# hw3

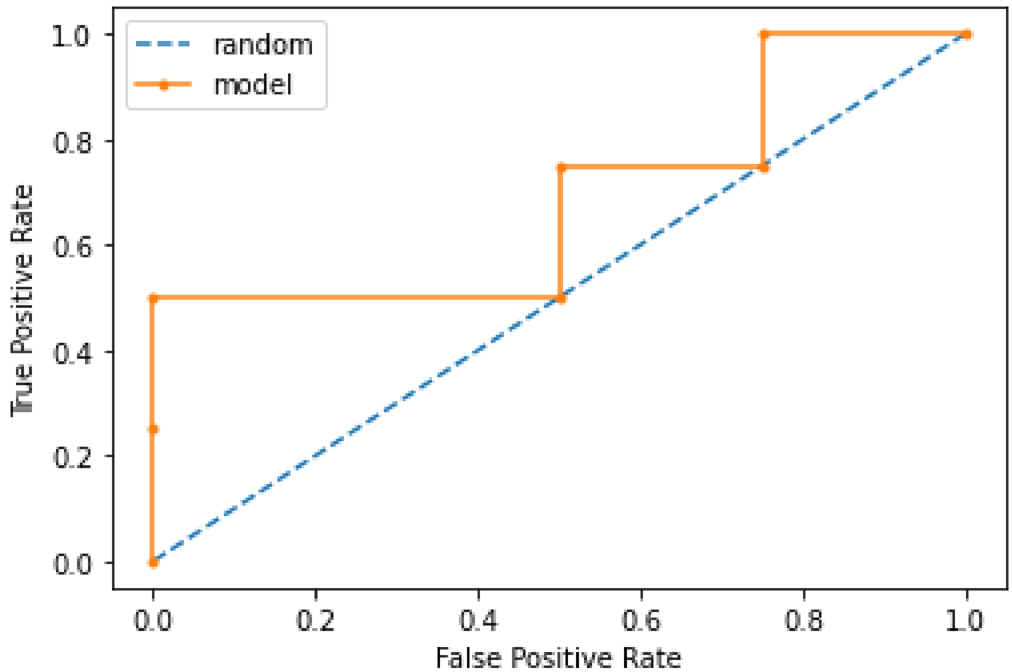
October 3, 2021

[10]:
```
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.metrics import roc_auc_score, roc_curve
```

[11]:
```
model_prob = [0.004, 0.015, 0.448, 0.568, 0.780, 0.879, 0.967, 0.978]
model_class = [0, 1, 0, 1, 0, 0, 1, 1]
```

[12]:
```
def plot_roc_curve(model_class, model_prob):
    random_probs = [0 for __ in range(len(model_prob))] # used for linear line␣
 ↪to compare to ROC

    #AUC
    model_auc = roc_auc_score(model_class, model_prob)
    #model score
    print("Model: ROC AUC = %.3f" % (model_auc))

    #random model:
    random_false_pos, random_true_pos, __ = roc_curve(model_class, random_probs)

    #actual model:
    model_false_pos, model_true_pos, __ = roc_curve(model_class, model_prob)

    #roc curve plot
    plt.plot(random_false_pos, random_true_pos, linestyle = '--', label =␣
 ↪'random')
    plt.plot(model_false_pos, model_true_pos, marker = '.', label ='model')

    #labels, legend, show
    plt.xlabel('False Positive Rate')
    plt.ylabel('True Positive Rate')
    plt.legend()
    plt.show()

plot_roc_curve(model_class, model_prob)
```

```
Model: ROC AUC = 0.688
```




[13]:

```
#Part 2: Logistic Regression
from sklearn.linear_model import LogisticRegression
from sklearn import metrics
import numpy as np

df = pd.read_csv("EE627A_HW3_DataSet1.csv", header = None)
df.head()
```

[13]:

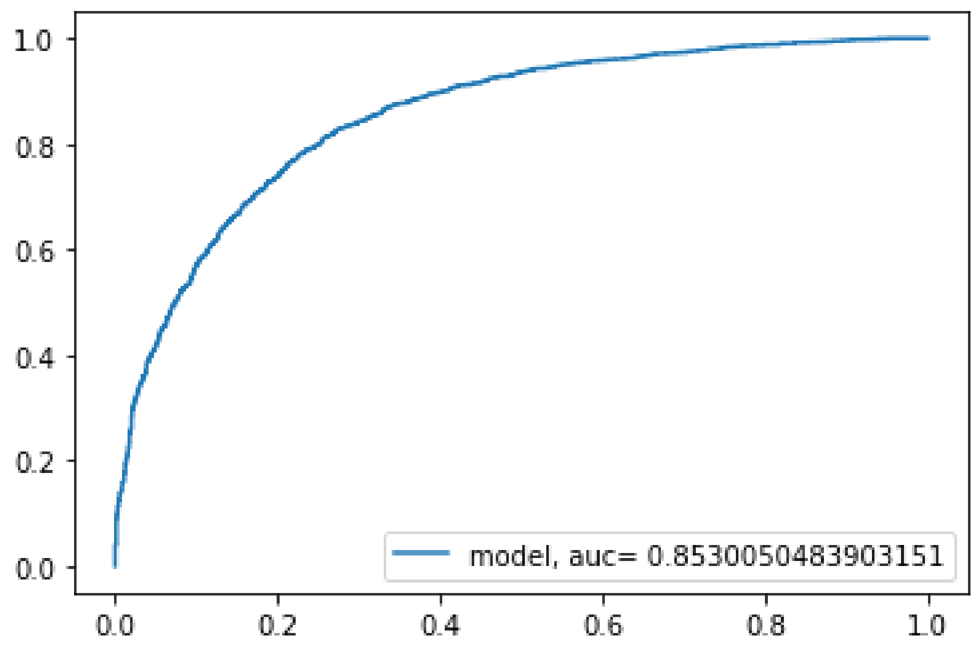
```
        0       1       2       3       4       5       6       7       8    \
0  5.5986  5.5986  5.5340  5.5340  289.37  289.82  289.30  289.66  289.37
1  5.5340  5.5521  5.5108  5.5185  289.64  289.89  289.63  289.76  289.64
2  5.5185  5.5185  5.4566  5.4772  289.86  290.07  289.65  289.93  289.86
3  5.4772  5.4772  5.3894  5.3894  289.93  290.13  289.63  289.86  289.93
4  5.3894  5.4152  5.3868  5.4152  289.85  290.03  289.45  289.51  289.85

        9   ...     467     468     469     470     471     472     473  \
0  289.82  ...  21.206  41.042  42.338  41.042  42.108  2.1330  2.1744
1  289.89  ...  21.258  42.108  42.108  41.881  42.033  2.1175  2.1227
2  290.07  ...  21.268  42.033  42.261  41.804  41.881  2.1227  2.1227
3  290.13  ...  21.310  42.033  42.186  42.033  42.108  2.1227  2.1227
4  290.03  ...  21.310  42.108  42.186  42.033  42.108  2.0995  2.0995

      474     475  476
0  2.1175  2.1175    1
```

```
1  2.1175  2.1175    1
2  2.1124  2.1124    1
3  2.0995  2.0995    1
4  2.0943  2.0995    0

[5 rows x 477 columns]
```

[14]:
```
predictor = df.iloc[:, 0:476]
response = df[476]
response.tail()
```

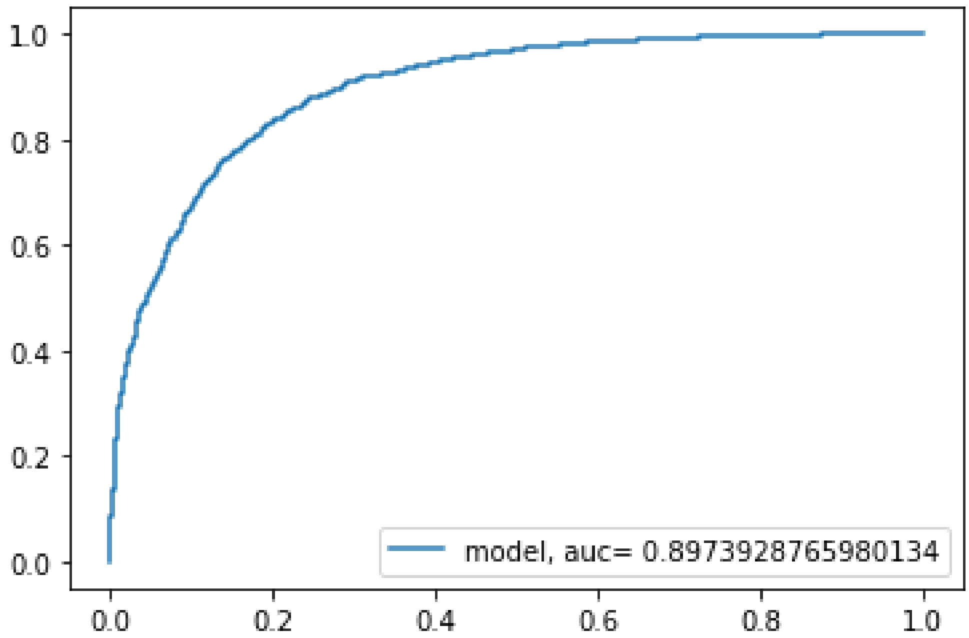
[14]:
```
3995    0
3996    0
3997    0
3998    1
3999    0
Name: 476, dtype: int64
```

[15]:
```
#fit and instantiate the model:
logreg = LogisticRegression(solver='liblinear', C=10.0, random_state=0)
logreg.fit(predictor, response)
y_pred_proba = logreg.predict_proba(predictor)[::,1]

#modeling:
model_falsepos, model_truepos, __ = roc_curve(response, y_pred_proba)
auc = roc_auc_score(response, y_pred_proba)

#plot
plt.plot(model_falsepos, model_truepos, label ='model, auc= '+str(auc))
plt.legend()
plt.show()
```

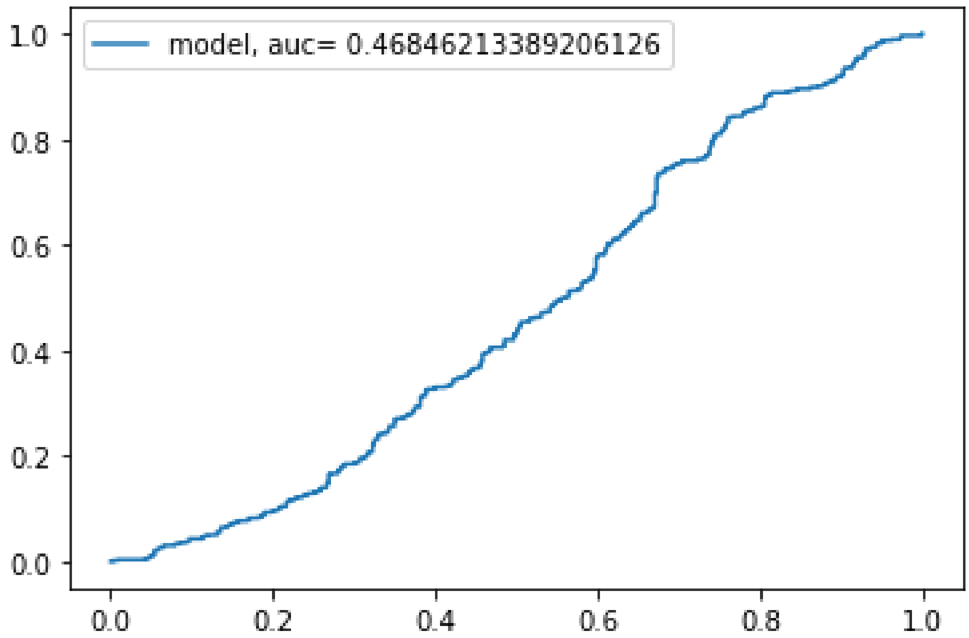



[16]:
```
#Task 2
training_set = df.iloc[0:3000, 0:476]
validation_set = df.iloc[3000:4000, 0:476]
response_training = df.iloc[0:3000, 476]
response_validate = df.iloc[3000:4000, 476]
#response_training = df[np.ix_([476], [0:3000])]
```

[17]:
```
#training set date to apply logistic regression
model_train = LogisticRegression(solver='liblinear', C=10.0, random_state=0)
model_train.fit(training_set, response_training)
model_train_proba = model_train.predict_proba(training_set)[::,1]

training_FP, training_TP, __ = roc_curve(response_training, model_train_proba)
auc = roc_auc_score(response_training, model_train_proba)

#plot
plt.plot(training_FP, training_TP, label ='model, auc= '+str(auc))
plt.legend()
plt.show()
```




[19]:
```
#validate set
model_validate_proba = model_train.predict_proba(validation_set)[::,1]

validate_FP, validate_TP, __ = roc_curve(response_validate, model_validate_proba)
auc = roc_auc_score(response_validate, model_validate_proba)

plt.plot(validate_FP, validate_TP, label ='model, auc= '+str(auc))
plt.legend()
plt.show()
```




[20]:
```
#The validate auc is 0.468 and the training auc is 0.897, a difference of 0.429
#The validate model is not a good model because it shows that it is predicting␣
 ↪false positives more than 50% of the time,
#which is worse than guessing. Something is wrong with the model
```