Sistemas Inteligentes Comparando Decision Tree x KNN

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```
In [1]: import pydotplus
        import numpy as np
        import pandas as pd
        from sklearn import tree
        from sklearn.externals.six import StringIO
        from sklearn import metrics
        from sklearn.metrics import accuracy_score
        from sklearn.neighbors import KNeighborsClassifier
        from sklearn.model_selection import train_test_split
        import scikitplot as skplt
        import seaborn as sns
        import matplotlib.pyplot as plt
```

0.0.1 Carregando o Dataset

```
In [2]: df = pd.read_csv('../dataset/pulsar_stars.csv')
```

0.0.2 Normalizando o Dataset

```
In [3]: df = (df-df.min())/(df.max()-df.min())
```

0.0.3 Balanceando as classes

- Estrela Não-Pulsar:
- Estrela Pulsar: 1639

```
In [4]: not_stars = df[df['target_class'] == 0].sample(1639)
        stars = df[df['target_class'] == 1]
```

```
In [5]: X = pd.concat([not_stars.drop(['target_class'], axis=1), stars.drop(['target_class'], a
        y = pd.concat([not_stars[['target_class']], stars[['target_class']]])

        df = pd.concat([stars, not_stars])
```

0.0.4 Rodando os classificadores

- Variando o conjunto de teste entre 1% até 99%

In [6]:
```
acc_knn  = []
rec_knn  = []
pre_knn  = []
acc_tree = []
rec_tree = []
pre_tree = []
counter  = []

for i in np.arange(1,100,2):
    test_size = i/100
    counter.append(test_size)

    #Divide em train e validation
    X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=test_size)

    #Declara classificadores
    decision_tree = tree.DecisionTreeClassifier()
    knn = KNeighborsClassifier(3) # k = 3

    #Treina knn
    knn.fit(X_train, y_train)

    #Treina decision_tree
    decision_tree.fit(X_train, y_train)

    #Predictions knn
    predictions_knn = knn.predict(X_test)

    #Predictions decision tree
    predictions_tree = decision_tree.predict(X_test)


    acc_knn.append(metrics.accuracy_score(y_test, predictions_knn))
    acc_tree.append(metrics.accuracy_score(y_test, predictions_tree))
    rec_knn.append(metrics.recall_score(y_test, predictions_knn))
    rec_tree.append(metrics.recall_score(y_test, predictions_tree))
    pre_knn.append(metrics.precision_score(y_test, predictions_knn))
    pre_tree.append(metrics.precision_score(y_test, predictions_tree))
```

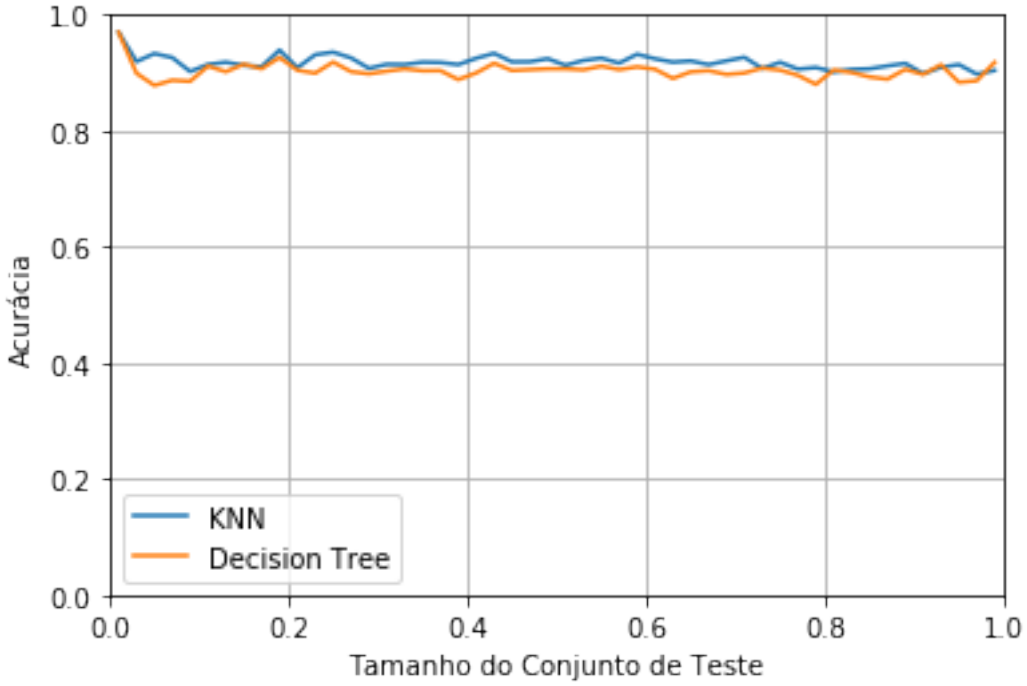
```
/Users/viniciuslucena/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:21: DataConve
```

0.0.5 Plotando gráfico Acurácia x Tamanho Conjunto Teste

Acurácia x Tamanho do Conjunto de Teste

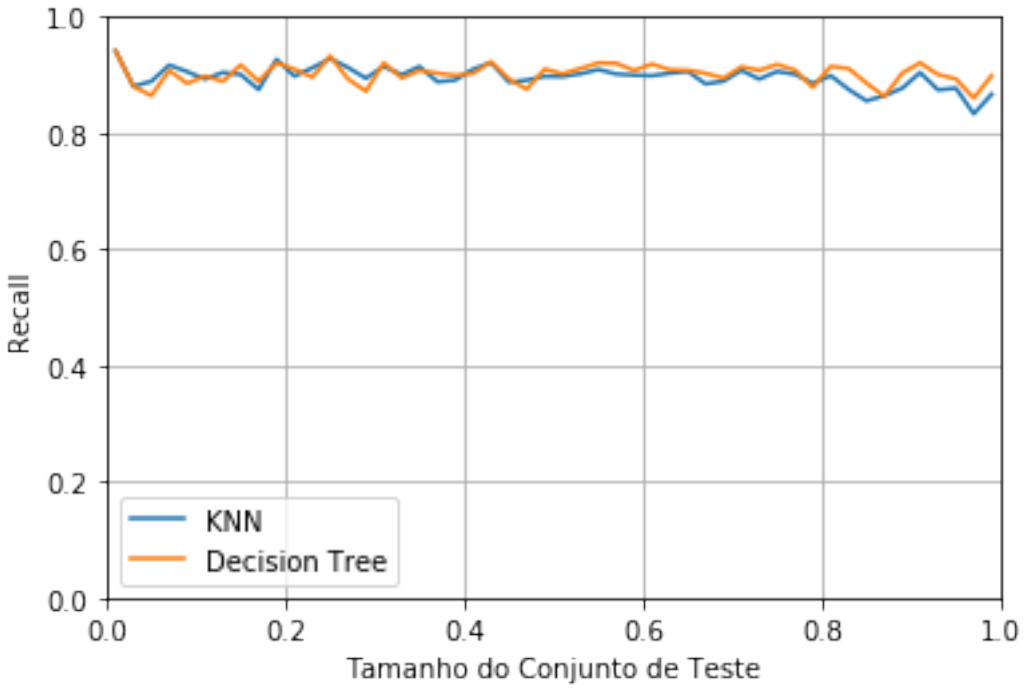
In [13]:
```
plt.plot(counter, acc_knn)
plt.plot(counter, acc_tree)
```

```
plt.ylabel("Acurácia", fontsize=(10))
plt.xlabel("Tamanho do Conjunto de Teste", fontsize=(10))
plt.legend(["KNN", "Decision Tree"])
plt.axis([0, 1, 0, 1])
plt.grid(True)
plt.savefig('../Plots/acuracia_x_testsize.png', dpi=300)
plt.show()
```



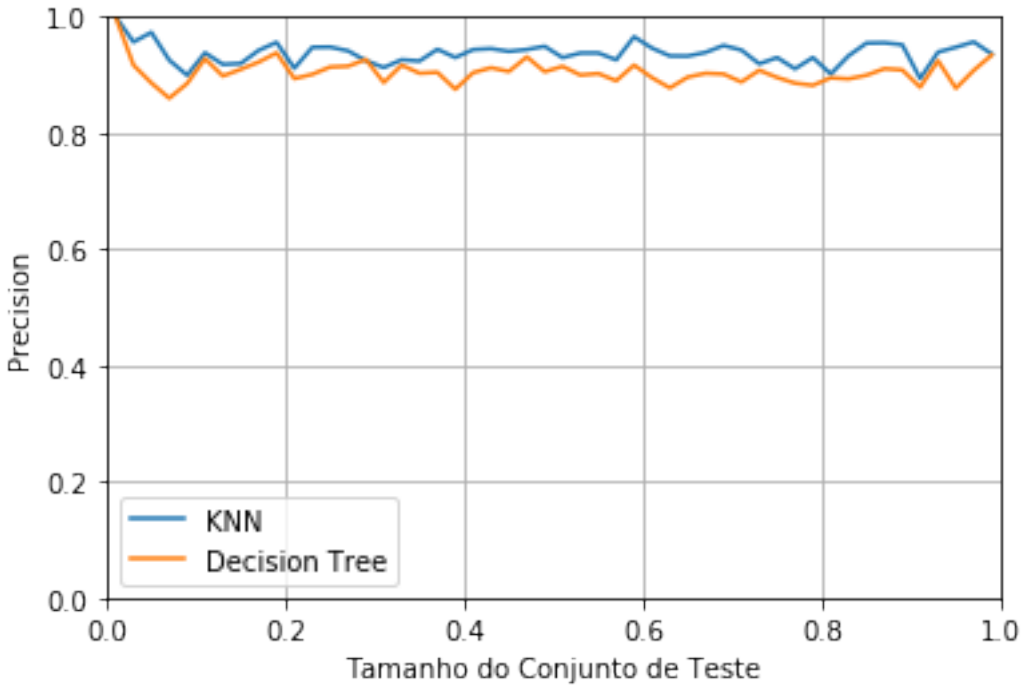
Recall x Tamanho do Conjunto de Teste

In [14]:
```
plt.plot(counter, rec_knn)
plt.plot(counter, rec_tree)

plt.ylabel("Recall", fontsize=(10))
plt.xlabel("Tamanho do Conjunto de Teste", fontsize=(10))
plt.legend(["KNN", "Decision Tree"])
plt.axis([0, 1, 0, 1])
plt.grid(True)
plt.savefig('../Plots/recall_x_testsize.png', dpi=300)
plt.show()
```



Precision x Tamanho do Conjunto de Teste

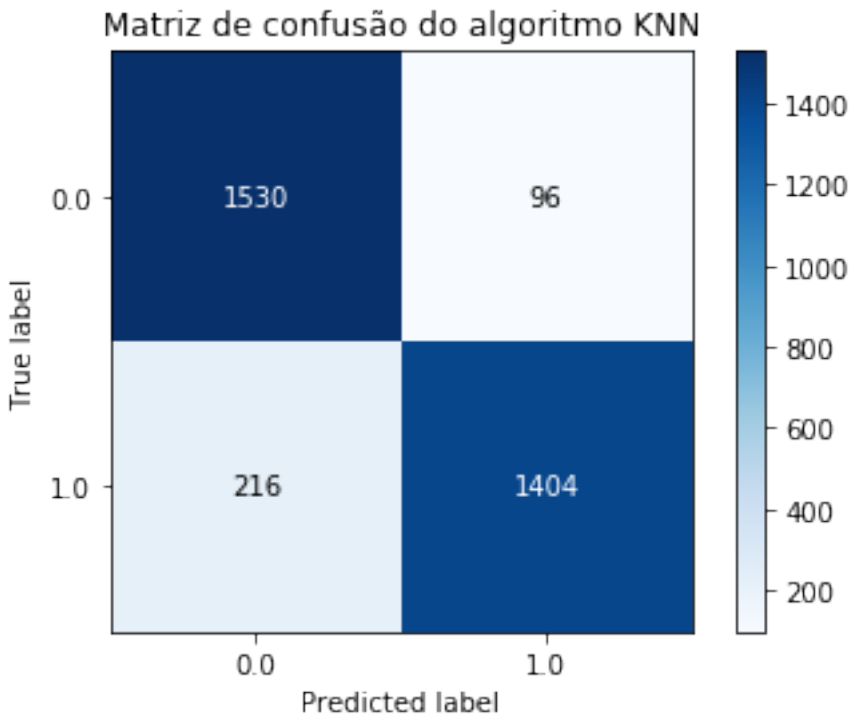
```
In [15]: plt.plot(counter, pre_knn)
         plt.plot(counter, pre_tree)

         plt.ylabel("Precision", fontsize=(10))
         plt.xlabel("Tamanho do Conjunto de Teste", fontsize=(10))
         plt.legend(["KNN", "Decision Tree"])
         plt.axis([0, 1, 0, 1])
         plt.grid(True)
         plt.savefig('../Plots/precision_x_testsize.png', dpi=300)
         plt.show()
```



0.0.6 Matriz de Confusão

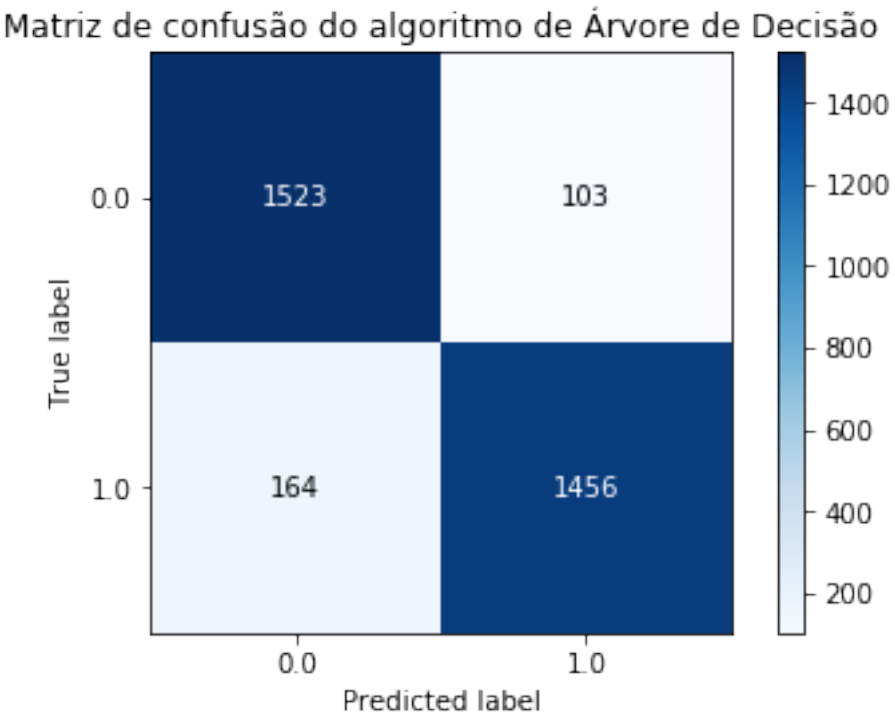
Algoritmo KNN

```
In [19]: skplt.metrics.plot_confusion_matrix(y_test, predictions_knn)
         plt.title('Matriz de confusão do algoritmo KNN')
         plt.savefig('../Plots/confusion_matrix_knn', dpi=300)
```



Árvore de Decisão

```
In [18]: skplt.metrics.plot_confusion_matrix(y_test, predictions_tree)
         plt.title('Matriz de confusão do algoritmo de Árvore de Decisão')
         plt.savefig('../Plots/confusion_matrix_knn', dpi=300)
```



0.0.7 Plot da Árvore de Decisão

exportando para PDF

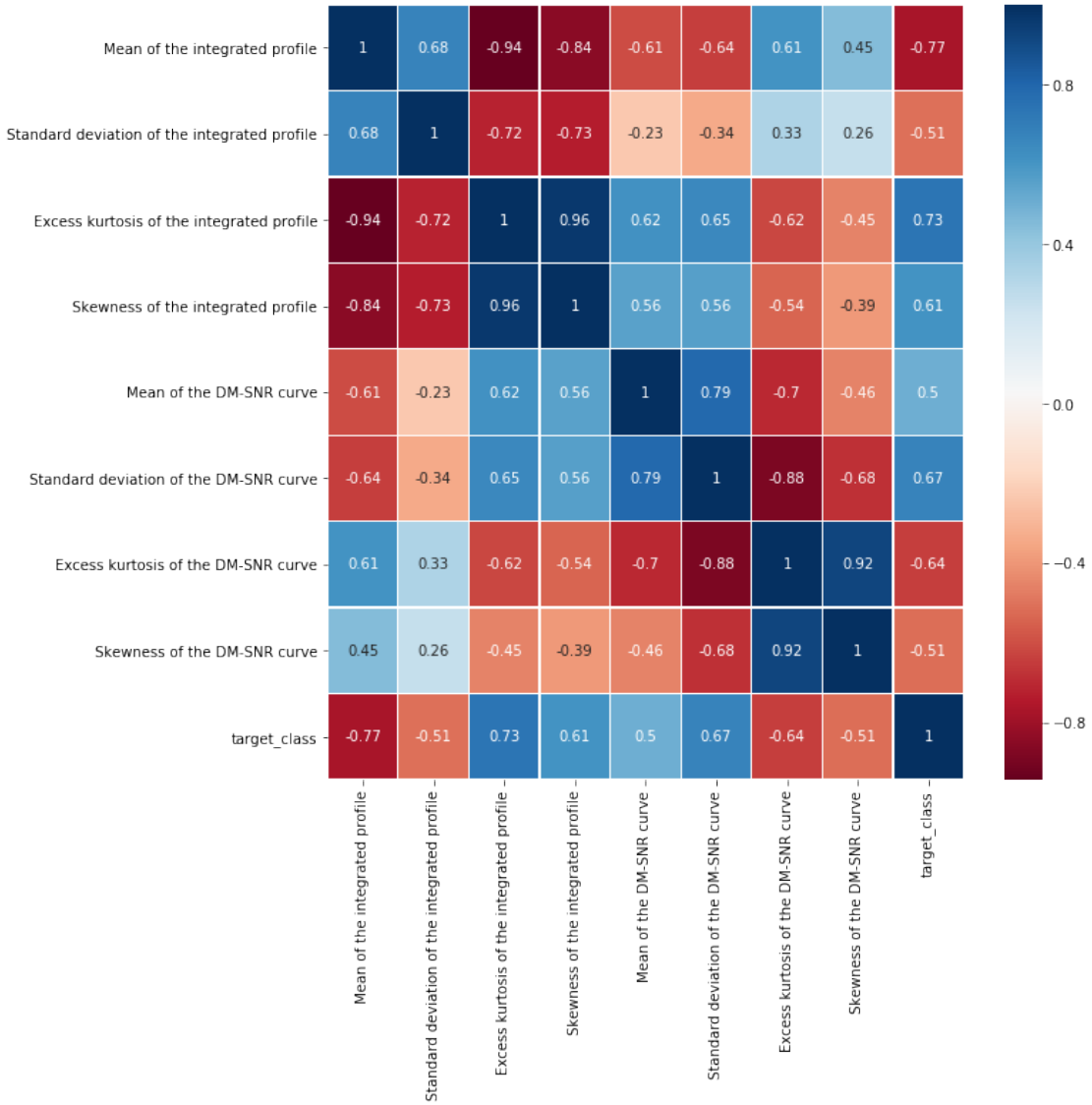
```
In [202]: #Salva PDF da arvore gerada (requer pydotplus e graphviz)
          dot_data = StringIO()
          tree.export_graphviz(decision_tree,
                               out_file=dot_data,
                               feature_names=list(X_train),
                               class_names=['pulsar_star', 'not_star'],
                               filled=True, rounded=True,
                               impurity=False)
          graph = pydotplus.graph_from_dot_data(dot_data.getvalue())
          #graph.write_pdf("tree.pdf")
```

0.1 Análise Exploratória

```
In [203]: import seaborn as sns
          import matplotlib.pyplot as plt
```

0.1.1 Matriz de Correlação

```
In [204]: plt.figure(figsize=(10,10))

          sns.heatmap(df.corr(), linecolor="white", annot=True, linewidths=0.1, cmap="RdBu")
          plt.savefig('../Plots/correlacao.png', dpi=300)
```



0.1.2 Scatter plot

```
In [ ]: for i in list(df):
            for j in list(df):
```

```
plt.scatter(x=df[i],
            y=df[j],
            c=df['target_class'],
            alpha=0.05)

plt.grid(False)

plt.xlabel(i)
plt.ylabel(j)

i_aux = i.replace(" ", "_")
j_aux = j.replace(" ", "_")

#plt.savefig('scatterplot/' + i_aux + j_aux + '.png', dpi=300)
```