Week 7 Quiz

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Due Tues Oct 25 11:59pm ET

In this quiz we will practice creating a train/test split and compare training and test set accuracy of a trained Decision Tree model against a baseline.

Instructions

Replace the Name and UNI in cell above and the notebook filename

Replace all '__' below using the instructions provided.

When completed,

1. make sure you've replaced Name and UNI in the first cell and filename
2. Kernel -> Restart & Run All to run all cells in order
3. Print Preview -> Print (Landscape Layout) -> Save to pdf
4. post pdf to GradeScope

In [1]:
```
import numpy as np
from collections import Counter
from sklearn.datasets import load_breast_cancer
```

In [2]:
```
# Load the sample breast_cancer dataset from Scikit-Learn returning just the
#   X features and y label (instead of the full Bunch data-structure)
#   This is a common binary classification task dataset used for demonstration.
#   For more information, see:
#     https://scikit-learn.org/stable/datasets/index.html#breast-cancer-dataset
X,y = load_breast_cancer(return_X_y=True)

print(f'num observations:    {X.shape[0]}')
```

```
print(f'num features:         {X.shape[1]}')
print(f'target value counts: {dict(Counter(y))}')
```

```
num observations:    569
num features:        30
target value counts: {0: 212, 1: 357}
```

In [3]:
```
# Import the train_test_split function from sklearn.model_selection
from sklearn.model_selection import train_test_split

# Split X and y into X_train,X_test,y_train,y_test
#    using train_test_split,
#    stratify using y,
#    and use the default test_size of 0.25.
X_train,X_test,y_train,y_test = train_test_split(X, y , stratify = y)

# Check that the distribution of classes is similar in train and test
assert ((y_train == 0).sum() / len(y_train) -
        (y_test == 0).sum() / len(y_test)) < .01
```

In [4]:
```
# Get a baseline

# Import DummyClassifier from sklearn
from sklearn.dummy import DummyClassifier

#   Instantiate DummyClassifier
#      with strategy="prior" (the default)
#      and fit on X_train, y_train
#      store as dummyc
dummyc = DummyClassifier().fit(X_train, y_train)

# print out the training set accuracy using dummyc.score()
print(f'dummy training set accuracy: {dummyc.score(X_train, y_train):0.2f}')

# print out the test set accuracy using dummyc.score()
print(f'    dummy test set accuracy: {dummyc.score(X_test, y_test):0.2f}')
```

```
dummy training set accuracy: 0.63
    dummy test set accuracy: 0.63
```

In [5]:
```
# Train and compare a Decision Tree model

# Import DecisionTreeClassifier from sklearn
from sklearn.tree import DecisionTreeClassifier
```

```
# Instantiate a DecisionTreeClassifier
#    with max_depth=10
#    and train on X_train,y_train
#    store as dtc
dtc = DecisionTreeClassifier(max_depth=10).fit(X_train,y_train)

# print out the training set accuracy using dtc.score()
print(f'dtc training set accuracy: {dtc.score(X_train,y_train):0.2f}')

# print out the test set accuracy using dtc.score()
print(f'    dtc test set accuracy: {dtc.score(X_test, y_test):0.2f}')
```

```
dtc training set accuracy: 1.00
    dtc test set accuracy: 0.94
```

In [6]:
```
# To expose the different kinds of errors that our Decision Tree model is making,
#   print a confusion matrix

# import confusion_matrix from sklearn.metrics
from sklearn.metrics import confusion_matrix

# generate a confusion_matrix
#    using y_test
#    and the predictions generated by the trained dtc model on X_test
#    store as cm
cm = confusion_matrix(y_test, dtc.predict(X_test))

print(cm)
```

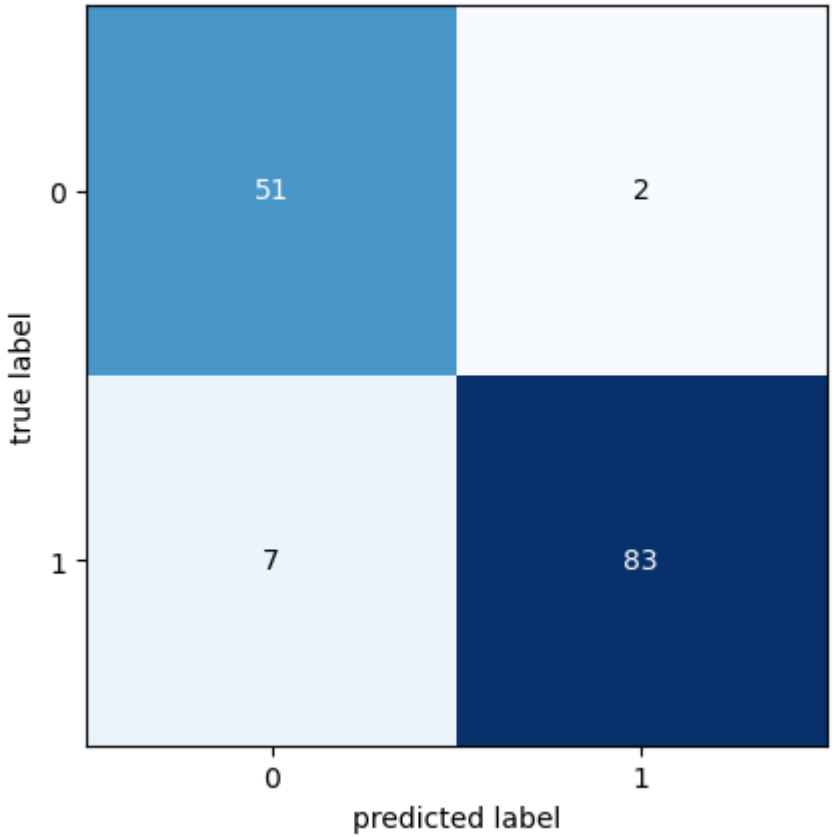
```
[[51  2]
 [ 7 83]]
```

In [7]:
```
# To help interpret the output of confusion_matrix,
#    use plot_confusion_matrix from mlxtend

# Import the plot_confusion_matrix function from mlxtend.plotting
from mlxtend.plotting import plot_confusion_matrix

# call plot_confusion_matrix() on the output of
#   confusion_matrix generated above (cm)
plot_confusion_matrix(cm)
```

Out[7]:
```
(<Figure size 640x480 with 1 Axes>,
 <AxesSubplot: xlabel='predicted label', ylabel='true label'>)
```



In [ ]: