Name: Madhusudan D. Pangarkar

Class: TEIT Roll No.: 41

Sub: Laboratory Practice-I (Machine Learning) (314448)

------------------------------------------------------------------------------------------------

**Assignment No-02) Assignment on Regression Technique**

**Code:**

import pandas as pd  
from sklearn.linear\_model import LinearRegression  
from sklearn.model\_selection import train\_test\_split  
from sklearn import metrics as m  
import matplotlib.pyplot as plt  
  
trainData = pd.read\_csv(r"E:\ML Practicals\temperatures.csv")  
  
cols = list(trainData.columns)  
  
# Plot Subplots  
fig, axs = plt.subplots(2, 6, )  
  
for i in range(1, 13):  
 X = trainData[[cols[0]]]  
 Y = trainData[[cols[i]]]  
  
 print('\n\nMONTH:', cols[i])  
  
 X\_train, X\_test, Y\_train, Y\_test = train\_test\_split(X, Y, test\_size=0.2, random\_state=1)  
  
 LR\_model = LinearRegression()  
  
 LR\_model.fit(X\_train, Y\_train)  
  
 r\_sq = LR\_model.score(X\_train, Y\_train)  
  
 print("determination coefficient:", r\_sq)  
  
 print("INTERCEPT:", LR\_model.intercept\_)  
 print('SLOPE\t:', LR\_model.coef\_)  
  
 Y\_pred = LR\_model.predict(X\_test)  
 print('PREDICTION:', Y\_pred, sep='\n')  
  
 print('METRICS:')  
 print('MSE: ', m.mean\_squared\_error(Y\_test, Y\_pred, squared=True))  
 print('RMSE: ', m.mean\_squared\_error(Y\_test, Y\_pred, squared=False))  
 print('MAE: ', m.mean\_absolute\_error(Y\_test, Y\_pred))  
 print('R-Squared Score: ', m.r2\_score(Y\_test, Y\_pred))  
  
  
  
 # Plot Graph for Temperature vs Year for Training Data  
 # axs[0, 0].scatter(X\_train, Y\_train, color='black')  
 # axs[0, 0].plot(X\_train, LR\_model.predict(X\_train), color='blue', linewidth=3)  
 # axs[0, 0].set\_title("Temperature vs Year: Training Data")  
 # axs[0, 0].set\_xlabel("Year")  
 # axs[0, 0].set\_ylabel("Temperature")  
  
 if i < 7:  
 j = 0  
 k = i - 1  
 else:  
 j = 1  
 k = i - 7  
  
 # Plot Graph for Temperature vs Year for Testing Data  
 axs[j, k].scatter(X\_test, Y\_test, color='red')  
 axs[j, k].plot(X\_test, LR\_model.predict(X\_test), color='black', linewidth=3)  
 axs[j, k].set\_title("Temp vs Year: {}".format(cols[i]))  
 axs[j, k].set\_xlabel("Year")  
 axs[j, k].set\_ylabel("Temperature")  
  
plt.show()

**Output:**

"C:\Python 310\python.exe" "E:/ML Practicals/ml\_pr2/main.py"

MONTH: JAN

determination coefficient: 0.3548045849122119

INTERCEPT: [-5.35338281]

SLOPE : [[0.01486008]]

PREDICTION:

[[23.92097555]

[23.5791937 ]

[23.75751466]

[24.58967916]

[23.98041587]

[24.35191788]

[23.35629249]

[23.68321426]

[23.86153523]

[24.32219772]

[24.30733764]

[24.3370578 ]

[22.92535016]

[23.81695498]

[24.53023884]

[23.71293442]

[24.42621828]

[24.38163804]

[23.87639531]

[23.54947354]

[24.03985619]

[23.14825137]

[24.09929651]

[23.99527595]]

METRICS:

MSE: 0.4474127538283697

RMSE: 0.6688891939838538

MAE: 0.575735016242341

R-Squared Score: 0.13772507149336943

MONTH: FEB

determination coefficient: 0.411298833362709

INTERCEPT: [-18.07813877]

SLOPE : [[0.02228699]]

PREDICTION:

[[25.82722539]

[25.3146247 ]

[25.58206854]

[26.8301398 ]

[25.91637334]

[26.47354801]

[24.98031989]

[25.4706336 ]

[25.73807745]

[26.42897404]

[26.40668705]

[26.45126103]

[24.33399727]

[25.67121649]

[26.74099186]

[25.51520758]

[26.58498295]

[26.51812199]

[25.76036443]

[25.27005072]

[26.00552129]

[24.66830208]

[26.09466924]

[25.93866033]]

METRICS:

MSE: 0.4809982998658562

RMSE: 0.6935404096848692

MAE: 0.5735691679328223

R-Squared Score: 0.3619088707621523

MONTH: MAR

determination coefficient: 0.3066501485307951

INTERCEPT: [-4.64910894]

SLOPE : [[0.01723055]]

PREDICTION:

[[29.29508214]

[28.89877941]

[29.10554605]

[30.07045707]

[29.36400436]

[29.79476821]

[28.6403211 ]

[29.01939328]

[29.22615993]

[29.7603071 ]

[29.74307654]

[29.77753765]

[28.14063504]

[29.17446827]

[30.00153485]

[29.05385439]

[29.88092098]

[29.82922931]

[29.24339048]

[28.8643183 ]

[29.43292658]

[28.39909334]

[29.50184879]

[29.38123491]]

METRICS:

MSE: 0.766404157590963

RMSE: 0.8754451196910992

MAE: 0.661365976919735

R-Squared Score: 0.2906200173574891

MONTH: APR

determination coefficient: 0.3154500678057759

INTERCEPT: [2.4291693]

SLOPE : [[0.01509518]]

PREDICTION:

[[32.16667043]

[31.81948133]

[32.00062347]

[32.84595345]

[32.22705114]

[32.6044306 ]

[31.59305365]

[31.92514758]

[32.10628971]

[32.57424024]

[32.55914506]

[32.58933542]

[31.15529349]

[32.06100418]

[32.78557274]

[31.95533793]

[32.67990649]

[32.63462095]

[32.12138489]

[31.78929097]

[32.28743185]

[31.38172116]

[32.34781257]

[32.24214632]]

METRICS:

MSE: 0.4593360178322951

RMSE: 0.6777433273978395

MAE: 0.5369162476615214

R-Squared Score: 0.11774988363579952

MONTH: MAY

determination coefficient: 0.1585445247749957

INTERCEPT: [16.44633139]

SLOPE : [[0.00874355]]

PREDICTION:

[[33.67113183]

[33.4700301 ]

[33.57495274]

[34.06459174]

[33.70610604]

[33.92469488]

[33.33887679]

[33.53123497]

[33.63615761]

[33.90720777]

[33.89846422]

[33.91595133]

[33.08531374]

[33.60992695]

[34.02961752]

[33.54872208]

[33.96841265]

[33.94218199]

[33.64490117]

[33.45254299]

[33.74108026]

[33.21646704]

[33.77605447]

[33.7148496 ]]

METRICS:

MSE: 0.2683015805678108

RMSE: 0.5179783591693873

MAE: 0.43834801587371847

R-Squared Score: 0.19965721218710397

MONTH: JUN

determination coefficient: 0.20105476514534515

INTERCEPT: [15.85843524]

SLOPE : [[0.00865567]]

PREDICTION:

[[32.91010232]

[32.71102194]

[32.81488996]

[33.2996074 ]

[32.94472499]

[33.16111671]

[32.58118691]

[32.77161162]

[32.87547964]

[33.14380537]

[33.1351497 ]

[33.15246104]

[32.33017252]

[32.84951264]

[33.26498473]

[32.78892296]

[33.20439505]

[33.17842804]

[32.88413531]

[32.6937106 ]

[32.97934767]

[32.46000755]

[33.01397034]

[32.95338066]]

METRICS:

MSE: 0.33658180268421645

RMSE: 0.5801567052824749

MAE: 0.4732476590314845

R-Squared Score: -0.4312743365517233

MONTH: JUL

determination coefficient: 0.2721110283435181

INTERCEPT: [17.67448877]

SLOPE : [[0.00681605]]

PREDICTION:

[[31.10211552]

[30.94534627]

[31.02713892]

[31.40883796]

[31.12937974]

[31.29978109]

[30.84310546]

[30.99305865]

[31.0748513 ]

[31.28614898]

[31.27933293]

[31.29296504]

[30.64543989]

[31.05440314]

[31.38157374]

[31.00669076]

[31.33386136]

[31.3134132 ]

[31.08166736]

[30.93171417]

[31.15664395]

[30.7476807 ]

[31.18390817]

[31.13619579]]

METRICS:

MSE: 0.25306015893332984

RMSE: 0.503050851240041

MAE: 0.3750678079512535

R-Squared Score: 0.050539783681266326

MONTH: AUG

determination coefficient: 0.42582579619911

INTERCEPT: [12.57428232]

SLOPE : [[0.00915435]]

PREDICTION:

[[30.60834705]

[30.39779706]

[30.50764923]

[31.02029269]

[30.64496444]

[30.87382313]

[30.26048184]

[30.46187749]

[30.57172966]

[30.85551444]

[30.84636009]

[30.86466878]

[29.99500576]

[30.54426662]

[30.9836753 ]

[30.48018619]

[30.91959487]

[30.89213183]

[30.58088401]

[30.37948836]

[30.68158183]

[30.13232098]

[30.71819922]

[30.65411879]]

METRICS:

MSE: 0.11215424047319361

RMSE: 0.334894372113348

MAE: 0.25436576068595773

R-Squared Score: 0.3884997566094218

MONTH: SEP

determination coefficient: 0.4269858899486153

INTERCEPT: [10.33176626]

SLOPE : [[0.01028789]]

PREDICTION:

[[30.59891565]

[30.36229411]

[30.48574882]

[31.06187084]

[30.64006722]

[30.89726455]

[30.20797571]

[30.43430936]

[30.55776407]

[30.87668876]

[30.86640087]

[30.88697665]

[29.90962681]

[30.5269004 ]

[31.02071926]

[30.45488514]

[30.94870401]

[30.91784033]

[30.56805197]

[30.34171832]

[30.68121879]

[30.06394521]

[30.72237036]

[30.65035511]]

METRICS:

MSE: 0.1537224668876904

RMSE: 0.3920745680195164

MAE: 0.3004007404913646

R-Squared Score: 0.4519806690343964

MONTH: OCT

determination coefficient: 0.40050002271832574

INTERCEPT: [4.30140352]

SLOPE : [[0.01302672]]

PREDICTION:

[[29.96404508]

[29.66443048]

[29.82075114]

[30.55024755]

[30.01615197]

[30.34182001]

[29.46902966]

[29.75561753]

[29.91193819]

[30.31576656]

[30.30273984]

[30.32879328]

[29.09125473]

[29.87285803]

[30.49814066]

[29.78167098]

[30.40695361]

[30.36787345]

[29.92496491]

[29.63837704]

[30.06825885]

[29.28665556]

[30.12036574]

[30.02917869]]

METRICS:

MSE: 0.4303682841339444

RMSE: 0.6560246063479208

MAE: 0.4873641919879457

R-Squared Score: 0.08551960971161066

MONTH: NOV

determination coefficient: 0.49649899112575735

INTERCEPT: [-2.29108155]

SLOPE : [[0.01511686]]

PREDICTION:

[[27.48912797]

[27.14144025]

[27.32284254]

[28.16938657]

[27.5495954 ]

[27.92751684]

[26.91468738]

[27.24725825]

[27.42866054]

[27.89728313]

[27.88216627]

[27.91239999]

[26.47629851]

[27.38330997]

[28.10891914]

[27.27749197]

[28.00310113]

[27.95775056]

[27.4437774 ]

[27.11120653]

[27.61006283]

[26.70305138]

[27.67053026]

[27.56471226]]

METRICS:

MSE: 0.21693403570835565

RMSE: 0.4657617799995569

MAE: 0.3706911585197501

R-Squared Score: 0.4089650689541704

MONTH: DEC

determination coefficient: 0.5461960403787112

INTERCEPT: [-9.31374721]

SLOPE : [[0.01733832]]

PREDICTION:

[[24.84273724]

[24.44395595]

[24.65201575]

[25.62296151]

[24.91209051]

[25.34554843]

[24.1838812 ]

[24.56532417]

[24.77338397]

[25.3108718 ]

[25.29353348]

[25.32821012]

[23.68107 ]

[24.72136902]

[25.55360824]

[24.6000008 ]

[25.43224002]

[25.38022507]

[24.79072229]

[24.40927932]

[24.98144378]

[23.94114476]

[25.05079705]

[24.92942883]]

METRICS:

MSE: 0.2449038244279631

RMSE: 0.4948775852955588

MAE: 0.3561237905861276

R-Squared Score: 0.45437806942738346

Process finished with exit code 0

