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Classificação KNN

O KNN é um dos algoritmos mais simples para Machine Learning, sendo um algoritmo do tipo "lazy", ou seja, nenhuma computação é realizada no dataset até que um novo ponto de dado seja alvo de teste.

In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
```

In [2]:

```
df = pd.read_excel("logi1.xlsx")
df.head()
```

Out[2]:

	Score	Accepted
0	982	0
1	1304	1
2	1256	1
3	1562	1
4	703	0

In [3]:

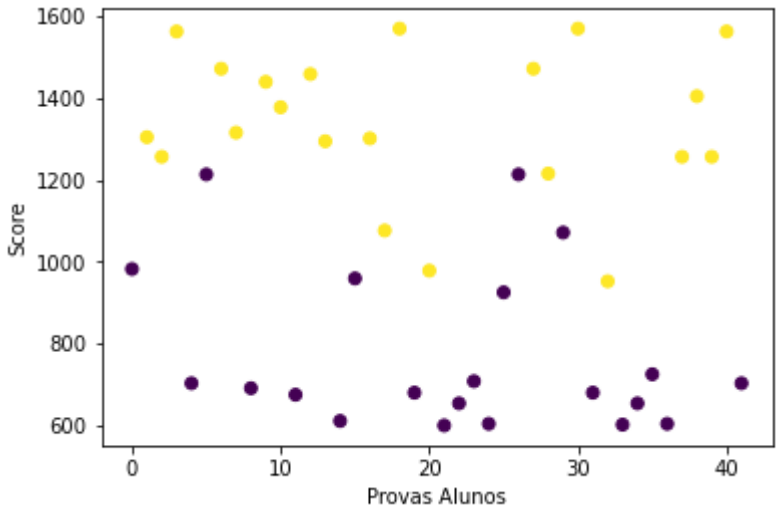
```
len(df)
```

Out[3]:

42

In [4]:

```
plt.scatter(df.index, df['Score'], c = df['Accepted'].astype('category').cat.cod
es)
plt.xlabel('Provas Alunos')
plt.ylabel('Score')
plt.show()
```



Preparação do dados

In [5]:

```
X = df["Score"].values.reshape(-1, 1)
y = df["Accepted"]
```

In [6]:

```
print(X[:3])
print(y[:3])
```

```
[[ 982]
 [1304]
 [1256]]
0    0
1    1
2    1
Name: Accepted, dtype: int64
```

Aplicacao do modelo

In [7]:

```
from sklearn.neighbors import KNeighborsClassifier
```

In [8]:

```
modelo = KNeighborsClassifier(n_neighbors=5)
```

In [9]:

```
modelo.fit(X,y)
```

Out[9]:

```
KNeighborsClassifier()
```

para acessar outras métricas de distância

http://scikit-learn.org/stable/modules/generated/sklearn.neighbors.DistanceMetric.html (http://scikit-learn.org/stable/modules/generated/sklearn.neighbors.DistanceMetric.html)

In [10]:

```
metricas_distancias = ['euclidean',  'manhattan', 'minkowski', 'chebyshev',
                       'jaccard', 'hamming']
```

In [11]:

```
for metrica in metricas_distancias:
    modelo = KNeighborsClassifier(n_neighbors=5, metric=metrica)
    modelo.fit(X,y)
    print(metrica, sum(modelo.predict(X) == y) / len(X))
```

```
euclidean 0.8809523809523809
manhattan 0.8809523809523809
minkowski 0.8809523809523809
chebyshev 0.8809523809523809
jaccard 0.5
hamming 0.7380952380952381
```

In [12]:

```
for k in [1,3,5,7,9,11,13]:
    modelo = KNeighborsClassifier(n_neighbors=k, metric='euclidean')
    modelo.fit(X,y)
    print(k, sum(modelo.predict(X) == y) / len(X))
```

```
1 1.0
3 0.9047619047619048
5 0.8809523809523809
7 0.8809523809523809
9 0.8809523809523809
11 0.8809523809523809
13 0.8809523809523809
```

In [13]:

```
for k in [1,3,5,7,9,11,13]:
    modelo = KNeighborsClassifier(n_neighbors=k, metric='manhattan')
    modelo.fit(X,y)
    print(k, sum(modelo.predict(X) == y) / len(X))
```

```
1 1.0
3 0.9047619047619048
5 0.8809523809523809
7 0.8809523809523809
9 0.8809523809523809
11 0.8809523809523809
13 0.8809523809523809
```

uso do modelo

modelo.predict() retornará 1 ou 0 – (Accepted or Not)

In [14]:

```
valor = 1200
valor = np.array(valor).reshape(-1, 1)
modelo.predict(valor)
```

Out[14]:

```
array([1], dtype=int64)
```

In [15]:

```
valor = 1200
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor) # (23% de chance de não ser Aceito(0), 76% chance de ser  Aceito(1))
```

Out[15]:

```
array([[0.23076923, 0.76923077]])
```

In [16]:

```
valor = 1800
valor = np.array(valor).reshape(-1, 1)
modelo.predict(valor)
```

Out[16]:

```
array([1], dtype=int64)
```

In [17]:

```
valor = 1300
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor)
```

Out[17]:

```
array([[0.15384615, 0.84615385]])
```

In [18]:

```
valor = 550
valor = np.array(valor).reshape(-1, 1)
modelo.predict(valor)
```

Out[18]:

```
array([0], dtype=int64)
```

In [19]:

```
valor = 550
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor)
```

Out[19]:

```
array([[1., 0.]])
```

In [20]:

```
valor = 1190
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor)
```

Out[20]:

```
array([[0.23076923, 0.76923077]])
```

KNN - dados do Titanic

In [21]:

```
df = pd.read_csv("titanic_train.csv")
df.head()
```

Out[21]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.250(
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.283(
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.925(
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.100(
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.050(

In [22]:

```
len(df)
```

Out[22]:

891

In [23]:

```
df['fsex'] = df.apply(lambda row: 0 if row['Sex'] == "male" else 1, axis=1)
df.head()
```

Out[23]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.250(
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.283(
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.925(
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.100(
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.050(

pclass- Ticket class 1 = 1st, 2 = 2nd, 3 = 3rd

Survived: 0 = No, 1 = Yes

In [24]:

```
print("Número de passageiros= ",len(df))
```

```
Número de passageiros=  891
```

In [25]:

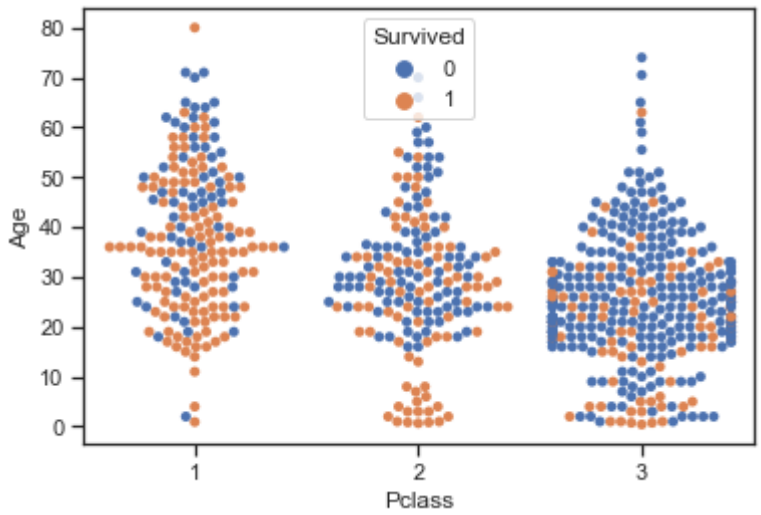
```
import seaborn as sns
sns.set(style="ticks")

#sns.boxplot(x='Age', y='Pclass', data=df, hue="Survived")
sns.swarmplot(y="Age", x="Pclass", hue="Survived", data=df)
```

```
C:\Users\Dijay Lima\anaconda3\lib\site-packages\seaborn\categorical.
py:1311: RuntimeWarning: invalid value encountered in less
  off_low = points < low_gutter
C:\Users\Dijay Lima\anaconda3\lib\site-packages\seaborn\categorical.
py:1315: RuntimeWarning: invalid value encountered in greater
  off_high = points > high_gutter
```

Out[25]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x2906e38fac0>
```

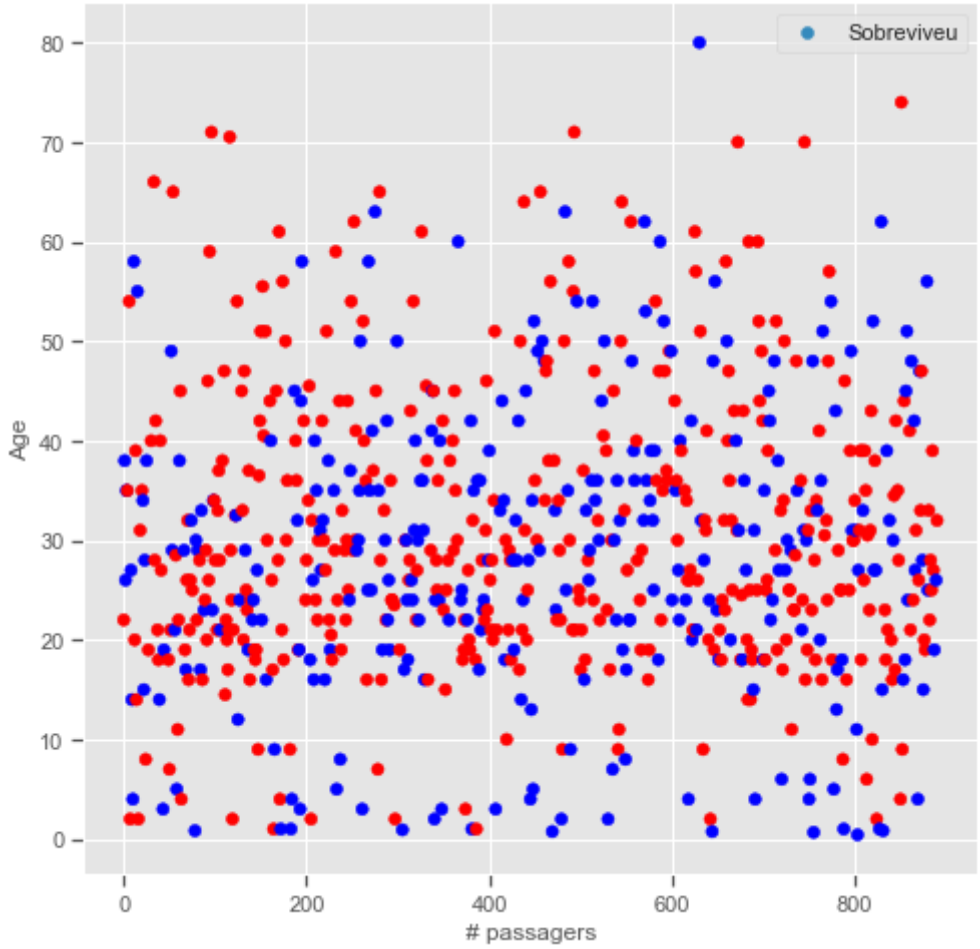


In [26]:

```
import matplotlib
fig = plt.figure(figsize=(8,8))
plt.style.use('ggplot')

colors = ['red', 'blue']
p = plt.scatter(   df.index, df.Age, c = df['Survived'],
                cmap=matplotlib.colors.ListedColormap(colors)) #.astype('categor
y').cat.codes);
plt.xlabel('# passagers')
plt.ylabel('Age')
plt.legend(["Sobreviveu", "Não Sobreviveu"])

plt.show()
```



In [27]:

```
X = df["Pclass"].values.reshape(-1, 1)
y = df["Survived"]
```

In [29]:

```
modelo = KNeighborsClassifier(n_neighbors=9)
```

In [30]:

```
modelo.fit(X,y)
```

Out[30]:

```
KNeighborsClassifier(n_neighbors=9)
```

Métricas

In [31]:

```
import sklearn.metrics as metrics
from sklearn.linear_model import LogisticRegression
modelo = LogisticRegression()
modelo.fit(X,y)

prediction = modelo.predict(X)
acc = metrics.accuracy_score(y, prediction)
print('Acurácia:', acc)
print('matriz de confusão:')
print(metrics.confusion_matrix(y, prediction))
```

```
Acurácia: 0.6790123456790124
matriz de confusão:
[[469  80]
 [206 136]]
```

In [32]:

```
# sobrevivente na 2a Classe
valor = 2
valor = np.array(valor).reshape(-1, 1)
modelo.predict(valor)
```

Out[32]:

```
array([0], dtype=int64)
```

In [33]:

```
# sobrevivente na 2a Classe
valor = 2
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor)
```

Out[33]:

```
array([[0.56337582, 0.43662418]])
```

remover valores missing - nan

In [34]:

```
df = df.dropna(axis=0, how='any')
len(df)
```

Out[34]:

```
183
```

In [35]:

```
X = df["Age"].values.reshape(-1, 1)
y = df["Survived"]
```

In [36]:

```
modelo = KNeighborsClassifier(n_neighbors=9)
modelo.fit(X,y)
```

Out[36]:

```
KNeighborsClassifier(n_neighbors=9)
```

In [37]:

```
valor = 30
valor = np.array(valor).reshape(-1, 1)
modelo.predict(valor)
```

Out[37]:

```
array([1], dtype=int64)
```

In [38]:

```
modelo.predict_proba(valor)
```

Out[38]:

```
array([[0.44444444, 0.55555556]])
```

In [39]:

```
valor = 34
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor)
```

Out[39]:

```
array([[0.11111111, 0.88888889]])
```

In [40]:

```
valor = 11
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor)
```

Out[40]:

```
array([[0., 1.]])
```

In [41]:

```
valor = 50
valor = np.array(valor).reshape(-1, 1)
modelo.predict(valor)
```

Out[41]:

```
array([1], dtype=int64)
```

In [42]:

```
valor = 50
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor)
```

Out[42]:

```
array([[0.44444444, 0.55555556]])
```

In [43]:

```
valor = 60
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor)
```

Out[43]:

```
array([[0.55555556, 0.44444444]])
```

In [44]:

```
valor = 80
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor)
```

Out[44]:

```
array([[0.77777778, 0.22222222]])
```

In [45]:

```
valor = 120
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor)
```

Out[45]:

```
array([[0.77777778, 0.22222222]])
```

In [46]:

```
# modelo 3 - fare (valor do ticket)
```

In [47]:

```
df = pd.read_csv("titanic_train.csv")
df.head()
```

Out[47]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.250(
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.283(
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.925(
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.100(
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.050(

In [48]:

```
df.describe().T
```

Out[48]:

	count	mean	std	min	25%	50%	75%	max
PassengerId	891.0	446.000000	257.353842	1.00	223.5000	446.0000	668.5	891.0000
Survived	891.0	0.383838	0.486592	0.00	0.0000	0.0000	1.0	1.0000
Pclass	891.0	2.308642	0.836071	1.00	2.0000	3.0000	3.0	3.0000
Age	714.0	29.699118	14.526497	0.42	20.1250	28.0000	38.0	80.0000
SibSp	891.0	0.523008	1.102743	0.00	0.0000	0.0000	1.0	8.0000
Parch	891.0	0.381594	0.806057	0.00	0.0000	0.0000	0.0	6.0000
Fare	891.0	32.204208	49.693429	0.00	7.9104	14.4542	31.0	512.3292

In [49]:

```
X = df["Fare"].values.reshape(-1, 1)
y = df["Survived"]
```

In [50]:

```
modelo = KNeighborsClassifier(n_neighbors=9)
modelo.fit(X,y)
```

Out[50]:

```
KNeighborsClassifier(n_neighbors=9)
```

In [51]:

```
valor = 10.0
valor = np.array(valor).reshape(-1, 1)
modelo.predict(valor)
```

Out[51]:

```
array([0], dtype=int64)
```

In [52]:

```
valor = 10
valor = np.array(valor).reshape(-1, 1)
modelo.predict_proba(valor)
```

Out[52]:

```
array([[0.77777778, 0.22222222]])
```

In [53]:

```
valor = 200 # 56
valor = np.array(valor).reshape(-1, 1)
print(modelo.predict(valor), modelo.predict_proba(valor))
```

```
[1] [[0.33333333 0.66666667]]
```

In [54]:

```
# valor pago do ticket do titatic
valores = [10, 30, 50, 70, 100, 200, 300, 400, 512 ]
for valor in valores:
    valor = np.array(valor).reshape(-1, 1)
    previsao = modelo.predict(valor)
    if previsao == 0:
        passageiro = "Morrer"
    else:
        passageiro = "Sobreviver"

    print("$",valor[0][0],passageiro, modelo.predict_proba(valor)[0])
```

```
$ 10 Morrer [0.77777778 0.22222222]
$ 30 Sobreviver [0.33333333 0.66666667]
$ 50 Morrer [0.55555556 0.44444444]
$ 70 Morrer [0.77777778 0.22222222]
$ 100 Sobreviver [0.22222222 0.77777778]
$ 200 Sobreviver [0.33333333 0.66666667]
$ 300 Sobreviver [0.33333333 0.66666667]
$ 400 Sobreviver [0.22222222 0.77777778]
$ 512 Sobreviver [0.22222222 0.77777778]
```

In [55]:

```
df = df.dropna(axis=0, how='any')
df['fsex'] = df.apply(lambda row: 0 if row['Sex'] == "male" else 1, axis=1)
atributos = ['Pclass', 'Age', 'SibSp', 'Fare', 'fsex']
X = df.loc[:, atributos].values
y = df["Survived"]
len(df)
```

Out[55]:

```
183
```

In [56]:

```
X[:3]
```

Out[56]:

```
array([[ 1.    , 38.    ,  1.    , 71.2833,  1.    ],
       [ 1.    , 35.    ,  1.    , 53.1   ,  1.    ],
       [ 1.    , 54.    ,  0.    , 51.8625,  0.    ]])
```

In [57]:

```
y[:3]
```

Out[57]:

```
1    1
3    1
6    0
Name: Survived, dtype: int64
```

In [58]:

```
X.shape
```

Out[58]:

```
(183, 5)
```

In [59]:

```
modelo = KNeighborsClassifier(n_neighbors=9)
modelo.fit(X,y)
```

Out[59]:

```
KNeighborsClassifier(n_neighbors=9)
```

In [60]:

```
dados = np.array([2, 20, 1, 50, 1])
dados = dados.reshape(1, -1)
dados
modelo.predict(dados), modelo.predict_proba(dados)
```

Out[60]:

```
(array([1], dtype=int64), array([[0.22222222, 0.77777778]]))
```

In [61]:

```
                # ['Pclass', 'Age', 'SibSp', 'Fare', 'fsex']
dados = np.array([ 3,         50,     1,      40,      1])
dados = dados.reshape(1, -1)
# valor pago do ticket do titatic
previsao = modelo.predict(dados)
if previsao == 0:
    passageiro = "Morrer"
else:
    passageiro = "Sobreviver"

print("$", passageiro, modelo.predict_proba(dados)[0])
```

```
$ Morrer [0.66666667 0.33333333]
```

Normalizar os dados (Usar mais de uma variável preditora)

In [62]:

```
df = pd.read_excel("dados.xlsx")
df
```

Out[62]:

	Altura	Peso	Salario
0	1.77	90	10000
1	1.52	51	990
2	1.62	57	2000
3	1.82	95	3000
4	1.55	53	1200
5	1.93	100	5000

Normalizacao de dados - forma 1

In [63]:

```
df_norm = (df - df.mean()) / (df.max() - df.min())
df_norm
```

Out[63]:

	Altura	Peso	Salario
0	0.166667	0.319728	0.699408
1	-0.443089	-0.476190	-0.300592
2	-0.199187	-0.353741	-0.188494
3	0.288618	0.421769	-0.077506
4	-0.369919	-0.435374	-0.277284
5	0.556911	0.523810	0.144469

Normalizacao de dados - forma 2

In [64]:

```
from sklearn import preprocessing

min_max_scaler = preprocessing.MinMaxScaler()
np_scaled = min_max_scaler.fit_transform(df)
df_normalized = pd.DataFrame(np_scaled)
df_normalized.columns = ["Altura", "Peso", "Salario"]
df_normalized
```

Out[64]:

	Altura	Peso	Salario
0	0.609756	0.795918	1.000000
1	0.000000	0.000000	0.000000
2	0.243902	0.122449	0.112098
3	0.731707	0.897959	0.223085
4	0.073171	0.040816	0.023307
5	1.000000	1.000000	0.445061

Executar o Modelo para k= 7 e k = 9 (titanic) e exibir métricas (acurária, matriz de confusão)

In [ ]:

```

```