```python
# Define parameters to test
C = np.logspace(-4,4,50)
penalty = ['l1', 'l2']
grid = dict(classifier__C = C,
classifier__penalty= penalty)
# define classifier
classifier = LogisticRegression(solver="lbfgs", n_jobs = -
1, max_iter=5000, random_state=72)
pipe = Pipeline([('vectorizer', tfidf_vector),
                 ('classifier', classifier)])
clf = GridSearchCV(pipe, grid)

clf.fit(X_train, y_train)

#Printing the results and the complete LogisticRegression parameters
print(clf.cv_results_)
print('Best C:', clf.best_estimator_.get_params()['classifier__C'])
print(); print(clf.best_estimator_.get_params()['classifier'])
```

Output was trimmed for performance reasons. To see the full output set the setting "jupyter.textOutputLimit" to 0. ...

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