", evaluation[1])
predictions = model.predict(test_features)
```

```
1/1 [==============================] - 0s 19ms/step - loss: 1.4335 - mae: 1.0757
Evaluation Loss: 1.4335206747055054
Evaluation MAE: 1.0757253170013428
1/1 [==============================] - 0s 55ms/step
```

In [53]:

```
predictions = model.predict(test_features)
print("Predictions:", predictions)
```

```
1/1 [==============================] - 0s 19ms/step
Predictions: [[-0.20603113]
 [-0.20603113]
 [-0.20603113]
 [-0.20603113]
 [-0.20603113]]
```

In [ ]: