ML ASSIGNMENT-3

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BATCH:12

1 Implement the K Nearest Neighbor Classification using Classified Manufacturing Dataset

Part 1 – Import the required Python, Pandas, Matplotlib, Seaborn packages

1. Load the classified dataset into a dataframe using `pandas`
2. Check the data types of each feature(column) in the dataset.
3. Generate a summary of the dataset for `min, max, stddev, quartile vales for 25%,50%,75%,90%,`
4. List the names of columns/features in the dataset
5. Scale the features using `StandardScaler` and transform the data

Part 2 – Model training and Fit the data to Model

1. Split the data generated from list created as `X, Y` is distributed using train test split function as X train, Y train, X test, Y test
2. Apply the KNN Classifier model of `sklearn.neighbors import KNeighborsClassifier` package
3. Fit the data to the Classier Model using `fit`.

Part 3 – Evaluate the Classification Quality

1. Generate the confusion matrix to estimate the correction among features
2. Generate the classification report using `classification report`

PART-1:-

```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import numpy as np
%matplotlib inline

df = pd.read_table("Classified_Data.txt",sep=',', index_col=0)
df.head()
```

	WTT	PTI	EQW	SBI	LQE	QWG	FDJ	PJF	HQE	NXJ	TARGET CLASS
0	0.913917	1.162073	0.567946	0.755464	0.780862	0.352608	0.759697	0.643798	0.879422	1.231409	1
1	0.635632	1.003722	0.535342	0.825645	0.924109	0.648450	0.675334	1.013546	0.621552	1.492702	0
2	0.721360	1.201493	0.921990	0.855595	1.526629	0.720781	1.626351	1.154483	0.957877	1.285597	0
3	1.234204	1.386726	0.653046	0.825624	1.142504	0.875128	1.409708	1.380003	1.522692	1.153093	1
4	1.279491	0.949750	0.627280	0.668976	1.232537	0.703727	1.115596	0.646691	1.463812	1.419167	1

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1000 entries, 0 to 999
Data columns (total 11 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   WTT            1000 non-null   float64
 1   PTI            1000 non-null   float64
 2   EQW            1000 non-null   float64
 3   SBI            1000 non-null   float64
 4   LQE            1000 non-null   float64
 5   QWG            1000 non-null   float64
 6   FDJ            1000 non-null   float64
 7   PJF            1000 non-null   float64
 8   HQE            1000 non-null   float64
 9   NXJ            1000 non-null   float64
 10  TARGET CLASS   1000 non-null   int64
dtypes: float64(10), int64(1)
memory usage: 93.8 KB
```

```
df.describe()
```

	WTT	PTI	EQW	SBI	LQE	QWG	FDJ	PJF	HQE	NXJ	TARGET CLASS
count	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.000000	1000.00000
mean	0.949682	1.114303	0.834127	0.682099	1.032336	0.943534	0.963422	1.071960	1.158251	1.362725	0.50000
std	0.289635	0.257085	0.291554	0.229645	0.243413	0.256121	0.255118	0.288982	0.293738	0.204225	0.50025
min	0.174412	0.441398	0.170924	0.045027	0.315307	0.262389	0.295228	0.299476	0.365157	0.639693	0.00000
25%	0.742358	0.942071	0.615451	0.515010	0.870855	0.761064	0.784407	0.866306	0.934340	1.222623	0.00000
50%	0.940475	1.118486	0.813264	0.676835	1.035824	0.941502	0.945333	1.065500	1.165556	1.375368	0.50000
75%	1.163295	1.307904	1.028340	0.834317	1.198270	1.123060	1.134852	1.283156	1.383173	1.504832	1.00000
max	1.721779	1.833757	1.722725	1.634884	1.650050	1.666902	1.713342	1.785420	1.885690	1.893950	1.00000

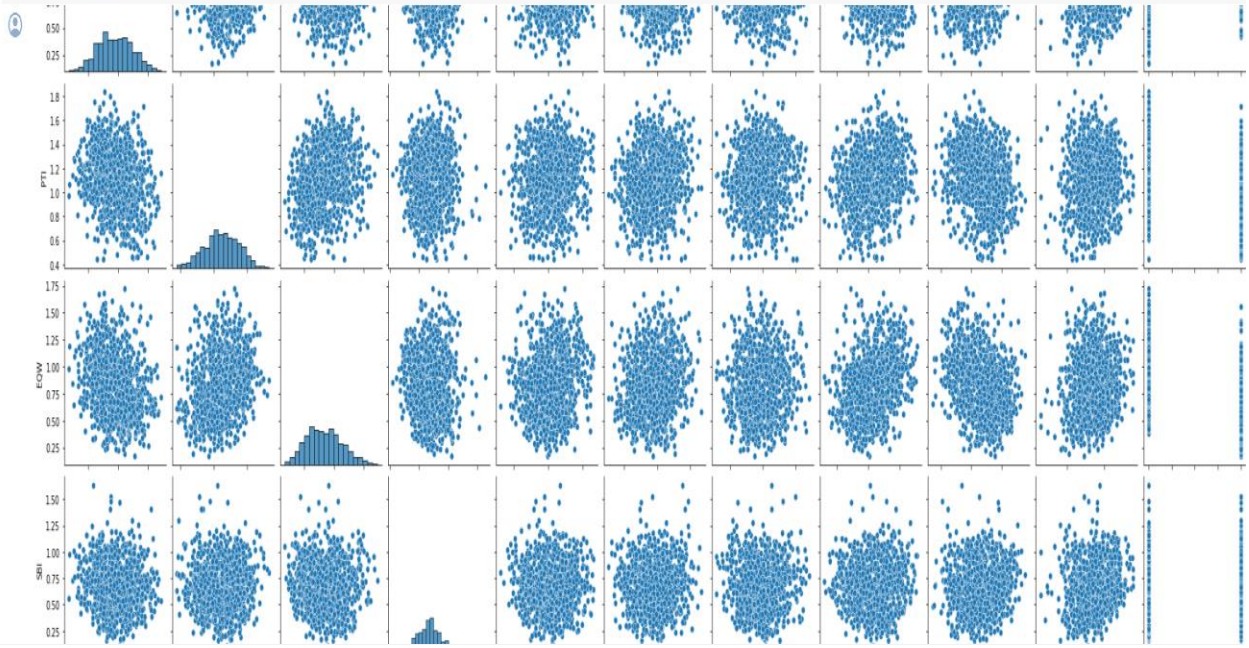
Check the spread of the features

```
l=list(df.columns)
l[0:len(l)-2]
```

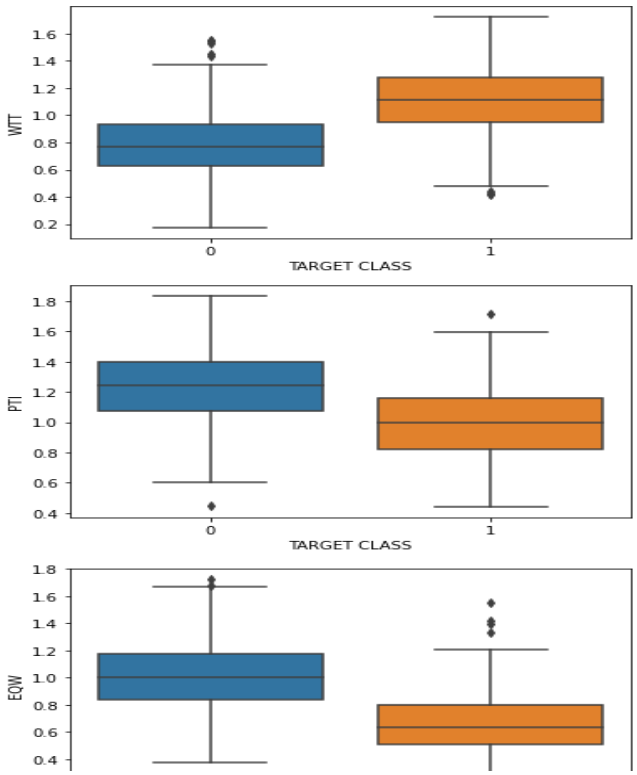
```
['WTT', 'PTI', 'EQW', 'SBI', 'LQE', 'QWG', 'FDJ', 'PJF', 'HQE']
```

Run a 'for' loop to draw boxlots of all the features for '0' and '1' TARGET CLASS

```
sns.pairplot(df)
```



```
for i in range(len(l)-1):
    sns.boxplot(x='TARGET CLASS',y=l[i], data=df)
    plt.figure()
```



Instantiate a scaler standardizing estimator

```
[ ] from sklearn.preprocessing import StandardScaler
    scaler = StandardScaler()
```

Fit the features data only to this estimator
(leaving the TARGET CLASS column) and transform

```
[ ] scaler.fit(df.drop('TARGET CLASS',axis=1))
    scaled_features = scaler.transform(df.drop('TARGET CLASS',axis=1))
```

```
df_feat = pd.DataFrame(scaled_features,columns=df.columns[:-1])
df_feat.head()
```

	WTT	PTI	EQW	SBI	LQE	QWG	FDJ	PJF	HQE	NXJ
0	-0.123542	0.185907	-0.913431	0.319629	-1.033637	-2.308375	-0.798951	-1.482368	-0.949719	-0.643314
1	-1.084836	-0.430348	-1.025313	0.625388	-0.444847	-1.152706	-1.129797	-0.202240	-1.828051	0.636759
2	-0.788702	0.339318	0.301511	0.755873	2.031693	-0.870156	2.599818	0.285707	-0.682494	-0.377850
3	0.982841	1.060193	-0.621399	0.625299	0.452820	-0.267220	1.750208	1.066491	1.241325	-1.026987
4	1.139275	-0.640392	-0.709819	-0.057175	0.822886	-0.936773	0.596782	-1.472352	1.040772	0.276510

PART-2:-

Train/Test split, model fit and prediction

```
[ ]  from sklearn.model_selection import train_test_split
     X = df_feat
     y = df['TARGET CLASS']
     X_train, X_test, y_train, y_test =
     train_test_split(scaled_features,df['TARGET CLASS'],
                      test_size=0.30, random_state=101)
```

```
[ ]  from sklearn.neighbors import KNeighborsClassifier
     knn = KNeighborsClassifier(n_neighbors=1)
     knn.fit(X_train,y_train)
```

```
KNeighborsClassifier
KNeighborsClassifier(n_neighbors=1)
```

```
pred = knn.predict(X_test)
```

PART-3:-

Evaluation of classification quality

```
[ ] from sklearn.metrics import classification_report,confusion_matrix
    conf_mat=confusion_matrix(y_test,pred)
    print(conf_mat)
```

```
[[233  17]
 [ 24 226]]
```

```
[ ] print(classification_report(y_test,pred))
```

```
              precision    recall  f1-score   support

           0       0.91      0.93      0.92       250
           1       0.93      0.90      0.92       250

    accuracy                           0.92       500
   macro avg       0.92      0.92      0.92       500
weighted avg       0.92      0.92      0.92       500
```

```
print("Misclassification error rate:",round(np.mean(pred!=y_test),3))
```

```
Misclassification error rate: 0.082
```

Choosing 'k' by elbow method

```
error_rate = []

# Will take some time
for i in range(1,60):

    knn = KNeighborsClassifier(n_neighbors=1)
    knn.fit(X_train,y_train)
    pred_i = knn.predict(X_test)
    error_rate.append(np.mean(pred_i != y_test))
```

```
[ ] plt.figure(figsize=(10,6))
    plt.plot(range(1,60),error_rate,color='blue', linestyle='dashed', marker='o',
             markerfacecolor='red', markersize=8)
    plt.title('Error Rate vs. K Value', fontsize=20)
    plt.xlabel('K',fontsize=15)
    plt.ylabel('Error (misclassification) Rate',fontsize=15)
```

```
<matplotlib.text.Text at 0x28d46e31f60>
```