CIENCIA_DE_DATOS (/github/SamatarouKami/CIENCIA_DE_DATOS/tree/master)
/ P10.ipynb (/github/SamatarouKami/CIENCIA_DE_DATOS/tree/master/P10.ipynb)

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Reporte de Práctica 10: Clasificación de datos con sklearn

Para esta práctica solamente trabajamos con los datos del año 2017 para clasificar la categoria a la que pertenecen los cortos tomando como base la edad y sexo del concursante y el género del corto. Utilizaremos losclasificadores de scikit-learn (https://scikit-learn.org/stable/auto_examples/classification/plot_classifier_comparison.html) y la distribución de los datos que vamos a usar serán 60% para entrenar y 40% para validar.

arregla los detalles

Objetivos

- Utiliza por lo menos tres distintos métodos de clasificación
- Por lo menos una división de interés en tus datos

Preparación de los datos

Primero tomamos los archivos originales y los procesamos fuera de la nube, producto de esta limpieza se generó el archivo "clasificacion2017.csv"

Para poder trabajar importaremos las librerias necesarias y cargaremos el documento .csv

In [1]:
```
import pandas as pd
from sklearn.decomposition import PCA
from matplotlib.colors import ListedColormap
from numpy import isnan, nan
from sklearn import metrics
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.datasets import make_moons, make_circles, make_classification
from sklearn.neural_network import MLPClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.svm import SVC
from sklearn.gaussian_process import GaussianProcessClassifier
from sklearn.gaussian_process.kernels import RBF
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier, AdaBoostClassifier
from sklearn.naive_bayes import GaussianNB
from sklearn.discriminant_analysis import QuadraticDiscriminantAnalysis

df = pd.read_csv("https://raw.githubusercontent.com/SamatarouKami/CIENCIA_DE_DATOS/master/clasifi
cacion2017.csv")
```

```
/usr/lib/python2.7/dist-packages/sklearn/ensemble/weight_boosting.py:29: DeprecationWarning:
numpy.core.umath_tests is an internal NumPy module and should not be imported. It will be rem
oved in a future NumPy release.
  from numpy.core.umath_tests import inner1d
```

Categorización de los campos

Como tenemos campos con cadenas de caracteres utilizaremos la Categorización por defecto de pandas, y generaremos una columna con la etiqueta que utlizaremos para la clasificación.

In [11]:

```
gen = pd.Categorical(df['Género'])
df['Género'] = gen.codes

pai = pd.Categorical(df['País'])
df['País'] = pai.codes

sex = pd.Categorical(df.Sexo)
df.Sexo = pai.codes

df['etiquetas'] = [1 if df['Categoría'][i] == 'Juvenil' else 0 for i in df['Categoría'].keys()]#
Clasificar Categorias
print(df.etiquetas.value_counts())
```

```
  File "<ipython-input-11-dbf01bc04159>", line 1
    gen = pd.Categorical(df.Género)
                            ^

SyntaxError: invalid syntax
```

Preparamos las variables que necesitamos para preparar el clasificador y además aplicamos un PCA, como debió haberse hecho en la práctica 8.

In [5]:

```
y = df.etiquetas

xVars = ['Edad', 'Sexo', 'Género']
x = df.loc[:, xVars].values
x = StandardScaler().fit_transform(x)
pca = PCA(n_components = 2) # pedimos uno bidimensional
X = pca.fit_transform(x)
```

```
---------------------------------------------------------------------------
AttributeError                            Traceback (most recent call last)
<ipython-input-5-d266a2929f96> in <module>()
----> 1 y = df.etiquetas
      2
      3 xVars = ['Edad', 'Sexo', 'Género']
      4 x = df.loc[:, xVars].values
      5 x = StandardScaler().fit_transform(x)

/home/samataroukami/.local/lib/python2.7/site-packages/pandas/core/generic.pyc in __getattr__
(self, name)
   5065             if self._info_axis._can_hold_identifiers_and_holds_name(name):
   5066                 return self[name]
-> 5067             return object.__getattribute__(self, name)
   5068
   5069     def __setattr__(self, name, value):

AttributeError: 'DataFrame' object has no attribute 'etiquetas'
```

In [7]:

```
xVars = ['Edad', 'Sexo', 'Género']
x = df.loc[:, xVars].values

pca = PCA(n_components = 2) # pedimos uno bidimensional
X = pca.fit_transform(x)
from math import ceil, sqrt
from numpy import isnan, nan, arange, meshgrid, c_
import matplotlib.pyplot as plt
h=0.2
# código de https://scikit-learn.org/stable/auto_examples/classification/plot_classifier_comparis
on.html
names = ["Nearest Neighbors", "Linear SVM", "RBF SVM", "Gaussian Process", \
         "Decision Tree", "Random Forest", "AdaBoost", "Naive Bayes"]
classifiers = [KNeighborsClassifier(3), SVC(kernel="linear", C=0.025), \
    SVC(gamma=2, C=1), GaussianProcessClassifier(1.0 * RBF(1.0)), \
    DecisionTreeClassifier(max_depth=5), RandomForestClassifier(max_depth=5, n_estimators=10, max
_features=1), \
    AdaBoostClassifier(), GaussianNB()]
```

```
k = int(ceil(sqrt(len(classifiers) + 1)))
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=.4, random_state=42) # división
x_min, x_max = X[:, 0].min() - .5, X[:, 0].max() + .5
y_min, y_max = X[:, 1].min() - .5, X[:, 1].max() + .5
xx, yy = meshgrid(arange(x_min, x_max, h), arange(y_min, y_max, 0.02))
cm = plt.cm.RdBu
cm_bright = ListedColormap(['#FF0000', '#0000FF'])
plt.rcParams["figure.figsize"] = [16, 16]
figure = plt.figure()
ax = plt.subplot(k, k, 1)
ax.set_title("Datos de entrada")
ax.scatter(X_train[:, 0], X_train[:, 1], c=y_train, cmap=cm_bright, alpha=0.2, edgecolors='k') # entrenamiento
ax.scatter(X_test[:, 0], X_test[:, 1], c=y_test, cmap=cm_bright, alpha=0.2, edgecolors='k') # validación
ax.set_xlim(xx.min(), xx.max())
ax.set_ylim(yy.min(), yy.max())
ax.set_xticks(())
ax.set_yticks(())
i = 2
for name, clf in zip(names, classifiers):
    ax = plt.subplot(k, k, i)
    clf.fit(X_train, y_train)
    score = clf.score(X_test, y_test)
    if hasattr(clf, "decision_function"):
        Z = clf.decision_function(c_[xx.ravel(), yy.ravel()])
    else:
        Z = clf.predict_proba(c_[xx.ravel(), yy.ravel()])[:, 1]
    Z = Z.reshape(xx.shape)
    ax.contourf(xx, yy, Z, cmap=cm, alpha=.8)
    ax.scatter(X_train[:, 0], X_train[:, 1], c=y_train, cmap=cm_bright, edgecolors='k')
    ax.scatter(X_test[:, 0], X_test[:, 1], c=y_test, cmap=cm_bright, edgecolors='k', alpha=0.6)
    ax.set_xlim(xx.min(), xx.max())
    ax.set_ylim(yy.min(), yy.max())
    ax.set_xticks(())
    ax.set_yticks(())
    ax.set_title(name)
    ax.text(xx.max() - .3, yy.min() + .3, ('%.3f' % score).lstrip('0'), size=40, horizontalalignment='right')
    i += 1
plt.tight_layout()
plt.show()
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-7-e060a1c9522c> in <module>()
      4 
      5 pca = PCA(n_components = 2) # pedimos uno bidimensional
----> 6 X = pca.fit_transform(x)
      7 from math import ceil, sqrt
      8 from numpy import isnan, nan, arange, meshgrid, c_

/usr/lib/python2.7/dist-packages/sklearn/decomposition/pca.pyc in fit_transform(self, X, y)
    346 
    347         """
--> 348         U, S, V = self._fit(X)
    349         U = U[:, :self.n_components_]
    350 

/usr/lib/python2.7/dist-packages/sklearn/decomposition/pca.pyc in _fit(self, X)
    368 
    369         X = check_array(X, dtype=[np.float64, np.float32], ensure_2d=True,
--> 370                         copy=self.copy)
    371 
    372         # Handle n_components==None

/usr/lib/python2.7/dist-packages/sklearn/utils/validation.pyc in check_array(array, accept_sparse, dtype, order, copy, force_all_finite, ensure_2d, allow_nd, ensure_min_samples, ensure_min_features, warn_on_dtype, estimator)
```

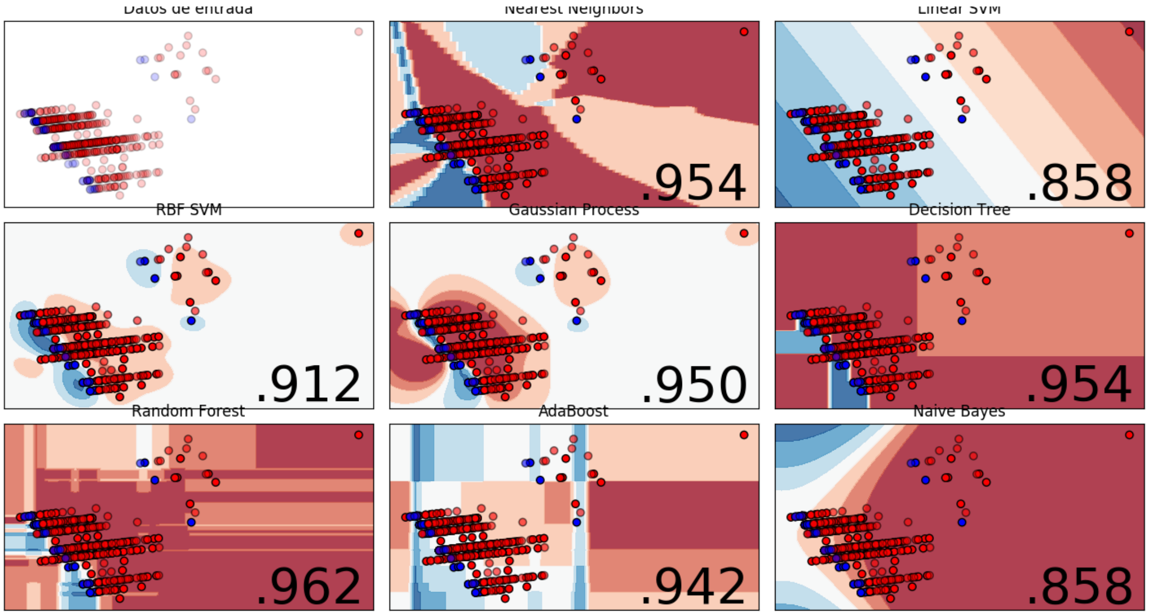
```
    431                                             force_all_finite)
    432         else:
--> 433             array = np.array(array, dtype=dtype, order=order, copy=copy)
    434 
    435             if ensure_2d:

ValueError: invalid literal for float(): 47
```

Como se puede ver aqui en el sklearn no funcionó con jupyter notebook asi que decidí hacer el codigo en un block de notas y corrí todo en la terminal de Ubuntu 18 obteniendo los siguientes graficos con diferentes metodos

In [13]:

```python
from IPython.display import Image
Image("Figure_1.png")
```

Out[13]:



Ahora calcularemos las matrices de confusión. Este fue el código que utilicé:

In [ ]:

```python
# código de https://scikit-learn.org/stable/auto_examples/classification/plot_classifier_comparison.html
names = ["Nearest Neighbors", "Linear SVM", "RBF SVM", "Gaussian Process", \
         "Decision Tree", "Random Forest", "AdaBoost", "Naive Bayes"]
classifiers = [KNeighborsClassifier(3), SVC(kernel="linear", C=0.025), \
    SVC(gamma=2, C=1), GaussianProcessClassifier(1.0 * RBF(1.0)), \
    DecisionTreeClassifier(max_depth=5), RandomForestClassifier(max_depth=5, n_estimators=10, max_features=1), \
    AdaBoostClassifier(), GaussianNB()]
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=.4, random_state=42) # la misma división

for name, clf in zip(names, classifiers):
    clf.fit(X_train, y_train)
    print(name, clf.score(X_test, y_test))
    expected, predicted = y_test, clf.predict(X_test)
    print(metrics.classification_report(expected, predicted))
    print(metrics.confusion_matrix(expected, predicted))
    print('-' * 60)
```

Obteniendo los siguientes resultados

/home/samataroukami/.local/lib/python3.6/site-packages/sklearn/externals/joblib/externals/cloudpickle/cloudpickle.py:47: DeprecationWarning: the imp module is deprecated in favour of importlib; see the module's documentation for alternative uses import imp 0 521 1 128 Name: etiquetas, dtype: int64 /home/samataroukami/.local/lib/python3.6/site-packages/sklearn/utils/validation.py:590: DataConversionWarning: Data with input dtype object was converted to float64 by StandardScaler. warnings.warn(msg, DataConversionWarning) /home/samataroukami/.local/lib/python3.6/site-packages/sklearn/utils/validation.py:590: DataConversionWarning: Data with input dtype object was converted to float64 by StandardScaler. warnings.warn(msg, DataConversionWarning) Nearest Neighbors 0.9538461538461539 precision recall f1-score support

```
       0       0.99      0.96      0.97       223
       1       0.79      0.92      0.85        37
```

micro avg 0.95 0.95 0.95 260 macro avg 0.89 0.94 0.91 260 weighted avg 0.96 0.95 0.96 260

[[214 9]

[3 34]]

Linear SVM 0.8576923076923076 /home/samataroukami/.local/lib/python3.6/site-packages/sklearn/metrics/classification.py:1143: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. 'precision', 'predicted', average, warn_for) precision recall f1-score support

```
       0       0.86      1.00      0.92       223
       1       0.00      0.00      0.00        37
```

micro avg 0.86 0.86 0.86 260 macro avg 0.43 0.50 0.46 260 weighted avg 0.74 0.86 0.79 260

[[223 0]

[37 0]]

RBF SVM 0.9115384615384615 precision recall f1-score support

```
       0       0.99      0.91      0.95       223
       1       0.63      0.92      0.75        37
```

micro avg 0.91 0.91 0.91 260 macro avg 0.81 0.91 0.85 260 weighted avg 0.93 0.91 0.92 260

[[203 20]

[3 34]]

/home/samataroukami/.local/lib/python3.6/site-packages/sklearn/gaussian_process/gpc.py:434: ConvergenceWarning: fmin_l_bfgs_b terminated abnormally with the state: {'grad': array([-1.45960984, 8.20994214]), 'task': b'ABNORMAL_TERMINATION_IN_LNSRCH', 'funcalls': 184, 'nit': 14, 'warnflag': 2} ConvergenceWarning) Gaussian Process 0.9615384615384616 precision recall f1-score support

```
       0       1.00      0.96      0.98       223
       1       0.79      1.00      0.88        37
```

micro avg 0.96 0.96 0.96 260 macro avg 0.89 0.98 0.93 260 weighted avg 0.97 0.96 0.96 260

[[213 10]

[0 37]]

Decision Tree 0.9538461538461539 precision recall f1-score support

```
          0       0.99      0.96      0.97       223
          1       0.79      0.92      0.85        37
```

micro avg 0.95 0.95 0.95 260 macro avg 0.89 0.94 0.91 260 weighted avg 0.96 0.95 0.96 260

[[214 9]

[3 34]]

Random Forest 0.9615384615384616 precision recall f1-score support

```
          0       1.00      0.96      0.98       223
          1       0.80      0.97      0.88        37
```

micro avg 0.96 0.96 0.96 260 macro avg 0.90 0.97 0.93 260 weighted avg 0.97 0.96 0.96 260

[[214 9]

[1 36]]

AdaBoost 0.9423076923076923 precision recall f1-score support

```
          0       0.97      0.96      0.97       223
          1       0.78      0.84      0.81        37
```

micro avg 0.94 0.94 0.94 260 macro avg 0.87 0.90 0.89 260 weighted avg 0.94 0.94 0.94 260

[[214 9]

[6 31]]

Naive Bayes 0.8576923076923076 /home/samataroukami/.local/lib/python3.6/site-packages/sklearn/metrics/classification.py:1143: UndefinedMetricWarning: Precision and F-score are ill-defined and being set to 0.0 in labels with no predicted samples. 'precision', 'predicted', average, warn_for) precision recall f1-score support

```
          0       0.86      1.00      0.92       223
          1       0.00      0.00      0.00        37
```

micro avg 0.86 0.86 0.86 260 macro avg 0.43 0.50 0.46 260 weighted avg 0.74 0.86 0.79 260

[[223 0]

[37 0]]

tres

Conclusión

Como se puede apreciar en la gráfica y en las matrices de confusión los 3 mejores metodos para clasificar los datos son

- Random Forest
- Nearest Neighbors
- Gaussian Process

obteniendo valores por encima del 95% de precisión.

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