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```
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```

Open in Colab

```
try:
  # %tensorflow_version only exists in Colab.
  %tensorflow_version 2.x
except Exception:
  pass
```

```
import tensorflow as tf
import numpy as np
import matplotlib.pyplot as plt
print(tf.__version__)
```

```
2.3.0
```

```
#synthetic data one last time
def plot_series(time, series, format="-", start=0, end=None):
    plt.plot(time[start:end], series[start:end], format)
    plt.xlabel("Time")
    plt.ylabel("Value")
    plt.grid(True)

def trend(time, slope=0):
    return slope * time

def seasonal_pattern(season_time):
    """Just an arbitrary pattern, you can change it if you wish"""
    return np.where(season_time < 0.4,
                    np.cos(season_time * 2 * np.pi),
                    1 / np.exp(3 * season_time))

def seasonality(time, period, amplitude=1, phase=0):
    """Repeats the same pattern at each period"""
    season_time = ((time + phase) % period) / period
```

```
        return amplitude * seasonal_pattern(season_time)

    def noise(time, noise_level=1, seed=None):
        rnd = np.random.RandomState(seed)
        return rnd.randn(len(time)) * noise_level

    time = np.arange(4 * 365 + 1, dtype="float32")
    baseline = 10
    series = trend(time, 0.1)
    baseline = 10
    amplitude = 40
    slope = 0.05
    noise_level = 5

    # Create the series
    series = baseline + trend(time, slope) + seasonality(time, period=365, amplitude=amplitude)
    # Update with noise
    series += noise(time, noise_level, seed=42)

    split_time = 1000
    time_train = time[:split_time]
    x_train = series[:split_time]
    time_valid = time[split_time:]
    x_valid = series[split_time:]

    window_size = 20
    batch_size = 32
    shuffle_buffer_size = 1000


    def windowed_dataset(series, window_size, batch_size, shuffle_buffer):
        #note that we're using CNN's now as the first layer instead of the lambda
        #however also note that the lambda is what changed the dimensions into 3D
        #so that it can be fed into the RNN, since that functionality had been removed
        #we add it here since there's no other place to do so
        series = tf.expand_dims(series, axis=-1)
        ds = tf.data.Dataset.from_tensor_slices(series)
        ds = ds.window(window_size + 1, shift=1, drop_remainder=True)
        ds = ds.flat_map(lambda w: w.batch(window_size + 1))
        ds = ds.shuffle(shuffle_buffer)
        ds = ds.map(lambda w: (w[:-1], w[1:]))
        return ds.batch(batch_size).prefetch(1)


    def model_forecast(model, series, window_size):
        ds = tf.data.Dataset.from_tensor_slices(series)
        ds = ds.window(window_size, shift=1, drop_remainder=True)
        ds = ds.flat_map(lambda w: w.batch(window_size))
        ds = ds.batch(32).prefetch(1)
        forecast = model.predict(ds)
        return forecast
```

```
tf.keras.backend.clear_session()
tf.random.set_seed(51)
np.random.seed(51)

window_size = 30
train_set = windowed_dataset(x_train, window_size, batch_size=128, shuffle_buffer=shuffle_buf

model = tf.keras.models.Sequential([
  #a generalized conv2D
  #causal padding simply pre-pads with zeros
  #window size of 5 with the regular stride of 1 step
  tf.keras.layers.Conv1D(filters=32, kernel_size=5,
                      strides=1, padding="causal",
                      activation="relu",
                      input_shape=[None, 1]),
  tf.keras.layers.Bidirectional(tf.keras.layers.LSTM(32, return_sequences=True)),
  tf.keras.layers.Bidirectional(tf.keras.layers.LSTM(32, return_sequences=True)),
  tf.keras.layers.Dense(1),
  tf.keras.layers.Lambda(lambda x: x * 200)
])
lr_schedule = tf.keras.callbacks.LearningRateScheduler(
    lambda epoch: 1e-8 * 10**(epoch / 20))
optimizer = tf.keras.optimizers.SGD(lr=1e-8, momentum=0.9)
model.compile(loss=tf.keras.losses.Huber(),
              optimizer=optimizer,
              metrics=["mae"])
history = model.fit(train_set, epochs=100, callbacks=[lr_schedule])
```

```
Epoch 1/100
8/8 [==============================] - 1s 69ms/step - loss: 73.1912 - mae: 73.6904
Epoch 2/100
8/8 [==============================] - 1s 63ms/step - loss: 72.4799 - mae: 72.9791
Epoch 3/100
8/8 [==============================] - 0s 61ms/step - loss: 71.3446 - mae: 71.8437
Epoch 4/100
8/8 [==============================] - 0s 60ms/step - loss: 69.9230 - mae: 70.4223
Epoch 5/100
8/8 [==============================] - 0s 62ms/step - loss: 68.2678 - mae: 68.7669
Epoch 6/100
8/8 [==============================] - 0s 60ms/step - loss: 66.3621 - mae: 66.8609
Epoch 7/100
8/8 [==============================] - 0s 61ms/step - loss: 64.2432 - mae: 64.7424
Epoch 8/100
8/8 [==============================] - 1s 64ms/step - loss: 61.8749 - mae: 62.3738
Epoch 9/100
8/8 [==============================] - 0s 61ms/step - loss: 59.2491 - mae: 59.7479
Epoch 10/100
8/8 [==============================] - 0s 59ms/step - loss: 56.3267 - mae: 56.8254
Epoch 11/100
8/8 [==============================] - 0s 62ms/step - loss: 53.0701 - mae: 53.5686
Epoch 12/100
8/8 [==============================] - 0s 59ms/step - loss: 49.3867 - mae: 49.8850
Epoch 13/100
8/8 [==============================] - 0s 61ms/step - loss: 45.1182 - mae: 45.6166
Epoch 14/100
8/8 [==============================] - 0s 62ms/step - loss: 41.6538 - mae: 42.1518
Epoch 15/100
8/8 [==============================] - 0s 59ms/step - loss: 40.6341 - mae: 41.1322
Epoch 16/100
8/8 [==============================] - 0s 60ms/step - loss: 39.5119 - mae: 40.0100
Epoch 17/100
8/8 [==============================] - 0s 60ms/step - loss: 38.1009 - mae: 38.5985
Epoch 18/100
8/8 [==============================] - 0s 59ms/step - loss: 36.5304 - mae: 37.0279
Epoch 19/100
8/8 [==============================] - 0s 61ms/step - loss: 34.9672 - mae: 35.4642
Epoch 20/100
8/8 [==============================] - 0s 59ms/step - loss: 33.5379 - mae: 34.0347
Epoch 21/100
8/8 [==============================] - 0s 61ms/step - loss: 32.2358 - mae: 32.7321
Epoch 22/100
8/8 [==============================] - 0s 59ms/step - loss: 31.0509 - mae: 31.5469
Epoch 23/100
8/8 [==============================] - 0s 61ms/step - loss: 29.9243 - mae: 30.4202
Epoch 24/100
8/8 [==============================] - 0s 62ms/step - loss: 28.8317 - mae: 29.3274
Epoch 25/100
8/8 [==============================] - 0s 60ms/step - loss: 27.7314 - mae: 28.2272
Epoch 26/100
8/8 [==============================] - 0s 59ms/step - loss: 26.6107 - mae: 27.1066
Epoch 27/100
8/8 [==============================] - 0s 61ms/step - loss: 25.4565 - mae: 25.9519
Epoch 28/100
8/8 [==============================] - 0s 59ms/step - loss: 24.2668 - mae: 24.7617
Epoch 29/100
```

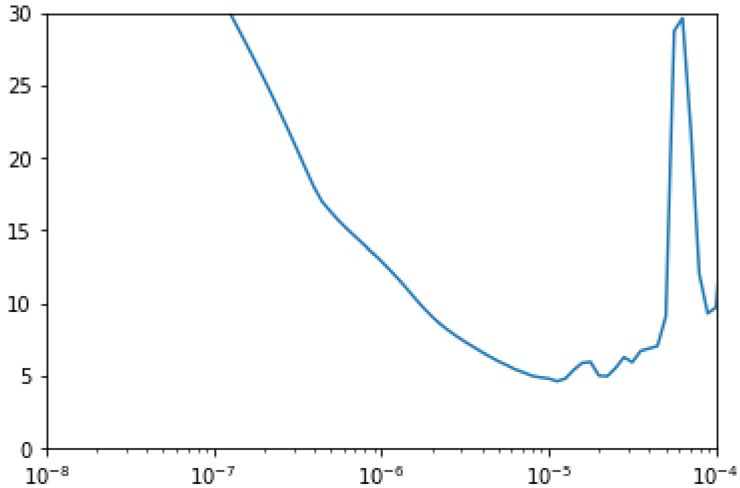
```
8/8 [==============================] - 0s 60ms/step - loss: 23.0459 - mae: 23.5406
Epoch 30/100
8/8 [==============================] - 0s 60ms/step - loss: 21.8057 - mae: 22.3000
Epoch 31/100
8/8 [==============================] - 0s 59ms/step - loss: 20.5264 - mae: 21.0202
Epoch 32/100
8/8 [==============================] - 0s 61ms/step - loss: 19.2341 - mae: 19.7269
Epoch 33/100
8/8 [==============================] - 0s 60ms/step - loss: 17.9646 - mae: 18.4568
Epoch 34/100
8/8 [==============================] - 0s 59ms/step - loss: 16.9362 - mae: 17.4279
Epoch 35/100
8/8 [==============================] - 0s 61ms/step - loss: 16.2657 - mae: 16.7576
Epoch 36/100
8/8 [==============================] - 0s 59ms/step - loss: 15.6281 - mae: 16.1192
Epoch 37/100
8/8 [==============================] - 0s 61ms/step - loss: 15.0540 - mae: 15.5447
Epoch 38/100
8/8 [==============================] - 0s 62ms/step - loss: 14.5219 - mae: 15.0126
Epoch 39/100
8/8 [==============================] - 0s 60ms/step - loss: 13.9836 - mae: 14.4747
Epoch 40/100
8/8 [==============================] - 0s 62ms/step - loss: 13.4414 - mae: 13.9318
Epoch 41/100
8/8 [==============================] - 0s 60ms/step - loss: 12.8781 - mae: 13.3677
Epoch 42/100
8/8 [==============================] - 0s 60ms/step - loss: 12.2855 - mae: 12.7749
Epoch 43/100
8/8 [==============================] - 0s 61ms/step - loss: 11.6690 - mae: 12.1582
Epoch 44/100
8/8 [==============================] - 0s 59ms/step - loss: 11.0181 - mae: 11.5063
Epoch 45/100
8/8 [==============================] - 0s 61ms/step - loss: 10.3387 - mae: 10.8260
Epoch 46/100
8/8 [==============================] - 1s 63ms/step - loss: 9.6894 - mae: 10.1757
Epoch 47/100
8/8 [==============================] - 0s 60ms/step - loss: 9.0956 - mae: 9.5809
Epoch 48/100
8/8 [==============================] - 0s 62ms/step - loss: 8.5688 - mae: 9.0536
Epoch 49/100
8/8 [==============================] - 0s 60ms/step - loss: 8.1153 - mae: 8.5996
Epoch 50/100
8/8 [==============================] - 0s 60ms/step - loss: 7.7040 - mae: 8.1884
Epoch 51/100
8/8 [==============================] - 0s 61ms/step - loss: 7.3262 - mae: 7.8096
Epoch 52/100
8/8 [==============================] - 0s 61ms/step - loss: 6.9725 - mae: 7.4548
Epoch 53/100
8/8 [==============================] - 0s 62ms/step - loss: 6.6218 - mae: 7.1033
Epoch 54/100
8/8 [==============================] - 0s 60ms/step - loss: 6.2898 - mae: 6.7712
Epoch 55/100
8/8 [==============================] - 0s 61ms/step - loss: 5.9775 - mae: 6.4581
Epoch 56/100
8/8 [==============================] - 1s 65ms/step - loss: 5.7096 - mae: 6.1898
Epoch 57/100
8/8 [==============================] - 1s 66ms/step - loss: 5.4204 - mae: 5.8992
Epoch 58/100
```

```
8/8 [==============================] - 0s 62ms/step - loss: 5.2126 - mae: 5.6904
Epoch 59/100
8/8 [==============================] - 1s 66ms/step - loss: 4.9788 - mae: 5.4558
Epoch 60/100
8/8 [==============================] - 1s 65ms/step - loss: 4.8674 - mae: 5.3438
Epoch 61/100
8/8 [==============================] - 0s 61ms/step - loss: 4.7943 - mae: 5.2711
Epoch 62/100
8/8 [==============================] - 1s 65ms/step - loss: 4.6056 - mae: 5.0814
Epoch 63/100
8/8 [==============================] - 1s 63ms/step - loss: 4.7894 - mae: 5.2667
Epoch 64/100
8/8 [==============================] - 0s 60ms/step - loss: 5.3933 - mae: 5.8746
Epoch 65/100
8/8 [==============================] - 0s 60ms/step - loss: 5.8707 - mae: 6.3541
Epoch 66/100
8/8 [==============================] - 0s 60ms/step - loss: 5.9396 - mae: 6.4231
Epoch 67/100
8/8 [==============================] - 0s 60ms/step - loss: 4.9887 - mae: 5.4693
Epoch 68/100
8/8 [==============================] - 1s 63ms/step - loss: 4.9489 - mae: 5.4281
Epoch 69/100
8/8 [==============================] - 0s 59ms/step - loss: 5.5230 - mae: 6.0056
Epoch 70/100
8/8 [==============================] - 0s 59ms/step - loss: 6.2621 - mae: 6.7472
Epoch 71/100
8/8 [==============================] - 1s 63ms/step - loss: 5.9139 - mae: 6.3982
Epoch 72/100
8/8 [==============================] - 0s 59ms/step - loss: 6.7009 - mae: 7.1889
Epoch 73/100
8/8 [==============================] - 1s 63ms/step - loss: 6.8660 - mae: 7.3530
Epoch 74/100
8/8 [==============================] - 0s 62ms/step - loss: 7.0335 - mae: 7.5207
Epoch 75/100
8/8 [==============================] - 0s 61ms/step - loss: 9.0791 - mae: 9.5681
Epoch 76/100
8/8 [==============================] - 0s 60ms/step - loss: 28.7364 - mae: 29.2346
Epoch 77/100
8/8 [==============================] - 0s 59ms/step - loss: 29.6234 - mae: 30.1218
Epoch 78/100
8/8 [==============================] - 0s 60ms/step - loss: 21.8284 - mae: 22.3246
Epoch 79/100
8/8 [==============================] - 0s 61ms/step - loss: 12.0193 - mae: 12.5116
Epoch 80/100
8/8 [==============================] - 0s 61ms/step - loss: 9.2818 - mae: 9.7718
Epoch 81/100
8/8 [==============================] - 0s 62ms/step - loss: 9.7042 - mae: 10.1946
Epoch 82/100
8/8 [==============================] - 0s 61ms/step - loss: 17.5090 - mae: 18.0038
Epoch 83/100
8/8 [==============================] - 0s 60ms/step - loss: 36.1916 - mae: 36.6898
Epoch 84/100
8/8 [==============================] - 1s 63ms/step - loss: 18.0964 - mae: 18.5904
Epoch 85/100
8/8 [==============================] - 0s 60ms/step - loss: 9.7329 - mae: 10.2230
Epoch 86/100
8/8 [==============================] - 0s 59ms/step - loss: 12.0223 - mae: 12.5122
Epoch 87/100
```

```
Epoch 87/100
8/8 [==============================] - 0s 59ms/step - loss: 27.3052 - mae: 27.8019
Epoch 88/100
```

```
plt.semilogx(history.history["lr"], history.history["loss"])
plt.axis([1e-8, 1e-4, 0, 30])
```

```
(1e-08, 0.0001, 0.0, 30.0)
```




```
8/8 [==============================] - 1s 67ms/step - loss: 11.3681 - mae: 11.8604
```

```
#using the optimal learning rate from the graph above
tf.keras.backend.clear_session()
tf.random.set_seed(51)
np.random.seed(51)
#batch sizes affect the training, batches introduce noise into the data
#so it's better to have a smaller batch size
#batch_size = 16
dataset = windowed_dataset(x_train, window_size, batch_size, shuffle_buffer_size)

model = tf.keras.models.Sequential([
  tf.keras.layers.Conv1D(filters=32, kernel_size=3,
                      strides=1, padding="causal",
                      activation="relu",
                      input_shape=[None, 1]),
  tf.keras.layers.LSTM(32, return_sequences=True),
  tf.keras.layers.LSTM(32, return_sequences=True),
  tf.keras.layers.Dense(1),
  tf.keras.layers.Lambda(lambda x: x * 200)
])

optimizer = tf.keras.optimizers.SGD(lr=1e-5, momentum=0.9)
model.compile(loss=tf.keras.losses.Huber(),
              optimizer=optimizer,
              metrics=["mae"])
history = model.fit(dataset,epochs=500)
```

```
Epoch 1/500
31/31 [==============================] - 1s 23ms/step - loss: 20.0714 - mae: 20.5646
Epoch 2/500
31/31 [==============================] - 1s 23ms/step - loss: 7.9198 - mae: 8.4048
Epoch 3/500
31/31 [==============================] - 1s 25ms/step - loss: 6.6716 - mae: 7.1533
Epoch 4/500
31/31 [==============================] - 1s 25ms/step - loss: 6.1672 - mae: 6.6477
Epoch 5/500
31/31 [==============================] - 1s 25ms/step - loss: 5.7152 - mae: 6.1947
Epoch 6/500
31/31 [==============================] - 1s 25ms/step - loss: 5.6691 - mae: 6.1493
Epoch 7/500
31/31 [==============================] - 1s 24ms/step - loss: 5.5057 - mae: 5.9846
Epoch 8/500
31/31 [==============================] - 1s 24ms/step - loss: 5.4893 - mae: 5.9692
Epoch 9/500
31/31 [==============================] - 1s 24ms/step - loss: 5.5435 - mae: 6.0236
Epoch 10/500
31/31 [==============================] - 1s 24ms/step - loss: 5.2388 - mae: 5.7178
Epoch 11/500
31/31 [==============================] - 1s 24ms/step - loss: 5.1307 - mae: 5.6091
Epoch 12/500
31/31 [==============================] - 1s 25ms/step - loss: 5.0818 - mae: 5.5607
Epoch 13/500
31/31 [==============================] - 1s 24ms/step - loss: 5.1603 - mae: 5.6395
Epoch 14/500
31/31 [==============================] - 1s 27ms/step - loss: 5.0470 - mae: 5.5261
Epoch 15/500
31/31 [==============================] - 1s 30ms/step - loss: 4.9708 - mae: 5.4490
Epoch 16/500
31/31 [==============================] - 1s 33ms/step - loss: 5.0487 - mae: 5.5271
Epoch 17/500
31/31 [==============================] - 1s 32ms/step - loss: 4.8986 - mae: 5.3773
Epoch 18/500
31/31 [==============================] - 1s 29ms/step - loss: 4.8657 - mae: 5.3438
Epoch 19/500
31/31 [==============================] - 1s 38ms/step - loss: 4.9139 - mae: 5.3924
Epoch 20/500
31/31 [==============================] - 1s 34ms/step - loss: 4.8340 - mae: 5.3115
Epoch 21/500
31/31 [==============================] - 1s 27ms/step - loss: 4.7562 - mae: 5.2344
Epoch 22/500
31/31 [==============================] - 1s 24ms/step - loss: 4.7475 - mae: 5.2249
Epoch 23/500
31/31 [==============================] - 1s 24ms/step - loss: 4.7178 - mae: 5.1948
Epoch 24/500
31/31 [==============================] - 1s 24ms/step - loss: 4.7000 - mae: 5.1771
Epoch 25/500
31/31 [==============================] - 1s 25ms/step - loss: 4.7621 - mae: 5.2396
Epoch 26/500
31/31 [==============================] - 1s 25ms/step - loss: 4.6434 - mae: 5.1211
Epoch 27/500
31/31 [==============================] - 1s 26ms/step - loss: 4.6775 - mae: 5.1544
Epoch 28/500
31/31 [==============================] - 1s 25ms/step - loss: 4.6573 - mae: 5.1345
Epoch 29/500
```

```
31/31 [==============================] - 1s 25ms/step - loss: 4.6140 - mae: 5.0920
Epoch 30/500
31/31 [==============================] - 1s 26ms/step - loss: 4.6174 - mae: 5.0940
Epoch 31/500
31/31 [==============================] - 1s 25ms/step - loss: 4.5990 - mae: 5.0763
Epoch 32/500
31/31 [==============================] - 1s 24ms/step - loss: 4.6100 - mae: 5.0867
Epoch 33/500
31/31 [==============================] - 1s 25ms/step - loss: 4.5454 - mae: 5.0233
Epoch 34/500
31/31 [==============================] - 1s 24ms/step - loss: 4.5627 - mae: 5.0396
Epoch 35/500
31/31 [==============================] - 1s 24ms/step - loss: 4.5274 - mae: 5.0047
Epoch 36/500
31/31 [==============================] - 1s 24ms/step - loss: 4.5332 - mae: 5.0097
Epoch 37/500
31/31 [==============================] - 1s 24ms/step - loss: 4.5132 - mae: 4.9901
Epoch 38/500
31/31 [==============================] - 1s 24ms/step - loss: 4.5260 - mae: 5.0027
Epoch 39/500
31/31 [==============================] - 1s 25ms/step - loss: 4.5017 - mae: 4.9788
Epoch 40/500
31/31 [==============================] - 1s 24ms/step - loss: 4.4532 - mae: 4.9292
Epoch 41/500
31/31 [==============================] - 1s 24ms/step - loss: 4.5468 - mae: 5.0234
Epoch 42/500
31/31 [==============================] - 1s 24ms/step - loss: 4.4375 - mae: 4.9133
Epoch 43/500
31/31 [==============================] - 1s 24ms/step - loss: 4.4251 - mae: 4.9018
Epoch 44/500
31/31 [==============================] - 1s 25ms/step - loss: 4.4871 - mae: 4.9633
Epoch 45/500
31/31 [==============================] - 1s 25ms/step - loss: 4.5163 - mae: 4.9921
Epoch 46/500
31/31 [==============================] - 1s 23ms/step - loss: 4.4053 - mae: 4.8813
Epoch 47/500
31/31 [==============================] - 1s 24ms/step - loss: 4.4223 - mae: 4.8984
Epoch 48/500
31/31 [==============================] - 1s 24ms/step - loss: 4.4028 - mae: 4.8786
Epoch 49/500
31/31 [==============================] - 1s 24ms/step - loss: 4.4822 - mae: 4.9584
Epoch 50/500
31/31 [==============================] - 1s 24ms/step - loss: 4.4034 - mae: 4.8797
Epoch 51/500
31/31 [==============================] - 1s 25ms/step - loss: 4.4036 - mae: 4.8779
Epoch 52/500
31/31 [==============================] - 1s 24ms/step - loss: 4.6161 - mae: 5.0930
Epoch 53/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3984 - mae: 4.8739
Epoch 54/500
31/31 [==============================] - 1s 25ms/step - loss: 4.4083 - mae: 4.8836
Epoch 55/500
31/31 [==============================] - 1s 25ms/step - loss: 4.5537 - mae: 5.0301
Epoch 56/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3604 - mae: 4.8354
Epoch 57/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3937 - mae: 4.8693
Epoch 58/500
```

```
31/31 [==============================] - 1s 24ms/step - loss: 4.3429 - mae: 4.8182
Epoch 59/500
31/31 [==============================] - 1s 23ms/step - loss: 4.3267 - mae: 4.8013
Epoch 60/500
31/31 [==============================] - 1s 23ms/step - loss: 4.4009 - mae: 4.8769
Epoch 61/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3842 - mae: 4.8603
Epoch 62/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3256 - mae: 4.8007
Epoch 63/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3501 - mae: 4.8254
Epoch 64/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3318 - mae: 4.8067
Epoch 65/500
31/31 [==============================] - 1s 25ms/step - loss: 4.3912 - mae: 4.8665
Epoch 66/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3288 - mae: 4.8041
Epoch 67/500
31/31 [==============================] - 1s 24ms/step - loss: 4.5089 - mae: 4.9859
Epoch 68/500
31/31 [==============================] - 1s 24ms/step - loss: 4.5145 - mae: 4.9919
Epoch 69/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2889 - mae: 4.7639
Epoch 70/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2887 - mae: 4.7634
Epoch 71/500
31/31 [==============================] - 1s 25ms/step - loss: 4.3078 - mae: 4.7828
Epoch 72/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3707 - mae: 4.8459
Epoch 73/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3150 - mae: 4.7900
Epoch 74/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2921 - mae: 4.7664
Epoch 75/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2522 - mae: 4.7269
Epoch 76/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2568 - mae: 4.7313
Epoch 77/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2630 - mae: 4.7380
Epoch 78/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3196 - mae: 4.7949
Epoch 79/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3007 - mae: 4.7754
Epoch 80/500
31/31 [==============================] - 1s 25ms/step - loss: 4.3114 - mae: 4.7866
Epoch 81/500
31/31 [==============================] - 1s 25ms/step - loss: 4.2581 - mae: 4.7322
Epoch 82/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3690 - mae: 4.8452
Epoch 83/500
31/31 [==============================] - 1s 25ms/step - loss: 4.3143 - mae: 4.7893
Epoch 84/500
31/31 [==============================] - 1s 24ms/step - loss: 4.4267 - mae: 4.9026
Epoch 85/500
31/31 [==============================] - 1s 25ms/step - loss: 4.3791 - mae: 4.8555
Epoch 86/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2678 - mae: 4.7425
Epoch 87/500
```

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Epoch 87/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2940 - mae: 4.7694
Epoch 88/500
31/31 [==============================] - 1s 25ms/step - loss: 4.2198 - mae: 4.6938
Epoch 89/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2221 - mae: 4.6967
Epoch 90/500
31/31 [==============================] - 1s 25ms/step - loss: 4.2358 - mae: 4.7103
Epoch 91/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2422 - mae: 4.7163
Epoch 92/500
31/31 [==============================] - 1s 23ms/step - loss: 4.2507 - mae: 4.7257
Epoch 93/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2234 - mae: 4.6976
Epoch 94/500
31/31 [==============================] - 1s 23ms/step - loss: 4.3142 - mae: 4.7884
Epoch 95/500
31/31 [==============================] - 1s 26ms/step - loss: 4.2867 - mae: 4.7612
Epoch 96/500
31/31 [==============================] - 1s 26ms/step - loss: 4.2390 - mae: 4.7144
Epoch 97/500
31/31 [==============================] - 1s 27ms/step - loss: 4.2348 - mae: 4.7089
Epoch 98/500
31/31 [==============================] - 1s 26ms/step - loss: 4.3246 - mae: 4.8004
Epoch 99/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2681 - mae: 4.7428
Epoch 100/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1904 - mae: 4.6635
Epoch 101/500
31/31 [==============================] - 1s 26ms/step - loss: 4.2378 - mae: 4.7117
Epoch 102/500
31/31 [==============================] - 1s 25ms/step - loss: 4.2133 - mae: 4.6874
Epoch 103/500
31/31 [==============================] - 1s 26ms/step - loss: 4.1830 - mae: 4.6574
Epoch 104/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1891 - mae: 4.6626
Epoch 105/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1779 - mae: 4.6515
Epoch 106/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2571 - mae: 4.7320
Epoch 107/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2688 - mae: 4.7436
Epoch 108/500
31/31 [==============================] - 1s 23ms/step - loss: 4.2268 - mae: 4.7007
Epoch 109/500
31/31 [==============================] - 1s 23ms/step - loss: 4.1979 - mae: 4.6721
Epoch 110/500
31/31 [==============================] - 1s 25ms/step - loss: 4.2417 - mae: 4.7158
Epoch 111/500
31/31 [==============================] - 1s 25ms/step - loss: 4.2060 - mae: 4.6798
Epoch 112/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2059 - mae: 4.6799
Epoch 113/500
31/31 [==============================] - 1s 23ms/step - loss: 4.1956 - mae: 4.6698
Epoch 114/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2553 - mae: 4.7297
Epoch 115/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2292 - mae: 4.7040
```

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Epoch 116/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1484 - mae: 4.6218
Epoch 117/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1798 - mae: 4.6533
Epoch 118/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1836 - mae: 4.6571
Epoch 119/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2187 - mae: 4.6930
Epoch 120/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2917 - mae: 4.7666
Epoch 121/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1587 - mae: 4.6321
Epoch 122/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1972 - mae: 4.6704
Epoch 123/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1690 - mae: 4.6418
Epoch 124/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1403 - mae: 4.6133
Epoch 125/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1780 - mae: 4.6519
Epoch 126/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1795 - mae: 4.6529
Epoch 127/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1530 - mae: 4.6262
Epoch 128/500
31/31 [==============================] - 1s 25ms/step - loss: 4.2650 - mae: 4.7391
Epoch 129/500
31/31 [==============================] - 1s 25ms/step - loss: 4.2283 - mae: 4.7031
Epoch 130/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2115 - mae: 4.6855
Epoch 131/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2316 - mae: 4.7063
Epoch 132/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3120 - mae: 4.7870
Epoch 133/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3190 - mae: 4.7947
Epoch 134/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1578 - mae: 4.6319
Epoch 135/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1602 - mae: 4.6339
Epoch 136/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1509 - mae: 4.6243
Epoch 137/500
31/31 [==============================] - 1s 23ms/step - loss: 4.1468 - mae: 4.6210
Epoch 138/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2082 - mae: 4.6828
Epoch 139/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2006 - mae: 4.6747
Epoch 140/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1913 - mae: 4.6650
Epoch 141/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1385 - mae: 4.6124
Epoch 142/500
31/31 [==============================] - 1s 23ms/step - loss: 4.1256 - mae: 4.5993
Epoch 143/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1529 - mae: 4.6253
Epoch 144/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2102 - mae: 4.6840
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Epoch 145/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1359 - mae: 4.6088
Epoch 146/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1511 - mae: 4.6248
Epoch 147/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1395 - mae: 4.6128
Epoch 148/500
31/31 [==============================] - 1s 23ms/step - loss: 4.2042 - mae: 4.6780
Epoch 149/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1295 - mae: 4.6030
Epoch 150/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1164 - mae: 4.5892
Epoch 151/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1352 - mae: 4.6083
Epoch 152/500
31/31 [==============================] - 1s 24ms/step - loss: 4.3149 - mae: 4.7908
Epoch 153/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1505 - mae: 4.6241
Epoch 154/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2809 - mae: 4.7557
Epoch 155/500
31/31 [==============================] - 1s 25ms/step - loss: 4.2069 - mae: 4.6818
Epoch 156/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2029 - mae: 4.6777
Epoch 157/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1219 - mae: 4.5948
Epoch 158/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2041 - mae: 4.6783
Epoch 159/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1064 - mae: 4.5796
Epoch 160/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1486 - mae: 4.6219
Epoch 161/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1094 - mae: 4.5831
Epoch 162/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1105 - mae: 4.5841
Epoch 163/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1047 - mae: 4.5780
Epoch 164/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1958 - mae: 4.6704
Epoch 165/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1546 - mae: 4.6288
Epoch 166/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1292 - mae: 4.6031
Epoch 167/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1061 - mae: 4.5792
Epoch 168/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1071 - mae: 4.5813
Epoch 169/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1151 - mae: 4.5888
Epoch 170/500
31/31 [==============================] - 1s 25ms/step - loss: 4.2475 - mae: 4.7221
Epoch 171/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0986 - mae: 4.5717
Epoch 172/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1445 - mae: 4.6182
Epoch 173/500
31/31 [==============================] - 1s 26ms/step - loss: 4.1118 - mae: 4.5849
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31/31 [==============================] - 1s 26ms/step - loss: 4.1118 - mae: 4.5849
Epoch 174/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1159 - mae: 4.5892
Epoch 175/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1463 - mae: 4.6208
Epoch 176/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1023 - mae: 4.5748
Epoch 177/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1103 - mae: 4.5836
Epoch 178/500
31/31 [==============================] - 1s 23ms/step - loss: 4.1310 - mae: 4.6052
Epoch 179/500
31/31 [==============================] - 1s 23ms/step - loss: 4.2657 - mae: 4.7414
Epoch 180/500
31/31 [==============================] - 1s 27ms/step - loss: 4.1037 - mae: 4.5764
Epoch 181/500
31/31 [==============================] - 1s 27ms/step - loss: 4.1200 - mae: 4.5938
Epoch 182/500
31/31 [==============================] - 1s 28ms/step - loss: 4.1400 - mae: 4.6137
Epoch 183/500
31/31 [==============================] - 1s 27ms/step - loss: 4.2051 - mae: 4.6801
Epoch 184/500
31/31 [==============================] - 1s 27ms/step - loss: 4.0689 - mae: 4.5417
Epoch 185/500
31/31 [==============================] - 1s 27ms/step - loss: 4.0856 - mae: 4.5585
Epoch 186/500
31/31 [==============================] - 1s 27ms/step - loss: 4.1317 - mae: 4.6047
Epoch 187/500
31/31 [==============================] - 1s 30ms/step - loss: 4.2896 - mae: 4.7637
Epoch 188/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1523 - mae: 4.6266
Epoch 189/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1464 - mae: 4.6213
Epoch 190/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1135 - mae: 4.5871
Epoch 191/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1009 - mae: 4.5736
Epoch 192/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1177 - mae: 4.5911
Epoch 193/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0768 - mae: 4.5502
Epoch 194/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1786 - mae: 4.6530
Epoch 195/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1223 - mae: 4.5962
Epoch 196/500
31/31 [==============================] - 1s 24ms/step - loss: 4.2288 - mae: 4.7034
Epoch 197/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0874 - mae: 4.5610
Epoch 198/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0659 - mae: 4.5392
Epoch 199/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0917 - mae: 4.5652
Epoch 200/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1081 - mae: 4.5812
Epoch 201/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0651 - mae: 4.5373
Epoch 202/500
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31/31 [==============================] - 1s 24ms/step - loss: 4.0692 - mae: 4.5421
Epoch 203/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1290 - mae: 4.6029
Epoch 204/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1505 - mae: 4.6252
Epoch 205/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0897 - mae: 4.5637
Epoch 206/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1249 - mae: 4.5993
Epoch 207/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0580 - mae: 4.5314
Epoch 208/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1144 - mae: 4.5873
Epoch 209/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0637 - mae: 4.5362
Epoch 210/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0835 - mae: 4.5573
Epoch 211/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0831 - mae: 4.5564
Epoch 212/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0449 - mae: 4.5173
Epoch 213/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0633 - mae: 4.5362
Epoch 214/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0547 - mae: 4.5278
Epoch 215/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0707 - mae: 4.5437
Epoch 216/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0713 - mae: 4.5451
Epoch 217/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0833 - mae: 4.5561
Epoch 218/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0374 - mae: 4.5096
Epoch 219/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0516 - mae: 4.5244
Epoch 220/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0619 - mae: 4.5347
Epoch 221/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0415 - mae: 4.5141
Epoch 222/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0486 - mae: 4.5215
Epoch 223/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1847 - mae: 4.6593
Epoch 224/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0999 - mae: 4.5735
Epoch 225/500
31/31 [==============================] - 1s 27ms/step - loss: 4.1361 - mae: 4.6097
Epoch 226/500
31/31 [==============================] - 1s 28ms/step - loss: 4.0822 - mae: 4.5547
Epoch 227/500
31/31 [==============================] - 1s 27ms/step - loss: 4.0324 - mae: 4.5048
Epoch 228/500
31/31 [==============================] - 1s 28ms/step - loss: 4.0614 - mae: 4.5346
Epoch 229/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0622 - mae: 4.5351
Epoch 230/500
31/31 [==============================] - 1s 26ms/step - loss: 4.1893 - mae: 4.6643
Epoch 231/500
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31/31 [==============================] - 1s 27ms/step - loss: 4.3156 - mae: 4.7912
Epoch 232/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0825 - mae: 4.5564
Epoch 233/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0774 - mae: 4.5508
Epoch 234/500
31/31 [==============================] - 1s 26ms/step - loss: 4.1796 - mae: 4.6542
Epoch 235/500
31/31 [==============================] - 1s 27ms/step - loss: 4.1071 - mae: 4.5805
Epoch 236/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0295 - mae: 4.5028
Epoch 237/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0438 - mae: 4.5163
Epoch 238/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1786 - mae: 4.6525
Epoch 239/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1129 - mae: 4.5877
Epoch 240/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1546 - mae: 4.6284
Epoch 241/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1906 - mae: 4.6653
Epoch 242/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0283 - mae: 4.5008
Epoch 243/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1106 - mae: 4.5846
Epoch 244/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0545 - mae: 4.5271
Epoch 245/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0421 - mae: 4.5145
Epoch 246/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0593 - mae: 4.5324
Epoch 247/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0539 - mae: 4.5271
Epoch 248/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0420 - mae: 4.5145
Epoch 249/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0455 - mae: 4.5179
Epoch 250/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1038 - mae: 4.5776
Epoch 251/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0934 - mae: 4.5670
Epoch 252/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0444 - mae: 4.5171
Epoch 253/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0394 - mae: 4.5120
Epoch 254/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0336 - mae: 4.5064
Epoch 255/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1256 - mae: 4.5998
Epoch 256/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1184 - mae: 4.5918
Epoch 257/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1145 - mae: 4.5888
Epoch 258/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0537 - mae: 4.5264
Epoch 259/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0455 - mae: 4.5190
Epoch 260/500
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Epoch 260/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0948 - mae: 4.5677
Epoch 261/500
31/31 [==============================] - 1s 29ms/step - loss: 4.1510 - mae: 4.6250
Epoch 262/500
31/31 [==============================] - 1s 28ms/step - loss: 4.0847 - mae: 4.5587
Epoch 263/500
31/31 [==============================] - 1s 27ms/step - loss: 4.0848 - mae: 4.5584
Epoch 264/500
31/31 [==============================] - 1s 28ms/step - loss: 4.0609 - mae: 4.5348
Epoch 265/500
31/31 [==============================] - 1s 28ms/step - loss: 4.0916 - mae: 4.5647
Epoch 266/500
31/31 [==============================] - 1s 28ms/step - loss: 4.0826 - mae: 4.5563
Epoch 267/500
31/31 [==============================] - 1s 28ms/step - loss: 4.1118 - mae: 4.5863
Epoch 268/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0612 - mae: 4.5350
Epoch 269/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0125 - mae: 4.4847
Epoch 270/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0441 - mae: 4.5175
Epoch 271/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0030 - mae: 4.4746
Epoch 272/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0140 - mae: 4.4857
Epoch 273/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0456 - mae: 4.5186
Epoch 274/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0130 - mae: 4.4855
Epoch 275/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0372 - mae: 4.5099
Epoch 276/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0915 - mae: 4.5652
Epoch 277/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0639 - mae: 4.5362
Epoch 278/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0411 - mae: 4.5144
Epoch 279/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0430 - mae: 4.5159
Epoch 280/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0483 - mae: 4.5217
Epoch 281/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0148 - mae: 4.4874
Epoch 282/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0334 - mae: 4.5062
Epoch 283/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0932 - mae: 4.5664
Epoch 284/500
31/31 [==============================] - 1s 23ms/step - loss: 4.0480 - mae: 4.5218
Epoch 285/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0677 - mae: 4.5410
Epoch 286/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0613 - mae: 4.5351
Epoch 287/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0128 - mae: 4.4859
Epoch 288/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0258 - mae: 4.4990
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Epoch 289/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0660 - mae: 4.5389
Epoch 290/500
31/31 [==============================] - 1s 26ms/step - loss: 4.1096 - mae: 4.5832
Epoch 291/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1409 - mae: 4.6156
Epoch 292/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0498 - mae: 4.5229
Epoch 293/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0461 - mae: 4.5188
Epoch 294/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0590 - mae: 4.5327
Epoch 295/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0327 - mae: 4.5055
Epoch 296/500
31/31 [==============================] - 1s 26ms/step - loss: 4.1669 - mae: 4.6421
Epoch 297/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1080 - mae: 4.5819
Epoch 298/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0754 - mae: 4.5496
Epoch 299/500
31/31 [==============================] - 1s 25ms/step - loss: 4.2081 - mae: 4.6834
Epoch 300/500
31/31 [==============================] - 1s 25ms/step - loss: 4.1173 - mae: 4.5914
Epoch 301/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0229 - mae: 4.4959
Epoch 302/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0440 - mae: 4.5186
Epoch 303/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0182 - mae: 4.4906
Epoch 304/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9894 - mae: 4.4612
Epoch 305/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0037 - mae: 4.4759
Epoch 306/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9827 - mae: 4.4547
Epoch 307/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0192 - mae: 4.4919
Epoch 308/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9917 - mae: 4.4645
Epoch 309/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9874 - mae: 4.4594
Epoch 310/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9878 - mae: 4.4604
Epoch 311/500
31/31 [==============================] - 1s 24ms/step - loss: 4.1178 - mae: 4.5921
Epoch 312/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0819 - mae: 4.5559
Epoch 313/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0506 - mae: 4.5234
Epoch 314/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9960 - mae: 4.4691
Epoch 315/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9963 - mae: 4.4687
Epoch 316/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9829 - mae: 4.4543
Epoch 317/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0398 - mae: 4.5123
```

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Epoch 318/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0332 - mae: 4.5057
Epoch 319/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9800 - mae: 4.4518
Epoch 320/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0016 - mae: 4.4740
Epoch 321/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0858 - mae: 4.5600
Epoch 322/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0900 - mae: 4.5635
Epoch 323/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0791 - mae: 4.5533
Epoch 324/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9833 - mae: 4.4553
Epoch 325/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0010 - mae: 4.4733
Epoch 326/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9709 - mae: 4.4425
Epoch 327/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9966 - mae: 4.4693
Epoch 328/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0266 - mae: 4.4999
Epoch 329/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0467 - mae: 4.5199
Epoch 330/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9757 - mae: 4.4486
Epoch 331/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9646 - mae: 4.4373
Epoch 332/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9808 - mae: 4.4533
Epoch 333/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9765 - mae: 4.4488
Epoch 334/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9808 - mae: 4.4520
Epoch 335/500
31/31 [==============================] - 1s 23ms/step - loss: 4.0892 - mae: 4.5631
Epoch 336/500
31/31 [==============================] - 1s 23ms/step - loss: 4.0181 - mae: 4.4910
Epoch 337/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0603 - mae: 4.5342
Epoch 338/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9830 - mae: 4.4555
Epoch 339/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9618 - mae: 4.4336
Epoch 340/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0340 - mae: 4.5070
Epoch 341/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0374 - mae: 4.5117
Epoch 342/500
31/31 [==============================] - 1s 28ms/step - loss: 4.0113 - mae: 4.4841
Epoch 343/500
31/31 [==============================] - 1s 26ms/step - loss: 3.9833 - mae: 4.4557
Epoch 344/500
31/31 [==============================] - 1s 27ms/step - loss: 4.0126 - mae: 4.4860
Epoch 345/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0034 - mae: 4.4767
Epoch 346/500
```

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31/31 [==============================] - 1s 26ms/step - loss: 3.9725 - mae: 4.4442
Epoch 347/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9962 - mae: 4.4681
Epoch 348/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0096 - mae: 4.4827
Epoch 349/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0546 - mae: 4.5289
Epoch 350/500
31/31 [==============================] - 1s 28ms/step - loss: 3.9686 - mae: 4.4412
Epoch 351/500
31/31 [==============================] - 1s 26ms/step - loss: 3.9804 - mae: 4.4534
Epoch 352/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9969 - mae: 4.4696
Epoch 353/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9846 - mae: 4.4575
Epoch 354/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9517 - mae: 4.4237
Epoch 355/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9758 - mae: 4.4488
Epoch 356/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9704 - mae: 4.4430
Epoch 357/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0234 - mae: 4.4969
Epoch 358/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9973 - mae: 4.4703
Epoch 359/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9632 - mae: 4.4364
Epoch 360/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9496 - mae: 4.4216
Epoch 361/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9844 - mae: 4.4561
Epoch 362/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0949 - mae: 4.5690
Epoch 363/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0191 - mae: 4.4922
Epoch 364/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0138 - mae: 4.4866
Epoch 365/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0182 - mae: 4.4915
Epoch 366/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0195 - mae: 4.4932
Epoch 367/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0019 - mae: 4.4741
Epoch 368/500
31/31 [==============================] - 1s 26ms/step - loss: 3.9872 - mae: 4.4600
Epoch 369/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0078 - mae: 4.4810
Epoch 370/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9493 - mae: 4.4220
Epoch 371/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0189 - mae: 4.4927
Epoch 372/500
31/31 [==============================] - 1s 26ms/step - loss: 3.9987 - mae: 4.4714
Epoch 373/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9529 - mae: 4.4253
Epoch 374/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9726 - mae: 4.4447
Epoch 375/500
```

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31/31 [==============================] - 1s 24ms/step - loss: 3.9425 - mae: 4.4141
Epoch 376/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9461 - mae: 4.4187
Epoch 377/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9860 - mae: 4.4592
Epoch 378/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9743 - mae: 4.4466
Epoch 379/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9557 - mae: 4.4277
Epoch 380/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9739 - mae: 4.4467
Epoch 381/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9896 - mae: 4.4623
Epoch 382/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9691 - mae: 4.4414
Epoch 383/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9682 - mae: 4.4406
Epoch 384/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9548 - mae: 4.4268
Epoch 385/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9631 - mae: 4.4352
Epoch 386/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9388 - mae: 4.4106
Epoch 387/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0159 - mae: 4.4890
Epoch 388/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9610 - mae: 4.4335
Epoch 389/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0235 - mae: 4.4972
Epoch 390/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0089 - mae: 4.4822
Epoch 391/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9747 - mae: 4.4470
Epoch 392/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9805 - mae: 4.4529
Epoch 393/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9798 - mae: 4.4525
Epoch 394/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0071 - mae: 4.4798
Epoch 395/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9600 - mae: 4.4321
Epoch 396/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0863 - mae: 4.5609
Epoch 397/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9818 - mae: 4.4541
Epoch 398/500
31/31 [==============================] - 1s 26ms/step - loss: 4.1833 - mae: 4.6578
Epoch 399/500
31/31 [==============================] - 1s 27ms/step - loss: 3.9697 - mae: 4.4423
Epoch 400/500
31/31 [==============================] - 1s 26ms/step - loss: 4.0152 - mae: 4.4882
Epoch 401/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9864 - mae: 4.4589
Epoch 402/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9873 - mae: 4.4606
Epoch 403/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9789 - mae: 4.4514
Epoch 404/500
```

```
31/31 [==============================] - 1s 23ms/step - loss: 3.9623 - mae: 4.4346
Epoch 405/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0839 - mae: 4.5581
Epoch 406/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9918 - mae: 4.4656
Epoch 407/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9394 - mae: 4.4113
Epoch 408/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9559 - mae: 4.4279
Epoch 409/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9703 - mae: 4.4424
Epoch 410/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0610 - mae: 4.5353
Epoch 411/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9314 - mae: 4.4032
Epoch 412/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9375 - mae: 4.4103
Epoch 413/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9413 - mae: 4.4129
Epoch 414/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9574 - mae: 4.4292
Epoch 415/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9409 - mae: 4.4128
Epoch 416/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9453 - mae: 4.4174
Epoch 417/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0364 - mae: 4.5099
Epoch 418/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0127 - mae: 4.4856
Epoch 419/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9421 - mae: 4.4146
Epoch 420/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9502 - mae: 4.4221
Epoch 421/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9285 - mae: 4.3996
Epoch 422/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9319 - mae: 4.4040
Epoch 423/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9278 - mae: 4.3987
Epoch 424/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9345 - mae: 4.4064
Epoch 425/500
31/31 [==============================] - 1s 28ms/step - loss: 3.9540 - mae: 4.4264
Epoch 426/500
31/31 [==============================] - 1s 26ms/step - loss: 3.9463 - mae: 4.4184
Epoch 427/500
31/31 [==============================] - 1s 30ms/step - loss: 3.9855 - mae: 4.4584
Epoch 428/500
31/31 [==============================] - 1s 28ms/step - loss: 3.9623 - mae: 4.4348
Epoch 429/500
31/31 [==============================] - 1s 27ms/step - loss: 3.9362 - mae: 4.4076
Epoch 430/500
31/31 [==============================] - 1s 33ms/step - loss: 4.0078 - mae: 4.4800
Epoch 431/500
31/31 [==============================] - 1s 31ms/step - loss: 3.9387 - mae: 4.4108
Epoch 432/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9394 - mae: 4.4114
```

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Epoch 433/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9559 - mae: 4.4279
Epoch 434/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9517 - mae: 4.4232
Epoch 435/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0539 - mae: 4.5270
Epoch 436/500
31/31 [==============================] - 1s 23ms/step - loss: 3.9456 - mae: 4.4180
Epoch 437/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0230 - mae: 4.4970
Epoch 438/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9863 - mae: 4.4583
Epoch 439/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9874 - mae: 4.4599
Epoch 440/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0541 - mae: 4.5271
Epoch 441/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9845 - mae: 4.4568
Epoch 442/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9771 - mae: 4.4503
Epoch 443/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9525 - mae: 4.4251
Epoch 444/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9784 - mae: 4.4509
Epoch 445/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9178 - mae: 4.3892
Epoch 446/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9301 - mae: 4.4014
Epoch 447/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9282 - mae: 4.4001
Epoch 448/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9840 - mae: 4.4567
Epoch 449/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0318 - mae: 4.5051
Epoch 450/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9542 - mae: 4.4265
Epoch 451/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9342 - mae: 4.4060
Epoch 452/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9144 - mae: 4.3858
Epoch 453/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9302 - mae: 4.4018
Epoch 454/500
31/31 [==============================] - 1s 25ms/step - loss: 4.0417 - mae: 4.5151
Epoch 455/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9233 - mae: 4.3950
Epoch 456/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9124 - mae: 4.3835
Epoch 457/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9135 - mae: 4.3850
Epoch 458/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9390 - mae: 4.4106
Epoch 459/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9905 - mae: 4.4633
Epoch 460/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9424 - mae: 4.4133
Epoch 461/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9655 - mae: 4.4380
```
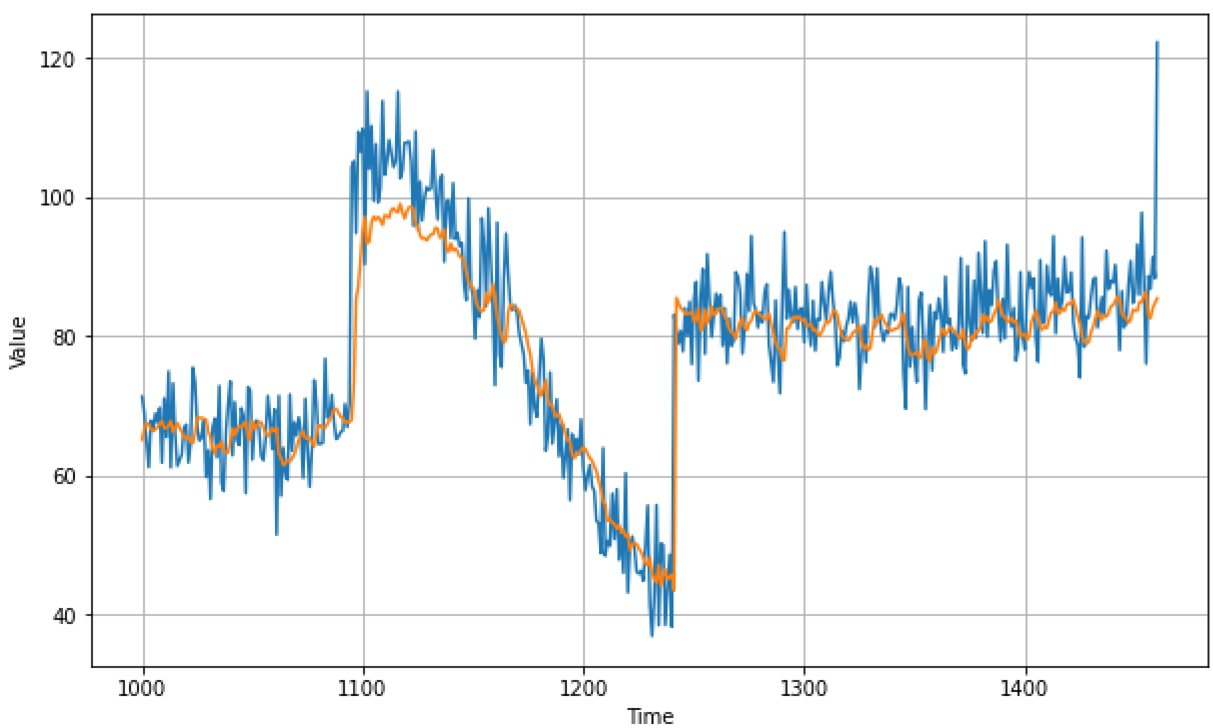

```
Epoch 462/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9353 - mae: 4.4074
Epoch 463/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9215 - mae: 4.3933
Epoch 464/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9283 - mae: 4.4000
Epoch 465/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9522 - mae: 4.4250
Epoch 466/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9534 - mae: 4.4251
Epoch 467/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9383 - mae: 4.4111
Epoch 468/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9218 - mae: 4.3937
Epoch 469/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9175 - mae: 4.3897
Epoch 470/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9601 - mae: 4.4324
Epoch 471/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9748 - mae: 4.4473
Epoch 472/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9499 - mae: 4.4217
Epoch 473/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9144 - mae: 4.3865
Epoch 474/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9453 - mae: 4.4176
Epoch 475/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9511 - mae: 4.4232
Epoch 476/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9523 - mae: 4.4238
Epoch 477/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9855 - mae: 4.4587
Epoch 478/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9374 - mae: 4.4095
Epoch 479/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9947 - mae: 4.4675
Epoch 480/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9931 - mae: 4.4654
Epoch 481/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9880 - mae: 4.4606
Epoch 482/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9472 - mae: 4.4184
Epoch 483/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9426 - mae: 4.4140
Epoch 484/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9266 - mae: 4.3980
Epoch 485/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9481 - mae: 4.4207
Epoch 486/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9996 - mae: 4.4724
Epoch 487/500
31/31 [==============================] - 1s 23ms/step - loss: 3.9523 - mae: 4.4240
Epoch 488/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9324 - mae: 4.4041
Epoch 489/500
31/31 [==============================] - 1s 23ms/step - loss: 3.9875 - mae: 4.4602
Epoch 490/500
31/31 [==============================] - 1s 23ms/step - loss: 3.9413 - mae: 4.4124
```

```
31/31 [==============================] - 1s 25ms/step - loss: 3.9415 - mae: 4.4124
Epoch 491/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9062 - mae: 4.3769
Epoch 492/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9422 - mae: 4.4139
Epoch 493/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9171 - mae: 4.3891
Epoch 494/500
31/31 [==============================] - 1s 24ms/step - loss: 4.0240 - mae: 4.4974
Epoch 495/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9925 - mae: 4.4641
Epoch 496/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9228 - mae: 4.3944
Epoch 497/500
31/31 [==============================] - 1s 25ms/step - loss: 3.9311 - mae: 4.4029
Epoch 498/500
31/31 [==============================] - 1s 24ms/step - loss: 3.9556 - mae: 4.4275
```

```
rnn_forecast = model_forecast(model, series[..., np.newaxis], window_size)
rnn_forecast = rnn_forecast[split_time - window_size:-1, -1, 0]
```

```
plt.figure(figsize=(10, 6))
plot_series(time_valid, x_valid)
plot_series(time_valid, rnn_forecast)
```



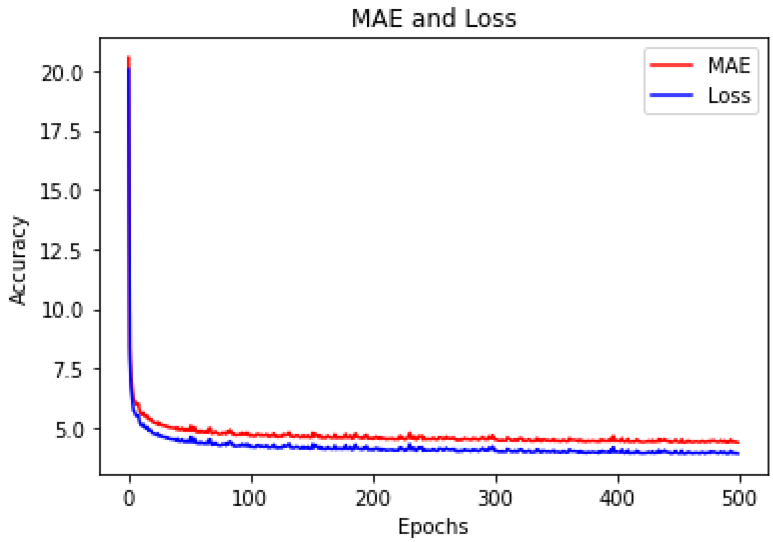

```
tf.keras.metrics.mean_absolute_error(x_valid, rnn_forecast).numpy()
```

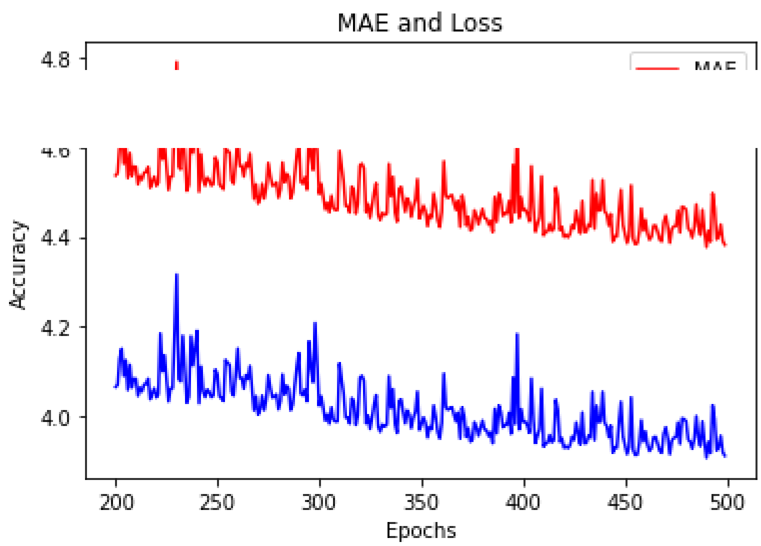
```
5.091009
```

```
import matplotlib.image  as mpimg
import matplotlib.pyplot as plt
```

```
#-----------------------------------------------------------
# Retrieve a list of list results on training and test data
# sets for each training epoch
#-----------------------------------------------------------
mae=history.history['mae']
loss=history.history['loss']

epochs=range(len(loss)) # Get number of epochs

#------------------------------------------------
# Plot MAE and Loss
#------------------------------------------------
plt.plot(epochs, mae, 'r')
plt.plot(epochs, loss, 'b')
plt.title('MAE and Loss')
plt.xlabel("Epochs")
plt.ylabel("Accuracy")
plt.legend(["MAE", "Loss"])

plt.figure()

epochs_zoom = epochs[200:]
mae_zoom = mae[200:]
loss_zoom = loss[200:]

#------------------------------------------------
# Plot Zoomed MAE and Loss
#------------------------------------------------
plt.plot(epochs_zoom, mae_zoom, 'r')
plt.plot(epochs_zoom, loss_zoom, 'b')
plt.title('MAE and Loss')
plt.xlabel("Epochs")
plt.ylabel("Accuracy")
plt.legend(["MAE", "Loss"])

plt.figure()
```

```
<Figure size 432x288 with 0 Axes>
```






```
<Figure size 432x288 with 0 Axes>
```