Support Vector Machine Classifier

Índice

In [1]:
```
import numpy as np
import matplotlib.pyplot as plt
import scipy.stats as st

from sklearn.svm import LinearSVC, SVC
from sklearn.metrics import confusion_matrix, classification_report, roc_curve
from sklearn.feature_extraction.text import TfidfVectorizer

import pickle
X_train_smt = pickle.load(open("saved_feats/ShuffleSplit_X_train_smt", "rb"))
X_test = pickle.load(open("saved_feats/ShuffleSplit_X_test", "rb"))
y_train_smt = pickle.load(open("saved_feats/ShuffleSplit_y_train_smt", "rb"))
y_test = pickle.load(open("saved_feats/ShuffleSplit_y_test", "rb"))
data_text = pickle.load(open("saved_feats/data_text", "rb"))

# FORMATO DE PLOTS
plt.style.use('bmh')
```

Entrenamiento del modelo

Para ver el estudio realizado de la elección de mejores hierparametros, consulta el siguiente notebook: Parameters_SVM

In [2]:
```
clf_svc = LinearSVC(penalty='l1', loss='squared_hinge', dual=False, tol=0.0001, C=1.0, multi_class='ovr',
                    fit_intercept=True, intercept_scaling=1, class_weight={'Negative': 0.2, 'Neutral': 0.5,
clf_svc.fit(X_train_smt, y_train_smt)
pred_svc = clf_svc.predict(X_test)
estim_prob_svc = np.array(clf_svc.decision_function(
    X_test))  # decision is a voting function
pred_prob_svc = np.exp(estim_prob_svc)/np.sum(np.exp(estim_prob_svc),
                                              axis=1, keepdims=True)  # softmax after the voting
```

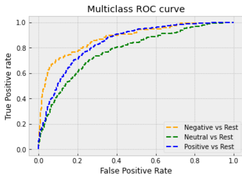
Visualización de resultados

In [3]:
```
print('Predicted classes:', clf_svc.classes_)
print('Average accuracy :', np.mean(pred_svc == y_test)*100)
print('Train accuracy :', (clf_svc.score(
    X_train_smt, y_train_smt))*100)
print('Test accuracy :', (clf_svc.score(
    X_test, y_test))*100)

print('\n CONFUSION MATRIX')
print(confusion_matrix(y_test, pred_svc))
print('\n CLASSIFICATION REPORT')
print(classification_report(y_test, pred_svc))
```

```
Predicted classes: ['Negative' 'Neutral' 'Positive']
Average accuracy : 88.59085063384164
Train accuracy : 97.51297719955319
Test accuracy : 88.59085063384164

 CONFUSION MATRIX
[[  48   28   43]
 [  33   86  131]
 [  69  317 4688]]

 CLASSIFICATION REPORT
              precision    recall  f1-score   support

    Negative       0.32      0.40      0.36       119
     Neutral       0.20      0.34      0.25       250
    Positive       0.96      0.92      0.94      5074

    accuracy                           0.89      5443
   macro avg       0.49      0.56      0.52      5443
weighted avg       0.92      0.89      0.90      5443
```

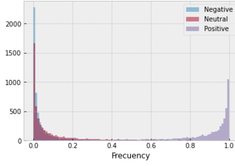
In [4]:
```
fpr = {}
tpr = {}
thresh = {}

fpr[0], tpr[0], thresh[0] = roc_curve(
    y_test, pred_prob_svc[:, 0], pos_label='Negative')
fpr[1], tpr[1], thresh[1] = roc_curve(
    y_test, pred_prob_svc[:, 1], pos_label='Neutral')
fpr[2], tpr[2], thresh[2] = roc_curve(
    y_test, pred_prob_svc[:, 2], pos_label='Positive')

plt.plot(fpr[0], tpr[0], linestyle='--',
         color='orange', label='Negative vs Rest')
plt.plot(fpr[1], tpr[1], linestyle='--',
         color='green', label='Neutral vs Rest')
plt.plot(fpr[2], tpr[2], linestyle='--',
         color='blue', label='Positive vs Rest')
plt.title('Multiclass ROC curve')
plt.xlabel('False Positive Rate')
plt.ylabel('True Positive rate')
plt.legend(loc='best')
```

Out[4]:
```
<matplotlib.legend.Legend at 0x7fa76c65f0d0>
```



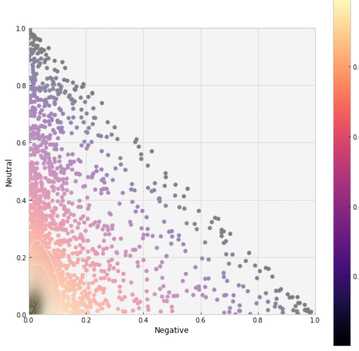
In [5]:
```
fig = plt.figure()
ax = fig.add_subplot()
ax.hist(pred_prob_svc[:, 0], 100, alpha=0.5, label="Negative")
ax.hist(pred_prob_svc[:, 1], 100, alpha=0.5, label="Neutral")
ax.hist(pred_prob_svc[:, 2], 100, alpha=0.5, label="Positive")
ax.set_xlabel('Probability')
ax.set_xlabel('Frecuency')
ax.legend(prop={'size': 10})
```

Out[5]:
```
<matplotlib.legend.Legend at 0x7fa76c6a2da0>
```



In [6]:
```
x = pred_prob_svc[:, 0]
y = pred_prob_svc[:, 1]
z = pred_prob_svc[:, 2]
cmap = plt.get_cmap('magma')

fig = plt.figure(figsize=(10, 10))
ax = fig.add_subplot()
ax.set_xlabel('Negative')
ax.set_xlabel('Neutral')
plt.scatter(x, y, c=z, cmap=cmap)
cbar = plt.colorbar()
cbar.set_label('Positive', rotation=270, fontsize=10, labelpad=10.0)
ax.set_aspect('equal', adjustable='box')
#ax.set_aspect(1.0/ax.get_data_ratio(), adjustable='box')

xx, yy = np.mgrid[0:1:100j, 0:1:100j]
positions = np.vstack([xx.ravel(), yy.ravel()])
values = np.vstack([x, y])
kernel = st.gaussian_kde(values)
f = np.reshape(kernel(positions).T, xx.shape)

plt.contourf(xx, yy, f, levels=20, cmap=plt.get_cmap('Greys'), alpha=0.5)
plt.show()
```

```
/tmp/ipykernel_27059/878502397.py:11: MatplotlibDeprecationWarning: Auto-removal of grids by pcolor() and pcol
ormesh() is deprecated since 3.5 and will be removed two minor releases later; please call grid(False) first.
  cbar = plt.colorbar()
```



Demo

In [7]:
```
# CountVectorizer followed by TfidfTransformer
tfidf = TfidfVectorizer(use_idf=True, norm='l2',
                        smooth_idf=True, sublinear_tf=False, max_features=5000)
tfidf.fit_transform(data_text)

# Input sentence
text = input("Enter sentence: ")
arr_text = np.array([text])
tfidf_arr_text = tfidf.transform(arr_text)

# Output
print(clf_svc.predict(tfidf_arr_text))
```

```
Enter sentence: Product description is accurate
['Neutral']
```