arbol_artistas_23Nov

November 23, 2024

1 Arbol de decisiones

Vamos a predecir si una canción llega al top 1 de billboard o no.

[3]:
```
import numpy as np
import pandas as pd
import seaborn as sb
import matplotlib.pyplot as plt
import pydot
plt.rcParams['figure.figsize'] = (16, 9)
plt.style.use('ggplot')
from sklearn import tree
from sklearn.metrics import accuracy_score
from sklearn.model_selection import KFold
from sklearn.model_selection import cross_val_score
from IPython.display import Image as PImage
from subprocess import check_call
from PIL import Image, ImageDraw, ImageFont
```

[4]:
```
artists_billboard = pd.read_csv("artists_billboard_fix3.csv")
artists_billboard.head()
```

[4]:
```
   id                title  \
0   0  Small Town Throwdown
1   1             Bang Bang
2   2                Timber
3   3       Sweater Weather
4   4             Automatic

                                              artist        mood  \
0  BRANTLEY GILBERT featuring JUSTIN MOORE & THOM…    Brooding
1              JESSIE J, ARIANA GRANDE & NICKI MINAJ  Energizing
2                           PITBULL featuring KE$HA     Excited
3                                THE NEIGHBOURHOOD    Brooding
4                                  MIRANDA LAMBERT    Yearning

          tempo               genre artist_type  chart_date  durationSeg  top  \
0  Medium Tempo         Traditional        Male    20140628        191.0    0
```

```
1  Medium Tempo                 Pop      Female    20140816        368.0    0
2  Medium Tempo               Urban       Mixed    20140118        223.0    1
3  Medium Tempo  Alternative & Punk        Male    20140104        206.0    0
4  Medium Tempo         Traditional      Female    20140301        232.0    0

   anioNacimiento
0          1975.0
1          1989.0
2          1993.0
3          1989.0
4             0.0
```

[5]:
```
artists_billboard.shape
```

[5]:
```
(635, 11)
```

[6]:
```
# Cuántas canciones tengo de cada clase
artists_billboard.groupby('top').size()
```

[6]:
```
top
0    494
1    141
dtype: int64
```

[7]:
```
# Cambiar los 0 de anioNacimiento por el valor None
def edad_fix(anio):
    if anio==0:
        return None
    return anio
```

[8]:
```
# Reemplazar de 0's por el valor "None"
artists_billboard['anioNacimiento'] = artists_billboard.apply(lambda x:␣
↪edad_fix(x['anioNacimiento']), axis=1)
```

[9]:
```
artists_billboard.head()
```

[9]:
```
   id                title  \
0   0  Small Town Throwdown
1   1             Bang Bang
2   2                Timber
3   3       Sweater Weather
4   4             Automatic

                                              artist        mood  \
0  BRANTLEY GILBERT featuring JUSTIN MOORE & THOM…    Brooding
1              JESSIE J, ARIANA GRANDE & NICKI MINAJ  Energizing
2                           PITBULL featuring KE$HA     Excited
3                                 THE NEIGHBOURHOOD    Brooding
```

```
4                                    MIRANDA LAMBERT    Yearning

          tempo                genre artist_type  chart_date  durationSeg  top  \
0  Medium Tempo          Traditional        Male    20140628        191.0    0
1  Medium Tempo                  Pop      Female    20140816        368.0    0
2  Medium Tempo                Urban       Mixed    20140118        223.0    1
3  Medium Tempo  Alternative & Punk        Male    20140104        206.0    0
4  Medium Tempo          Traditional      Female    20140301        232.0    0

   anioNacimiento
0          1975.0
1          1989.0
2          1993.0
3          1989.0
4             NaN
```

[11]:
```
# Función para calcular las edades en las que estuvieron en el billboard
def calcula_edad(anio, cuando):
    cad = str(cuando)
    momento = cad[:4]
    if anio == 0.0:
        return None
    return int(momento) - anio
```

[13]:
```
artists_billboard['edad_en_billboard']=artists_billboard.apply(lambda x:␣
↪calcula_edad(x['anioNacimiento'],x['chart_date']),axis=1)
```

[14]:
```
artists_billboard.head()
```

[14]:
```
   id                 title  \
0   0  Small Town Throwdown
1   1             Bang Bang
2   2                Timber
3   3       Sweater Weather
4   4             Automatic

                                              artist        mood  \
0  BRANTLEY GILBERT featuring JUSTIN MOORE & THOM…    Brooding
1              JESSIE J, ARIANA GRANDE & NICKI MINAJ  Energizing
2                          PITBULL featuring KE$HA     Excited
3                               THE NEIGHBOURHOOD    Brooding
4                                 MIRANDA LAMBERT    Yearning

          tempo                genre artist_type  chart_date  durationSeg  top  \
0  Medium Tempo          Traditional        Male    20140628        191.0    0
1  Medium Tempo                  Pop      Female    20140816        368.0    0
```

```
2  Medium Tempo                Urban       Mixed    20140118        223.0    1
3  Medium Tempo  Alternative & Punk        Male    20140104        206.0    0
4  Medium Tempo         Traditional      Female    20140301        232.0    0

   anioNacimiento  edad_en_billboard
0          1975.0               39.0
1          1989.0               25.0
2          1993.0               21.0
3          1989.0               25.0
4             NaN                NaN
```

[15]:
```
artists_billboard.describe()
```

[15]:
```
                id    chart_date  durationSeg         top  anioNacimiento  \
count   635.000000  6.350000e+02   635.000000  635.000000      496.000000
mean    317.000000  2.013036e+07   321.768504    0.222047     1982.570565
std     183.452991  2.617996e+04   633.753787    0.415950        8.346478
min       0.000000  2.004021e+07     0.000000    0.000000     1919.000000
25%     158.500000  2.014010e+07   200.000000    0.000000     1978.000000
50%     317.000000  2.014051e+07   232.000000    0.000000     1984.000000
75%     475.500000  2.014101e+07   266.500000    0.000000     1988.000000
max     634.000000  2.015031e+07  6840.000000    1.000000     1999.000000

       edad_en_billboard
count         496.000000
mean           30.102823
std             8.400788
min            15.000000
25%            24.000000
50%            29.000000
75%            35.000000
max            95.000000
```

[16]:
```
# Asignar valores al azar en el rango media-std  media +std que es de 21 a 37
age_avg = artists_billboard['edad_en_billboard'].mean()
age_std = artists_billboard['edad_en_billboard'].std()
age_null_count = artists_billboard['edad_en_billboard'].isnull().sum()
age_null_random_list = np.random.randint(age_avg - age_std, age_avg + age_std,␣
 ↪size=age_null_count)
```

[17]:
```
conValoresNulos = np.isnan(artists_billboard['edad_en_billboard'])
artists_billboard.loc[np.isnan(artists_billboard['edad_en_billboard']),␣
 ↪'edad_en_billboard'] = age_null_random_list
artists_billboard['edad_en_billboard'] = artists_billboard['edad_en_billboard'].
 ↪astype(int)
print("Edad Promedio: " + str(age_avg))
print("Desvió Std Edad: " + str(age_std))
```

```
print("Intervalo para asignar edad aleatoria: " + str(int(age_avg - age_std)) +␣
 ↪" a " + str(int(age_avg + age_std)))
```

```
Edad Promedio: 30.10282258064516
Desvió Std Edad: 8.40078832861513
Intervalo para asignar edad aleatoria: 21 a 38
```

[18]:
```
artists_billboard.head()
```

[18]:
```
   id                title  \
0   0  Small Town Throwdown
1   1             Bang Bang
2   2                Timber
3   3       Sweater Weather
4   4             Automatic

                                              artist        mood  \
0  BRANTLEY GILBERT featuring JUSTIN MOORE & THOM…    Brooding
1              JESSIE J, ARIANA GRANDE & NICKI MINAJ  Energizing
2                           PITBULL featuring KE$HA     Excited
3                                THE NEIGHBOURHOOD    Brooding
4                                  MIRANDA LAMBERT    Yearning

          tempo               genre artist_type  chart_date  durationSeg  top  \
0  Medium Tempo         Traditional        Male    20140628        191.0    0
1  Medium Tempo                 Pop      Female    20140816        368.0    0
2  Medium Tempo               Urban       Mixed    20140118        223.0    1
3  Medium Tempo  Alternative & Punk        Male    20140104        206.0    0
4  Medium Tempo         Traditional      Female    20140301        232.0    0

   anioNacimiento  edad_en_billboard
0          1975.0                 39
1          1989.0                 25
2          1993.0                 21
3          1989.0                 25
4             NaN                 36
```

[19]:
```
#Voy a empezara mappear el mood para que sean variables categóricas
artists_billboard['moodEncoded'] = artists_billboard['mood'].map(
    {
        'Energizing': 6,
        'Empowering': 6,
        'Cool': 5,
        'Yearning': 4,
        'Excited': 5,
        'Defiant': 3,
        'Sensual': 2,
        'Gritty': 3,
```

```
        'Sophisticated': 4,
        'Aggressive': 4,
        'Fiery': 4,
        'Urgent': 3,
        'Rowdy': 4,
        'Sentimental': 4,
        'Easygoing': 1,
        'Melancholy': 4,
        'Romantic': 2,
        'Peaceful': 1,
        'Brooding': 4,
        'Upbeat': 5,
        'Stirring': 5,
        'Lively': 5,
        'Other': 0,
        '':0
    }).astype(int)
```

[20]:
```
artists_billboard.head()
```

[20]:
```
   id                title  \
0   0  Small Town Throwdown
1   1             Bang Bang
2   2                Timber
3   3       Sweater Weather
4   4             Automatic

                                              artist        mood  \
0  BRANTLEY GILBERT featuring JUSTIN MOORE & THOM…    Brooding
1              JESSIE J, ARIANA GRANDE & NICKI MINAJ  Energizing
2                           PITBULL featuring KE$HA     Excited
3                                THE NEIGHBOURHOOD    Brooding
4                                  MIRANDA LAMBERT    Yearning

         tempo               genre artist_type  chart_date  durationSeg  top  \
0  Medium Tempo         Traditional        Male    20140628        191.0    0
1  Medium Tempo                 Pop      Female    20140816        368.0    0
2  Medium Tempo               Urban       Mixed    20140118        223.0    1
3  Medium Tempo  Alternative & Punk        Male    20140104        206.0    0
4  Medium Tempo         Traditional      Female    20140301        232.0    0

   anioNacimiento  edad_en_billboard  moodEncoded
0          1975.0                 39            4
1          1989.0                 25            6
2          1993.0                 21            5
3          1989.0                 25            4
4             NaN                 36            4
```

[21]:
```
#Mapeo del tempo
artists_billboard['tempoEncoded'] = artists_billboard['tempo'].map( {'Fast␣
↪Tempo': 0,
                                                                    'Medium␣
↪Tempo': 2,
                                                                    'Slow␣
↪Tempo': 1,
                                                                    '': 0} ).
↪astype(int)
```

[22]:
```
artists_billboard.head()
```

[22]:
```
   id                title  \
0   0  Small Town Throwdown
1   1             Bang Bang
2   2                Timber
3   3       Sweater Weather
4   4             Automatic

                                              artist        mood  \
0  BRANTLEY GILBERT featuring JUSTIN MOORE & THOM…    Brooding
1              JESSIE J, ARIANA GRANDE & NICKI MINAJ  Energizing
2                           PITBULL featuring KE$HA     Excited
3                                THE NEIGHBOURHOOD    Brooding
4                                  MIRANDA LAMBERT    Yearning

          tempo               genre artist_type  chart_date  durationSeg  top  \
0  Medium Tempo         Traditional        Male    20140628        191.0    0
1  Medium Tempo                 Pop      Female    20140816        368.0    0
2  Medium Tempo               Urban       Mixed    20140118        223.0    1
3  Medium Tempo  Alternative & Punk        Male    20140104        206.0    0
4  Medium Tempo         Traditional      Female    20140301        232.0    0

   anioNacimiento  edad_en_billboard  moodEncoded  tempoEncoded
0          1975.0                 39            4             2
1          1989.0                 25            6             2
2          1993.0                 21            5             2
3          1989.0                 25            4             2
4             NaN                 36            4             2
```

[24]:
```
# Mapeo del genero
artists_billboard['genreEncoded'] = artists_billboard['genre'].map(
    {'Urban': 4,
    'Pop': 3,
    'Traditional': 2,
    'Alternative & Punk': 1,
    'Electronica': 1,
```

```
    'Rock': 1,
    'Soundtrack': 0,
    'Jazz': 0,
    'Other':0,
    '':0}
).astype(int)
```

[25]:
```
artists_billboard.head()
```

[25]:
```
   id                 title  \
0   0  Small Town Throwdown
1   1             Bang Bang
2   2                Timber
3   3       Sweater Weather
4   4             Automatic

                                              artist        mood  \
0  BRANTLEY GILBERT featuring JUSTIN MOORE & THOM…    Brooding
1              JESSIE J, ARIANA GRANDE & NICKI MINAJ  Energizing
2                          PITBULL featuring KE$HA     Excited
3                                THE NEIGHBOURHOOD    Brooding
4                                  MIRANDA LAMBERT    Yearning

          tempo               genre artist_type  chart_date  durationSeg  top  \
0  Medium Tempo         Traditional        Male    20140628        191.0    0
1  Medium Tempo                 Pop      Female    20140816        368.0    0
2  Medium Tempo               Urban       Mixed    20140118        223.0    1
3  Medium Tempo  Alternative & Punk        Male    20140104        206.0    0
4  Medium Tempo         Traditional      Female    20140301        232.0    0

   anioNacimiento  edad_en_billboard  moodEncoded  tempoEncoded  genreEncoded
0          1975.0                 39            4             2             2
1          1989.0                 25            6             2             3
2          1993.0                 21            5             2             4
3          1989.0                 25            4             2             1
4             NaN                 36            4             2             2
```

[26]:
```
#Mapeo del tipo de artista
artists_billboard['artist_typeEncoded'] = artists_billboard['artist_type'].map(␣
 ↪{'Female': 2,
                                                                               ␣
 ↪ 'Male': 3,
                                                                               ␣
 ↪ 'Mixed': 1,
                                                                               ␣
 ↪ '': 0} ).astype(int)
```

[27]:
```
artists_billboard.head()
```

[27]:
```
   id                title  \
0   0  Small Town Throwdown
1   1             Bang Bang
2   2                Timber
3   3       Sweater Weather
4   4             Automatic

                                              artist        mood  \
0  BRANTLEY GILBERT featuring JUSTIN MOORE & THOM…    Brooding
1              JESSIE J, ARIANA GRANDE & NICKI MINAJ  Energizing
2                          PITBULL featuring KE$HA     Excited
3                                THE NEIGHBOURHOOD    Brooding
4                                  MIRANDA LAMBERT    Yearning

          tempo               genre artist_type  chart_date  durationSeg  top  \
0  Medium Tempo         Traditional        Male    20140628        191.0    0
1  Medium Tempo                 Pop      Female    20140816        368.0    0
2  Medium Tempo               Urban       Mixed    20140118        223.0    1
3  Medium Tempo  Alternative & Punk        Male    20140104        206.0    0
4  Medium Tempo         Traditional      Female    20140301        232.0    0

   anioNacimiento  edad_en_billboard  moodEncoded  tempoEncoded  genreEncoded  \
0          1975.0                 39            4             2             2
1          1989.0                 25            6             2             3
2          1993.0                 21            5             2             4
3          1989.0                 25            4             2             1
4             NaN                 36            4             2             2

   artist_typeEncoded
0                   3
1                   2
2                   1
3                   3
4                   2
```

[28]:
```
#Mapeo de la edad
artists_billboard.loc[ artists_billboard['edad_en_billboard'] <= 21,␣
 ↪'edadEncoded'] = 0
artists_billboard.loc[(artists_billboard['edad_en_billboard'] > 21) &␣
 ↪(artists_billboard['edad_en_billboard'] <= 26), 'edadEncoded'] = 1
artists_billboard.loc[(artists_billboard['edad_en_billboard'] > 26) &␣
 ↪(artists_billboard['edad_en_billboard'] <= 30), 'edadEncoded'] = 2
artists_billboard.loc[(artists_billboard['edad_en_billboard'] > 30) &␣
 ↪(artists_billboard['edad_en_billboard'] <= 40), 'edadEncoded'] = 3
```

```
artists_billboard.loc[ artists_billboard['edad_en_billboard'] > 40,␣
 ↪'edadEncoded'] = 4
```

[29]:
```
artists_billboard.head()
```

[29]:
```
   id                title  \
0   0  Small Town Throwdown
1   1             Bang Bang
2   2                Timber
3   3       Sweater Weather
4   4             Automatic

                                              artist        mood  \
0  BRANTLEY GILBERT featuring JUSTIN MOORE & THOM…    Brooding
1              JESSIE J, ARIANA GRANDE & NICKI MINAJ  Energizing
2                          PITBULL featuring KE$HA     Excited
3                               THE NEIGHBOURHOOD    Brooding
4                                 MIRANDA LAMBERT    Yearning

          tempo               genre artist_type  chart_date  durationSeg  top  \
0  Medium Tempo         Traditional        Male    20140628        191.0    0
1  Medium Tempo                 Pop      Female    20140816        368.0    0
2  Medium Tempo               Urban       Mixed    20140118        223.0    1
3  Medium Tempo  Alternative & Punk        Male    20140104        206.0    0
4  Medium Tempo         Traditional      Female    20140301        232.0    0

   anioNacimiento  edad_en_billboard  moodEncoded  tempoEncoded  genreEncoded  \
0          1975.0                 39            4             2             2
1          1989.0                 25            6             2             3
2          1993.0                 21            5             2             4
3          1989.0                 25            4             2             1
4             NaN                 36            4             2             2

   artist_typeEncoded  edadEncoded
0                   3          3.0
1                   2          1.0
2                   1          0.0
3                   3          1.0
4                   2          3.0
```

[30]:
```
#Mapeo de duracion en segundos
artists_billboard.loc[ artists_billboard['durationSeg'] <= 150,␣
 ↪'durationEncoded'] = 0
artists_billboard.loc[(artists_billboard['durationSeg'] > 150) &␣
 ↪(artists_billboard['durationSeg'] <= 180), 'durationEncoded'] = 1
artists_billboard.loc[(artists_billboard['durationSeg'] > 180) &␣
 ↪(artists_billboard['durationSeg'] <= 210), 'durationEncoded'] = 2
```

```
artists_billboard.loc[(artists_billboard['durationSeg'] > 210) &␣
 ↪(artists_billboard['durationSeg'] <= 240), 'durationEncoded'] = 3
artists_billboard.loc[(artists_billboard['durationSeg'] > 240) &␣
 ↪(artists_billboard['durationSeg'] <= 270), 'durationEncoded'] = 4
artists_billboard.loc[(artists_billboard['durationSeg'] > 270) &␣
 ↪(artists_billboard['durationSeg'] <= 300), 'durationEncoded'] = 5
artists_billboard.loc[ artists_billboard['durationSeg'] > 300,␣
 ↪'durationEncoded'] = 6
```

[31]:
```
artists_billboard.head()
```

[31]:

	id	title	artist	mood	tempo	genre	artist_type	chart_date	durationSeg	top	anioNacimiento	edad_en_billboard	moodEncoded	tempoEncoded	genreEncoded	artist_typeEncoded	edadEncoded	durationEncoded
0	0	Small Town Throwdown	BRANTLEY GILBERT featuring JUSTIN MOORE & THOM…	Brooding	Medium Tempo	Traditional	Male	20140628	191.0	0	1975.0	39	4	2	2	3	3.0	2.0
1	1	Bang Bang	JESSIE J, ARIANA GRANDE & NICKI MINAJ	Energizing	Medium Tempo	Pop	Female	20140816	368.0	0	1989.0	25	6	2	3	2	1.0	6.0
2	2	Timber	PITBULL featuring KE$HA	Excited	Medium Tempo	Urban	Mixed	20140118	223.0	1	1993.0	21	5	2	4	1	0.0	3.0
3	3	Sweater Weather	THE NEIGHBOURHOOD	Brooding	Medium Tempo	Alternative & Punk	Male	20140104	206.0	0	1989.0	25	4	2	1	3	1.0	2.0
4	4	Automatic	MIRANDA LAMBERT	Yearning	Medium Tempo	Traditional	Female	20140301	232.0	0	NaN	36	4	2	2	2	3.0	3.0

[32]:
```
# Tirar (drop) todas las columnas que no necesito
drop_elements =␣
 ↪['id','title','artist','mood','tempo','genre','artist_type','chart_date','anioNacimiento','
artists_encoded = artists_billboard.drop(drop_elements, axis = 1)
```

[33]:
```
artists_encoded.head()
```

[33]:

	top	moodEncoded	tempoEncoded	genreEncoded	artist_typeEncoded	\
0	0	4	2	2	3	
1	0	6	2	3	2	
2	1	5	2	4	1	
3	0	4	2	1	3	
4	0	4	2	2	2	

	edadEncoded	durationEncoded
0	3.0	2.0
1	1.0	6.0
2	0.0	3.0
3	1.0	2.0
4	3.0	3.0

[34]:
```
#Encontrar la profundidad máxima de mi árbol
cv = KFold(n_splits=10) # Numero deseado de "folds" que haremos
accuracies = list()
max_attributes = len(list(artists_encoded))
depth_range = range(1, max_attributes + 1)
for depth in depth_range:
    fold_accuracy = []
    tree_model = tree.DecisionTreeClassifier(
        criterion='entropy',
        min_samples_split=20,
        min_samples_leaf=5,
        max_depth = depth,
        class_weight={1:3.5})
    for train_fold, valid_fold in cv.split(artists_encoded):
        f_train = artists_encoded.loc[train_fold]
        f_valid = artists_encoded.loc[valid_fold]
        model = tree_model.fit(X = f_train.drop(['top'], axis=1), y =␣
 ↪f_train["top"])
        valid_acc = model.score(X = f_valid.drop(['top'], axis=1), y =␣
 ↪f_valid["top"])
        # calculamos la precision con el segmento de validacion
        fold_accuracy.append(valid_acc)
    avg = sum(fold_accuracy)/len(fold_accuracy)
    accuracies.append(avg)
```

[35]:
```
df = pd.DataFrame({"Max Depth": depth_range, "Average Accuracy": accuracies})
df = df[["Max Depth", "Average Accuracy"]]
print(df.to_string(index=False))
```

```
 Max Depth  Average Accuracy
         1          0.556101
         2          0.556126
         3          0.564038
         4          0.631597
         5          0.628522
         6          0.626885
         7          0.647272
```

[36]:
```
# Crear arrays de entrenamiento y las etiquetas que indican si llegó a top o no
y_train = artists_encoded['top']
x_train = artists_encoded.drop(['top'], axis=1).values
```

[37]:
```
decision_tree = tree.DecisionTreeClassifier(criterion='entropy',
                                            min_samples_split=20,
                                            min_samples_leaf=5,
                                            max_depth = 4,
                                            class_weight={1:3.5})
```

[38]:
```
decision_tree.fit(x_train, y_train)
```

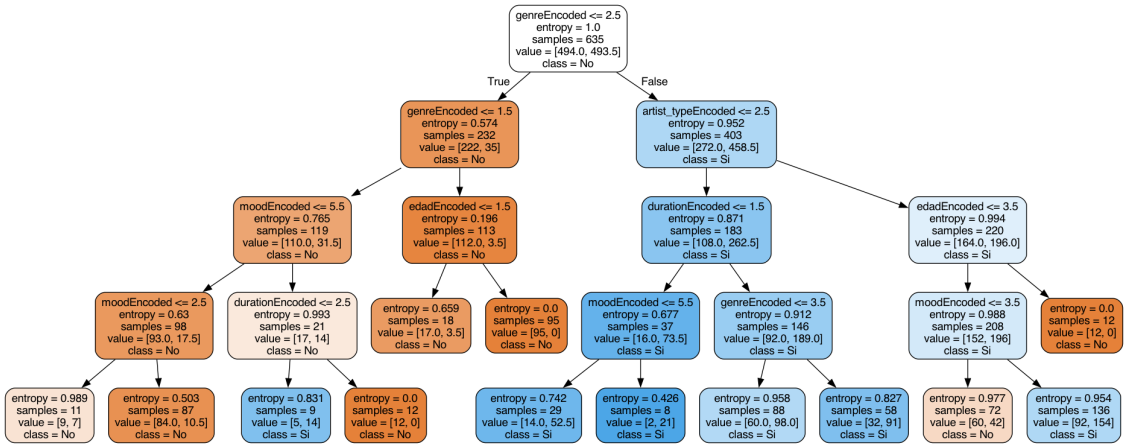
[38]:
```
DecisionTreeClassifier(class_weight={1: 3.5}, criterion='entropy', max_depth=4,
                       min_samples_leaf=5, min_samples_split=20)
```

[39]:
```
with open(r"tree1.dot", 'w') as f:
    f = tree.export_graphviz(decision_tree,
                             out_file=f,
                             max_depth = 7,
                             impurity = True,
                             feature_names = list(artists_encoded.drop(['top'],␣
 ↪axis=1)),
                             class_names = ['No', 'Si'],
                             rounded = True,
                             filled= True )
```

[41]:
```
(graph,) = pydot.graph_from_dot_file('tree1.dot')
graph.write_png('tree1.png')
```

[42]:
```
PImage("tree1.png")
```

[42]:



[43]:
```
# Prediccion para la canción Havanna de Camila Cabello que SI llegó al top 1
x_test = pd.DataFrame(columns=('top','moodEncoded', 'tempoEncoded',␣
 ↪'genreEncoded','artist_typeEncoded','edadEncoded','durationEncoded '))
```

[44]:
```
x_test.loc[0] = (1,5,2,4,1,0,3)
```

[45]:
```
y_pred = decision_tree.predict(x_test.drop(['top'], axis = 1))
```

```
/Users/haydeml/Library/Python/3.9/lib/python/site-packages/sklearn/base.py:486:
UserWarning: X has feature names, but DecisionTreeClassifier was fitted without
feature names
  warnings.warn(
```

[46]:
```
print("Prediccion: " + str(y_pred))
```

```
Prediccion: [1]
```

[47]:
```
y_proba = decision_tree.predict_proba(x_test.drop(['top'], axis = 1))
```

```
/Users/haydeml/Library/Python/3.9/lib/python/site-packages/sklearn/base.py:486:
UserWarning: X has feature names, but DecisionTreeClassifier was fitted without
feature names
  warnings.warn(
```

[48]:
```
print("Probabilidad de Acierto: " + str(y_proba[0][y_pred]* 100)+"%")
```

```
Probabilidad de Acierto: [73.98373984]%
```

[49]:
```
# Prediccion para la canción Believer de Imagine Dragons que NO llegó al top 1
x_test = pd.DataFrame(columns=('top','moodEncoded', 'tempoEncoded',␣
 ↪'genreEncoded','artist_typeEncoded','edadEncoded','durationEncoded '))
```

[50]:
```
x_test.loc[0] = (0,4,2,1,3,2,3)
```

[51]:
```
y_pred = decision_tree.predict(x_test.drop(['top'], axis = 1))
```

```
/Users/haydeml/Library/Python/3.9/lib/python/site-packages/sklearn/base.py:486:
UserWarning: X has feature names, but DecisionTreeClassifier was fitted without
feature names
  warnings.warn(
```

[52]:
```
print("Prediccion: " + str(y_pred))
```

```
Prediccion: [0]
```

[53]:
```
y_proba = decision_tree.predict_proba(x_test.drop(['top'], axis = 1))
```

```
/Users/haydeml/Library/Python/3.9/lib/python/site-packages/sklearn/base.py:486:
UserWarning: X has feature names, but DecisionTreeClassifier was fitted without
feature names
  warnings.warn(
```

[54]:
```
print("Probabilidad de Acierto: " + str(y_proba[0][y_pred]* 100)+"%")
```

```
Probabilidad de Acierto: [88.88888889]%
```

[ ]:
```

```