2602063913_Bernardus Ignasio_Assignment 4 Machine Learning

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1 Assignment 4 Machine Learning

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CLASS : LA01

Assignment Number: 4

1.0.1 Importing library and datasets

[72]:

```
import pandas as pd
import numpy as np
from sklearn.svm import SVC
from sklearn.model_selection import train_test_split
from sklearn.metrics import classification_report, confusion_matrix,␣
  ↪accuracy_score,precision_score,recall_score,f1_score
import seaborn as sns
from sklearn.preprocessing import StandardScaler
```

[73]:

```
df=pd.read_csv('cell_samples.csv')
df.head()
```

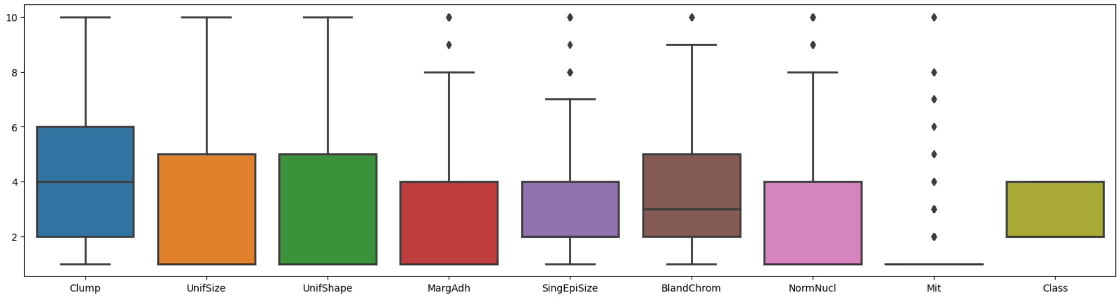
[73]:

```
        ID  Clump  UnifSize  UnifShape  MargAdh  SingEpiSize BareNuc  \
0  1000025      5         1          1        1            2       1
1  1002945      5         4          4        5            7      10
2  1015425      3         1          1        1            2       2
3  1016277      6         8          8        1            3       4
4  1017023      4         1          1        3            2       1

   BlandChrom  NormNucl  Mit  Class
0           3         1    1      2
1           3         2    1      2
2           3         1    1      2
3           3         7    1      2
4           3         1    1      2
```

1.0.2 EDA & Preprocessing

[74]:
```
df=df.drop(['ID'], axis=1)
```

[75]:
```
import matplotlib.pyplot as plt
fig, ax = plt.subplots(figsize=(20, 5))
sns.boxplot(data=df,linewidth=2,ax=ax)
plt.show()
```



Terlihat pada boxplot bahwa banyak outliers yang harus di handle

[76]:
```
df.dtypes
```

[76]:
```
Clump            int64
UnifSize         int64
UnifShape        int64
MargAdh          int64
SingEpiSize      int64
BareNuc         object
BlandChrom       int64
NormNucl         int64
Mit              int64
Class            int64
dtype: object
```

[77]:
```
df['BareNuc'].unique()
```

[77]:
```
array(['1', '10', '2', '4', '3', '9', '7', '?', '5', '8', '6'],
      dtype=object)
```

Ada value yang seharusnya tidak ada di kolom'BareNuc' berupa '?' menyebabkan error dan tidak bisa fit data, maka di handling

[78]:
```
df[df['BareNuc'] == '?'] = df['BareNuc'].mode()[0]
```

[79]:
```
df=df.astype('int64')
df.dtypes
```

[79]:

```
Clump           int64
UnifSize        int64
UnifShape       int64
MargAdh         int64
SingEpiSize     int64
BareNuc         int64
BlandChrom      int64
NormNucl        int64
Mit             int64
Class           int64
dtype: object
```

[80]:

```
df['Class'].unique()
```

[80]:

```
array([2, 4, 1], dtype=int64)
```

terdapat 3 value di kolom 'class' diminta hanya classify hanya 2 (benign) dan 4 (malignant), maka harus di handling

[81]:

```
a = []
for idx,i in enumerate(df['Class']):
    if i == 1:
        a.append(idx)
```

[82]:

```
a
```

[82]:

```
[23, 40, 139, 145, 158, 164, 235, 249, 275, 292, 294, 297, 315, 321, 411, 617]
```

[83]:

```
df = df.drop(a)
```

[84]:

```
df['Class'].unique()
```

[84]:

```
array([2, 4], dtype=int64)
```

[85]:

```
#kalau class 1 nya mau di mode
#df['Class'].groupby(df['Class']).count()
#df[df['Class'] == 1] = df['Class'].mode()[0]
```

[86]:

```
#df['Class'].unique()
```

[87]:

```
def data_preprocessing_pipeline(data):
    numeric_features=data.select_dtypes(include=['float','int']).columns
    categorical_features=data.select_dtypes(include=['object']).columns

    data[numeric_features]=data[numeric_features].fillna(data[numeric_features].
 ↪mean())

    for feature in numeric_features:
        Q1 = data[feature].quantile(0.25)
        Q3 = data[feature].quantile(0.75)
        IQR = Q3-Q1
        lower_bound= Q1 - (1.5*IQR)
        upper_bound= Q3 + (1.5*IQR)
        data[feature]= np.where((data[feature]<lower_bound) | (data[feature]>␣
↪upper_bound),
                                 data[feature].mean(), data[feature])

    scaler = StandardScaler()
    scaled_data = scaler.fit_transform(data[numeric_features])
    data[numeric_features]=scaler.transform(data[numeric_features])
    #data[categorical_features]=data[categorical_features].
↪fillna(data[categorical_features].mode().iloc[0])
    return data
```

[88]:

```
data_preprocessing_pipeline(df)
df.head()
```

[88]:

```
      Clump  UnifSize  UnifShape   MargAdh  SingEpiSize   BareNuc  BlandChrom  \
0  0.197905 -0.702212  -0.741774 -0.654577    -0.563025 -0.698853   -0.116804
1  0.197905  0.277252   0.262783  1.497467     3.122838  1.772867   -0.116804
2 -0.511643 -0.702212  -0.741774 -0.654577    -0.563025 -0.424217   -0.116804
3  0.552679  1.583204   1.602192 -0.654577     0.174148  0.125054   -0.116804
4 -0.156869 -0.702212  -0.741774  0.421445    -0.563025 -0.698853   -0.116804

   NormNucl       Mit     Class
0 -0.598251 -0.461675 -0.733681
1 -0.058643 -0.461675 -0.733681
2 -0.598251 -0.461675 -0.733681
3  2.639393 -0.461675 -0.733681
4 -0.598251 -0.461675 -0.733681
```

Data setelah distandarisasi agar memiliki scale yang sama

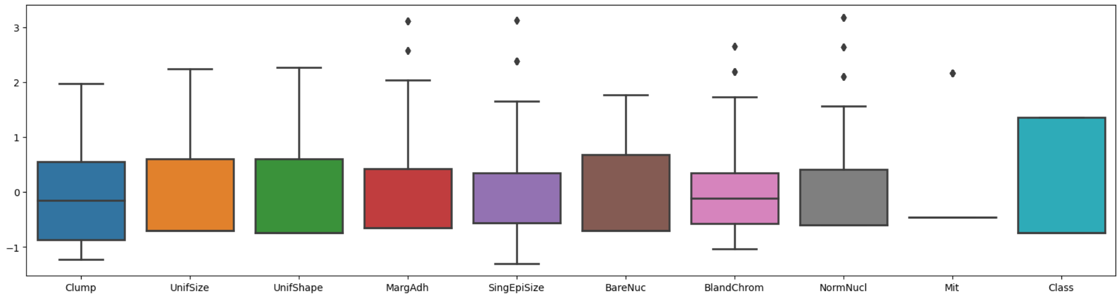
[89]:

```
df.dtypes
```

[89]:

```
Clump          float64
UnifSize       float64
UnifShape      float64
MargAdh        float64
SingEpiSize    float64
BareNuc        float64
BlandChrom     float64
NormNucl       float64
Mit            float64
Class          float64
dtype: object
```

```
[90]: fig, ax = plt.subplots(figsize=(20, 5))
      sns.boxplot(data=df,linewidth=2,ax=ax)
      plt.show()
```



Dapat terlihat bahwa outliers sudah berkurang

```
[91]: df['Class'].unique()
```

```
[91]: array([-0.73368133,  1.36298958])
```

```
[92]: df['BareNuc'].unique()
```

```
[92]: array([-0.69885309,  1.77286724, -0.4242175 ,  0.12505369, -0.1495819 ,
              1.49823165,  0.94896047,  0.39968928,  1.22359606,  0.67432487])
```

1.0.3 Fitting & Predict with SVC RBF Kernel

```
[93]: X=df.drop(['Class'],axis=1)
      y=df['Class'].astype('int64')
```

```
[94]: X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.
       ↪2,random_state=42)
```

```
[95]: y_test
```

```
[95]: 304    1
      149    1
      217    0
      120    0
      314    0
            ..
      112    1
      84     1
      53     1
      216    0
      563    0
      Name: Class, Length: 137, dtype: int64
```

[96]:
```
svc=SVC(kernel='rbf')
svc.fit(X_train,y_train)
```

[96]:
```
SVC()
```

[97]:
```
y_pred=svc.predict(X_test)
```

1.0.4 Evaluation

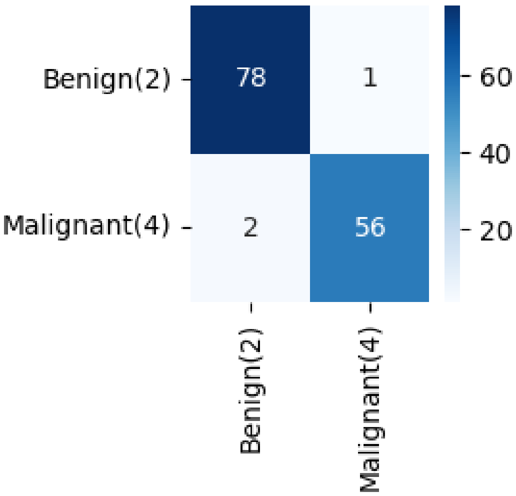
[98]:
```
print(f'Accuracy Score : {accuracy_score(y_test,y_pred)}')
print(f'Precision Score : {precision_score(y_test,y_pred)}')
print(f'Recall Score : {recall_score(y_test,y_pred)}')
print(f'F1 Score : {f1_score(y_test,y_pred)}')
```

```
Accuracy Score : 0.9781021897810219
Precision Score : 0.9824561403508771
Recall Score : 0.9655172413793104
F1 Score : 0.9739130434782608
```

[99]:
```
print(classification_report(y_test,y_pred))
```

```
              precision    recall  f1-score   support

           0       0.97      0.99      0.98        79
           1       0.98      0.97      0.97        58

    accuracy                           0.98       137
   macro avg       0.98      0.98      0.98       137
weighted avg       0.98      0.98      0.98       137
```

[102]:
```
fig, ax = plt.subplots(figsize=(2, 2))
axislabel=['Benign(2)','Malignant(4)']

sns.heatmap(confusion_matrix(y_test,y_pred),xticklabels=axislabel,␣
 ↪yticklabels=axislabel, annot=True,cmap='Blues')




plt.show()
```


Benign(2)
Malignant(4)
78
1
2
56
60
40
20
Benign(2)
Malignant(4)