Lab 3

November 20, 2021

[401]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

from sklearn.model_selection import train_test_split
from numpy import trapz
```

[407]:
```
class rOC():
    def __init__(self, probs, trueClass):
        self.probs = probs
        self.trueClass = trueClass

    def compute_ROC_coordinates(self, probs, trueClass ):
        #this is the psudo code given
        probs = probs.sort_values(ascending=False)
        trueClass = trueClass.reindex(probs.index)
        fp = 0
        tp = 0
        ROC_cordinates =[]
        previous_prob = float('-inf')
        for i in range(len(probs)):
            if(probs.iloc[i] != previous_prob):
                count= trueClass.value_counts()
                # im assuming here that TrueClass is boolean dataframe with␣
↪possitive true and negative false
                ROC_cordinates.append([fp / count[False]  , tp / count[True]])
                previous_prob = probs.iloc[i]
            if(trueClass.iloc[i]['class'] == True):
                tp = tp + 1
            else:
                fp = fp + 1
        ROC_cordinates.append([fp / count[False]  , tp / count[True]])
        return ROC_cordinates

    def compute_ROC_coordinates_optimized(self, probs, trueClass ):
        #this is the optimized version of compute_ROC_coordinates
```

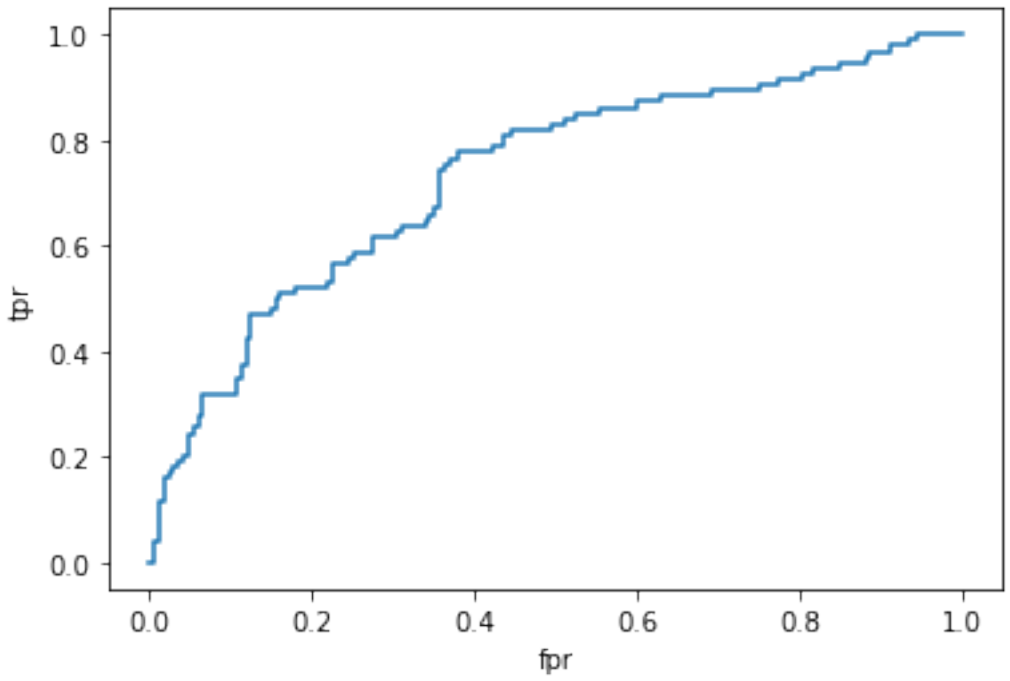
```
        # here before going throw test instances and calculating tpr and fpr im␣
↪finding the instances that have same
        # probability and then sorting them from true to false
        # this way i can use all the data and dont need previous_prob
        probs = probs.sort_values(ascending=False)
        trueClass = trueClass.reindex(probs.index)
        df = pd.DataFrame(probs)
        df['trueClass'] = trueClass # putting probs and truClass in same data␣
↪frame
        df2 = pd.DataFrame(df['probs'].value_counts())
        df2 = df2[df2.probs != 1] # making a data frame with value of␣
↪duplicates and number of that value in the data
        for value in df2.index:
            # for all these values im making new data frame with sorted values
            df3 = df[df.probs == value]['trueClass'].
↪sort_values(ascending=False)
            i = 0
            for index in df[df.probs == value]['trueClass'].index:
                # updating the original data frame to be sorted for duplicates
                df.loc[index, 'trueClass'] = df3.iloc[i]
                i = i + 1
        fp = 0
        tp = 0
        ROC_cordinates =[]
        for i in range(len(probs)):
            count= trueClass.value_counts()
            # im assuming here that TrueClass is boolean dataframe with␣
↪possitive true and negative false
            ROC_cordinates.append([fp / count[False]  , tp / count[True]])
            if(trueClass.iloc[i]['class'] == True):
                tp = tp + 1
            else:
                fp = fp + 1
        ROC_cordinates.append([fp / count[False]  , tp / count[True]])
        return ROC_cordinates

    def plot_ROC(self,cordinates): #take fpr as x and tpr as y and plot
        fpr = []
        tpr = []
        for j in range(len(cordinates)):
            fpr.append(cordinates[j][0])
            tpr.append(cordinates[j][1])
        plt.plot(fpr,tpr)
        plt.xlabel('fpr')
        plt.ylabel('tpr')
```

```
    def compute_AUCROC(self, cordinates): # calculate the area under the curve␣
 ↪using trapzoid method
        fpr = []
        tpr = []
        for j in range(len(cordinates)):
            fpr.append(cordinates[j][0])
            tpr.append(cordinates[j][1])
        area = trapz(tpr, fpr)
        return(area)
```

[409]:
```
#Making test using diabetes data
data = pd.read_csv('/Users/macbook/Downloads/diabetes.csv')
data.head()
Y = data['class']
X = data.drop(['class'],axis=1)
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.34,␣
 ↪random_state=10)
# using kNN classifiar
neigh = KNeighborsClassifier(n_neighbors=3)
neigh.fit(X_train, Y_train)

trueClass = pd.DataFrame(Y_test).reset_index(drop=True) # making true class␣
 ↪from Y_test
# as i said above my class assum trueClass is an Dataframe of booleans so here␣
 ↪im making
#trueClass a boolean df
trueClass = trueClass.replace({'tested_positive': True,'tested_negative' :␣
 ↪False})

probs = pd.DataFrame(neigh.predict_proba(X_test), columns = ['col0' , 'probs'])␣
 ↪#making probs
# this method give the probability of being positive and negative so im only␣
 ↪taking the second column
# corresponding to positive
probs = probs.iloc[:,1]

rOCc = rOC(probs, trueClass)
```

[419]:
```
# compute_ROC_coordinates_optimized method returning an list of Tpr and Fpr for␣
 ↪each instance
cordinates = rOCc.compute_ROC_coordinates_optimized(probs, trueClass)
# this was really long so i didnt print
```

[415]:
```
# plot_ROC plotting the values find from compute_ROC_coordinates_optimized
rOCc.plot_ROC(cordinates)
```



[416]:
```
# compute_AUCROC calculating the area under the curve using the plot from␣
 ↪plot_ROC
rOCc.compute_AUCROC(cordinates)
```

[416]: 0.7324594731509625