REG1

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Experiment No 3

Write a program to perform regression tasks over given data using direct functions and evaluate its performance.

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[ ]:
```
import tensorflow as tf
from tensorflow import keras
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
%matplotlib inline
```

[ ]:
```
housing='housing.csv'
data=pd.read_csv(housing)
data.head()
```

[ ]:

	longitude	latitude	housing_median_age	total_rooms	total_bedrooms	\
0	-122.23	37.88	41.0	880.0	129.0	
1	-122.22	37.86	21.0	7099.0	1106.0	
2	-122.24	37.85	52.0	1467.0	190.0	
3	-122.25	37.85	52.0	1274.0	235.0	
4	-122.25	37.85	52.0	1627.0	280.0	

	population	households	median_income	median_house_value	ocean_proximity
0	322.0	126.0	8.3252	452600.0	NEAR BAY
1	2401.0	1138.0	8.3014	358500.0	NEAR BAY
2	496.0	177.0	7.2574	352100.0	NEAR BAY
3	558.0	219.0	5.6431	341300.0	NEAR BAY
4	565.0	259.0	3.8462	342200.0	NEAR BAY

[ ]:
```
data.pop('ocean_proximity')
data.pop('total_bedrooms')
```

[ ]:
```
0         129.0
1        1106.0
```

```
2         190.0
3         235.0
4         280.0
          …
20635     374.0
20636     150.0
20637     485.0
20638     409.0
20639     616.0
Name: total_bedrooms, Length: 20640, dtype: float64
```

[ ]:
```
data
```

[ ]:
```
       longitude  latitude  housing_median_age  total_rooms  population  \
0        -122.23     37.88                41.0        880.0       322.0
1        -122.22     37.86                21.0       7099.0      2401.0
2        -122.24     37.85                52.0       1467.0       496.0
3        -122.25     37.85                52.0       1274.0       558.0
4        -122.25     37.85                52.0       1627.0       565.0
…          …       …                   …          …          …
20635    -121.09     39.48                25.0       1665.0       845.0
20636    -121.21     39.49                18.0        697.0       356.0
20637    -121.22     39.43                17.0       2254.0      1007.0
20638    -121.32     39.43                18.0       1860.0       741.0
20639    -121.24     39.37                16.0       2785.0      1387.0

       households  median_income  median_house_value
0           126.0         8.3252            452600.0
1          1138.0         8.3014            358500.0
2           177.0         7.2574            352100.0
3           219.0         5.6431            341300.0
4           259.0         3.8462            342200.0
…             …            …                 …
20635       330.0         1.5603             78100.0
20636       114.0         2.5568             77100.0
20637       433.0         1.7000             92300.0
20638       349.0         1.8672             84700.0
20639       530.0         2.3886             89400.0

[20640 rows x 8 columns]
```

[ ]:
```
hnorm=(((data-data.min()))/(data.max()-data.min()))
hnorm.isna().sum()
```

[ ]:
```
longitude             0
latitude              0
housing_median_age    0
```

```
total_rooms           0
population            0
households            0
median_income         0
median_house_value    0
dtype: int64
```

[ ]:
```
data.dtypes
```

[ ]:
```
longitude             float64
latitude              float64
housing_median_age    float64
total_rooms           float64
population            float64
households            float64
median_income         float64
median_house_value    float64
dtype: object
```

[ ]:
```
data.total_rooms
```

[ ]:
```
0         880.0
1        7099.0
2        1467.0
3        1274.0
4        1627.0
          …
20635    1665.0
20636     697.0
20637    2254.0
20638    1860.0
20639    2785.0
Name: total_rooms, Length: 20640, dtype: float64
```

[ ]:
```
target=data.pop('median_income')
```

[ ]:
```
print(data.columns.tolist())
```

```
['longitude', 'latitude', 'housing_median_age', 'total_rooms', 'population',
'households', 'median_house_value']
```

[ ]:
```
Y=target.values
X=hnorm.values
X.shape
```

[ ]:
```
(20640, 8)
```

[ ]:
```
X_train,X_test,Y_train,Y_test=train_test_split(X,Y,test_size=0.2)
X_train
```

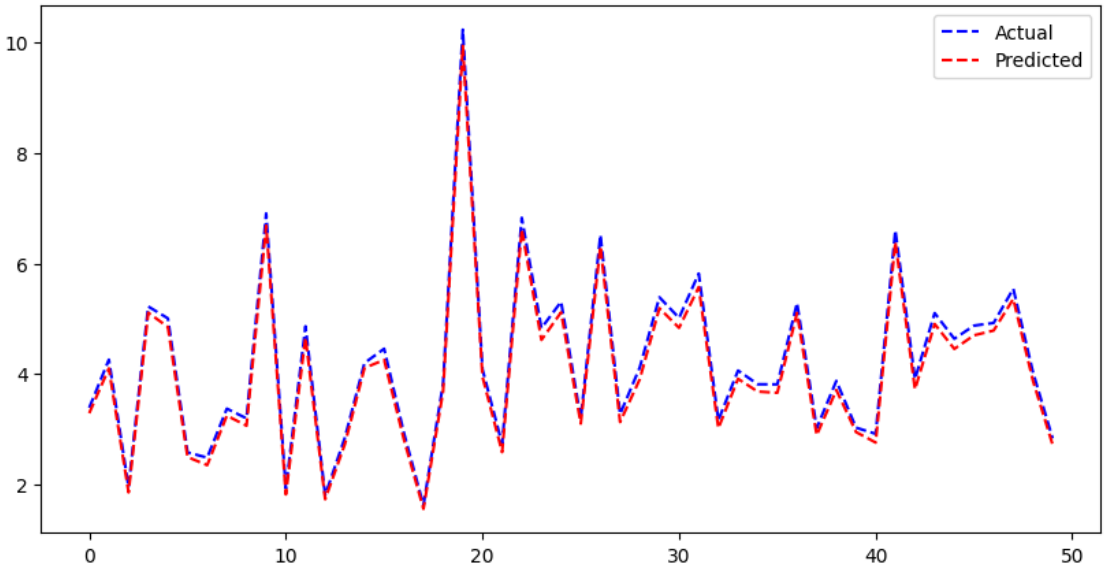
[ ]:
```
array([[0.30577689, 0.59511158, 0.70588235, …, 0.09439237, 0.19991448,
        0.17422815],
       [0.61055777, 0.16578108, 0.66666667, …, 0.12547278, 0.24974828,
        0.48886603],
       [0.187251  , 0.55366631, 0.98039216, …, 0.07169873, 0.24199666,
        0.70515379],
       …,
       [0.16035857, 0.76195537, 0.29411765, …, 0.00608453, 0.08005407,
        0.        ],
       [0.60657371, 0.18065887, 0.66666667, …, 0.06660089, 0.35919505,
        0.648453  ],
       [0.57370518, 0.18278427, 0.37254902, …, 0.17316231, 0.45979366,
        0.70535998]])
```

[ ]:
```
model=keras.models.Sequential([
    keras.layers.Dense(8,activation="relu",input_shape=(8,)),
    keras.layers.Dense(1)
])
model.summary()
```

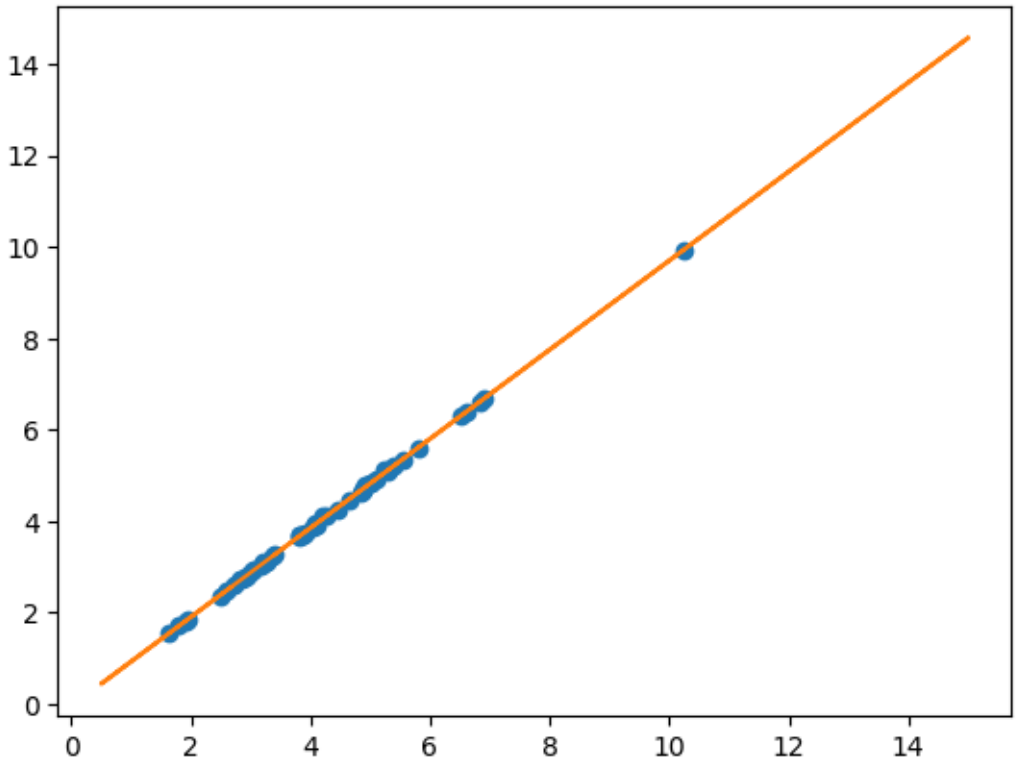
```
Model: "sequential_2"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense_4 (Dense)             (None, 8)                 72

 dense_5 (Dense)             (None, 1)                 9

=================================================================
Total params: 81 (324.00 Byte)
Trainable params: 81 (324.00 Byte)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 dense_4 (Dense)             (None, 8)                 72

 dense_5 (Dense)             (None, 1)                 9

=================================================================
Total params: 81 (324.00 Byte)
Trainable params: 81 (324.00 Byte)
Non-trainable params: 0 (0.00 Byte)
_________________________________________________________________
```

[ ]:
```
model.compile(loss="mae", optimizer="sgd")
history = model.fit(X_train, Y_train, epochs=10,verbose=1)
htest = model.evaluate(X_test, Y_test)
X_new = X_test[:50] # pretend these are new instances
y_pred = model.predict(X_new)
plt.figure(figsize=(10,5))
plt.plot(np.arange(0,len(X_new),1),Y_test[:50],'b--',label='Actual')
plt.plot(np.arange(0,len(X_new),1),y_pred,'r--',label='Predicted')
plt.legend()
plt.show()
plt.show()
#plt.scatter(y_test[:20],y_pred)
X_new = X_test[:50]
plt. plot(Y_test[:50],y_pred, 'o')
m, b = np. polyfit(Y_test[:50],y_pred, 1)
plt. plot(Y_test, m*Y_test+ b)
print(m)
```

```
Epoch 1/10
516/516 [==============================] - 1s 961us/step - loss: 1.2157
Epoch 2/10
516/516 [==============================] - 1s 987us/step - loss: 0.7116
Epoch 3/10
516/516 [==============================] - 0s 957us/step - loss: 0.4756
Epoch 4/10
516/516 [==============================] - 1s 1ms/step - loss: 0.2161
Epoch 5/10
516/516 [==============================] - 1s 1ms/step - loss: 0.1503
Epoch 6/10
516/516 [==============================] - 1s 1ms/step - loss: 0.1460
Epoch 7/10
516/516 [==============================] - 1s 1ms/step - loss: 0.1424
Epoch 8/10
516/516 [==============================] - 0s 951us/step - loss: 0.1371
Epoch 9/10
516/516 [==============================] - 1s 1ms/step - loss: 0.1335
Epoch 10/10
516/516 [==============================] - 1s 1ms/step - loss: 0.1307
129/129 [==============================] - 0s 1ms/step - loss: 0.1544
2/2 [==============================] - 0s 2ms/step
```


Actual
Predicted
10
8
6
4
2
0
10
20
30
40
50

[0.97460627]


14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14

[ ]: