Compute performance metrics for the given Y and Y_score without sklearn

In [1]:
```
import numpy as np
import pandas as pd
from tqdm import tqdm # To chek execution i just imported this
# other than these two you should not import any other packages
```

A. Compute performance metrics for the given data **5_a.csv**

Note 1: in this data you can see number of positive points >> number of negatives points

Note 2: use pandas or numpy to read the data from **5_a.csv**

Note 3: you need to derive the class labels from given score

$$y^{pred} = [0 \text{ if y\_score} < 0.5 \text{ else } 1]$$

1. Compute Confusion Matrix

2. Compute F1 Score

3. Compute AUC Score, you need to compute different thresholds and for each threshold compute tpr,fpr and then use numpy.trapz(tpr_array, fpr_array) https://stackoverflow.com/q/53603376/4084039 (https://stackoverflow.com/q/53603376/4084039), https://stackoverflow.com/a/39678975/4084039 (https://stackoverflow.com/a/39678975/4084039) Note: it should be numpy.trapz(tpr_array, fpr_array) not numpy.trapz(fpr_array, tpr_array)

4. Compute Accuracy Score

In [2]:

```
# write your code here

# Read 5_a csv file
df_a  = pd.read_csv('5_a.csv')

df_a.head()

# Step 1 Find Y_predict using probablity
# In the Dataset we have large postive les negative

df_a.loc[df_a['proba'] >= 0.5, 'y_predict'] = 1
df_a.loc[df_a['proba'] < 0.5, 'y_predict'] = 0

df_a.head()

# Step 2 Calculate Confusion matrix
True_postive= 0
True_negative =0
False_postive =0
False_negative =0



for i,j in zip(df_a['y'],df_a['y_predict']):
    if i==1.0 and j==1.0:
        True_postive += 1
    elif i==0.0 and j==1.0:
        False_postive += 1
    elif i==1.0 and j==0.0:
        False_negative += 1
    elif i==0.0 and j==0.0:
        True_negative += 1

print('True Positive ' + str(True_postive))
print('True Negative ' + str(True_negative))
print('False Positive ' + str(False_postive))
print('False Negative ' + str(False_negative))


# Step 3  - F1 Score
# F1 score = 2*((precision*recall)/(precision+recall)).
# precision = TP/TP+FN
# Recall = TP / Tp+FP

precision  = True_postive/ (True_postive+False_negative)
Recall     = True_postive/ (True_postive+False_postive)
F1_score   = 2*((precision * Recall) / (precision+ Recall))
print('F1_score - ' +str(F1_score))

# Step 4 Accuracy
Accuracy = (True_postive + True_negative) / (True_postive+True_negative+False_pos
print('Accuracy_score - ' +str(Accuracy))

# Step5 AUC Curve

df_a = df_a.sort_values(by=['proba'],axis=0,ascending=False,ignore_index= True)
```

```
prob_value_df = df_a['proba']
list_number =  list(range(0,len(prob_value_df),100))
prob_value_df  = prob_value_df[list_number]

df_a.head()

prob_value_df

True_positive_rate = []
False_positive_rate =[]
for prob_i in tqdm(prob_value_df):

    #convert = lambda x : 1.0 if x >= prob_i else 0.0
    df_a.loc[df_a['proba'] >= prob_i, 'y_'+str(prob_i)] = 1
    df_a.loc[df_a['proba'] < prob_i, 'y_'+str(prob_i)] = 0
    True_postive= 0
    True_negative =0
    False_postive =0
    False_negative =0
    for i,j in zip(df_a['y'],df_a['y_'+str(prob_i)]):
        if i==1.0 and j==1.0:
            True_postive += 1
        elif i==0.0 and j==1.0:
            False_postive += 1
        elif i==1.0 and j==0.0:
            False_negative += 1
        elif i==0.0 and j==0.0:
            True_negative += 1
    TP_rate = ((True_postive) /(True_postive+False_negative))
    FP_rate = ((False_postive) /(True_negative+False_postive))
    True_positive_rate.append(TP_rate)
    False_positive_rate.append(FP_rate)



import matplotlib.pyplot as plt
plt.plot(False_positive_rate,True_positive_rate)

True_positive_rate  = np.array(True_positive_rate)
False_positive_rate = np.array(False_positive_rate)

pAUC = np.trapz(True_positive_rate, False_positive_rate)

print('Area Under Curve - '+str(pAUC))
#Note  - 0 - Model Terrible
#        1 - Good Model
```

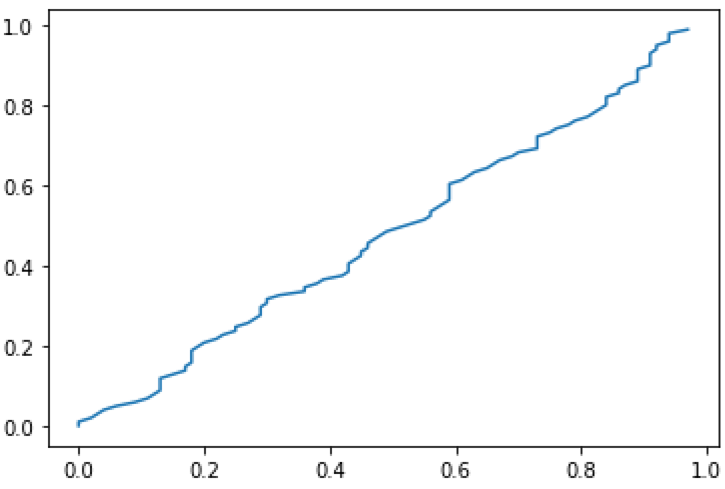
```
  7%|██████▋
| 7/101 [00:00<00:01, 61.52it/s]

True Positive 10000
True Negative 0
False Positive 100
False Negative 0
F1_score - 0.9950248756218906
Accuracy_score - 0.9900990099009901

100%|████████████████████████████████████████████████████████████████████
```

```
██████████| 101/101 [00:02<00:00, 46.59it/s]

Area Under Curve - 0.4580425
```



B. Compute performance metrics for the given data **5_b.csv**

Note 1: in this data you can see number of positive points << number of negatives points

Note 2: use pandas or numpy to read the data from **5_b.csv**

Note 3: you need to derive the class labels from given score

$$y^{pred} = [0 \text{ if y\_score} < 0.5 \text{ else } 1]$$

1. Compute Confusion Matrix

2. Compute F1 Score

3. Compute AUC Score, you need to compute different thresholds and for each threshold compute tpr,fpr and then use numpy.trapz(tpr_array, fpr_array) https://stackoverflow.com/q/53603376/4084039 (https://stackoverflow.com/q/53603376/4084039), https://stackoverflow.com/a/39678975/4084039 (https://stackoverflow.com/a/39678975/4084039)

