In [1]:

*#!pip install tensorflow*

In [2]:

**import** **tensorflow**

In [3]:

**import** **pandas** **as** **pd**  
data = pd.read\_csv(r'C:\Users\user\Desktop\Salary\_Data.csv')

In [4]:

data.head()

Out[4]:

|  | **YearsExperience** | **Salary** |
| --- | --- | --- |
| **0** | 1.1 | 39343.0 |
| **1** | 1.3 | 46205.0 |
| **2** | 1.5 | 37731.0 |
| **3** | 2.0 | 43525.0 |
| **4** | 2.2 | 39891.0 |

In [5]:

data.hist()

Out[5]:

array([[<matplotlib.axes.\_subplots.AxesSubplot object at 0x00000180A1402880>,  
 <matplotlib.axes.\_subplots.AxesSubplot object at 0x00000180A146FCD0>]],  
 dtype=object)

In [6]:

X=data.iloc[:,:-1].values  
y=data.iloc[:,-1].values

In [7]:

X

Out[7]:

array([[ 1.1],  
 [ 1.3],  
 [ 1.5],  
 [ 2. ],  
 [ 2.2],  
 [ 2.9],  
 [ 3. ],  
 [ 3.2],  
 [ 3.2],  
 [ 3.7],  
 [ 3.9],  
 [ 4. ],  
 [ 4. ],  
 [ 4.1],  
 [ 4.5],  
 [ 4.9],  
 [ 5.1],  
 [ 5.3],  
 [ 5.9],  
 [ 6. ],  
 [ 6.8],  
 [ 7.1],  
 [ 7.9],  
 [ 8.2],  
 [ 8.7],  
 [ 9. ],  
 [ 9.5],  
 [ 9.6],  
 [10.3],  
 [10.5]])

In [8]:

y

Out[8]:

array([ 39343., 46205., 37731., 43525., 39891., 56642., 60150.,  
 54445., 64445., 57189., 63218., 55794., 56957., 57081.,  
 61111., 67938., 66029., 83088., 81363., 93940., 91738.,  
 98273., 101302., 113812., 109431., 105582., 116969., 112635.,  
 122391., 121872.])

In [9]:

**from** **sklearn.preprocessing** **import** MinMaxScaler  
scale =MinMaxScaler()  
X\_scaled=scale.fit\_transform(X)

In [10]:

X\_scaled

Out[10]:

array([[0. ],  
 [0.0212766 ],  
 [0.04255319],  
 [0.09574468],  
 [0.11702128],  
 [0.19148936],  
 [0.20212766],  
 [0.22340426],  
 [0.22340426],  
 [0.27659574],  
 [0.29787234],  
 [0.30851064],  
 [0.30851064],  
 [0.31914894],  
 [0.36170213],  
 [0.40425532],  
 [0.42553191],  
 [0.44680851],  
 [0.5106383 ],  
 [0.5212766 ],  
 [0.60638298],  
 [0.63829787],  
 [0.72340426],  
 [0.75531915],  
 [0.80851064],  
 [0.84042553],  
 [0.89361702],  
 [0.90425532],  
 [0.9787234 ],  
 [1. ]])

In [11]:

**from** **sklearn.model\_selection** **import** train\_test\_split

In [38]:

X\_train, X\_test, y\_train, y\_test = train\_test\_split(X\_scaled, y, test\_size=0.1, random\_state=123)

In [39]:

X\_train.shape

Out[39]:

(27, 1)

In [40]:

X\_test.shape

Out[40]:

(3, 1)

In [41]:

y\_train.shape

Out[41]:

(27,)

In [42]:

y\_train

Out[42]:

array([116969., 64445., 112635., 56957., 98273., 55794., 113812.,  
 81363., 39891., 43525., 109431., 66029., 61111., 91738.,  
 57189., 67938., 105582., 39343., 46205., 101302., 63218.,  
 93940., 83088., 60150., 122391., 37731., 57081.])

In [43]:

X\_train

Out[43]:

array([[0.89361702],  
 [0.22340426],  
 [0.90425532],  
 [0.30851064],  
 [0.63829787],  
 [0.30851064],  
 [0.75531915],  
 [0.5106383 ],  
 [0.11702128],  
 [0.09574468],  
 [0.80851064],  
 [0.42553191],  
 [0.36170213],  
 [0.60638298],  
 [0.27659574],  
 [0.40425532],  
 [0.84042553],  
 [0. ],  
 [0.0212766 ],  
 [0.72340426],  
 [0.29787234],  
 [0.5212766 ],  
 [0.44680851],  
 [0.20212766],  
 [0.9787234 ],  
 [0.04255319],  
 [0.31914894]])

In [44]:

y\_test.shape

Out[44]:

(3,)

**create ANN**[**¶**](#gjdgxs)

In [88]:

**from** **tensorflow.keras.models** **import** Sequential  
**from** **tensorflow.keras.layers** **import** Dense

In [89]:

model=Sequential()  
model.add(Dense(4,activation="sigmoid")) *# 1st HL with 4N and "relu" activation*  
model.add(Dense(2,activation="sigmoid")) *# 2nd HL with 2N and "relu" activation*  
model.add(Dense(1))*# output layer with 1N*

In [90]:

model.compile(optimizer="rmsprop",loss="mse") *# choose the loss function and optimizer*

In [91]:

model.fit(X\_train,y\_train,epochs=200,batch\_size=5)

Epoch 1/200  
6/6 [==============================] - 0s 1ms/step - loss: 6446867968.0000  
Epoch 2/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446863872.0000  
Epoch 3/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446861312.0000  
Epoch 4/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446858240.0000  
Epoch 5/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446855680.0000  
Epoch 6/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446852608.0000  
Epoch 7/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446851072.0000  
Epoch 8/200  
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Epoch 9/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446845440.0000  
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6/6 [==============================] - 0s 2ms/step - loss: 6446844416.0000  
Epoch 11/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446840832.0000  
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Epoch 13/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446837248.0000  
Epoch 14/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446834176.0000  
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Epoch 17/200  
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Epoch 21/200  
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Epoch 22/200  
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Epoch 23/200  
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Epoch 25/200  
6/6 [==============================] - 0s 3ms/step - loss: 6446810112.0000  
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Epoch 27/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446806528.0000  
Epoch 28/200  
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Epoch 29/200  
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Epoch 30/200  
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Epoch 31/200  
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Epoch 34/200  
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Epoch 37/200  
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6/6 [==============================] - 0s 2ms/step - loss: 6446546432.0000  
Epoch 185/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446543872.0000  
Epoch 186/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446540800.0000  
Epoch 187/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446538240.0000  
Epoch 188/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446536704.0000  
Epoch 189/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446534144.0000  
Epoch 190/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446531584.0000  
Epoch 191/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446529536.0000  
Epoch 192/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446526976.0000  
Epoch 193/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446524416.0000  
Epoch 194/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446521856.0000  
Epoch 195/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446519808.0000  
Epoch 196/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446516736.0000  
Epoch 197/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446514688.0000  
Epoch 198/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446512128.0000  
Epoch 199/200  
6/6 [==============================] - 0s 2ms/step - loss: 6446510080.0000  
Epoch 200/200  
6/6 [==============================] - 0s 1ms/step - loss: 6446507520.0000

Out[91]:

<tensorflow.python.keras.callbacks.History at 0x180a70aa070>

In [92]:

model.summary()

Model: "sequential\_5"  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Layer (type) Output Shape Param #   
=================================================================  
dense\_15 (Dense) (None, 4) 8   
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
dense\_16 (Dense) (None, 2) 10   
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
dense\_17 (Dense) (None, 1) 3   
=================================================================  
Total params: 21  
Trainable params: 21  
Non-trainable params: 0  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In [93]:

model.history.history

Out[93]:

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 6446510080.0,  
 6446507520.0]}

In [94]:

d=model.history.history.get("loss")  
d

Out[94]:

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 6446516736.0,  
 6446514688.0,  
 6446512128.0,  
 6446510080.0,  
 6446507520.0]

In [95]:

model.predict(X\_test)

Out[95]:

array([[1.8672888],  
 [1.8700322],  
 [1.8670712]], dtype=float32)

In [96]:

**import** **matplotlib.pyplot** **as** **plt**  
plt.plot(d, marker='o')  
plt.xlabel("epoch")  
plt.ylabel("loss")  
plt.show()

In [98]:

**from** **sklearn.metrics** **import** explained\_variance\_score

In [99]:

explained\_variance\_score(y\_test, model.predict(X\_test))

Out[99]:

8.576865961895663e-08

In [102]:

y\_pred = model.predict(X\_test)

In [103]:

result=pd.DataFrame(y\_pred, columns=["y\_pred"])

In [104]:

result["y\_test"]=y\_test

In [109]:

result["error"] = (result["y\_test"] - result["y\_pred"])

In [110]:

result

Out[110]:

|  | **y\_pred** | **y\_test** | **error** |
| --- | --- | --- | --- |
| **0** | 1.867289 | 54445.0 | 54443.132711 |
| **1** | 1.870032 | 121872.0 | 121870.129968 |
| **2** | 1.867071 | 56642.0 | 56640.132929 |

In [111]:

**from** **sklearn.metrics** **import** r2\_score  
**from** **sklearn.metrics** **import** mean\_squared\_error  
**import** **numpy** **as** **np**  
  
rmse=np.sqrt(mean\_squared\_error(y\_pred,y\_test))  
r2= r2\_score(y\_pred,y\_test)  
print("rmse is **{}**".format(rmse))  
print("r2 score is **{}**".format(r2))

rmse is 83714.7695769679  
r2 score is -3859786203884777.5

**save the model**[**¶**](#30j0zll)

In [112]:

tensorflow.keras.models.save\_model(model, "Reg\_model.h5")

**Load the model**[**¶**](#1fob9te)

In [113]:

loaded\_model =tensorflow.keras.models.load\_model("Reg\_model.h5", compile=**False**)

In [114]:

loaded\_model.predict(scale.transform([[2]]))

Out[114]:

array([[1.8663585]], dtype=float32)

In [ ]: