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

In [2]:
```
dataFrame = pd.read_excel("bisiklet_fiyatlari.xlsx")
```

In [3]:
```
dataFrame
```

Out[3]:

	Fiyat	BisikletOzellik1	BisikletOzellik2
0	807.673876	1749.628226	1749.590668
1	959.227520	1748.007826	1751.824206
2	718.020033	1750.122967	1747.977026
3	945.668885	1749.916440	1750.771646
4	955.542968	1750.780519	1750.592430
...	...	...	...
995	833.920637	1750.033229	1749.427281
996	800.298076	1747.996913	1750.035046
997	799.261737	1752.540381	1747.983310
998	705.802257	1751.349290	1747.484989
999	1048.892414	1748.656426	1752.539962

1000 rows × 3 columns

In [4]:
```
# y = wx + b
# y --> label yani fiyat
y = dataFrame["Fiyat"].values  #numpy array formatına çevir

# x --> feature yani bisiklet özellikleri
x = dataFrame[["BisikletOzellik1","BisikletOzellik2"]].values
```

In [5]:
```
from sklearn.model_selection import train_test_split
#veri setini hem eğitim hem de test için ağırlıklı bi şekilde ikiye ayırmak için

#test_size --> test için ayrılacak veri yüzdesi %33
x_train, x_test, y_train, y_test = train_test_split(x,y,test_size=0.33)
```

In [6]:
```
x_train
```

Out[6]:
```
array([[1750.482746, 1750.778662],
       [1747.277403, 1749.647984],
       [1750.512058, 1748.444974],
       ...,
       [1748.268223, 1748.798416],
       [1753.324925, 1749.778418],
       [1748.195024, 1749.298745]])
```

In [7]:
```
from sklearn.preprocessing import MinMaxScaler
```

```python
#scaling --> tüm x değerlerini 0-1 arası değerlere ölçeklendirme

scaler = MinMaxScaler()
scaler.fit(x_train)       #ön hazırlık için uydur

x_train = scaler.transform(x_train)
x_test = scaler.transform(x_test)
```

In [8]:

```python
x_train
```

Out[8]:

```
array([[0.52320714, 0.60550034],
       [0.22536197, 0.49075659],
       [0.52593085, 0.36867243],
       ...,
       [0.31743041, 0.40454052],
       [0.78730657, 0.50399333],
       [0.31062865, 0.45531503]])
```

In [9]:

```python
import tensorflow as tf
from tensorflow.keras import models   # model sınıfı
from tensorflow.keras import layers   # katman sınıfı
```

In [10]:

```python
# Sinir Ağı Modeli Oluşturma

model = models.Sequential()

model.add(layers.Dense(4, activation="relu"))  #1.gizli katman ve 4 nöron
model.add(layers.Dense(4, activation="relu"))  #2.gizli katman ve 4 nöron
model.add(layers.Dense(4, activation="relu"))  #3.gizli katman ve 4 nöron

model.add(layers.Dense(1))   #çıkış katmanı
```

In [11]:

```python
# optimizasyon
model.compile(optimizer="rmsprop", loss="mse")
```

In [12]:

```python
# eğitme
model.fit(x_train,y_train, epochs=250)
```

```
Epoch 1/250
21/21 [==============================] - 0s 572us/step - loss: 786264.3750
Epoch 2/250
21/21 [==============================] - 0s 762us/step - loss: 786024.6875
Epoch 3/250
21/21 [==============================] - 0s 762us/step - loss: 785742.8125
Epoch 4/250
21/21 [==============================] - 0s 762us/step - loss: 785406.2500
Epoch 5/250
21/21 [==============================] - 0s 762us/step - loss: 785041.9375
Epoch 6/250
21/21 [==============================] - 0s 762us/step - loss: 784649.6250
Epoch 7/250
21/21 [==============================] - 0s 572us/step - loss: 784216.7500
Epoch 8/250
21/21 [==============================] - 0s 762us/step - loss: 783735.1250
Epoch 9/250
21/21 [==============================] - 0s 762us/step - loss: 783202.9375
Epoch 10/250
21/21 [==============================] - 0s 762us/step - loss: 782616.0000
Epoch 11/250
21/21 [==============================] - 0s 762us/step - loss: 781963.5625
Epoch 12/250
21/21 [==============================] - 0s 572us/step - loss: 781245.3125
```

```
Epoch 13/250
21/21 [==============================] - 0s 762us/step - loss: 780461.2500
Epoch 14/250
21/21 [==============================] - 0s 762us/step - loss: 779599.4375
Epoch 15/250
21/21 [==============================] - 0s 762us/step - loss: 778657.0625
Epoch 16/250
21/21 [==============================] - 0s 762us/step - loss: 777635.8125
Epoch 17/250
21/21 [==============================] - 0s 762us/step - loss: 776522.6875
Epoch 18/250
21/21 [==============================] - 0s 953us/step - loss: 775317.5000
Epoch 19/250
21/21 [==============================] - 0s 762us/step - loss: 774019.1250
Epoch 20/250
21/21 [==============================] - 0s 572us/step - loss: 772611.8750
Epoch 21/250
21/21 [==============================] - 0s 572us/step - loss: 771099.5000
Epoch 22/250
21/21 [==============================] - 0s 762us/step - loss: 769474.1875
Epoch 23/250
21/21 [==============================] - 0s 762us/step - loss: 767733.6875
Epoch 24/250
21/21 [==============================] - 0s 571us/step - loss: 765867.3125
Epoch 25/250
21/21 [==============================] - 0s 571us/step - loss: 763871.7500
Epoch 26/250
21/21 [==============================] - 0s 762us/step - loss: 761744.0625
Epoch 27/250
21/21 [==============================] - 0s 762us/step - loss: 759465.8125
Epoch 28/250
21/21 [==============================] - 0s 762us/step - loss: 757054.2500
Epoch 29/250
21/21 [==============================] - 0s 762us/step - loss: 754491.0000
Epoch 30/250
21/21 [==============================] - 0s 762us/step - loss: 751760.2500
Epoch 31/250
21/21 [==============================] - 0s 953us/step - loss: 748878.0625
Epoch 32/250
21/21 [==============================] - 0s 762us/step - loss: 745834.6875
Epoch 33/250
21/21 [==============================] - 0s 1ms/step - loss: 742601.1875
Epoch 34/250
21/21 [==============================] - 0s 1ms/step - loss: 739183.5000
Epoch 35/250
21/21 [==============================] - 0s 1ms/step - loss: 735592.5625
Epoch 36/250
21/21 [==============================] - 0s 1ms/step - loss: 731809.5625
Epoch 37/250
21/21 [==============================] - 0s 1ms/step - loss: 727810.7500
Epoch 38/250
21/21 [==============================] - 0s 1ms/step - loss: 723631.8750
Epoch 39/250
21/21 [==============================] - 0s 1ms/step - loss: 719244.6875
Epoch 40/250
21/21 [==============================] - 0s 952us/step - loss: 714635.8125
Epoch 41/250
21/21 [==============================] - 0s 953us/step - loss: 709820.3125
Epoch 42/250
21/21 [==============================] - 0s 1ms/step - loss: 704771.5000
Epoch 43/250
21/21 [==============================] - 0s 952us/step - loss: 699487.2500
Epoch 44/250
21/21 [==============================] - 0s 953us/step - loss: 693984.6250
Epoch 45/250
21/21 [==============================] - 0s 953us/step - loss: 688245.0000
Epoch 46/250
21/21 [==============================] - 0s 1ms/step - loss: 682238.6875
Epoch 47/250
21/21 [==============================] - 0s 953us/step - loss: 675988.8750
Epoch 48/250
21/21 [==============================] - 0s 952us/step - loss: 669483.5000
```

```
Epoch 49/250
21/21 [==============================] - 0s 952us/step - loss: 662701.5000
Epoch 50/250
21/21 [==============================] - 0s 762us/step - loss: 655680.0625
Epoch 51/250
21/21 [==============================] - 0s 1ms/step - loss: 648403.8750
Epoch 52/250
21/21 [==============================] - 0s 953us/step - loss: 640875.7500
Epoch 53/250
21/21 [==============================] - 0s 1ms/step - loss: 633057.1250
Epoch 54/250
21/21 [==============================] - 0s 953us/step - loss: 624950.5625
Epoch 55/250
21/21 [==============================] - 0s 953us/step - loss: 616595.1875
Epoch 56/250
21/21 [==============================] - 0s 1ms/step - loss: 607922.3750
Epoch 57/250
21/21 [==============================] - 0s 2ms/step - loss: 598966.5625
Epoch 58/250
21/21 [==============================] - 0s 1ms/step - loss: 589750.3750
Epoch 59/250
21/21 [==============================] - 0s 952us/step - loss: 580292.4375
Epoch 60/250
21/21 [==============================] - 0s 1ms/step - loss: 570496.7500
Epoch 61/250
21/21 [==============================] - 0s 953us/step - loss: 560460.4375
Epoch 62/250
21/21 [==============================] - 0s 1ms/step - loss: 550164.8125
Epoch 63/250
21/21 [==============================] - 0s 1ms/step - loss: 539511.3750
Epoch 64/250
21/21 [==============================] - 0s 953us/step - loss: 528612.9375
Epoch 65/250
21/21 [==============================] - 0s 762us/step - loss: 517440.9062
Epoch 66/250
21/21 [==============================] - 0s 953us/step - loss: 506067.1562
Epoch 67/250
21/21 [==============================] - 0s 953us/step - loss: 494368.6250
Epoch 68/250
21/21 [==============================] - 0s 953us/step - loss: 482341.7812
Epoch 69/250
21/21 [==============================] - 0s 953us/step - loss: 470140.9062
Epoch 70/250
21/21 [==============================] - 0s 1ms/step - loss: 457722.2188
Epoch 71/250
21/21 [==============================] - 0s 1ms/step - loss: 445112.2500
Epoch 72/250
21/21 [==============================] - 0s 953us/step - loss: 432258.7188
Epoch 73/250
21/21 [==============================] - 0s 762us/step - loss: 419135.0000
Epoch 74/250
21/21 [==============================] - 0s 996us/step - loss: 405799.9375
Epoch 75/250
21/21 [==============================] - 0s 1ms/step - loss: 392259.5938
Epoch 76/250
21/21 [==============================] - 0s 952us/step - loss: 378537.0000
Epoch 77/250
21/21 [==============================] - 0s 762us/step - loss: 364672.3750
Epoch 78/250
21/21 [==============================] - 0s 1ms/step - loss: 350671.0312
Epoch 79/250
21/21 [==============================] - 0s 953us/step - loss: 336596.8125
Epoch 80/250
21/21 [==============================] - 0s 953us/step - loss: 322371.8750
Epoch 81/250
21/21 [==============================] - 0s 1ms/step - loss: 307947.0000
Epoch 82/250
21/21 [==============================] - 0s 1ms/step - loss: 293581.5312
Epoch 83/250
21/21 [==============================] - 0s 1ms/step - loss: 279193.5312
Epoch 84/250
21/21 [==============================] - 0s 1ms/step - loss: 264768.3438
```

```
Epoch 85/250
21/21 [==============================] - 0s 2ms/step - loss: 250285.0156
Epoch 86/250
21/21 [==============================] - 0s 1ms/step - loss: 235809.9531
Epoch 87/250
21/21 [==============================] - 0s 1ms/step - loss: 221461.9219
Epoch 88/250
21/21 [==============================] - 0s 762us/step - loss: 207283.5312
Epoch 89/250
21/21 [==============================] - 0s 953us/step - loss: 193215.5469
Epoch 90/250
21/21 [==============================] - 0s 1ms/step - loss: 179272.6562
Epoch 91/250
21/21 [==============================] - 0s 762us/step - loss: 165475.7188
Epoch 92/250
21/21 [==============================] - 0s 953us/step - loss: 152009.3125
Epoch 93/250
21/21 [==============================] - 0s 952us/step - loss: 138840.6406
Epoch 94/250
21/21 [==============================] - 0s 762us/step - loss: 126072.7656
Epoch 95/250
21/21 [==============================] - 0s 953us/step - loss: 113570.2812
Epoch 96/250
21/21 [==============================] - 0s 953us/step - loss: 101649.4531
Epoch 97/250
21/21 [==============================] - 0s 762us/step - loss: 90198.5156
Epoch 98/250
21/21 [==============================] - 0s 953us/step - loss: 79239.6797
Epoch 99/250
21/21 [==============================] - 0s 953us/step - loss: 68880.8203
Epoch 100/250
21/21 [==============================] - 0s 1ms/step - loss: 59151.8047
Epoch 101/250
21/21 [==============================] - 0s 953us/step - loss: 50077.1797
Epoch 102/250
21/21 [==============================] - 0s 953us/step - loss: 41844.6602
Epoch 103/250
21/21 [==============================] - 0s 953us/step - loss: 34497.9570
Epoch 104/250
21/21 [==============================] - 0s 1ms/step - loss: 27954.5996
Epoch 105/250
21/21 [==============================] - 0s 953us/step - loss: 22403.8516
Epoch 106/250
21/21 [==============================] - 0s 1ms/step - loss: 17886.4277
Epoch 107/250
21/21 [==============================] - 0s 1ms/step - loss: 14405.1025
Epoch 108/250
21/21 [==============================] - 0s 953us/step - loss: 12009.0234
Epoch 109/250
21/21 [==============================] - 0s 953us/step - loss: 10553.7451
Epoch 110/250
21/21 [==============================] - 0s 1ms/step - loss: 9943.5791
Epoch 111/250
21/21 [==============================] - 0s 964us/step - loss: 9740.5674
Epoch 112/250
21/21 [==============================] - 0s 1ms/step - loss: 9640.5957
Epoch 113/250
21/21 [==============================] - 0s 952us/step - loss: 9560.6562
Epoch 114/250
21/21 [==============================] - 0s 953us/step - loss: 9464.9990
Epoch 115/250
21/21 [==============================] - 0s 953us/step - loss: 9372.5039
Epoch 116/250
21/21 [==============================] - 0s 953us/step - loss: 9288.8398
Epoch 117/250
21/21 [==============================] - 0s 953us/step - loss: 9197.8828
Epoch 118/250
21/21 [==============================] - 0s 1ms/step - loss: 9114.1201
Epoch 119/250
21/21 [==============================] - 0s 953us/step - loss: 9032.8623
Epoch 120/250
21/21 [==============================] - 0s 1ms/step - loss: 8942.1885
```

```
Epoch 121/250
21/21 [==============================] - 0s 953us/step - loss: 8868.8613
Epoch 122/250
21/21 [==============================] - 0s 1ms/step - loss: 8784.7861
Epoch 123/250
21/21 [==============================] - 0s 1ms/step - loss: 8701.4668
Epoch 124/250
21/21 [==============================] - 0s 762us/step - loss: 8613.4004
Epoch 125/250
21/21 [==============================] - 0s 953us/step - loss: 8534.0039
Epoch 126/250
21/21 [==============================] - 0s 1ms/step - loss: 8460.2539
Epoch 127/250
21/21 [==============================] - 0s 953us/step - loss: 8376.8213
Epoch 128/250
21/21 [==============================] - 0s 952us/step - loss: 8290.2451
Epoch 129/250
21/21 [==============================] - 0s 952us/step - loss: 8200.5674
Epoch 130/250
21/21 [==============================] - 0s 3ms/step - loss: 8120.8857
Epoch 131/250
21/21 [==============================] - 0s 1ms/step - loss: 8029.8267
Epoch 132/250
21/21 [==============================] - 0s 1ms/step - loss: 7948.0454
Epoch 133/250
21/21 [==============================] - 0s 1ms/step - loss: 7860.5894
Epoch 134/250
21/21 [==============================] - 0s 1ms/step - loss: 7777.6597
Epoch 135/250
21/21 [==============================] - 0s 953us/step - loss: 7707.1592
Epoch 136/250
21/21 [==============================] - 0s 1ms/step - loss: 7618.8843
Epoch 137/250
21/21 [==============================] - 0s 953us/step - loss: 7532.3672
Epoch 138/250
21/21 [==============================] - 0s 1ms/step - loss: 7456.7329
Epoch 139/250
21/21 [==============================] - 0s 1ms/step - loss: 7385.1919
Epoch 140/250
21/21 [==============================] - 0s 952us/step - loss: 7300.2231
Epoch 141/250
21/21 [==============================] - 0s 953us/step - loss: 7227.0737
Epoch 142/250
21/21 [==============================] - 0s 953us/step - loss: 7144.3911
Epoch 143/250
21/21 [==============================] - 0s 953us/step - loss: 7067.0029
Epoch 144/250
21/21 [==============================] - 0s 1ms/step - loss: 6999.8965
Epoch 145/250
21/21 [==============================] - 0s 1ms/step - loss: 6915.1099
Epoch 146/250
21/21 [==============================] - 0s 1ms/step - loss: 6836.6230
Epoch 147/250
21/21 [==============================] - 0s 953us/step - loss: 6773.8091
Epoch 148/250
21/21 [==============================] - 0s 762us/step - loss: 6695.0293
Epoch 149/250
21/21 [==============================] - 0s 1ms/step - loss: 6622.1401
Epoch 150/250
21/21 [==============================] - 0s 952us/step - loss: 6551.6084
Epoch 151/250
21/21 [==============================] - 0s 1ms/step - loss: 6466.8618
Epoch 152/250
21/21 [==============================] - 0s 953us/step - loss: 6389.1597
Epoch 153/250
21/21 [==============================] - 0s 953us/step - loss: 6302.5928
Epoch 154/250
21/21 [==============================] - 0s 1ms/step - loss: 6223.8062
Epoch 155/250
21/21 [==============================] - 0s 1ms/step - loss: 6148.2681
Epoch 156/250
21/21 [==============================] - 0s 952us/step - loss: 6079.9375
```

```
Epoch 157/250
21/21 [==============================] - 0s 1ms/step - loss: 6008.6338
Epoch 158/250
21/21 [==============================] - 0s 1ms/step - loss: 5934.3076
Epoch 159/250
21/21 [==============================] - 0s 1ms/step - loss: 5863.0615
Epoch 160/250
21/21 [==============================] - 0s 1ms/step - loss: 5798.4785
Epoch 161/250
21/21 [==============================] - 0s 952us/step - loss: 5727.5542
Epoch 162/250
21/21 [==============================] - 0s 953us/step - loss: 5645.4492
Epoch 163/250
21/21 [==============================] - 0s 1ms/step - loss: 5588.3140
Epoch 164/250
21/21 [==============================] - 0s 1ms/step - loss: 5525.4087
Epoch 165/250
21/21 [==============================] - 0s 952us/step - loss: 5456.1763
Epoch 166/250
21/21 [==============================] - 0s 1ms/step - loss: 5382.7905
Epoch 167/250
21/21 [==============================] - 0s 1ms/step - loss: 5315.9375
Epoch 168/250
21/21 [==============================] - 0s 1ms/step - loss: 5237.9678
Epoch 169/250
21/21 [==============================] - 0s 953us/step - loss: 5161.1118
Epoch 170/250
21/21 [==============================] - 0s 952us/step - loss: 5082.6963
Epoch 171/250
21/21 [==============================] - 0s 952us/step - loss: 5009.6470
Epoch 172/250
21/21 [==============================] - 0s 1ms/step - loss: 4930.1660
Epoch 173/250
21/21 [==============================] - 0s 953us/step - loss: 4845.9678
Epoch 174/250
21/21 [==============================] - 0s 1ms/step - loss: 4790.3838
Epoch 175/250
21/21 [==============================] - 0s 952us/step - loss: 4718.2681
Epoch 176/250
21/21 [==============================] - 0s 952us/step - loss: 4641.7847
Epoch 177/250
21/21 [==============================] - 0s 1ms/step - loss: 4564.2417
Epoch 178/250
21/21 [==============================] - 0s 952us/step - loss: 4484.9038
Epoch 179/250
21/21 [==============================] - 0s 1ms/step - loss: 4425.9429
Epoch 180/250
21/21 [==============================] - 0s 952us/step - loss: 4353.5645
Epoch 181/250
21/21 [==============================] - 0s 762us/step - loss: 4290.3701
Epoch 182/250
21/21 [==============================] - 0s 1ms/step - loss: 4219.4976
Epoch 183/250
21/21 [==============================] - 0s 1ms/step - loss: 4151.4009
Epoch 184/250
21/21 [==============================] - 0s 953us/step - loss: 4086.6646
Epoch 185/250
21/21 [==============================] - 0s 1ms/step - loss: 4014.1646
Epoch 186/250
21/21 [==============================] - 0s 953us/step - loss: 3952.0701
Epoch 187/250
21/21 [==============================] - 0s 762us/step - loss: 3888.4250
Epoch 188/250
21/21 [==============================] - 0s 1ms/step - loss: 3821.1880
Epoch 189/250
21/21 [==============================] - 0s 952us/step - loss: 3756.8750
Epoch 190/250
21/21 [==============================] - 0s 1ms/step - loss: 3697.0867
Epoch 191/250
21/21 [==============================] - 0s 762us/step - loss: 3626.6399
Epoch 192/250
21/21 [==============================] - 0s 953us/step - loss: 3568.1948
```

```
Epoch 193/250
21/21 [==============================] - 0s 1ms/step - loss: 3505.2322
Epoch 194/250
21/21 [==============================] - 0s 953us/step - loss: 3435.9993
Epoch 195/250
21/21 [==============================] - 0s 1ms/step - loss: 3376.0806
Epoch 196/250
21/21 [==============================] - 0s 953us/step - loss: 3306.8303
Epoch 197/250
21/21 [==============================] - 0s 1ms/step - loss: 3246.6143
Epoch 198/250
21/21 [==============================] - 0s 1ms/step - loss: 3186.6326
Epoch 199/250
21/21 [==============================] - ETA: 0s - loss: 2521.08 - 0s 1ms/step - loss: 3124.204
1
Epoch 200/250
21/21 [==============================] - 0s 3ms/step - loss: 3057.2312
Epoch 201/250
21/21 [==============================] - 0s 1ms/step - loss: 2995.4941
Epoch 202/250
21/21 [==============================] - 0s 2ms/step - loss: 2937.4958
Epoch 203/250
21/21 [==============================] - 0s 952us/step - loss: 2869.3254
Epoch 204/250
21/21 [==============================] - 0s 1ms/step - loss: 2818.7288
Epoch 205/250
21/21 [==============================] - 0s 1ms/step - loss: 2754.3525
Epoch 206/250
21/21 [==============================] - 0s 1ms/step - loss: 2695.9883
Epoch 207/250
21/21 [==============================] - 0s 952us/step - loss: 2638.6687
Epoch 208/250
21/21 [==============================] - 0s 762us/step - loss: 2577.2344
Epoch 209/250
21/21 [==============================] - 0s 953us/step - loss: 2522.8872
Epoch 210/250
21/21 [==============================] - 0s 953us/step - loss: 2462.7883
Epoch 211/250
21/21 [==============================] - 0s 953us/step - loss: 2404.5979
Epoch 212/250
21/21 [==============================] - 0s 953us/step - loss: 2347.2466
Epoch 213/250
21/21 [==============================] - 0s 953us/step - loss: 2291.1770
Epoch 214/250
21/21 [==============================] - 0s 1ms/step - loss: 2235.6118
Epoch 215/250
21/21 [==============================] - 0s 762us/step - loss: 2179.7742
Epoch 216/250
21/21 [==============================] - 0s 953us/step - loss: 2124.1855
Epoch 217/250
21/21 [==============================] - 0s 953us/step - loss: 2067.4070
Epoch 218/250
21/21 [==============================] - 0s 762us/step - loss: 2006.4364
Epoch 219/250
21/21 [==============================] - 0s 953us/step - loss: 1944.3616
Epoch 220/250
21/21 [==============================] - 0s 953us/step - loss: 1898.8468
Epoch 221/250
21/21 [==============================] - 0s 953us/step - loss: 1841.0487
Epoch 222/250
21/21 [==============================] - 0s 952us/step - loss: 1790.0681
Epoch 223/250
21/21 [==============================] - 0s 762us/step - loss: 1731.5778
Epoch 224/250
21/21 [==============================] - 0s 1ms/step - loss: 1677.0576
Epoch 225/250
21/21 [==============================] - 0s 1ms/step - loss: 1621.5319
Epoch 226/250
21/21 [==============================] - 0s 1ms/step - loss: 1567.0109
Epoch 227/250
21/21 [==============================] - 0s 762us/step - loss: 1516.2723
Epoch 228/250
```

```
21/21 [==============================] - 0s 1ms/step - loss: 1459.7236
Epoch 229/250
21/21 [==============================] - 0s 1ms/step - loss: 1419.3147
Epoch 230/250
21/21 [==============================] - 0s 953us/step - loss: 1369.1346
Epoch 231/250
21/21 [==============================] - 0s 953us/step - loss: 1317.7332
Epoch 232/250
21/21 [==============================] - 0s 1ms/step - loss: 1263.6365
Epoch 233/250
21/21 [==============================] - 0s 1ms/step - loss: 1222.0577
Epoch 234/250
21/21 [==============================] - 0s 953us/step - loss: 1183.7600
Epoch 235/250
21/21 [==============================] - 0s 1ms/step - loss: 1135.7925
Epoch 236/250
21/21 [==============================] - 0s 1ms/step - loss: 1089.0994
Epoch 237/250
21/21 [==============================] - 0s 1ms/step - loss: 1045.5421
Epoch 238/250
21/21 [==============================] - 0s 762us/step - loss: 1002.0670
Epoch 239/250
21/21 [==============================] - 0s 1ms/step - loss: 956.1333
Epoch 240/250
21/21 [==============================] - 0s 1ms/step - loss: 916.3654
Epoch 241/250
21/21 [==============================] - 0s 953us/step - loss: 878.5037
Epoch 242/250
21/21 [==============================] - 0s 978us/step - loss: 840.4198
Epoch 243/250
21/21 [==============================] - 0s 953us/step - loss: 801.9258
Epoch 244/250
21/21 [==============================] - 0s 952us/step - loss: 761.2888
Epoch 245/250
21/21 [==============================] - 0s 1ms/step - loss: 725.8373
Epoch 246/250
21/21 [==============================] - 0s 952us/step - loss: 690.0660
Epoch 247/250
21/21 [==============================] - 0s 952us/step - loss: 654.4760
Epoch 248/250
21/21 [==============================] - 0s 952us/step - loss: 621.3063
Epoch 249/250
21/21 [==============================] - 0s 953us/step - loss: 590.1779
Epoch 250/250
21/21 [==============================] - 0s 1ms/step - loss: 564.5442
```

Out[12]:

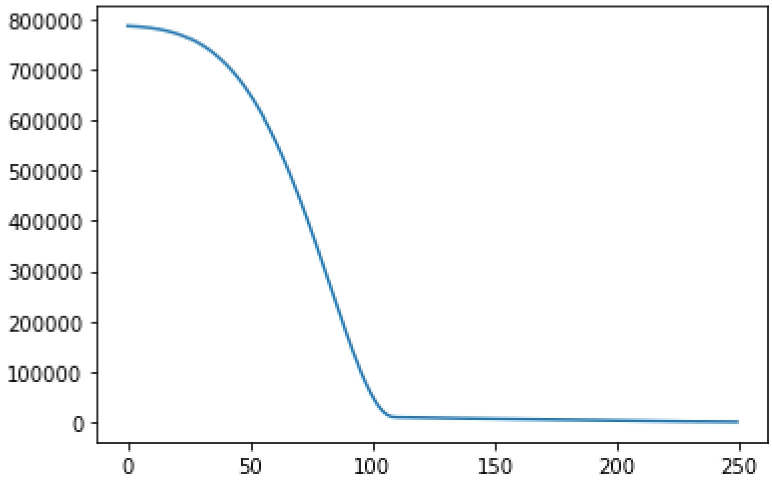
```
<tensorflow.python.keras.callbacks.History at 0x21939237b50>
```

In [13]:

```python
# Loss değerlerinin minimize olma eğrisi
loss = model.history.history["loss"]
axis = range(0,len(loss))
plt.plot(axis,loss)
```

Out[13]:

```
[<matplotlib.lines.Line2D at 0x2193a861e80>]
```



In [14]:
```
# Loss kayıplarının değerlendirilmesi
# train ve test kayıpları ne kadar az olursa o kadar iyidir
# train ve test kayıplarının birbirine yakın değerler olması sağlıklıdır

trainLoss = model.evaluate(x_train,y_train,verbose=0)
testLoss = model.evaluate(x_test,y_test,verbose=0)
```

In [15]:
```
trainLoss
```

Out[15]: 544.71435546875

In [16]:
```
testLoss
```

Out[16]: 569.54345703125

In [17]:
```
# Tahmin denemeleri

tahminler = model.predict(x_test)
# y --> fiyat tahminlerini numpy array şeklinde verir

tahminler.shape
```

Out[17]: (330, 1)

In [18]:
```
tahminler = pd.Series(tahminler.reshape(330,))
tahminler
```

Out[18]:
```
0       604.519287
1       958.786560
2       791.092102
3      1028.104614
4       947.453674
          ...
325    1192.929688
326     899.815979
327     765.805908
328     954.215393
329     792.958984
Length: 330, dtype: float32
```

In [19]:
```
# Tahminlerin gerçek değerlerle karşılaştırılması

compareFrame = pd.DataFrame(y_test,columns=["Gerçek Fiyat"])
```

```
compareFrame = pd.concat([compareFrame,tahminler],axis=1)
compareFrame.columns = ["Gerçek Fiyat","Tahmin"]
```

In [20]:

```
compareFrame
```

Out[20]:

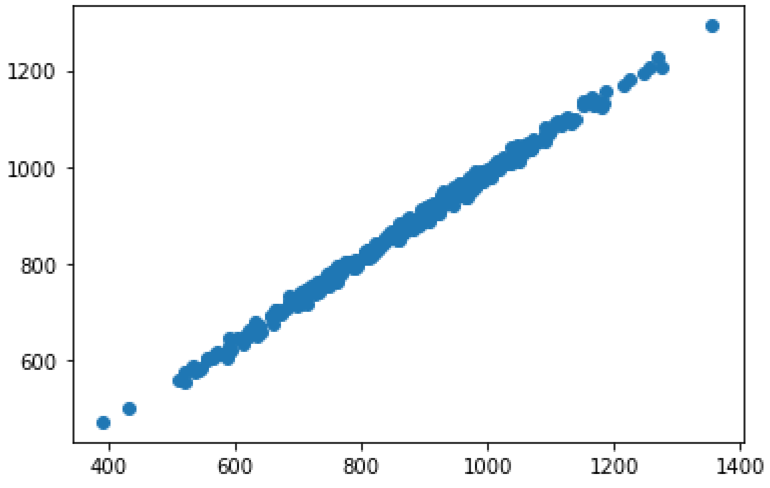
	Gerçek Fiyat	Tahmin
0	566.556564	604.519287
1	977.111437	958.786560
2	786.552347	791.092102
3	1042.940184	1028.104614
4	965.387674	947.453674
...	...	...
325	1245.401103	1192.929688
326	897.021611	899.815979
327	744.107388	765.805908
328	957.475775	954.215393
329	789.208125	792.958984

330 rows × 2 columns

In [21]:

```
plt.scatter(y_test,tahminler)
```

Out[21]: <matplotlib.collections.PathCollection at 0x2193a9e46a0>



In [22]:

```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
dense (Dense)                (None, 4)                 12
_________________________________________________________________
dense_1 (Dense)              (None, 4)                 20
_________________________________________________________________
dense_2 (Dense)              (None, 4)                 20
_________________________________________________________________
dense_3 (Dense)              (None, 1)                 5
=================================================================
```

```
Total params: 57
Trainable params: 57
Non-trainable params: 0
_________________________________________________________________
```

In [23]:

```python
# Hata oranı kabul edilebilir mi?
from sklearn.metrics import mean_absolute_error

mean_absolute_error(compareFrame["Gerçek Fiyat"],compareFrame["Tahmin"])
```

Out[23]:

```
18.99912551246567
```

In [24]:

```python
dataFrame["Fiyat"].mean()
```

Out[24]:

```
872.6778007425
```

In [25]:

```python
# ortalama 872 liralık fiyatlardan ortalama 6.94 tl sapabilir
```

In [26]:

```python
# modeli kaydetme
model.save("bisiklet_modeli.h5")

# modeli alma
# from tensorflow.keras.models import load_model
# my_model = load_model("bisiklet_modeli.h5")
```

In [ ]:

```python

```