HW4_P3_Jha_Vibhav

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HW4 Problem 4

0.1 Name: Vibhav Jha

1 Training section

1.0.1 Training imports

[1]:
```
from sklearn.svm import SVC
from sklearn.metrics import confusion_matrix,ConfusionMatrixDisplay
from sklearn import preprocessing
import pandas as pd
from joblib import dump
```

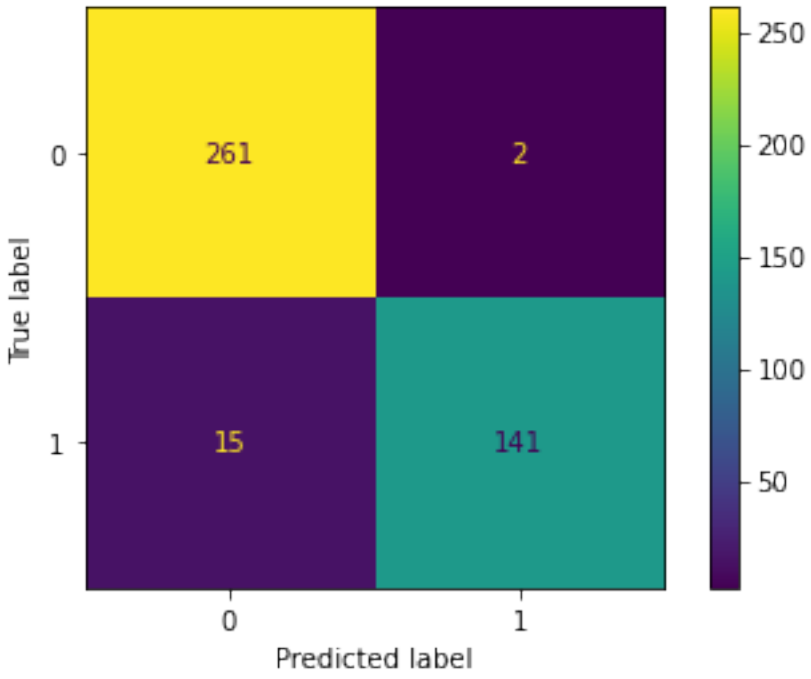
[2]:
```
df = pd.read_csv('training_Dataset.csv')
df.diagnosis.replace({"M":1,"B":0},inplace=True) #replace with integers

dfsc = pd.DataFrame(preprocessing.scale(df.iloc[:,2:32]))
#i tried both minmaxscaler and standardscaler which kept getting me perfect␣
 ↪classifications
#so instead i used this "leaky method" as is mentioned in the documentation

#there was no actual method (like kfolds, correlation analysis etc.) to feature␣
 ↪selection, I just chose a few
#subsets at random and was able to achieve the required sensitivities/
 ↪specificities

xtrain = dfsc.iloc[:,2:15] #selecting a subset of features
ytrain = df['diagnosis'] #labels

clf = SVC()
clf.fit(xtrain,ytrain)
ypred = clf.fit(xtrain, ytrain).predict(xtrain)


dump(clf, 'VJHA_SVM_model.joblib')
```

[2]:
```
['VJHA_SVM_model.joblib']
```

1.0.2 Performance and confusion matrix

[3]:
```
cm = confusion_matrix(ytrain,ypred)
ConfusionMatrixDisplay(confusion_matrix = cm).plot()

#Sensitivity = TP/(TP + FN) and Specificity = TN/(TN + FP).
tn, fp, fn, tp = confusion_matrix(ytrain, ypred).ravel()
sensitivity = tp/(tp+fn)
print('Train Sensitivity:', sensitivity)
specificity = tn/(tn+fp)
print('Train Specificity:', specificity)
```

```
Train Sensitivity: 0.9038461538461539
Train Specificity: 0.9923954372623575
```



2 Testing section

2.0.1 Testing imports

[4]:
```
from sklearn.svm import SVC
from sklearn.metrics import confusion_matrix,ConfusionMatrixDisplay
from sklearn import preprocessing
import pandas as pd
from joblib import load
```

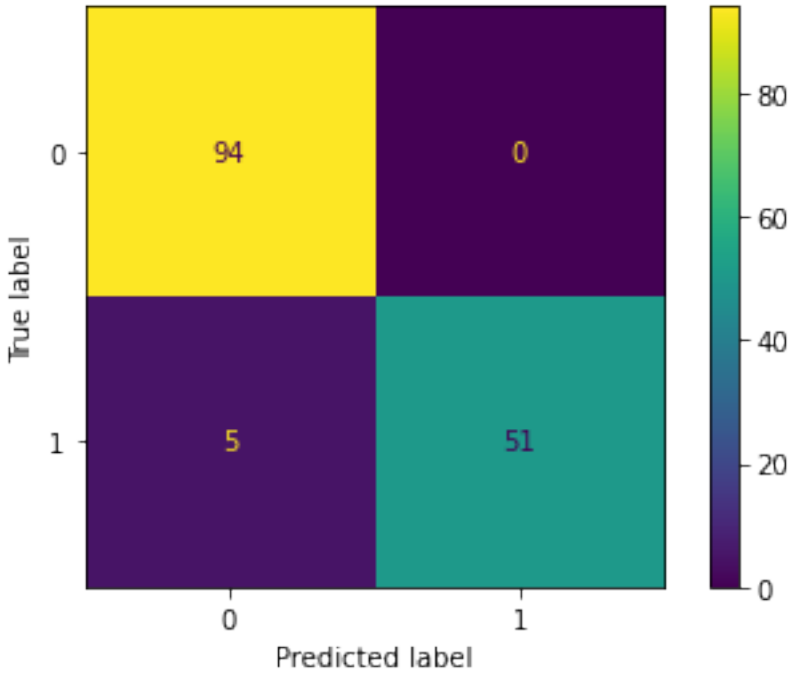
2.0.2 Testing

[5]:
```
dft = pd.read_csv('testing_Dataset.csv')
#use same preprocessing method as earlier
dft.diagnosis.replace({"M":1,"B":0},inplace=True)

dftsc = pd.DataFrame(preprocessing.scale(dft.iloc[:,2:32]))

xtest = dftsc.iloc[:,2:15] #select same subset as training
ytest = dft['diagnosis']


clf_loaded = load('VJHA_SVM_model.joblib')
ypred3 = clf_loaded.predict(xtest)
```

2.0.3 Performance and confusion matrix

[6]:
```
cm2 = confusion_matrix(ytest,ypred3)
ConfusionMatrixDisplay(confusion_matrix = cm2).plot()

#Sensitivity = TP/(TP + FN) and Specificity = TN/(TN + FP)
tn, fp, fn, tp = confusion_matrix(ytest, ypred3).ravel()
sensitivity = tp/(tp+fn)
print('Test Sensitivity:', sensitivity)
specificity = tn/(tn+fp)
print('Test Specificity:', specificity)
```

```
Test Sensitivity: 0.9107142857142857
Test Specificity: 1.0
```


94
0
5
51
0
1
True label
0
1
Predicted label
80
60
40
20
0

[ ]: