

MODELO 3 - Avaliação dos Modelos de machine learning.

```
In [1]: %matplotlib inline
```

```
In [2]: # Importa as bibliotecas
import pandas
import matplotlib.pyplot as plt
import numpy
#from pandas.tools.plotting import scatter_matrix
from pandas.plotting import scatter_matrix
import seaborn as sb
from sklearn.model_selection import train_test_split, cross_val_score
from sklearn.preprocessing import Normalizer
#Logistic Regression
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import roc_auc_score, roc_curve, auc, accuracy_score, recall_score, precision_score, f1_score
import statsmodels.api as sm
from sklearn.metrics import confusion_matrix
# Load Libraries
import pandas as pd
from sklearn.tree import DecisionTreeClassifier # Import Decision Tree Classifier
from sklearn import metrics #Import scikit-learn metrics module for accuracy calculation
```

1) Carregando os dados de treino e teste para avaliação do modelo

```
In [3]: try:
import cPickle as pickle
except ModuleNotFoundError:
import pickle
```

```
In [4]: output = ".\\baseDados\\voice_treino_test.pk"
```

```
In [5]: dic_base_treino_file = pickle.load(open( output, "rb" ))
```

```
In [6]: y_train = dic_base_treino_file['y_train']
y_test = dic_base_treino_file['y_test']
X_train = dic_base_treino_file['X_train_norm']
X_test = dic_base_treino_file['X_test_norm']
feature_cols = dic_base_treino_file['feature_cols']

print(feature_cols)
```

```
Index(['meanfreq', 'sd', 'median', 'Q25', 'Q75', 'IQR', 'skew', 'kurt',
      'sp.ent', 'sfm', 'mode', 'centroid', 'meanfun', 'minfun', 'maxfun',
      'meandom', 'mindom', 'maxdom', 'dfrange', 'modindx', 'int'],
      dtype='object')
```

```
In [7]: dfContador =pandas.DataFrame(list(y_train), columns = ['genero'])
contagem = dfContador.groupby('genero').size()
print(contagem)
```

```
genero
0      1108
1      1108
dtype: int64
```

```
In [8]: dfContador =pandas.DataFrame(list(y_test), columns = ['genero'])
contagem = dfContador.groupby('genero').size()
print(contagem)
```

```
genero
0       476
1       476
dtype: int64
```

2) carregando o modelo Random Forest

```
In [9]: from sklearn.ensemble import RandomForestClassifier
rf_model = RandomForestClassifier(random_state=1,n_estimators=100,min_impurity_decrease=0.05)
```

Treinamento e teste do modelo: Random Forest.

```
In [10]: rf_model.fit(X_train, y_train)
```

```
Out[10]: RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini',
                                max_depth=None, max_features='auto', max_leaf_nodes=None,
                                min_impurity_decrease=0.05, min_impurity_split=None,
                                min_samples_leaf=1, min_samples_split=2,
                                min_weight_fraction_leaf=0.0, n_estimators=100,
                                n_jobs=None, oob_score=False, random_state=1, verbose=0,
                                warm_start=False)
```

```
In [11]: rf_pred=rf_model.predict(X_test)
```

Modelo de avaliação de métricas.

Precisão Geral (Accuracy)

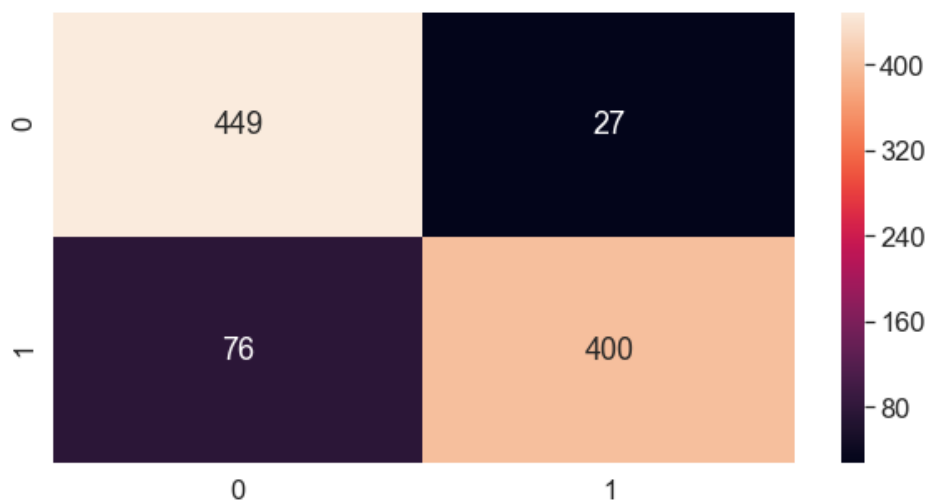
```
In [12]: #get accuracy
rf_accuracy_testdata = metrics.accuracy_score(y_test, rf_pred)
```

```
In [13]: #print accuracy
print ("Accuracy: {0:.4f}".format(rf_accuracy_testdata))
RF_Accuracy = metrics.accuracy_score(y_test, rf_pred)
print(RF_Accuracy)
```

Accuracy: 0.8918
0.8918067226890757

Matriz de confusão: Random Forest

```
In [14]: import plot as plot
cm=confusion_matrix(y_test,rf_pred)
#Plot the confusion matrix
plt.rcParams['figure.figsize'] = (10,5)
sb.set(font_scale=1.5)
sb.heatmap(cm, annot=True, fmt='g')
plt.show()
```



Metricas Report: Random Forest

```
In [15]: print ("{0}".format(metrics.classification_report(y_test, rf_pred, labels=[0, 1])))
```

	precision	recall	f1-score	support
0	0.86	0.94	0.90	476
1	0.94	0.84	0.89	476
accuracy			0.89	952
macro avg	0.90	0.89	0.89	952
weighted avg	0.90	0.89	0.89	952

```
In [16]: cm=confusion_matrix(y_test,rf_pred)
confusion_matrix_lda = pandas.DataFrame(cm, index = ['Negativos','Positivos'], columns = ['Previsão dos negativos','Previsão dos positivos'] )
confusion_matrix_lda['Total'] = 1
confusion_matrix_lda['Total'][0] = cm[0][0] + cm[0][1]
confusion_matrix_lda['Total'][1] = cm[1][0] + cm[1][1]
```

```
In [17]: confusion_matrix_lda
```

Out[17]:

	Previsão dos negativos	Previsão dos positivos	Total
Negativos	449	27	476
Positivos	76	400	476

```
In [18]: print(confusion_matrix_lda)
```

	Previsão dos negativos	Previsão dos positivos	Total
Negativos	449	27	476
Positivos	76	400	476

```
In [19]: TP = confusion_matrix_lda['Previsão dos positivos'][1]
dfTP = pandas.DataFrame(TP, index = ['Positivos verdadeiros'], columns = ['Quantidade acertos']
)
```

```
In [20]: TN = confusion_matrix_lda['Previsão dos negativos'][0]
dfTN = pandas.DataFrame(TN, index = ['Verdadeiro Negativo'], columns = ['Quantidade acertos']
)
```

```
In [21]: FP = confusion_matrix_lda['Previsão dos positivos'][0]
dfFP = pandas.DataFrame(FP, index = ['Falso Positivo'], columns = ['Quantidade acertos'] )
```

```
In [22]: FN = confusion_matrix_lda['Previsão dos negativos'][1]
dfFN = pandas.DataFrame(FN, index = ['Negativos Falsos'], columns = ['Quantidade acertos'] )
```

```
In [23]: rfSpecificity = TN / float(TN + FP)
dfSpecificity = pandas.DataFrame(rfSpecificity, index = ['Specificity'], columns = ['resultado'] )
```

```
In [24]: dfSpecificity
```

Out[24]:

	resultado
Specificity	0.943277

```
In [25]: rfRecall= recall_score(y_test, rf_pred)
print(rfRecall)
```

0.8403361344537815

```
In [26]: print(TP / float(TP + FP))
print(precision_score(y_test, rf_pred))
rfPrecision = precision_score(y_test, rf_pred)
```

0.936768149882904
0.936768149882904

```
In [27]: rfF1Score = 2 * rfPrecision * rfRecall / float(rfPrecision + rfRecall)
print(rfF1Score)
```

0.8859357696566998

```
In [ ]:
```

```
In [ ]:
```

Curva ROC: Random Forest

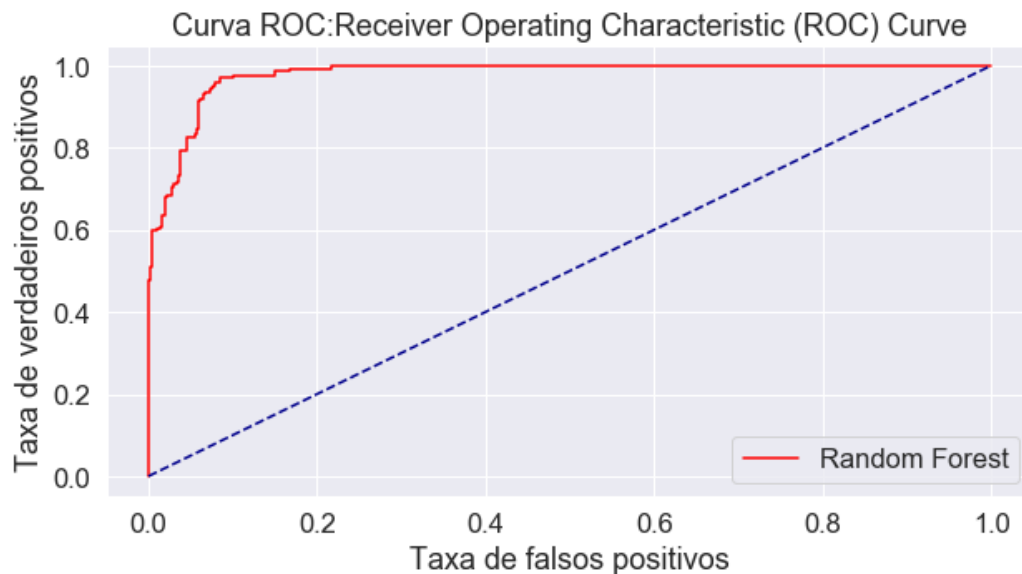
Uma curva ROC é uma forma comumente usada para visualizar o desempenho de um classificador binário, significando um classificador com duas classes de saída possíveis. A curva plota a Taxa Positiva Real (Recall) contra a Taxa Falsa Positiva (também interpretada como Especificidade 1).

```
In [28]: rf_pred_prob = rf_model.predict_proba(X_test)[: , 1]
```

```
In [29]: rf_fpr, rf_tpr, thresholds = roc_curve(y_test, rf_pred_prob)
```

```
In [30]: def plot_roc_curve(fpr, tpr, nome='ROC'):
plt.plot(fpr, tpr, color='red', label=nome)
plt.plot([0, 1], [0, 1], color='darkblue', linestyle='--')
plt.xlabel('Taxa de falsos positivos')
plt.ylabel('Taxa de verdadeiros positivos')
plt.title('Curva ROC:Receiver Operating Characteristic (ROC) Curve')
plt.legend()
plt.show()
```

```
In [31]: plot_roc_curve(rf_fpr, rf_tpr, 'Random Forest')
```



AUC (área sob a curva) da Curva ROC : Random Forest

AUC ou Area Under the Curve é a porcentagem do gráfico do ROC que está abaixo da curva. AUC é útil como um único número de resumo do desempenho do classificador.

```
In [32]: print(roc_auc_score(y_test, rf_pred_prob))
RF_Auc=roc_auc_score(y_test, rf_pred_prob)
```

```
0.9785767248075701
```

```
In [33]: dfAuc = pandas.DataFrame(RF_Auc, index = ['AUC'], columns = ['resultado' ])
dfAuc
```

Out[33]:

	resultado
AUC	0.978577

```
In [34]: print(dfAuc)
```

	resultado
AUC	0.978577

Carregando o modelo Máquina de vetores de suporte SVM

```
In [35]: from sklearn.svm import SVC
svm_model = SVC(kernel='linear', C=45, random_state=2 ,probability=True,coef0=0.3)

#kernel='linear'
```

Treinamento e teste do modelo: SVM.

```
In [36]: svm_model.fit(X_train, y_train)
```

```
Out[36]: SVC(C=45, cache_size=200, class_weight=None, coef0=0.3,
decision_function_shape='ovr', degree=3, gamma='auto_deprecated',
kernel='linear', max_iter=-1, probability=True, random_state=2,
shrinking=True, tol=0.001, verbose=False)
```

```
In [37]: svm_pred = svm_model.predict(X_test)
```

Modelo de avaliação de métricas.

Precisão Geral (Accuracy): SVM

```
In [38]: print(f"accuracy score: {accuracy_score(y_test, svm_pred):.4f}\n")
svm_accuracy_testdata = accuracy_score(y_test, svm_pred)

accuracy score: 0.9874
```

Matriz de confusão: SVM

```
In [39]: cm=confusion_matrix(y_test, svm_model.predict(X_test))
```

```
In [40]: confusion_matrix_lda = pandas.DataFrame(cm, index = ['Negativos','Positivos'], columns = ['Pre
visão dos negativos','Previsão dos positivos'] )
confusion_matrix_lda['Total'] = 1
confusion_matrix_lda['Total'][0] = cm[0][0] + cm[0][1]
confusion_matrix_lda['Total'][1] = cm[1][0] + cm[1][1]
```

```
In [41]: confusion_matrix_lda
```

```
Out[41]:
```

	Previsão dos negativos	Previsão dos positivos	Total
Negativos	475	1	476
Positivos	11	465	476

```
In [42]: TP = confusion_matrix_lda['Previsão dos positivos'][1]
dfTP = pandas.DataFrame(TP, index = ['Positivos verdadeiros'], columns = ['Quantidade acertos'
] )
TP
```

```
Out[42]: 465
```

```
In [43]: TN = confusion_matrix_lda['Previsão dos negativos'][0]
dfTN = pandas.DataFrame(TN, index = ['Verdadeiro Negativo'], columns = ['Quantidade acertos']
)
TN
```

Out[43]: 475

```
In [44]: FP = confusion_matrix_lda['Previsão dos positivos'][0]
dfFP = pandas.DataFrame(FP, index = ['Falso Positivo'], columns = ['Quantidade acertos'] )
FP
```

Out[44]: 1

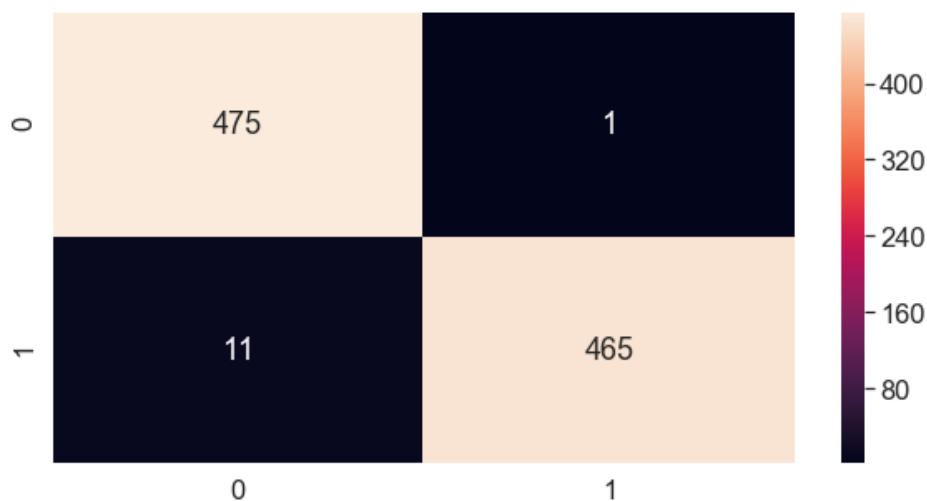
```
In [45]: FN = confusion_matrix_lda['Previsão dos negativos'][1]
dfFN = pandas.DataFrame(FN, index = ['Negativos Falsos'], columns = ['Quantidade acertos'] )
FN
```

Out[45]: 11

```
In [46]: print(f"accuracy score: {accuracy_score(y_test, svm_pred):.4f}\n")
svmAccuracy = accuracy_score(y_test, svm_pred)
```

accuracy score: 0.9874

```
In [47]: import plot as plot
cm=confusion_matrix(y_test, svm_model.predict(X_test))
#Plot the confusion matrix
plt.rcParams['figure.figsize'] = (10,5)
sb.set(font_scale=1.5)
sb.heatmap(cm, annot=True, fmt='g')
plt.show()
```



Metricas Report: svm

```
In [48]: print(f"Classification Report: \n \tPrecision: {precision_score(y_test, svm_pred)}\n\tRecall Score: {recall_score(y_test,svm_pred)}\n\tF1 score: {f1_score(y_test, svm_pred)}\n")
```

```
Classification Report:
Precision: 0.9978540772532188
Recall Score: 0.976890756302521
F1 score: 0.9872611464968152
```

```
In [49]: svmPrecision = precision_score(y_test, svm_pred)
```

```
In [50]: svmRecall = recall_score(y_test, svm_pred)
```

```
In [51]: svmF1_score = f1_score(y_test, svm_pred)
```

```
In [52]: svmSpecificity = TN / float(TN + FP)
dfSpecificity = pandas.DataFrame(svmSpecificity, index = ['Specificity'], columns = ['resultado'])
svmSpecificity
```

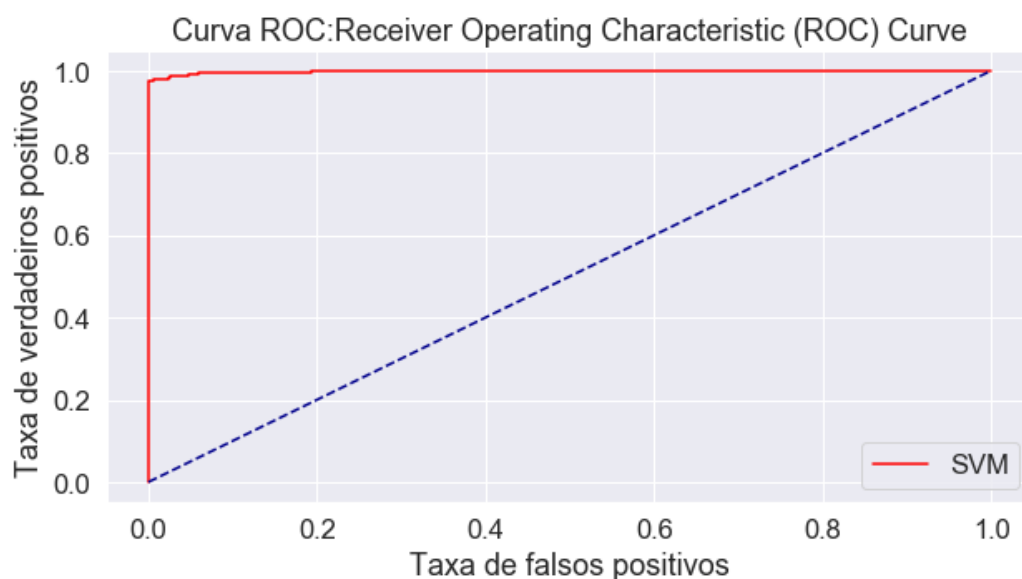
```
Out[52]: 0.9978991596638656
```

Curva ROC: SVM

```
In [53]: svm_pred_prob = svm_model.predict_proba(X_test)[: , 1]
```

```
In [54]: svm_fpr, svm_tpr, thresholds = roc_curve(y_test, svm_pred_prob)
```

```
In [55]: plot_roc_curve(svm_fpr, svm_tpr, 'SVM')
```



AUC (área sob a curva) da Curva ROC : SVM

AUC ou Area Under the Curve é a porcentagem do gráfico do ROC que está abaixo da curva. AUC é útil como um único número de resumo do desempenho do classificador.

```
In [56]: print(roc_auc_score(y_test, svm_pred_prob))
SVM_Auc=roc_auc_score(y_test, svm_pred_prob)
```

```
0.9981772120612952
```

Carregando o modelo Máquina de Naive Bayes


```
In [57]: from sklearn.naive_bayes import GaussianNB
nb_model = GaussianNB()
```

Treinamento e teste do modelo: NB.

```
In [58]: nb_model.fit(X_train, y_train)
```

```
Out[58]: GaussianNB(priors=None, var_smoothing=1e-09)
```

```
In [59]: nb_pred = nb_model.predict(X_test)
```

Modelo de avaliação de métricas. NB.

Precisão Geral (Accuracy): NB.

```
In [60]: #get accuracy
print(f"accuracy score: {accuracy_score(y_test, nb_pred):.4f}\n")
nb_accuracy_testdata = accuracy_score(y_test, nb_pred)

accuracy score: 0.8761
```

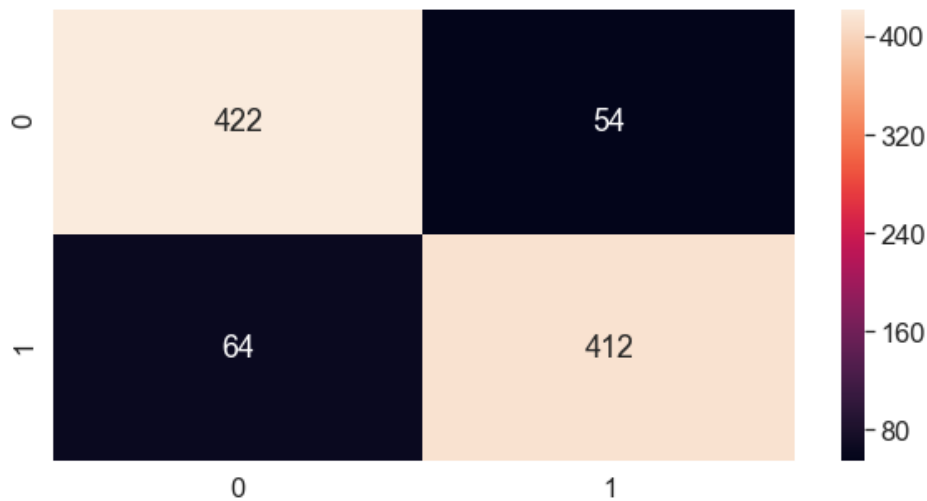
Matriz de confusão: NB.

```
In [61]: cm=confusion_matrix(y_test, nb_model.predict(X_test))
confusion_matrix_lda = pandas.DataFrame(cm, index = ['Negativos', 'Positivos'], columns = ['Previsão dos negativos', 'Previsão dos positivos'] )
confusion_matrix_lda['Total'] = 1
confusion_matrix_lda['Total'][0] = cm[0][0] + cm[0][1]
confusion_matrix_lda['Total'][1] = cm[1][0] + cm[1][1]
confusion_matrix_lda
```

```
Out[61]:
```

	Previsão dos negativos	Previsão dos positivos	Total
Negativos	422	54	476
Positivos	64	412	476

```
In [62]: import plot as plot
cm=confusion_matrix(y_test, nb_model.predict(X_test))
#Plot the confusion matrix
plt.rcParams['figure.figsize'] = (10,5)
sb.set(font_scale=1.5)
sb.heatmap(cm, annot=True, fmt='g')
plt.show()
```



Metrics Report: NB.

```
In [63]: print(f"Classification Report: \n \tPrecision: {precision_score(y_test, nb_pred)}\n\tRecall Score: {recall_score(y_test,nb_pred)}\n\tF1 score: {f1_score(y_test, nb_pred)}\n")
```

```
Classification Report:
Precision: 0.8841201716738197
Recall Score: 0.865546218487395
F1 score: 0.8747346072186836
```

```
In [64]: TP = confusion_matrix_lda['Previsão dos positivos'][1]
dfTP = pandas.DataFrame(TP, index = ['Positivos verdadeiros'], columns = ['Quantidade acertos'] )
TP
```

Out[64]: 412

```
In [65]: TN = confusion_matrix_lda['Previsão dos negativos'][0]
dfTN = pandas.DataFrame(TN, index = ['Verdadeiro Negativo'], columns = ['Quantidade acertos'] )
TN
```

Out[65]: 422

```
In [66]: FP = confusion_matrix_lda['Previsão dos positivos'][0]
dfFP = pandas.DataFrame(FP, index = ['Falso Positivo'], columns = ['Quantidade acertos'] )
FP
```

Out[66]: 54

```
In [67]: FN = confusion_matrix_lda['Previsão dos negativos'][1]
dfFN = pandas.DataFrame(FN, index = ['Negativos Falsos'], columns = ['Quantidade acertos'] )
FN
```

Out[67]: 64

```
In [68]: print(f"accuracy score: {accuracy_score(y_test, nb_pred):.4f}\n")
nbAccuracy = accuracy_score(y_test, nb_pred)
```

accuracy score: 0.8761

```
In [69]: nbPrecision = precision_score(y_test, nb_pred)
```

```
In [70]: nbRecall = recall_score(y_test, nb_pred)
```

```
In [71]: nbF1_score = f1_score(y_test, nb_pred)
```

```
In [72]: nbSpecificity = TN / float(TN + FP)
dfSpecificity = pandas.DataFrame(nbSpecificity, index = ['Specificity'], columns = ['resultado'])
nbSpecificity
```

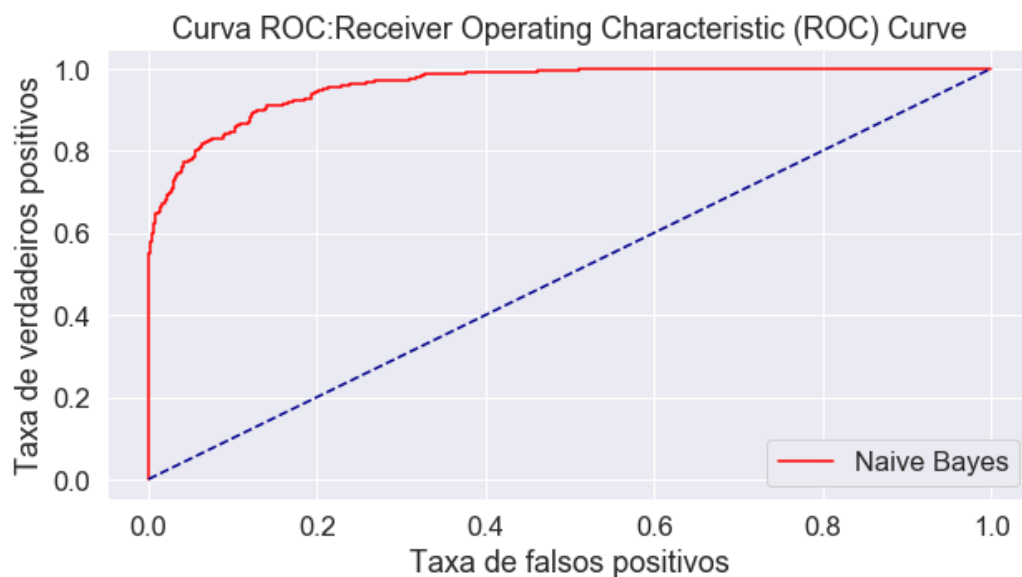
Out[72]: 0.8865546218487395

Curva ROC: NB.

```
In [73]: nb_pred_prob = nb_model.predict_proba(X_test)[: , 1]
```

```
In [74]: nb_fpr, nb_tpr, thresholds = roc_curve(y_test, nb_pred_prob)
```

```
In [75]: plot_roc_curve(nb_fpr, nb_tpr, 'Naive Bayes')
```



AUC (área sob a curva) da Curva ROC : NB.

```
In [76]: print(roc_auc_score(y_test, nb_pred_prob))
NB_Auc=roc_auc_score(y_test, nb_pred_prob)
```

0.9599516277099075

Comparativo entre os modelos

```
In [77]: import matplotlib.pyplot as plt
from sklearn.metrics import roc_curve, auc
import seaborn as sns
#sns.set('talk', 'whitegrid', 'dark', font_scale=1.5, font='Ricty', rc={"lines.linewidth":
2, 'grid.linestyle': '--'})
```

Carregar o modelo de Árvore Decisão

```
In [78]: filename = '.\\baseDados\\cart.jss'
infile = open(filename, 'rb')
cart_dict = pickle.load(infile)
infile.close()
CART_auc= cart_dict['Auc']
CART_pred_prob= cart_dict['y_pred_prob']
```

```
In [79]: #print(cart_dict)
```

```
In [80]: #print(cart_dict)
cart_fpr, cart_tpr, thresholds = roc_curve(y_test, CART_pred_prob)
```

Carregar o modelo de Regressão logística

```
In [81]: filenamer1 = '.\\baseDados\\regressaologitica.jss'
infile = open(filenamer1, 'rb')
rlog_dict = pickle.load(infile)
infile.close()
#print(rlog_dict)
rlog_auc= rlog_dict['Auc']
rlog_pred_prob= rlog_dict['y_pred_prob']
```

```
In [82]: rlog_fpr, rlog_tpr, thresholds = roc_curve(y_test, rlog_pred_prob)
```

Mostra o gráfico comparativo

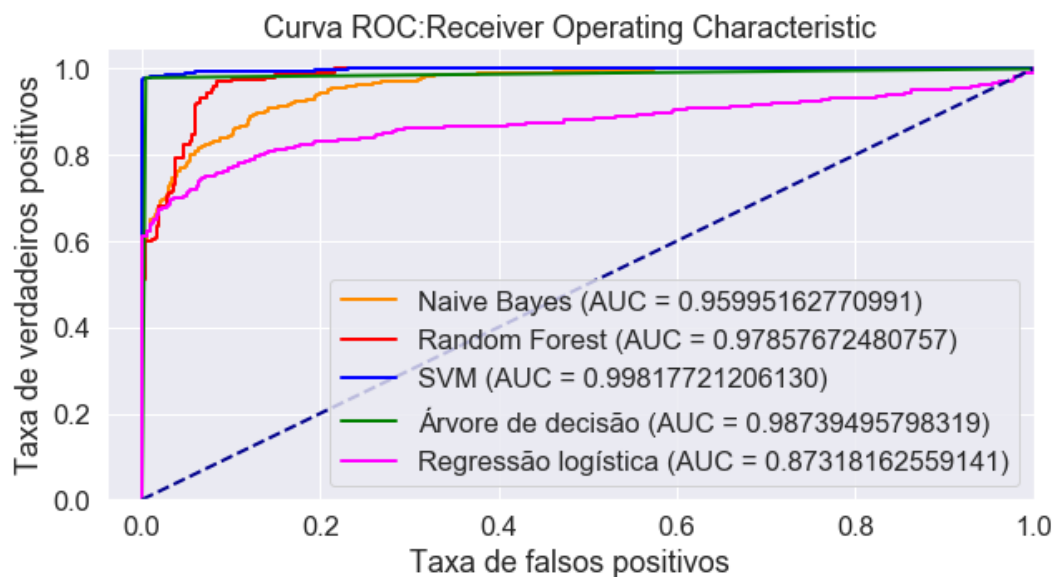
```
In [83]: lw = 2
plt.figure()
plt.rcParams['figure.figsize'] = (12,6)

plt.plot(nb_fpr, nb_tpr, color='darkorange', lw=lw, label='Naive Bayes (AUC = %0.14f)' % NB_Auc)
plt.plot(rf_fpr, rf_tpr, color='red', lw=lw, label='Random Forest (AUC = %0.14f)' % RF_Auc)
plt.plot(svm_fpr, svm_tpr, color='blue', lw=lw, label='SVM (AUC = %0.14f)' % SVM_Auc)
plt.plot(cart_fpr, cart_tpr, color='green', lw=lw, label='Árvore de decisão (AUC = %0.14f)' % CART_auc)
plt.plot(rlog_fpr, rlog_tpr, color='magenta', lw=lw, label='Regressão logística (AUC = %0.14f)' % rlog_auc)

#----- linha central-----
plt.plot([0, 1], [0, 1], color='darkblue', lw=lw, linestyle='--')
plt.xlabel('Taxa de falsos positivos')
plt.ylabel('Taxa de verdadeiros positivos')
plt.title('Curva ROC:Receiver Operating Characteristic')

sb.set(font_scale=1.5)
plt.legend()
plt.xlim([-0.04, 1.0])
plt.ylim([0.0, 1.05])

plt.show()
plt.savefig('roc_auc.png')
plt.close()
```



```
In [84]: plt.subplots_adjust(left=0.1, right=0.9, top=0.9, bottom=0.1)

<Figure size 864x432 with 0 Axes>
```

Comparando as métricas dos modelos Acurácia, Precisão e AUC.

```
In [85]: #print(cart_dict)
```

```
In [86]: dfresultado=pd.DataFrame.from_dict(dict([('Regressão Logística',[rlog_dict['Accuracy'],
rlog_dict['Precision'],
rlog_dict['Specificity'],
rlog_dict['F1Score'],
rlog_dict['Recall'],
rlog_dict['Auc']]],
('Arvore de decisão',[cart_dict['Accuracy'],
cart_dict['Precision'],
cart_dict['Specificity'],
cart_dict['F1Score'],
cart_dict['Recall'],
cart_dict['Auc']]],
('Random Forest', [RF_Accuracy, rfPrecision, rfSpecificity,rfF1Score,rfRecall,RF_Auc]),
('SVM', [svmAccuracy, svmPrecision, svmSpecificity,svmF1_score,svmRecall,SVM_Auc]),
('Naive Bayes', [nb_accuracy_testdata, nbPrecision, nbSpecificity,
nbF1_score,nbRecall,NB_Auc]))],
orient='index', columns=['Accuracy', 'Precision', 'Specificity',
'F1Score', 'Recall', 'AUC'])
```

```
In [87]: dfresultado
```

Out[87]:

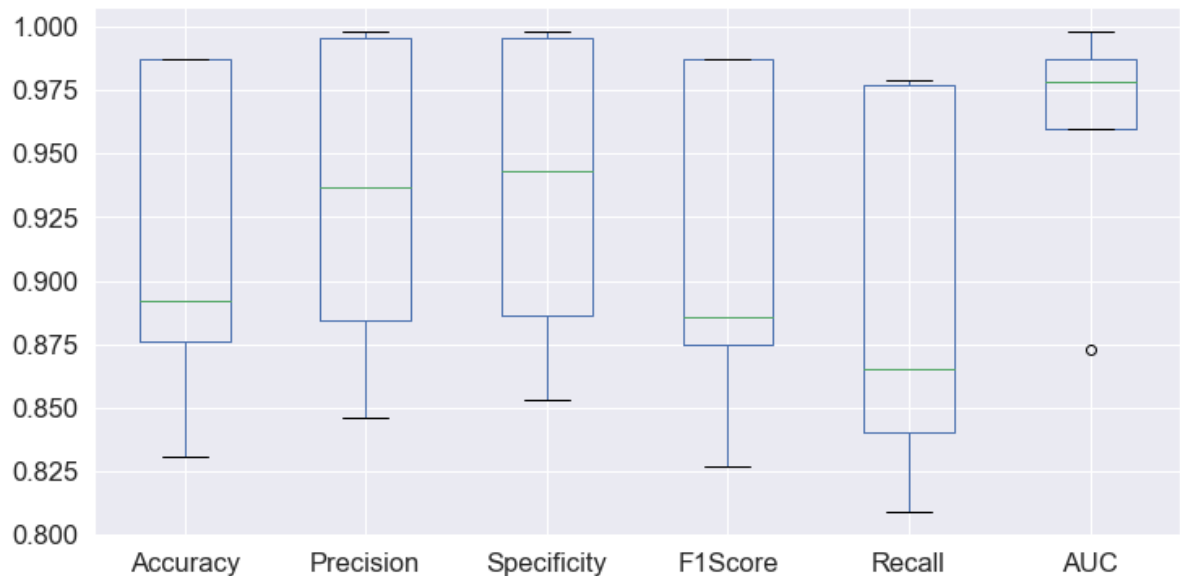
	Accuracy	Precision	Specificity	F1Score	Recall	AUC
Regressão Logística	0.830882	0.846154	0.852941	0.827068	0.808824	0.873182
Arvore de decisão	0.987395	0.995726	0.995798	0.987288	0.978992	0.987395
Random Forest	0.891807	0.936768	0.943277	0.885936	0.840336	0.978577
SVM	0.987395	0.997854	0.997899	0.987261	0.976891	0.998177
Naive Bayes	0.876050	0.884120	0.886555	0.874735	0.865546	0.959952

```
In [88]: dfresultado.describe()
```

Out[88]:

	Accuracy	Precision	Specificity	F1Score	Recall	AUC
count	5.000000	5.000000	5.000000	5.000000	5.000000	5.000000
mean	0.914706	0.932125	0.935294	0.912457	0.894118	0.959456
std	0.070022	0.067236	0.064810	0.071786	0.079118	0.050222
min	0.830882	0.846154	0.852941	0.827068	0.808824	0.873182
25%	0.876050	0.884120	0.886555	0.874735	0.840336	0.959952
50%	0.891807	0.936768	0.943277	0.885936	0.865546	0.978577
75%	0.987395	0.995726	0.995798	0.987261	0.976891	0.987395
max	0.987395	0.997854	0.997899	0.987288	0.978992	0.998177

```
In [89]: boxplot = dfresultado.boxplot()
```



```
In [90]: Amplitudedic = {}
Varianciadic = {}
CoeficienteVardic = {}
juntar = {}
IntervaloInterquartildic = {}
columnas=['Accuracy', 'Precision', 'Specificity', 'F1Score', 'Recall','AUC']
for x in columnas:
    juntar[x] = dfresultado[x].std()/1
    Amplitudedic[x]=dfresultado[x].max() - dfresultado[x].min()
    Varianciadic[x] = dfresultado[x].var()
    CoeficienteVardic[x] = (dfresultado[x].std()/dfresultado[x].mean()) * 100
    IntervaloInterquartildic[x] = dfresultado[x].quantile(q=0.75) - dfresultado[x].quantile(q=0.25)
```

```
In [91]: dfAmplitude = pandas.DataFrame.from_dict(Amplitudedic, orient="index").reset_index()
dfAmplitude.columns = ["quantitativas","Amplitude"]
dfAmplitude.head()
```

Out[91]:

	quantitativas	Amplitude
0	Accuracy	0.156513
1	Precision	0.151700
2	Specificity	0.144958
3	F1Score	0.160220
4	Recall	0.170168

```
In [92]: dfstd = pandas.DataFrame.from_dict(juntar, orient="index").reset_index()
dfstd.columns = ["quantitativas","std"]
dfstd.head()
```

Out[92]:

	quantitativas	std
0	Accuracy	0.070022
1	Precision	0.067236
2	Specificity	0.064810
3	F1Score	0.071786
4	Recall	0.079118

```
In [93]: dfVariancia = pandas.DataFrame.from_dict(Varianciadic, orient="index").reset_index()
dfVariancia.columns = ["quantitativas", "Variancia"]
dfVariancia.head()
```

Out[93]:

	quantitativas	Variancia
0	Accuracy	0.004903
1	Precision	0.004521
2	Specificity	0.004200
3	F1Score	0.005153
4	Recall	0.006260

```
In [94]: dfCoeficiente = pandas.DataFrame.from_dict(CoeficienteVardic, orient="index").reset_index()
dfCoeficiente.columns = ["quantitativas", "Coef_Var_%"]
dfCoeficiente.head()
```

Out[94]:

	quantitativas	Coef_Var_%
0	Accuracy	7.655154
1	Precision	7.213160
2	Specificity	6.929388
3	F1Score	7.867351
4	Recall	8.848760

```
In [95]: IntervaloInterquartil = pandas.DataFrame.from_dict(IntervaloInterquartildic, orient="index").reset_index()
IntervaloInterquartil.columns = ["quantitativas", "Intervalo_Interquartil"]
IntervaloInterquartil.head()
```

Out[95]:

	quantitativas	Intervalo_Interquartil
0	Accuracy	0.111345
1	Precision	0.111606
2	Specificity	0.109244
3	F1Score	0.112527
4	Recall	0.136555

```
In [96]: dfresultado_frame=pandas.merge(dfAmplitude,dfVariancia,how='right',on='quantitativas')
dfresultado_frame=pandas.merge(dfresultado_frame,dfCoeficiente,how='right',on='quantitativas')
dfresultado_frame=pandas.merge(dfresultado_frame,IntervaloInterquartil,how='right',on='quantitativas')
dfresultado_frame=pandas.merge(dfresultado_frame,dfstd,how='right',on='quantitativas')
dfresultado_frame
```

Out[96]:

	quantitativas	Amplitude	Variancia	Coef_Var_%	Intervalo_Interquartil	std
0	Accuracy	0.156513	0.004903	7.655154	0.111345	0.070022
1	Precision	0.151700	0.004521	7.213160	0.111606	0.067236
2	Specificity	0.144958	0.004200	6.929388	0.109244	0.064810
3	F1Score	0.160220	0.005153	7.867351	0.112527	0.071786
4	Recall	0.170168	0.006260	8.848760	0.136555	0.079118
5	AUC	0.124996	0.002522	5.234431	0.027443	0.050222

Fim da avaliação do modelo.