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import time

from sklearn import preprocessing as \
    preproc
from sklearn import linear_model as \
    linmod
import pandas as pd
from sklearn.linear_model import \
    LinearRegression
from sklearn import model_selection
from sklearn import metrics
import numpy as np
import pickle

def showStats(W, X, Yact, Ypred):
    print("R2 = %f, MSE = %f" % (
        mlr.score(X, Yact),
        metrics.mean_squared_error(
            Yact, Ypred)))

# Fitting on the entire dataset
df = pd.read_pickle('Cleaned_Dataset.pkl')

x = df[['PRCP', 'WT18',
        'PRECIPFLAG', 'PRECIPAMT',
        'SNOW', 'WT16', 'ACMH', 'ACSH',
        'TMIN', 'PSUN', 'WDF5', 'WDF1', 'WDF2',
        'TSUN']]
y = df['NEXTDAYPRECIPAMT']

scaler = preproc.MinMaxScaler()
(x_train, x_test, y_train, y_test) = \
    model_selection.train_test_split(x, y,
                                     test_size=1/3,
                                     random_state=0)

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

print()
t1 = time.time()
reg = LinearRegression().fit(x_train, y_train)
print(time.time() - t1)

y_pred = reg.predict(x_test)

print("MSE Without Polynomial Test: ",
      metrics.mean_squared_error(y_test, y_pred))
print("R2 Without Polynomial Test Score: ",
      reg.score(x_test, y_test))

print("R2 Without Polynomial Training Score: ",
      reg.score(x_train, y_train))

poly = preproc.PolynomialFeatures(1)
bigTrainX = poly.fit_transform(x_train)

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bigTestX = poly.fit_transform(x_test)
mlr = linmod.LinearRegression()

print()
t = time.time()
mlr.fit(bigTestX, y_test)
print("Test Fit Time", time.time() - t)

print()
t = time.time()
mlr.fit(bigTrainX, y_train)
print("Training Fit Time", time.time() - t)
print()

showStats(np.append(np.array(mlr.intercept_),
                        mlr.coef_), bigTestX, y_test,
           mlr.predict(bigTestX))
print()
showStats(np.append(np.array(mlr.intercept_), mlr.coef_),
           bigTrainX, y_train, mlr.predict(
           bigTrainX))

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