4. Compute Accuracy Score

In [3]:

```
# write your code

# Import Required Package
import numpy as np
import pandas as pd
from tqdm import tqdm

# Read 5_a csv file
df_a  = pd.read_csv('5_b.csv')

df_a.head()

# Step 1 Find Y_predict using probablity
# In the Dataset we have large postive les negative

df_a.loc[df_a['proba'] >= 0.5, 'y_predict'] = 1
df_a.loc[df_a['proba'] < 0.5, 'y_predict'] = 0

df_a.head()

# Step 2 Calculate Confusion matrix
True_postive= 0
True_negative =0
False_postive =0
False_negative =0



for i,j in zip(df_a['y'],df_a['y_predict']):
    if i==1.0 and j==1.0:
        True_postive += 1
    elif i==0.0 and j==1.0:
        False_postive += 1
    elif i==1.0 and j==0.0:
        False_negative += 1
    elif i==0.0 and j==0.0:
        True_negative += 1

print('True Positive ' + str(True_postive))
print('True Negative ' + str(True_negative))
print('False Positive ' + str(False_postive))
print('False Negative ' + str(False_negative))


from sklearn.metrics import confusion_matrix
confusion_matrix(df_a['y'],df_a['y_predict'])



# Step 3  - F1 Score
# F1 score = 2*((precision*recall)/(precision+recall)).
# precision = TP/TP+FN
# Recall = TP / Tp+FP

precision  = True_postive/ (True_postive+False_negative)
Recall     = True_postive/ (True_postive+False_postive)
```

```
F1_score   = 2*((precision * Recall) / (precision+ Recall))
print('F1_score - ' +str(F1_score))

# Step 4 Accuracy
Accuracy = (True_postive + True_negative) / (True_postive+True_negative+False_pos
print('Accuracy_score - ' +str(Accuracy))

# Step5 AUC Curve

df_a = df_a.sort_values(by=['proba'],axis=0,ascending=False,ignore_index= True)
prob_value_df = df_a['proba']
list_number =  list(range(0,len(prob_value_df),100))
prob_value_df  = prob_value_df[list_number]

df_a.head()

prob_value_df

True_positive_rate = []
False_positive_rate =[]
for prob_i in tqdm(prob_value_df):

    #convert = lambda x : 1.0 if x >= prob_i else 0.0
    df_a.loc[df_a['proba'] >= prob_i, 'y_'+str(prob_i)] = 1
    df_a.loc[df_a['proba'] < prob_i, 'y_'+str(prob_i)] = 0
    True_postive= 0
    True_negative =0
    False_postive =0
    False_negative =0
    for i,j in zip(df_a['y'],df_a['y_'+str(prob_i)]):
        if i==1.0 and j==1.0:
            True_postive += 1
        elif i==0.0 and j==1.0:
            False_postive += 1
        elif i==1.0 and j==0.0:
            False_negative += 1
        elif i==0.0 and j==0.0:
            True_negative += 1
    TP_rate = ((True_postive) /(True_postive+False_negative))
    FP_rate = ((False_postive) /(True_negative+False_postive))
    True_positive_rate.append(TP_rate)
    False_positive_rate.append(FP_rate)



import matplotlib.pyplot as plt
plt.plot(False_positive_rate,True_positive_rate)

True_positive_rate  = np.array(True_positive_rate)
False_positive_rate = np.array(False_positive_rate)

pAUC = np.trapz(True_positive_rate, False_positive_rate)

print('Area Under Curve - '+str(pAUC))
#Note  - 0 - Model Terrible
#        1 - Good Model
```

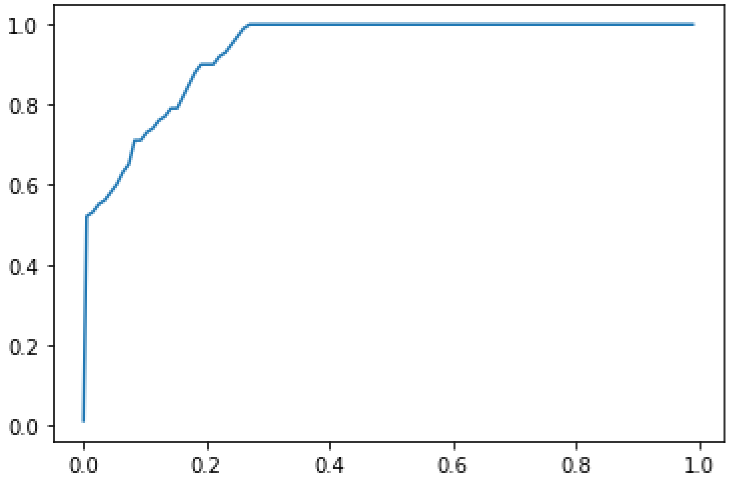
```
True Positive 55
True Negative 9761
False Positive 239
False Negative 45

  7%|█████▋
| 7/101 [00:00<00:01, 65.23it/s]

F1_score - 0.2791878172588833
Accuracy_score - 0.9718811881188119

100%|████████████████████████████████████████████████████████████████████████
██████| 101/101 [00:02<00:00, 45.27it/s]

Area Under Curve - 0.9263505000000001
```



C. Compute the best threshold (similarly to ROC curve computation) of probability which gives lowest values of metric **A** for the given data **5_c.csv**

you will be predicting label of a data points like this: $y^{pred} = [0 \text{ if y\_score} < \text{threshold else } 1]$

$$A = 500 \times \text{number of false negative} + 100 \times \text{numebr of false positive}$$

```
   Note 1: in this data you can see number of negative points > number o
f positive points
   Note 2: use pandas or numpy to read the data from 5_c.csv
```

In [4]:
```
# write your code

# Read 5_ac csv file
df_a  = pd.read_csv('5_c.csv')
df_a.head(5)

df_a = df_a.sort_values(by=['prob'],axis=0,ascending=False,ignore_index= True)
prob_value_df = df_a['prob']
list_number =  list(range(0,len(prob_value_df),100))
prob_value_df  = prob_value_df[list_number]

All_thershold = {}
for prob_i in tqdm(prob_value_df):

    #convert = lambda x : 1.0 if x >= prob_i else 0.0
    df_a.loc[df_a['prob'] >= prob_i, 'y_'+str(prob_i)] = 1
    df_a.loc[df_a['prob'] < prob_i, 'y_'+str(prob_i)] = 0
    True_postive= 0
    True_negative =0
    False_postive =0
    False_negative =0
    for i,j in zip(df_a['y'],df_a['y_'+str(prob_i)]):
        if i==1.0 and j==1.0:
            True_postive += 1
        elif i==0.0 and j==1.0:
            False_postive += 1
        elif i==1.0 and j==0.0:
            False_negative += 1
        elif i==0.0 and j==0.0:
            True_negative += 1
    FP_rate = False_postive
    FN_rate = False_negative
    All_thershold[prob_i]  = (500*FN_rate) + (100*FP_rate)



sorted_thershold = {k: v for k, v in sorted(All_thershold.items(), key=lambda ite

print('Thershold which has low False postive and False Negative is : ' +str(list(
```

```
100%|██████████████████████████████████████████████████
███████| 29/29 [00:00<00:00, 104.78it/s]

Thershold which has low False postive and False Negative is : 0.244075046197788
1
```

D. Compute performance metrics(for regression) for the given data **5_d.csv**

> **Note 2:** use pandas or numpy to read the data from **5_d.csv**
> **Note 1:** **5_d.csv** will having two columns Y and predicted_Y both are real valued features

1. Compute Mean Square Error

2. Compute MAPE: https://www.youtube.com/watch?v=ly6ztgIkUxk

3. Compute R^2 error: https://en.wikipedia.org/wiki/Coefficient_of_determination#Definitions

In [7]:

```
df_d  = pd.read_csv('5_d.csv')
df_d.head(5)

# SubTask 1 FInd Compute Mean Square Error
MSE = 0
total_data = len(df_d['y'])
for y,predict in zip(df_d['y'],df_d['pred']):
    MSE= (MSE + (y-predict)**2)

MSE = MSE/total_data
print('Mean Square Error is '+ str(MSE))

# SubTask 2 Find Mean Square Absolute error
def mean_absolute_percentage_error(y_true, y_pred):
    test_zero = (y_true == 0).sum(axis=0)
    MAPE_numerator = 0
    MAPE_Demonitator=sum(df_d['y'])

    if test_zero != 0:
        for actual, predict in zip(y_true,y_pred):
            MAPE_numerator =MAPE_numerator + (np.abs(predict-actual))
        MAPE  = (MAPE_numerator/MAPE_Demonitator) *100
        return MAPE
    else:
        y_true, y_pred = np.array(y_true), np.array(y_pred)
        return np.mean(np.abs((y_true - y_pred) / y_true)) * 100

print('Mean_Absolute_percentage_error: '+ str(mean_absolute_percentage_error(df_c

#  Subtask 3 - R2 score

# Find mean of Actual
Actual_mean = np.mean(df_d['y']) # Ans 66.56

total_Sum_of_error  =  0
n_actual = len(df_d['y'])
for actual in df_d['y']:
    total_Sum_of_error = total_Sum_of_error+((actual-Actual_mean)**2)

total_Sum_of_error= total_Sum_of_error/n_actual

# Total Sum of residual
Actual_mean = np.mean(df_d['pred'])
total_Sum_of_res_error  =  0
n_actual = len(df_d['pred'])
for actual,predict in zip(df_d['y'],df_d['pred']):
    total_Sum_of_res_error = total_Sum_of_res_error+((actual-predict)**2)

total_Sum_of_res_error= total_Sum_of_res_error/n_actual

r2_score = 1-(total_Sum_of_res_error/total_Sum_of_error)

print('R2_Score is '+str(r2_score))
```

```
Mean Square Error is 177.16569974554707
Mean_Absolute_percentage_error: 12.91202994009687
R2_Score is 0.9563582786990964
```

In [ ]: