

## MODEL no.1: Simple Regression Model

### Initialize Notebook

```
import datetime
print(f"Notebook last run (end-to-end): {datetime.datetime.now()}")
```

Notebook last run (end-to-end): 2025-09-12 01:26:43.874523

#### 1. Import libraries

```
import tensorflow as tf
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split

print(tf.__version__)
```

2.20.0

#### 1. Generate a dataset

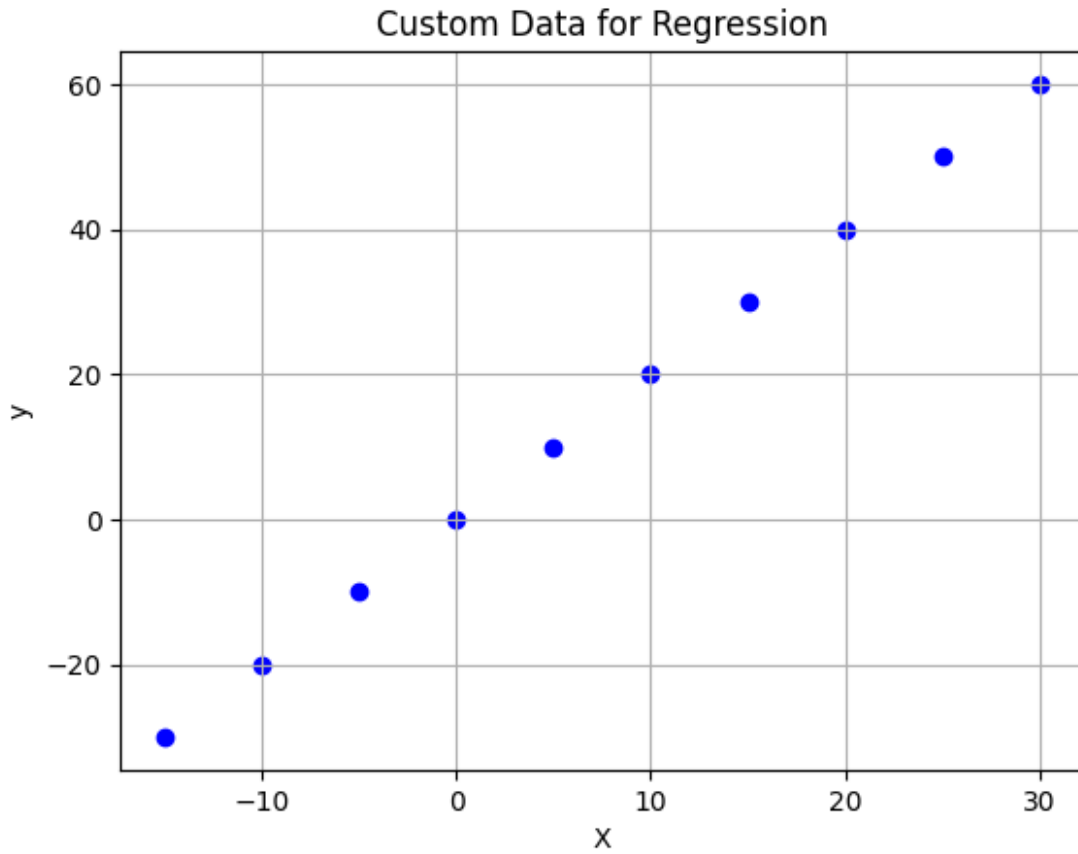
```
X = np.array([-15.0, -10.0, -5.0, 0.0, 5.0, 10.0, 15.0, 20.0, 25.0, 30.0])
y = np.array([-30.0, -20.0, -10.0, 0.0, 10.0, 20.0, 30.0, 40.0, 50.0, 60.0])
```

#### 2.1 Reshape dataset made from .array([]) for tensorflow

```
X = X.reshape(-1, 1)
y = y.reshape(-1, 1)
```

#### 2.1 dataset Visualization using matplotlib

```
plt.scatter(X, y, color="blue")
plt.title("Custom Data for Regression")
plt.xlabel("X")
plt.ylabel("y")
plt.grid(True)
plt.show()
```



#### 1. Building the model

```
tf.random.set_seed(42)

model = tf.keras.Sequential([
    tf.keras.layers.Input(shape=(1,)),
    tf.keras.layers.Dense(units=1)
])
```

#### 1. Compile the model

```
model.compile(
    loss=tf.keras.losses.MeanAbsoluteError(),
    optimizer=tf.keras.optimizers.SGD(learning_rate=0.001),
    metrics=["mae"]
)
```

#### 1. Training the model

```
history = model.fit(
    X, y,
    epochs=100,
    verbose=1
)
```

Epoch 1/100				
1/1	_____	0s 133ms/step	- loss: 18.4912	- mae: 18.4912
Epoch 2/100				
1/1	_____	0s 14ms/step	- loss: 18.3089	- mae: 18.3089
Epoch 3/100				
1/1	_____	0s 13ms/step	- loss: 18.1266	- mae: 18.1266
Epoch 4/100				
1/1	_____	0s 14ms/step	- loss: 17.9443	- mae: 17.9443
Epoch 5/100				
1/1	_____	0s 15ms/step	- loss: 17.7620	- mae: 17.7620
Epoch 6/100				
1/1	_____	0s 13ms/step	- loss: 17.5797	- mae: 17.5797
Epoch 7/100				
1/1	_____	0s 12ms/step	- loss: 17.3975	- mae: 17.3975
Epoch 8/100				
1/1	_____	0s 12ms/step	- loss: 17.2152	- mae: 17.2152
Epoch 9/100				
1/1	_____	0s 13ms/step	- loss: 17.0329	- mae: 17.0329
Epoch 10/100				
1/1	_____	0s 12ms/step	- loss: 16.8506	- mae: 16.8506
Epoch 11/100				
1/1	_____	0s 12ms/step	- loss: 16.6683	- mae: 16.6683
Epoch 12/100				
1/1	_____	0s 12ms/step	- loss: 16.4860	- mae: 16.4860
Epoch 13/100				
1/1	_____	0s 12ms/step	- loss: 16.3037	- mae: 16.3037
Epoch 14/100				
1/1	_____	0s 12ms/step	- loss: 16.1214	- mae: 16.1214
Epoch 15/100				
1/1	_____	0s 12ms/step	- loss: 15.9391	- mae: 15.9391
Epoch 16/100				
1/1	_____	0s 12ms/step	- loss: 15.7568	- mae: 15.7568
Epoch 17/100				
1/1	_____	0s 12ms/step	- loss: 15.5746	- mae: 15.5746
Epoch 18/100				
1/1	_____	0s 13ms/step	- loss: 15.3923	- mae: 15.3923
Epoch 19/100				
1/1	_____	0s 12ms/step	- loss: 15.2100	- mae: 15.2100
Epoch 20/100				
1/1	_____	0s 12ms/step	- loss: 15.0277	- mae: 15.0277
Epoch 21/100				
1/1	_____	0s 13ms/step	- loss: 14.8454	- mae: 14.8454
Epoch 22/100				
1/1	_____	0s 13ms/step	- loss: 14.6631	- mae: 14.6631
Epoch 23/100				
1/1	_____	0s 12ms/step	- loss: 14.4808	- mae: 14.4808
Epoch 24/100				
1/1	_____	0s 13ms/step	- loss: 14.2985	- mae: 14.2985
Epoch 25/100				
1/1	_____	0s 12ms/step	- loss: 14.1162	- mae: 14.1162

Epoch 26/100					
1/1	_____	0s	15ms/step	- loss: 13.9340	- mae: 13.9340
Epoch 27/100					
1/1	_____	0s	13ms/step	- loss: 13.7517	- mae: 13.7517
Epoch 28/100					
1/1	_____	0s	51ms/step	- loss: 13.5694	- mae: 13.5694
Epoch 29/100					
1/1	_____	0s	13ms/step	- loss: 13.3871	- mae: 13.3871
Epoch 30/100					
1/1	_____	0s	13ms/step	- loss: 13.2048	- mae: 13.2048
Epoch 31/100					
1/1	_____	0s	13ms/step	- loss: 13.0225	- mae: 13.0225
Epoch 32/100					
1/1	_____	0s	13ms/step	- loss: 12.8402	- mae: 12.8402
Epoch 33/100					
1/1	_____	0s	13ms/step	- loss: 12.6579	- mae: 12.6579
Epoch 34/100					
1/1	_____	0s	13ms/step	- loss: 12.4756	- mae: 12.4756
Epoch 35/100					
1/1	_____	0s	13ms/step	- loss: 12.2933	- mae: 12.2933
Epoch 36/100					
1/1	_____	0s	13ms/step	- loss: 12.1111	- mae: 12.1111
Epoch 37/100					
1/1	_____	0s	13ms/step	- loss: 11.9288	- mae: 11.9288
Epoch 38/100					
1/1	_____	0s	13ms/step	- loss: 11.7465	- mae: 11.7465
Epoch 39/100					
1/1	_____	0s	13ms/step	- loss: 11.5642	- mae: 11.5642
Epoch 40/100					
1/1	_____	0s	13ms/step	- loss: 11.3819	- mae: 11.3819
Epoch 41/100					
1/1	_____	0s	13ms/step	- loss: 11.1996	- mae: 11.1996
Epoch 42/100					
1/1	_____	0s	13ms/step	- loss: 11.0173	- mae: 11.0173
Epoch 43/100					
1/1	_____	0s	13ms/step	- loss: 10.8350	- mae: 10.8350
Epoch 44/100					
1/1	_____	0s	14ms/step	- loss: 10.6527	- mae: 10.6527
Epoch 45/100					
1/1	_____	0s	13ms/step	- loss: 10.4704	- mae: 10.4704
Epoch 46/100					
1/1	_____	0s	13ms/step	- loss: 10.2882	- mae: 10.2882
Epoch 47/100					
1/1	_____	0s	14ms/step	- loss: 10.1059	- mae: 10.1059
Epoch 48/100					
1/1	_____	0s	13ms/step	- loss: 9.9236	- mae: 9.9236
Epoch 49/100					
1/1	_____	0s	13ms/step	- loss: 9.7413	- mae: 9.7413
Epoch 50/100					
1/1	_____	0s	13ms/step	- loss: 9.5590	- mae: 9.5590

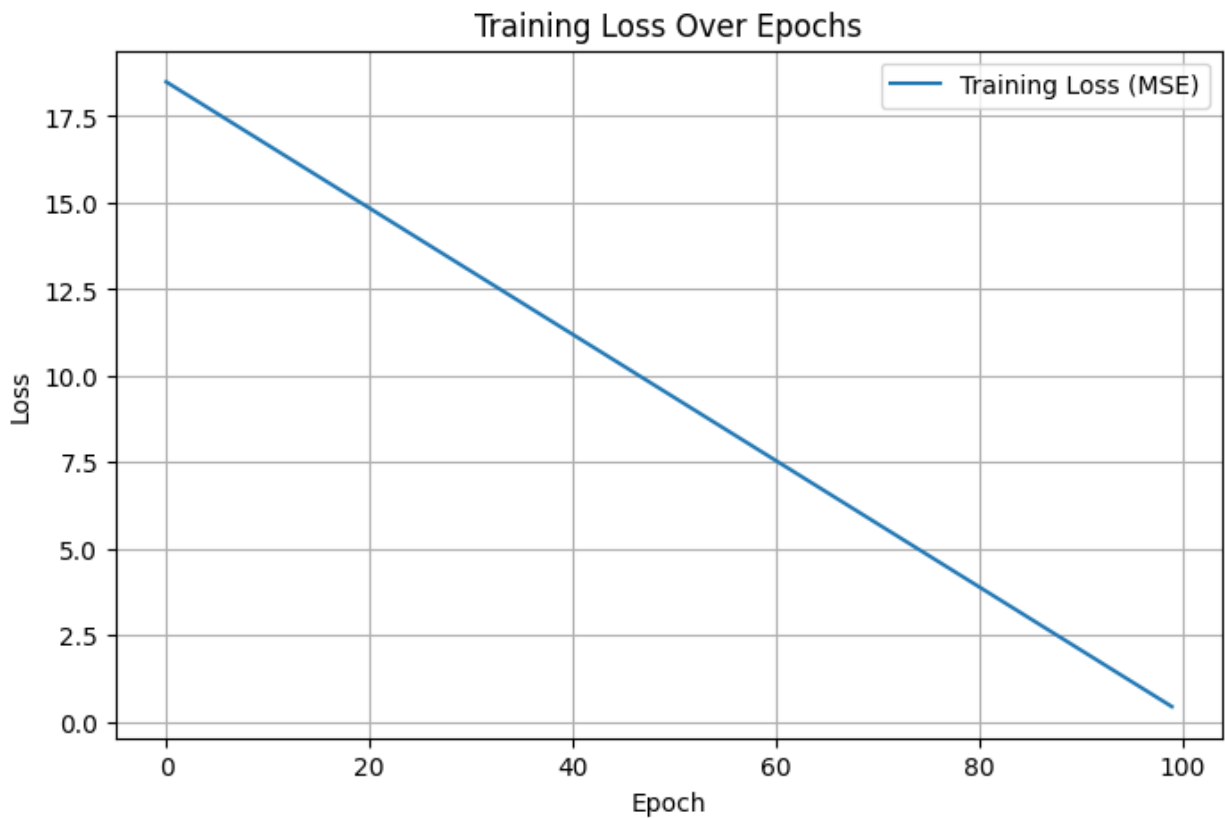
Epoch 51/100					
1/1	_____	0s 13ms/step	- loss: 9.3767	- mae: 9.3767	
Epoch 52/100					
1/1	_____	0s 14ms/step	- loss: 9.1944	- mae: 9.1944	
Epoch 53/100					
1/1	_____	0s 13ms/step	- loss: 9.0121	- mae: 9.0121	
Epoch 54/100					
1/1	_____	0s 13ms/step	- loss: 8.8298	- mae: 8.8298	
Epoch 55/100					
1/1	_____	0s 13ms/step	- loss: 8.6476	- mae: 8.6476	
Epoch 56/100					
1/1	_____	0s 15ms/step	- loss: 8.4653	- mae: 8.4653	
Epoch 57/100					
1/1	_____	0s 13ms/step	- loss: 8.2830	- mae: 8.2830	
Epoch 58/100					
1/1	_____	0s 13ms/step	- loss: 8.1007	- mae: 8.1007	
Epoch 59/100					
1/1	_____	0s 13ms/step	- loss: 7.9184	- mae: 7.9184	
Epoch 60/100					
1/1	_____	0s 14ms/step	- loss: 7.7361	- mae: 7.7361	
Epoch 61/100					
1/1	_____	0s 13ms/step	- loss: 7.5538	- mae: 7.5538	
Epoch 62/100					
1/1	_____	0s 13ms/step	- loss: 7.3715	- mae: 7.3715	
Epoch 63/100					
1/1	_____	0s 13ms/step	- loss: 7.1892	- mae: 7.1892	
Epoch 64/100					
1/1	_____	0s 14ms/step	- loss: 7.0069	- mae: 7.0069	
Epoch 65/100					
1/1	_____	0s 13ms/step	- loss: 6.8247	- mae: 6.8247	
Epoch 66/100					
1/1	_____	0s 13ms/step	- loss: 6.6424	- mae: 6.6424	
Epoch 67/100					
1/1	_____	0s 13ms/step	- loss: 6.4601	- mae: 6.4601	
Epoch 68/100					
1/1	_____	0s 13ms/step	- loss: 6.2778	- mae: 6.2778	
Epoch 69/100					
1/1	_____	0s 13ms/step	- loss: 6.0955	- mae: 6.0955	
Epoch 70/100					
1/1	_____	0s 13ms/step	- loss: 5.9132	- mae: 5.9132	
Epoch 71/100					
1/1	_____	0s 13ms/step	- loss: 5.7309	- mae: 5.7309	
Epoch 72/100					
1/1	_____	0s 50ms/step	- loss: 5.5486	- mae: 5.5486	
Epoch 73/100					
1/1	_____	0s 14ms/step	- loss: 5.3663	- mae: 5.3663	
Epoch 74/100					
1/1	_____	0s 13ms/step	- loss: 5.1840	- mae: 5.1840	
Epoch 75/100					
1/1	_____	0s 13ms/step	- loss: 5.0018	- mae: 5.0018	

```
Epoch 76/100
1/1 _____ 0s 13ms/step - loss: 4.8195 - mae: 4.8195
Epoch 77/100
1/1 _____ 0s 13ms/step - loss: 4.6372 - mae: 4.6372
Epoch 78/100
1/1 _____ 0s 13ms/step - loss: 4.4549 - mae: 4.4549
Epoch 79/100
1/1 _____ 0s 14ms/step - loss: 4.2726 - mae: 4.2726
Epoch 80/100
1/1 _____ 0s 13ms/step - loss: 4.0903 - mae: 4.0903
Epoch 81/100
1/1 _____ 0s 13ms/step - loss: 3.9080 - mae: 3.9080
Epoch 82/100
1/1 _____ 0s 13ms/step - loss: 3.7257 - mae: 3.7257
Epoch 83/100
1/1 _____ 0s 13ms/step - loss: 3.5434 - mae: 3.5434
Epoch 84/100
1/1 _____ 0s 13ms/step - loss: 3.3612 - mae: 3.3612
Epoch 85/100
1/1 _____ 0s 15ms/step - loss: 3.1789 - mae: 3.1789
Epoch 86/100
1/1 _____ 0s 15ms/step - loss: 2.9966 - mae: 2.9966
Epoch 87/100
1/1 _____ 0s 13ms/step - loss: 2.8143 - mae: 2.8143
Epoch 88/100
1/1 _____ 0s 13ms/step - loss: 2.6320 - mae: 2.6320
Epoch 89/100
1/1 _____ 0s 13ms/step - loss: 2.4497 - mae: 2.4497
Epoch 90/100
1/1 _____ 0s 14ms/step - loss: 2.2674 - mae: 2.2674
Epoch 91/100
1/1 _____ 0s 13ms/step - loss: 2.0851 - mae: 2.0851
Epoch 92/100
1/1 _____ 0s 13ms/step - loss: 1.9028 - mae: 1.9028
Epoch 93/100
1/1 _____ 0s 13ms/step - loss: 1.7205 - mae: 1.7205
Epoch 94/100
1/1 _____ 0s 13ms/step - loss: 1.5383 - mae: 1.5383
Epoch 95/100
1/1 _____ 0s 15ms/step - loss: 1.3560 - mae: 1.3560
Epoch 96/100
1/1 _____ 0s 13ms/step - loss: 1.1737 - mae: 1.1737
Epoch 97/100
1/1 _____ 0s 13ms/step - loss: 0.9914 - mae: 0.9914
Epoch 98/100
1/1 _____ 0s 13ms/step - loss: 0.8091 - mae: 0.8091
Epoch 99/100
1/1 _____ 0s 13ms/step - loss: 0.6268 - mae: 0.6268
```

Epoch 100/100  
1/1 ————— 0s 15ms/step - loss: 0.4445 - mae: 0.4445

### 5.1 Visualize training data loss

```
plt.figure(figsize=(8, 5))  
plt.plot(history.history['loss'], label="Training Loss (MSE)")  
plt.title("Training Loss Over Epochs")  
plt.xlabel("Epoch")  
plt.ylabel("Loss")  
plt.legend()  
plt.grid(True)  
plt.show()
```



### 1. Generate predictions

```
model.predict(np.array([35.0]))  
1/1 ————— 0s 17ms/step  
array([[69.32983]], dtype=float32)
```

### 6.1 Visualize predictions

```
X_test = np.linspace(-20, 40, 100)
y_pred = model.predict(X_test)

plt.scatter(X, y, label="Original Data")
plt.plot(X_test, y_pred, color="red", label="Model Predictions")
plt.legend()
plt.title("Model Fit on Custom Dataset")
plt.xlabel("X")
plt.ylabel("Predicted y")
plt.grid(True)
plt.show()
```

4/4 ————— 0s 2ms/step

