import matplotlib.pyplot as plt  
import numpy as np  
pp = [['T', 9], ['T', 0.7],['N', 0.65], ['T', 0.6], ['N', 0.5],['N', 0.4], ['N', 0.4],['T', 0.4],  
 ['N', 0.35],['N', 0.2]]  
aa = [0.9, 0.7, 0.65,0.6,0.5,0.4, 0.4,0.4, 0.35,0.2]  
  
  
TPR\_list = []  
FPR\_list = []  
  
for threshold in aa:  
 tp = 0  
 fp = 0  
 fn = 0  
 tn = 0  
 for label, score in pp:  
 if label == 'T':  
 if score >= threshold:  
 tp += 1  
 else:  
 fn += 1  
 else:  
 if score >= threshold:  
 fp += 1  
 else:  
 tn += 1  
  
  
 TPR = tp / (tp + fn) if (tp + fn) > 0 else 0  
 FPR = fp / (fp + tn) if (fp + tn) > 0 else 0  
  
 TPR\_list.append(TPR)  
 FPR\_list.append(FPR)  
  
  
def calculate\_auc(fpr, tpr):  
  
  
  
 assert len(fpr) == len(tpr), "FPR and TPR lists must have the same length"  
  
  
  
 auc = 0.0  
  
  
  
 for i in range(1, len(fpr)):  
 auc += (fpr[i] - fpr[i - 1]) \* (tpr[i] + tpr[i - 1]) / 2  
  
 return auc  
auc\_value = calculate\_auc(FPR\_list, TPR\_list)  
  
print("AUC value: ", auc\_value)  
  
plt.figure(figsize=(5, 5))  
plt.plot(FPR\_list, TPR\_list, marker='o')  
plt.title('ROC Curve')  
plt.xlabel('False Positive Rate')  
plt.ylabel('True Positive Rate')  
plt.grid(True)  
plt.ylim([0.0, 1.05])  
plt.xlim([0.0, 1.0])  
  
plt.show()