

# Experiment no. 1

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Class : BE-(B3)  
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```
In [ ]: import sklearn
from sklearn import datasets
import pandas as pd
from sklearn.datasets import load_boston
```

```
In [4]: boston=datasets.load_boston();
df=pd.DataFrame(data=boston.data,columns=boston.feature_names)
df['target']=boston.target
df
```

```
Out[4]:
```

	CRIM	ZN	INDUS	CHAS	NOX	RM	AGE	DIS	RAD	TAX	PTRATIO	B	LSTAT	1
0	0.00632	18.0	2.31	0.0	0.538	6.575	65.2	4.0900	1.0	296.0	15.3	396.90	4.98	
1	0.02731	0.0	7.07	0.0	0.469	6.421	78.9	4.9671	2.0	242.0	17.8	396.90	9.14	
2	0.02729	0.0	7.07	0.0	0.469	7.185	61.1	4.9671	2.0	242.0	17.8	392.83	4.03	
3	0.03237	0.0	2.18	0.0	0.458	6.998	45.8	6.0622	3.0	222.0	18.7	394.63	2.94	
4	0.06905	0.0	2.18	0.0	0.458	7.147	54.2	6.0622	3.0	222.0	18.7	396.90	5.33	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
501	0.06263	0.0	11.93	0.0	0.573	6.593	69.1	2.4786	1.0	273.0	21.0	391.99	9.67	
502	0.04527	0.0	11.93	0.0	0.573	6.120	76.7	2.2875	1.0	273.0	21.0	396.90	9.08	
503	0.06076	0.0	11.93	0.0	0.573	6.976	91.0	2.1675	1.0	273.0	21.0	396.90	5.64	
504	0.10959	0.0	11.93	0.0	0.573	6.794	89.3	2.3889	1.0	273.0	21.0	393.45	6.48	
505	0.04741	0.0	11.93	0.0	0.573	6.030	80.8	2.5050	1.0	273.0	21.0	396.90	7.88	

506 rows × 14 columns

```
In [5]: import tensorflow as tf
from tensorflow import keras
from tensorflow.keras import layers
from sklearn.model_selection import train_test_split
```

```
In [6]: y=df.target
X=df.drop('target',axis=1)
X_train,X_test,y_train,y_test=train_test_split(X,y)
```

```
In [7]: model = keras.Sequential(
[
    layers.Dense(500, activation="sigmoid"),
    layers.Dense(800, activation="sigmoid"),
```

```
        layers.Dense(4000, activation="sigmoid"),
        layers.Dense(2000, activation="sigmoid"),
        layers.Dense(1, name="layer5"),
    ]
)
model.compile(optimizer='nadam', loss='mean_absolute_error')
model.fit(X_train, y_train, epochs=100)
```

```
Epoch 1/100
12/12 [=====] - 5s 220ms/step - loss: 8.2208
Epoch 2/100
12/12 [=====] - 3s 216ms/step - loss: 6.3248
Epoch 3/100
12/12 [=====] - 2s 208ms/step - loss: 5.7000
Epoch 4/100
12/12 [=====] - 2s 209ms/step - loss: 5.6099
Epoch 5/100
12/12 [=====] - 2s 208ms/step - loss: 5.3362
Epoch 6/100
12/12 [=====] - 2s 207ms/step - loss: 5.3381
Epoch 7/100
12/12 [=====] - 2s 207ms/step - loss: 5.2501
Epoch 8/100
12/12 [=====] - 3s 218ms/step - loss: 5.0468
Epoch 9/100
12/12 [=====] - 3s 212ms/step - loss: 5.0132
Epoch 10/100
12/12 [=====] - 3s 213ms/step - loss: 4.8831
Epoch 11/100
12/12 [=====] - 3s 229ms/step - loss: 4.7286
Epoch 12/100
12/12 [=====] - 3s 218ms/step - loss: 4.6593
Epoch 13/100
12/12 [=====] - 3s 208ms/step - loss: 4.6107
Epoch 14/100
12/12 [=====] - 3s 211ms/step - loss: 4.4174
Epoch 15/100
12/12 [=====] - 3s 209ms/step - loss: 4.2210
Epoch 16/100
12/12 [=====] - 2s 209ms/step - loss: 4.2192
Epoch 17/100
12/12 [=====] - 3s 218ms/step - loss: 4.0420
Epoch 18/100
12/12 [=====] - 3s 210ms/step - loss: 3.8996
Epoch 19/100
12/12 [=====] - 3s 212ms/step - loss: 3.9317
Epoch 20/100
12/12 [=====] - 3s 209ms/step - loss: 3.8288
Epoch 21/100
12/12 [=====] - 3s 216ms/step - loss: 3.5671
Epoch 22/100
12/12 [=====] - 3s 219ms/step - loss: 3.6597
Epoch 23/100
12/12 [=====] - 3s 215ms/step - loss: 3.5420
Epoch 24/100
12/12 [=====] - 2s 209ms/step - loss: 3.5981
Epoch 25/100
12/12 [=====] - 2s 209ms/step - loss: 3.5396
Epoch 26/100
12/12 [=====] - 2s 208ms/step - loss: 3.5000
Epoch 27/100
12/12 [=====] - 3s 210ms/step - loss: 3.7320
Epoch 28/100
12/12 [=====] - 3s 223ms/step - loss: 3.2867
Epoch 29/100
12/12 [=====] - 3s 214ms/step - loss: 3.2880
Epoch 30/100
12/12 [=====] - 3s 209ms/step - loss: 3.2954
```

```
Epoch 31/100
12/12 [=====] - 3s 212ms/step - loss: 3.3870
Epoch 32/100
12/12 [=====] - 3s 209ms/step - loss: 3.2728
Epoch 33/100
12/12 [=====] - 2s 209ms/step - loss: 3.1816
Epoch 34/100
12/12 [=====] - 2s 208ms/step - loss: 3.3436
Epoch 35/100
12/12 [=====] - 3s 224ms/step - loss: 3.1433
Epoch 36/100
12/12 [=====] - 3s 218ms/step - loss: 3.2576
Epoch 37/100
12/12 [=====] - 3s 221ms/step - loss: 3.0327
Epoch 38/100
12/12 [=====] - 3s 233ms/step - loss: 3.2695
Epoch 39/100
12/12 [=====] - 3s 222ms/step - loss: 2.9796
Epoch 40/100
12/12 [=====] - 3s 211ms/step - loss: 3.1241
Epoch 41/100
12/12 [=====] - 3s 210ms/step - loss: 3.1659
Epoch 42/100
12/12 [=====] - 3s 210ms/step - loss: 3.0814
Epoch 43/100
12/12 [=====] - 3s 210ms/step - loss: 2.9151
Epoch 44/100
12/12 [=====] - 3s 210ms/step - loss: 2.9120
Epoch 45/100
12/12 [=====] - 3s 209ms/step - loss: 2.9079
Epoch 46/100
12/12 [=====] - 3s 210ms/step - loss: 3.0671
Epoch 47/100
12/12 [=====] - 3s 209ms/step - loss: 2.9905
Epoch 48/100
12/12 [=====] - 3s 209ms/step - loss: 2.8828
Epoch 49/100
12/12 [=====] - 3s 208ms/step - loss: 2.9467
Epoch 50/100
12/12 [=====] - 3s 208ms/step - loss: 3.0217
Epoch 51/100
12/12 [=====] - 3s 215ms/step - loss: 3.1038
Epoch 52/100
12/12 [=====] - 3s 226ms/step - loss: 2.8317
Epoch 53/100
12/12 [=====] - 3s 222ms/step - loss: 3.0233
Epoch 54/100
12/12 [=====] - 3s 215ms/step - loss: 2.9048
Epoch 55/100
12/12 [=====] - 3s 214ms/step - loss: 2.8457
Epoch 56/100
12/12 [=====] - 3s 211ms/step - loss: 2.7729
Epoch 57/100
12/12 [=====] - 2s 208ms/step - loss: 2.7292
Epoch 58/100
12/12 [=====] - 3s 209ms/step - loss: 2.7153
Epoch 59/100
12/12 [=====] - 3s 217ms/step - loss: 2.6906
Epoch 60/100
12/12 [=====] - 3s 217ms/step - loss: 2.6938
```

```
Epoch 61/100
12/12 [=====] - 3s 217ms/step - loss: 2.8771
Epoch 62/100
12/12 [=====] - 3s 221ms/step - loss: 2.5403
Epoch 63/100
12/12 [=====] - 3s 210ms/step - loss: 2.6024
Epoch 64/100
12/12 [=====] - 3s 212ms/step - loss: 2.6860
Epoch 65/100
12/12 [=====] - 3s 212ms/step - loss: 2.4995
Epoch 66/100
12/12 [=====] - 3s 215ms/step - loss: 2.5381
Epoch 67/100
12/12 [=====] - 3s 221ms/step - loss: 2.6534
Epoch 68/100
12/12 [=====] - 3s 221ms/step - loss: 2.5948
Epoch 69/100
12/12 [=====] - 3s 225ms/step - loss: 2.5568
Epoch 70/100
12/12 [=====] - 3s 215ms/step - loss: 2.6708
Epoch 71/100
12/12 [=====] - 2s 207ms/step - loss: 2.7450
Epoch 72/100
12/12 [=====] - 3s 225ms/step - loss: 2.6718
Epoch 73/100
12/12 [=====] - 3s 224ms/step - loss: 2.4538
Epoch 74/100
12/12 [=====] - 3s 231ms/step - loss: 2.5960
Epoch 75/100
12/12 [=====] - 3s 231ms/step - loss: 2.4921
Epoch 76/100
12/12 [=====] - 3s 225ms/step - loss: 2.4387
Epoch 77/100
12/12 [=====] - 3s 217ms/step - loss: 2.3516
Epoch 78/100
12/12 [=====] - 3s 229ms/step - loss: 2.5124
Epoch 79/100
12/12 [=====] - 3s 236ms/step - loss: 2.3486
Epoch 80/100
12/12 [=====] - 3s 226ms/step - loss: 2.7110
Epoch 81/100
12/12 [=====] - 3s 223ms/step - loss: 2.4707
Epoch 82/100
12/12 [=====] - 3s 215ms/step - loss: 2.4113
Epoch 83/100
12/12 [=====] - 3s 212ms/step - loss: 2.2169
Epoch 84/100
12/12 [=====] - 3s 222ms/step - loss: 2.4254
Epoch 85/100
12/12 [=====] - 3s 217ms/step - loss: 2.4694
Epoch 86/100
12/12 [=====] - 3s 219ms/step - loss: 2.5235
Epoch 87/100
12/12 [=====] - 3s 224ms/step - loss: 2.2158
Epoch 88/100
12/12 [=====] - 3s 222ms/step - loss: 2.2312
Epoch 89/100
12/12 [=====] - 3s 224ms/step - loss: 2.3638
Epoch 90/100
12/12 [=====] - 3s 234ms/step - loss: 2.3316
```

```
Epoch 91/100
12/12 [=====] - 2s 206ms/step - loss: 2.3590
Epoch 92/100
12/12 [=====] - 2s 209ms/step - loss: 2.1630
Epoch 93/100
12/12 [=====] - 3s 224ms/step - loss: 2.3621
Epoch 94/100
12/12 [=====] - 3s 214ms/step - loss: 2.4824
Epoch 95/100
12/12 [=====] - 3s 218ms/step - loss: 2.3011
Epoch 96/100
12/12 [=====] - 3s 214ms/step - loss: 2.1953
Epoch 97/100
12/12 [=====] - 3s 209ms/step - loss: 2.4041
Epoch 98/100
12/12 [=====] - 3s 220ms/step - loss: 2.3643
Epoch 99/100
12/12 [=====] - 3s 226ms/step - loss: 2.2417
Epoch 100/100
12/12 [=====] - 3s 210ms/step - loss: 2.3526
Out[7]: <keras.callbacks.History at 0x2d0675245b0>
```

```
In [8]: model.predict((X_test))
```

```
4/4 [=====] - 0s 26ms/step
```

```
Out[8]: array([[24.155107],
               [26.704992],
               [42.604877],
               [49.225105],
               [26.91773 ],
               [22.536083],
               [25.628548],
               [31.210789],
               [26.101076],
               [19.630585],
               [10.614275],
               [23.507631],
               [49.683273],
               [17.837542],
               [41.490562],
               [27.013577],
               [17.492441],
               [15.650462],
               [25.489939],
               [26.330872],
               [42.03463 ],
               [19.57444 ],
               [22.11166 ],
               [29.236668],
               [13.533901],
               [32.74338 ],
               [22.125263],
               [18.495352],
               [28.87776 ],
               [46.798317],
               [25.478912],
               [33.037994],
               [35.053116],
               [27.444939],
               [24.632837],
               [23.815311],
               [24.485205],
               [19.026493],
               [28.209705],
               [22.082712],
               [35.343296],
               [22.441381],
               [24.739674],
               [ 7.806842],
               [21.556261],
               [18.135038],
               [24.497143],
               [21.216475],
               [16.713902],
               [24.21175 ],
               [29.60464 ],
               [35.497818],
               [22.529993],
               [22.424576],
               [17.329723],
               [12.736004],
               [13.332946],
               [16.482674],
               [24.102972],
               [22.494728],
```

[13.52064 ],  
[42.884537],  
[ 9.174245],  
[29.110098],  
[23.126114],  
[24.142935],  
[24.231573],  
[19.609184],  
[43.24405 ],  
[16.924202],  
[11.654197],  
[17.336828],  
[24.29897 ],  
[18.54296 ],  
[37.24492 ],  
[25.919687],  
[20.931717],  
[25.034023],  
[15.006087],  
[24.402405],  
[26.717808],  
[19.047731],  
[24.277414],  
[15.144766],  
[22.828379],  
[26.720642],  
[22.89563 ],  
[ 9.361913],  
[27.541096],  
[19.510933],  
[35.59269 ],  
[21.033262],  
[29.285742],  
[15.360097],  
[16.818747],  
[19.634361],  
[19.544327],  
[14.650892],  
[44.488613],  
[16.792057],  
[29.654623],  
[22.922697],  
[17.007618],  
[19.640774],  
[27.797935],  
[19.636595],  
[30.059 ],  
[39.473682],  
[23.628576],  
[29.629019],  
[25.057161],  
[11.829733],  
[21.230795],  
[15.820941],  
[39.88597 ],  
[24.88261 ],  
[28.098085],  
[21.928474],  
[ 8.74911 ],  
[24.224192],



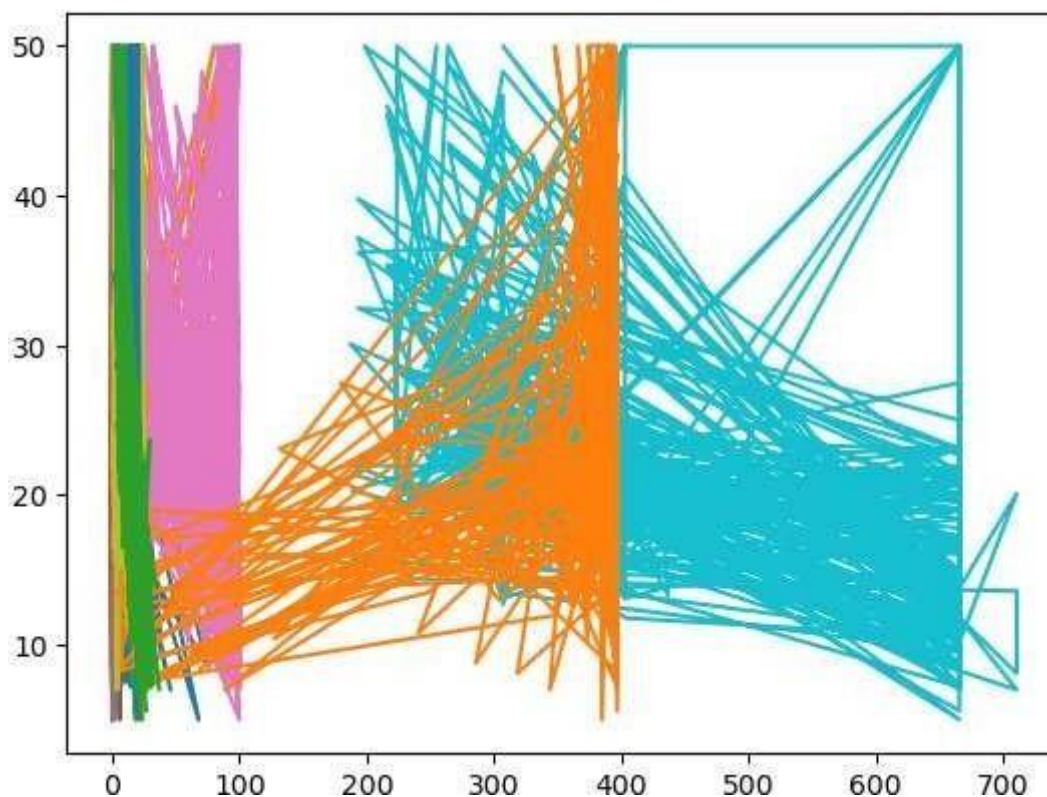
```
[38.513992],
[11.382247],
[14.16294 ],
[23.727959],
[32.33508 ],
[27.531239],
[32.380653]], dtype=float32)
```

In [9]: y\_test

```
Out[9]: 69      20.9
        295      28.6
        196      33.3
        368      50.0
        285      22.0
        ...
        141      14.4
        77       20.8
        292      27.9
        311      22.1
        89       28.7
        Name: target, Length: 127, dtype: float64
```

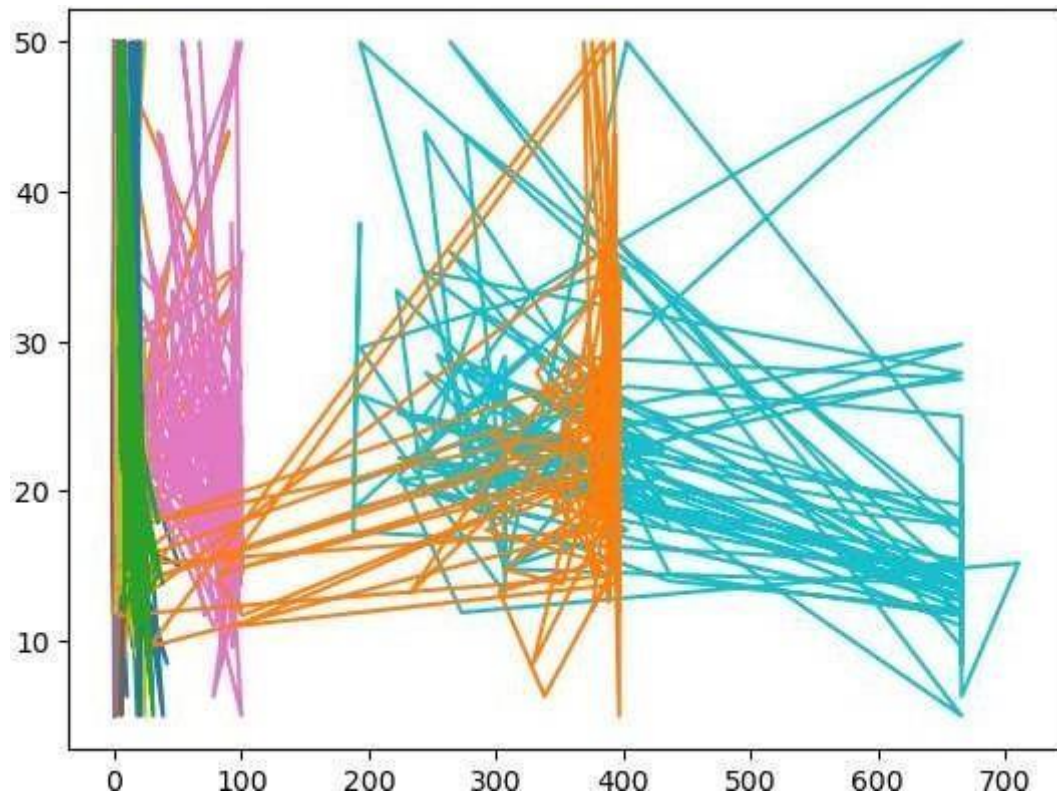
In [10]: `import matplotlib.pyplot as plt`  
`plt.plot(X_train,y_train)`

```
Out[10]: [<matplotlib.lines.Line2D at 0x2d000becfa0>,
<matplotlib.lines.Line2D at 0x2d000bf9040>,
<matplotlib.lines.Line2D at 0x2d000bf9160>,
<matplotlib.lines.Line2D at 0x2d000bf9280>,
<matplotlib.lines.Line2D at 0x2d000bf93a0>,
<matplotlib.lines.Line2D at 0x2d000bf94c0>,
<matplotlib.lines.Line2D at 0x2d000bf95e0>,
<matplotlib.lines.Line2D at 0x2d000bf9700>,
<matplotlib.lines.Line2D at 0x2d000bf9820>,
<matplotlib.lines.Line2D at 0x2d000bf9940>,
<matplotlib.lines.Line2D at 0x2d000becfd0>,
<matplotlib.lines.Line2D at 0x2d000bf9a60>,
<matplotlib.lines.Line2D at 0x2d000bf9c70>]
```



```
In [11]: plt.plot(X_test,y_test)
```

```
Out[11]: [<matplotlib.lines.Line2D at 0x2d0012e06a0>,  
<matplotlib.lines.Line2D at 0x2d0012e0700>,  
<matplotlib.lines.Line2D at 0x2d0012e0820>,  
<matplotlib.lines.Line2D at 0x2d0012e0940>,  
<matplotlib.lines.Line2D at 0x2d0012e0a60>,  
<matplotlib.lines.Line2D at 0x2d0012e0b80>,  
<matplotlib.lines.Line2D at 0x2d0012e0ca0>,  
<matplotlib.lines.Line2D at 0x2d0012e0dc0>,  
<matplotlib.lines.Line2D at 0x2d0012e0ee0>,  
<matplotlib.lines.Line2D at 0x2d0012ec040>,  
<matplotlib.lines.Line2D at 0x2d0012e06d0>,  
<matplotlib.lines.Line2D at 0x2d0012ec160>,  
<matplotlib.lines.Line2D at 0x2d0012ec370>]
```



In [ ]: