

Project1_Q8Update

January 23, 2020

1 Getting familiar with the dataset

```
[1]: from sklearn.datasets import fetch_20newsgroups
newsgroups_train = fetch_20newsgroups(subset='train')

from pprint import pprint
pprint(list(newsgroups_train.target_names))
```

```
['alt.atheism',
 'comp.graphics',
 'comp.os.ms-windows.misc',
 'comp.sys.ibm.pc.hardware',
 'comp.sys.mac.hardware',
 'comp.windows.x',
 'misc.forsale',
 'rec.autos',
 'rec.motorcycles',
 'rec.sport.baseball',
 'rec.sport.hockey',
 'sci.crypt',
 'sci.electronics',
 'sci.med',
 'sci.space',
 'soc.religion.christian',
 'talk.politics.guns',
 'talk.politics.mideast',
 'talk.politics.misc',
 'talk.religion.misc']
```

1.0.1 QUESTION 1: To get started, plot a histogram of the number of training documents for each of the 20 categories to check if they are evenly distributed.

```
[2]: import matplotlib.pyplot as plt
import numpy as np
np.random.seed(42)
import random
random.seed(42)
```

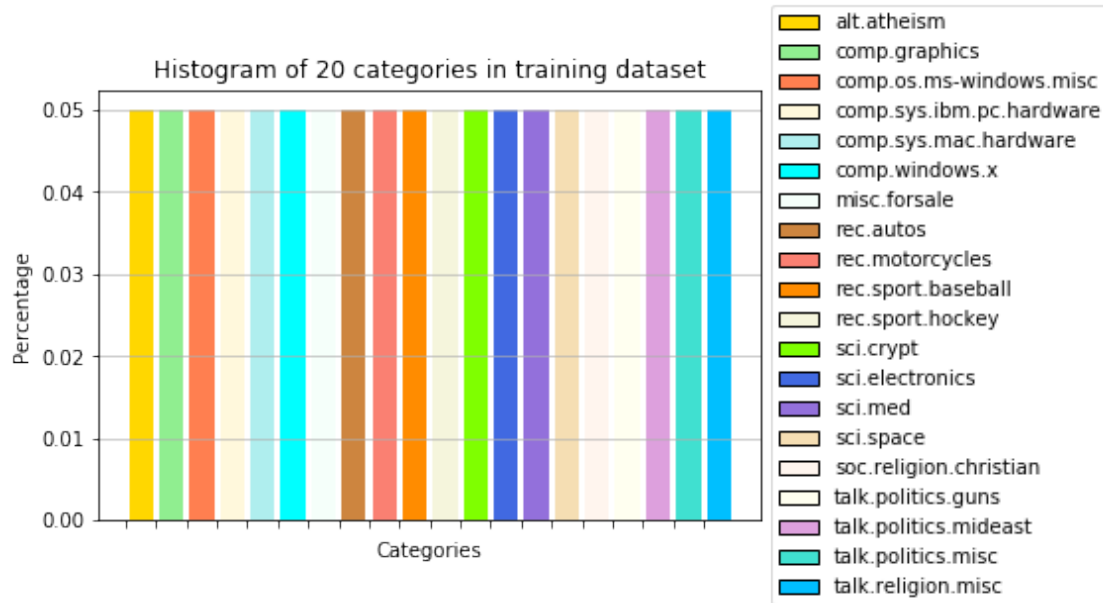
```
from matplotlib.patches import Rectangle
```

```
[3]: fig, axs = plt.subplots()

colors = ['gold', 'lightgreen',
          'coral', 'cornsilk',
          'paleturquoise', 'cyan',
          'mintcream', 'peru',
          'salmon', 'darkorange',
          'beige', 'chartreuse',
          'royalblue', 'mediumpurple',
          'wheat', 'seashell',
          'ivory', 'plum',
          'turquoise', 'deepskyblue',
          ]

xlabels = newsgroups_train.target_names
n, bins, patches = plt.hist(newsgroups_train.target_names, bins=20, range=(0,20), density='true', rwidth=0.8)
for i in range(0, len(patches)):
    patches[i].set_facecolor(colors[i])
axs.set_xticks(np.arange(20))
#axs.set_xticklabels(xlabels, rotation=40, ha = "right")
axs.set_xticklabels([], rotation_mode="anchor")

plt.grid(axis='y', alpha=0.75)
handles = [Rectangle((0,0),1,1,color=c,ec="k") for c in colors]
plt.xlabel('Categories')
plt.ylabel('Percentage')
plt.title('Histogram of 20 categories in training dataset')
plt.legend(handles, list(newsgroups_train.target_names), loc='center left',
           bbox_to_anchor=(1, 0.5))
plt.savefig('Q1 .png', bbox_inches='tight')
```



```
[4]: categories = ['comp.graphics', 'comp.os.ms-windows.misc',
                  'comp.sys.ibm.pc.hardware', 'comp.sys.mac.hardware',
                  'rec.autos', 'rec.motorcycles', 'rec.sport.baseball',
                  'rec.sport.hockey']
train_dataset = fetch_20newsgroups(subset = 'train', categories = categories,
                                   shuffle = True, random_state = None)
test_dataset = fetch_20newsgroups(subset = 'test', categories = categories,
                                   shuffle = True, random_state = None)
```

2 Feature Extraction

2.0.1 QUESTION 2: extract features from the textual data

```
[5]: from sklearn.feature_extraction.text import CountVectorizer
import nltk
from nltk.stem import WordNetLemmatizer
nltk.download('wordnet')
nltk.download('punkt')
nltk.download('averaged_perceptron_tagger')
from nltk import word_tokenize
from nltk.tag import pos_tag
```

```
[nltk_data] Downloading package wordnet to
[nltk_data] C:\Users\SANDS\AppData\Roaming\nltk_data...
[nltk_data] Package wordnet is already up-to-date!
[nltk_data] Downloading package punkt to
```

```

[nltk_data]      C:\Users\SANDS\AppData\Roaming\nltk_data...
[nltk_data]  Package punkt is already up-to-date!
[nltk_data] Downloading package averaged_perceptron_tagger to
[nltk_data]      C:\Users\SANDS\AppData\Roaming\nltk_data...
[nltk_data]  Package averaged_perceptron_tagger is already up-to-
[nltk_data]      date!

```

tokenize each line of each document, (lower), lemmatize with pos_tag, vectorize;

```

[6]: categories = ['comp.graphics', 'comp.os.ms-windows.misc',
                  'comp.sys.ibm.pc.hardware', 'comp.sys.mac.hardware',
                  'rec.autos', 'rec.motorcycles',
                  'rec.sport.baseball', 'rec.sport.hockey']

train_dataset = fetch_20newsgroups(subset = 'train', categories = categories,
    →shuffle = True, random_state = None)
test_dataset = fetch_20newsgroups(subset = 'test', categories = categories,
    →shuffle = True, random_state = None)

```

```

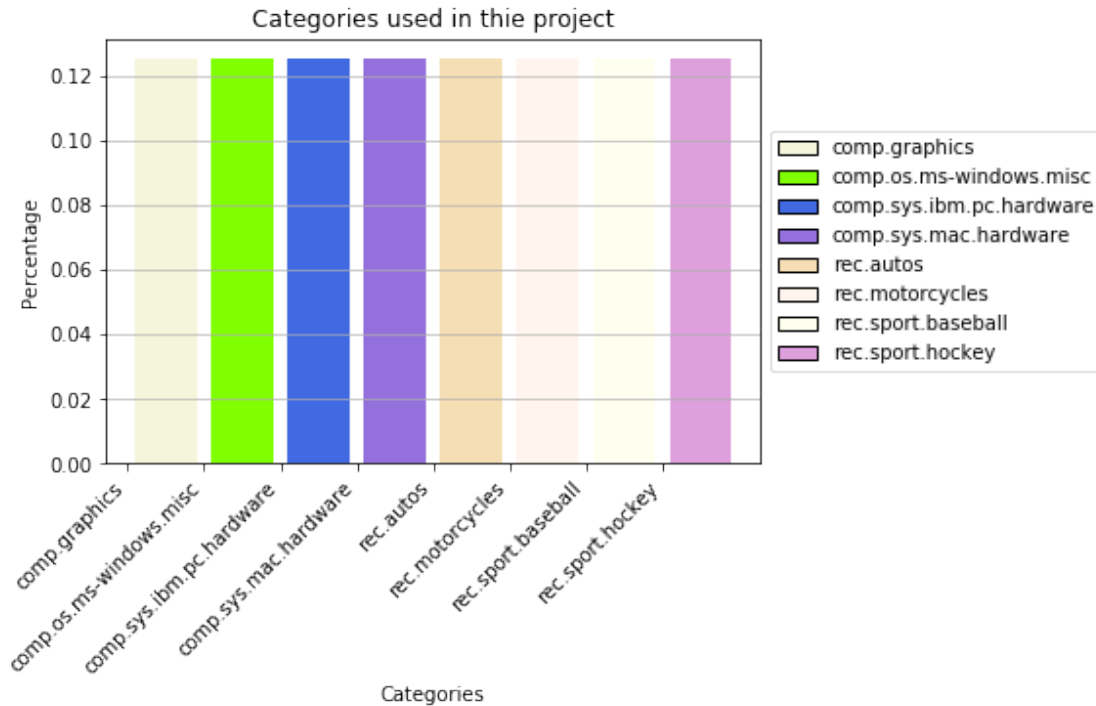
[7]: fig, axs = plt.subplots()

colors = ['beige', 'chartreuse',
          'royalblue', 'mediumpurple',
          'wheat', 'seashell',
          'ivory', 'plum',
          ]

xlabels = train_dataset.target_names
n, bins, patches = plt.hist(train_dataset.target_names, bins=8, range =
    →(0,8), density='true', rwidth=0.8)
for i in range(0, len(patches)):
    patches[i].set_facecolor(colors[i])
axs.set_xticks(np.arange(8))
axs.set_xticklabels(xlabels, rotation=45, ha = "right")
#axs.set_xticklabels([], rotation_mode="anchor")

plt.grid(axis='y', alpha=0.8)
handles = [Rectangle((0,0),1,1,color=c,ec="k") for c in colors]
plt.xlabel('Categories')
plt.ylabel('Percentage')
plt.title('Categories used in thie project')
plt.legend(handles, list(train_dataset.target_names), loc='center left',
    →bbox_to_anchor=(1, 0.5))
plt.savefig('Q1_2.png', bbox_inches='tight')

```



```
[8]: train_dataset.target_names
```

```
[8]: ['comp.graphics',
      'comp.os.ms-windows.misc',
      'comp.sys.ibm.pc.hardware',
      'comp.sys.mac.hardware',
      'rec.autos',
      'rec.motorcycles',
      'rec.sport.baseball',
      'rec.sport.hockey']
```

```
[9]: cv = CountVectorizer(stop_words='english', min_df=3)
      cv
```

```
[9]: CountVectorizer(analyzer='word', binary=False, decode_error='strict',
                    dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                    lowercase=True, max_df=1.0, max_features=None, min_df=3,
                    ngram_range=(1, 1), preprocessor=None, stop_words='english',
                    strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                    tokenizer=None, vocabulary=None)
```

```
[10]: wnl = nltk.wordnet.WordNetLemmatizer()
      walking_tagged = pos_tag(nltk.word_tokenize('He is walking to school'))
      print(walking_tagged)
```

```

print("mapping to Verb, Noun, Adjective, Adverbial")

def penn2morpho(penntag):
    """ Converts Penn Treebank tags to WordNet. """
    morphy_tag = {'NN':'n', 'JJ':'a',
                  'VB':'v', 'RB':'r'}

    try:
        return morphy_tag[penntag[:2]]
    except:
        return 'n'

def lemmatize_sent_demo(text):
    # Text input is string, returns array of lowercased strings(words).
    return [wnl.lemmatize(word.lower(), pos=penn2morpho(tag))
            for word, tag in pos_tag(nltk.word_tokenize(text))]

```

```

[('He', 'PRP'), ('is', 'VBZ'), ('walking', 'VBG'), ('to', 'TO'), ('school',
'NN')]
mapping to Verb, Noun, Adjective, Adverbial

```

```
[11]: lemmatize_sent_demo('He is walking to school')
```

```
[11]: ['he', 'be', 'walk', 'to', 'school']
```

```

[12]: import re
from nltk.corpus import stopwords
train_data_lammed = []
for line in train_dataset.data:
    wordlist = lemmatize_sent_demo(line)
    wordlist_cleaned = [re.sub(r"^\w", "", word) for word in wordlist]
    removedtrain = [word for word in wordlist_cleaned if word not in stopwords.
→words('english') and not word.isdigit()]
    each_line = " ".join(removedtrain)
    train_data_lammed.append(each_line)

```

```
[13]: train_data_lammed[0]
```

```

[13]: ' andrem pyrotechmispyramidcom andre molyneux subject lciii powerpc
replyto andrem pyrotechmispyramidcom andre molyneux organization pyramid
technology mt view california line article 1qksuq 1tt8 halgnuaimitedu
mirsky halgnuaimitedu david joshua mirsky write hi lciii recently hear
interesting rumor hear lciii build slot powerpc chip true hear slot pd
slot true thanks david mirsky mirsky gnuaimitedu well also lc iii
pop top reveal one socket additional vram simm one socket 72pin ram simm
one socket flatpack fpu processordirect slot pd identical lclc ii additional
set connetions one side full 32bit data path lclc ii lack guess board powerpc
chip could make would fit pd place

```

```
andre molyneux ka7wvv insert favorite disclaimer
pyramid technology corp internet          n first street andrem pyramidcom
san jose ca packet                       ka7wvv n0ary nocalcausana
,
```

```
[14]: test_data_lammed = []
      for line in test_dataset.data:
          wordlist = lemmatize_sent_demo(line)
          wordlist_cleaned = [re.sub(r"^\w", "", word) for word in wordlist]
          removedtest = [word for word in wordlist_cleaned if word not in stopwords.
→words('english') and not word.isdigit()]
          each_line = " ".join(removedtest)
          test_data_lammed.append(each_line)
```

```
[15]: test_data_lammed[0]
```

```
[15]: ' povlphp utsunicdk povl h pedersen subject se30 8bit card work 20mb
organization unic danish computing centre research education keywords se30
mode32 system7 pd line 1r4kve 6cl newscstuberlinde ossip cstuberlinde
ossip kaehr write se30 generation system 8bit pd card screen work great
upgrade mb ram sys71 mode32 32enabler boot tech support person say card
support 32bit fix guess right early version rasterops card either fix
people problem get free rom upgrade rasterops press shift key boot ext
monitor go black grey system sometimes boot properly work ok 20mb full
graphic happen easy boot without mode32 control panel disable rather
reinstall 32bit clean patch run ok must 24bit adresssing mode check macintosh
see havce 12mb system thank lot advice please answer mail send seperately
ossip kaehr ossip cstuberlinde voice --
_ ossip kaehr hermannstrasse d1000 berlin germany _ _ tel email ossip
cstuberlinde _ povl h pedersen macintosh
specialist know unix pope imvaaudk povlphp utsunicdk finger pope
imvaaudk pgp public key '
```

```
[16]: cv = CountVectorizer(stop_words='english', min_df=3)
      training_vectors = cv.fit_transform(train_data_lammed)
      testing_vectors = cv.transform(test_data_lammed)
```

```
[17]: # TF-IDF from notes
      from sklearn.feature_extraction.text import TfidfTransformer
      tfidf_transformer = TfidfTransformer()
      X_train_tfidf = tfidf_transformer.fit_transform(training_vectors)
      X_test_tfidf = tfidf_transformer.transform(testing_vectors)
      print(X_train_tfidf.shape)
      print(X_test_tfidf.shape)
```

```
(4732, 16741)
(3150, 16741)
```

```
[18]: #store the train and test data into pickle file
import pickle
pickle_out = open("X_train_tfidf.pickle","wb")
pickle.dump(X_train_tfidf, pickle_out)
pickle_out.close()
pickle_out = open("X_test_tfidf.pickle","wb")
pickle.dump(X_test_tfidf, pickle_out)
pickle_out.close()
```

3 Dimension Reduction

3.0.1 Question 3 Reduce the dimensionality of the data using the LSI and NMF methods, k = 50

```
[19]: import pickle
#extract files:
pickle_in = open("X_train_tfidf.pickle","rb")
train_tfidf_local = pickle.load(pickle_in)
pickle_in = open("X_test_tfidf.pickle","rb")
test_tfidf_local = pickle.load(pickle_in)
```

```
[20]: #LSI
from sklearn.decomposition import TruncatedSVD
from sklearn.utils.extmath import randomized_svd
k = 50
svd = TruncatedSVD(n_components=k, random_state=42)
X_train_lsi = svd.fit_transform(train_tfidf_local)
X_test_lsi = svd.transform(test_tfidf_local)

# NMF
from sklearn.decomposition import NMF
nmf = NMF(n_components=k, init='random', random_state=42)
W_train_nmf = nmf.fit_transform(train_tfidf_local)
W_test_nmf = nmf.transform(test_tfidf_local)
print('the shape of training data after LSI is:',X_train_lsi.shape)
print('the shape of training data after NMF is:',W_train_nmf.shape)
```

the shape of training data after LSI is: (4732, 50)

the shape of training data after NMF is: (4732, 50)

compare $\|X - WH\|^2$ in NMF and $\|X - U\Sigma V\|^2$ in LSI:

```
[21]: Uk, Sigmak, VTk = randomized_svd(train_tfidf_local, n_components=50,
    →random_state=42)
err_lsi = np.sum(np.array(train_tfidf_local - (Uk.dot(np.diag(Sigmak)).
    →dot(VTk)))*2)
H_train = nmf.components_
```



```
err_nmf = np.sum(np.array(train_tfidf_local - W_train_nmf.dot(H_train))**2)
print('the loss for LSI method is:',err_lsi)
print('the loss for NMF method is:',err_nmf)
```

the loss for LSI method is: 4142.143513443093
the loss for NMF method is: 4177.781665802169

4 Classification Algorithms

4.0.1 QUESTION 4: Hard margin and soft margin linear SVMs:

```
[22]: #data preparation: create two values for 2 classes - 'comp' and 'rec'
len(train_dataset.target) #train_dataset.target contains the category in_
    ↳formation of each documents [0,1,2,3,4,5,7] = 4732
Y_train = []
for document in train_dataset.target:
    CurrCate = train_dataset.target_names[document]
    if CurrCate.startswith('comp'):
        Y_train.append(int(0)) # 0 denotes 'comp' category
    elif CurrCate.startswith('rec'):
        Y_train.append(int(1)) # 1 denotes 'rec' category
    else:
        Y_train.append(int(2))
#np.unique(Y_train)
#len(Y_train)

Y_test = []
for document in test_dataset.target:
    CurrCate = test_dataset.target_names[document]
    if CurrCate.startswith('comp'):
        Y_test.append(int(0))
    elif CurrCate.startswith('rec'):
        Y_test.append(int(1))
    else:
        Y_test.append(int(2))
#np.unique(Y_train)
#len(Y_test)

[23]: from sklearn.svm import SVC
#Train one SVM with gamma = 1000 (hard margin), another with gamma = 0:0001_
    ↳(soft margin):
svc_hard = SVC(C = 1000, kernel = 'linear', random_state = 42).fit(X_train_lsi,_
    ↳Y_train)
svc_soft = SVC(C = 0.0001, kernel = 'linear', random_state = 42).
    ↳fit(X_train_lsi, Y_train)
```

```
[24]: #roc plot functions
from sklearn import metrics
from sklearn.metrics import confusion_matrix
from sklearn.metrics import accuracy_score
from sklearn.metrics import precision_score
from sklearn.metrics import recall_score
from sklearn.metrics import roc_curve
from sklearn.metrics import auc
import matplotlib.pyplot as plt
%matplotlib inline
def plot_roc(fpr, tpr):
    fig, ax = plt.subplots()

    roc_auc = auc(fpr,tpr)

    ax.plot(fpr, tpr, lw=2, label= 'area under curve = %0.4f' % roc_auc)

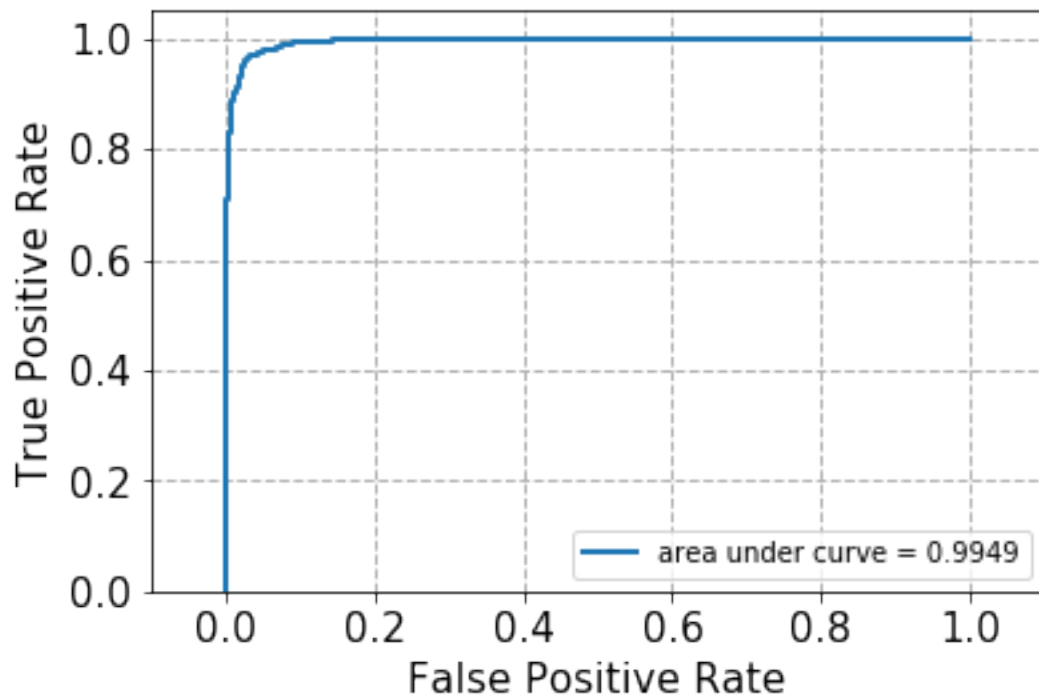
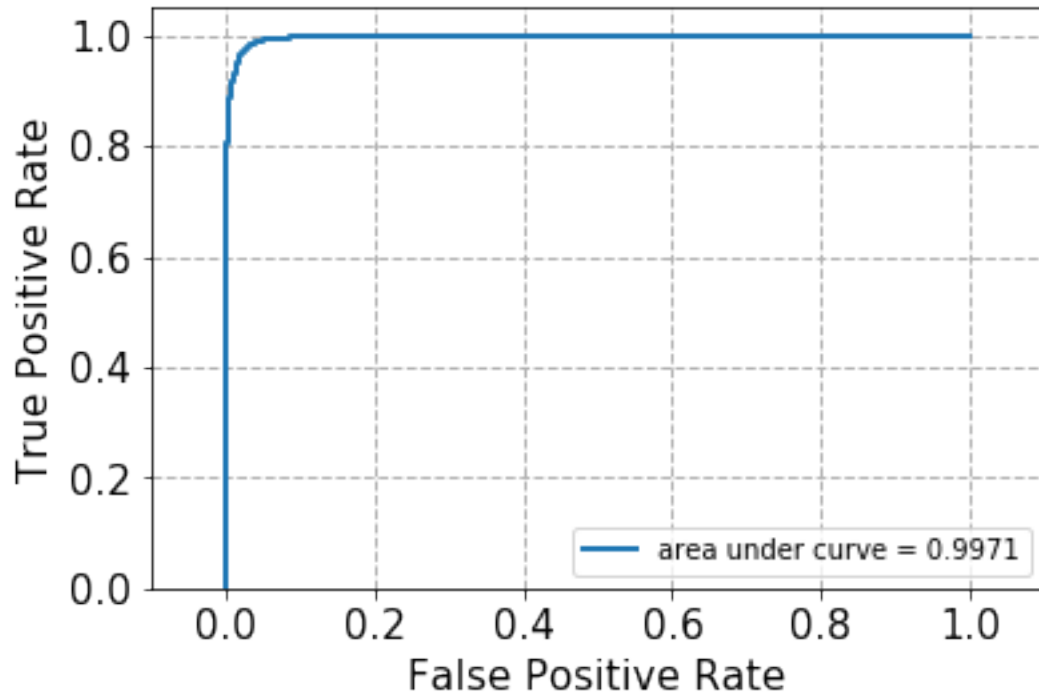
    ax.grid(color='0.7', linestyle='--', linewidth=1)

    ax.set_xlim([-0.1, 1.1])
    ax.set_ylim([0.0, 1.05])
    ax.set_xlabel('False Positive Rate',fontsize=15)
    ax.set_ylabel('True Positive Rate',fontsize=15)

    ax.legend(loc="lower right")

    for label in ax.get_xticklabels()+ax.get_yticklabels():
        label.set_fontsize(15)
```

```
[25]: #ROC plot for svm_hard
score_hard = svc_hard.decision_function(X_test_lsi)
#print(len(score_hard))
fpr_hard, tpr_hard, threshold = metrics.roc_curve(Y_test, score_hard)
# draw the ROC for svm_hard
plot_roc(fpr_hard, tpr_hard)
#ROC plot for svm_soft
score_soft = svc_soft.decision_function(X_test_lsi)
#print(len(score_soft))
fpr_soft, tpr_soft, threshold = metrics.roc_curve(Y_test, score_soft)
# draw the ROC for svm_soft
plot_roc(fpr_soft, tpr_soft)
```



Report the confusion matrix and calculate the Accuracy, Recall, Precision and F-1 score of both

SVM classifier

```
[59]: import numpy as np
from matplotlib import pyplot as plt
def plot_confusion_matrix(cm,
                          target_names,
                          title='Confusion matrix',
                          cmap=None,
                          normalize=True):

    """
    title:          the text to display at the top of the matrix

    cmap:          the gradient of the values displayed from matplotlib.pyplot.cm
                   see http://matplotlib.org/examples/color/colormaps_reference.
    →html          plt.get_cmap('jet') or plt.cm.Blues

    """
    import matplotlib.pyplot as plt
    import numpy as np
    import itertools

    accuracy = np.trace(cm) / float(np.sum(cm))
    misclass = 1 - accuracy

    if cmap is None:
        cmap = plt.get_cmap('Blues')

    plt.figure(figsize=(8, 6))
    plt.imshow(cm, interpolation='nearest', cmap=cmap)
    plt.title(title)
    plt.colorbar()

    if target_names is not None:
        tick_marks = np.arange(len(target_names))
        plt.xticks(tick_marks, target_names, rotation=45)
        plt.yticks(tick_marks, target_names)

    if normalize:
        cm = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]

    thresh = cm.max() / 1.5 if normalize else cm.max() / 2
    for i, j in itertools.product(range(cm.shape[0]), range(cm.shape[1])):
        if normalize:
            plt.text(j, i, "{:0.4f}".format(cm[i, j]),
                     horizontalalignment="center",
                     color="white" if cm[i, j] > thresh else "black")
        else:
            plt.text(j, i, cm[i, j],
                     horizontalalignment="center",
                     color="white" if cm[i, j] > thresh else "black")
```

```

plt.text(j, i, "{:,}".format(cm[i, j]),
        horizontalalignment="center",
        color="white" if cm[i, j] > thresh else "black")

plt.tight_layout()
plt.ylabel('True label')
plt.xlabel('Predicted label\naccuracy={:0.4f}; misclass={:0.4f}'.
→format(accuracy, misclass))
plt.show()

```

```

[136]: def EvaluationReport(clf, testset, Y_test, Averagetype, report_title):
    Y_predict = clf.predict(testset)
    cm = confusion_matrix(Y_test, Y_predict)
    np.set_printoptions(precision=2)
    #print('Confusion matrix, without normalization')
    #print(cm)
    plot_confusion_matrix(cm = cm,
                          normalize    = False,
                          target_names = ['Computer Technology', 'Recreational'],
                          title        = "Confusion Matrix for " + report_title)
    # Normalize the confusion matrix by row (i.e by the number of samples
    # in each class)
    cm_normalized = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]
    #print('Normalized confusion matrix')
    #print(cm_normalized)
    plot_confusion_matrix(cm = cm,
                          normalize    = True,
                          target_names = ['Recreational', 'Computer Technology'],
                          title        = "Normalised Confusion Matrix for " +
→report_title)
    accuracy = metrics.accuracy_score(Y_test, Y_predict)
    if Averagetype == '0':
        recall = metrics.recall_score(Y_test, Y_predict)
        precision = metrics.precision_score(Y_test, Y_predict)
        f1_score = metrics.f1_score(Y_test, Y_predict)
    else:
        recall = metrics.recall_score(Y_test, Y_predict, average = Averagetype)
        precision = metrics.precision_score(Y_test, Y_predict, average =
→Averagetype)
        f1_score = metrics.f1_score(Y_test, Y_predict, average = Averagetype)

    #ROC plot for svm_best
    if (clf in {svc_hard, svc_soft, svc_best}):
        Prob_score = clf.decision_function(testset)    #use decision_function
→for svm
        fpr, tpr, threshold = metrics.roc_curve(Y_test, Prob_score)
    else:

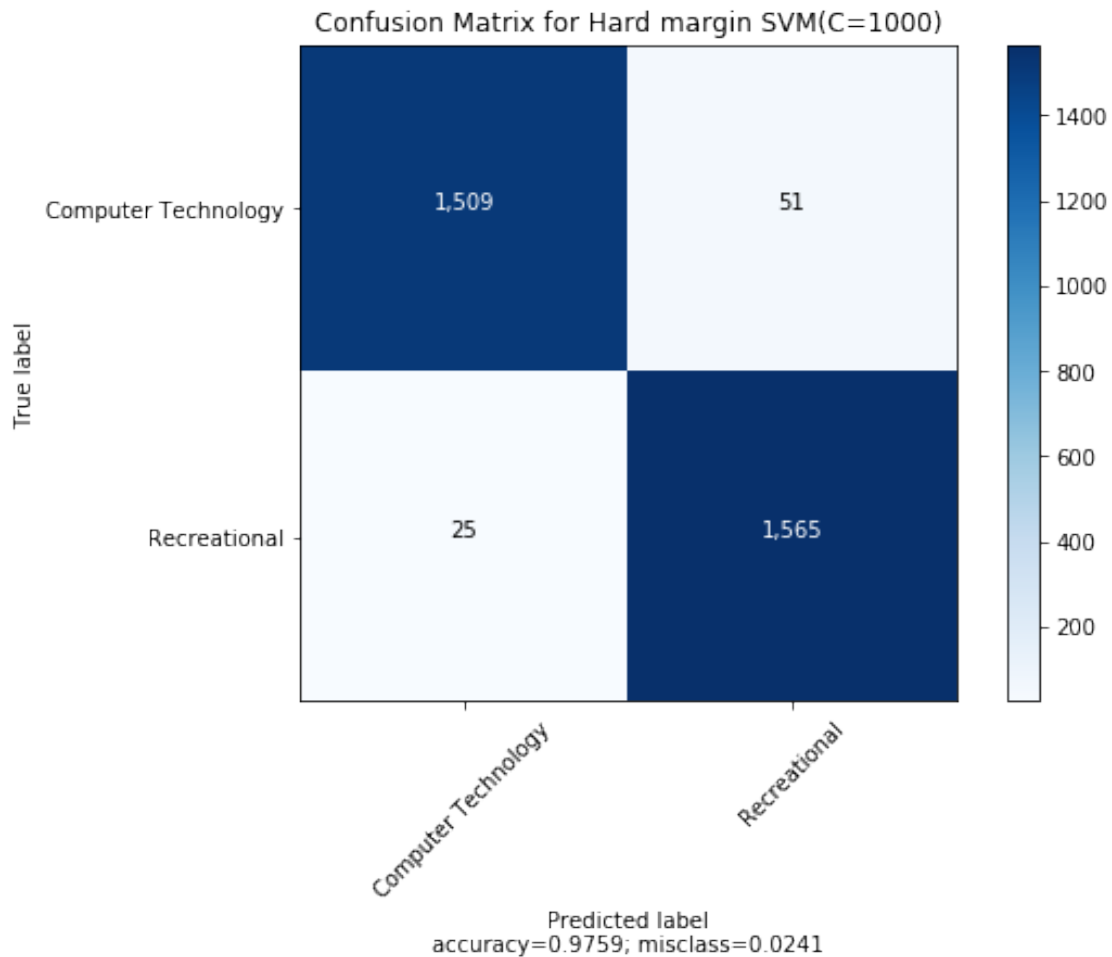
```

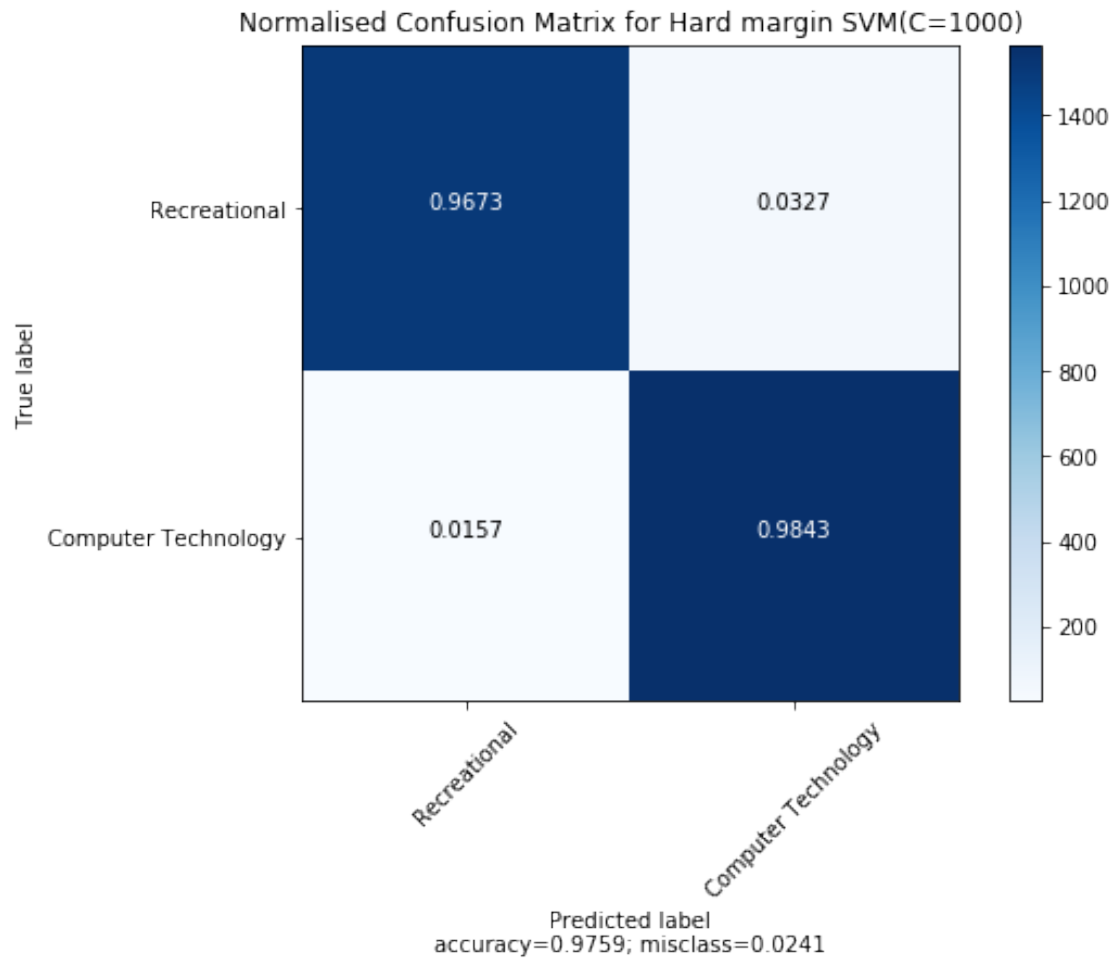
```

    Prob_score = clf.predict_proba(testset)    #use predict_proba for others
    fpr, tpr, threshold = metrics.roc_curve(Y_test, Prob_score[:,1])
    plot_roc(fpr, tpr)
    print('Other Evaluations for ' + report_title)
    print('Accuracy = {:.4f}'.format(accuracy))
    print('Recall = {:.4f}'.format(recall))
    print('Precision = {:.4f}'.format(precision))
    print('F1_score = {:.4f}'.format(f1_score))

```

```
[137]: EvaluationReport(svc_hard, X_test_lsi,Y_test,'0','Hard margin SVM(C=1000)')
```





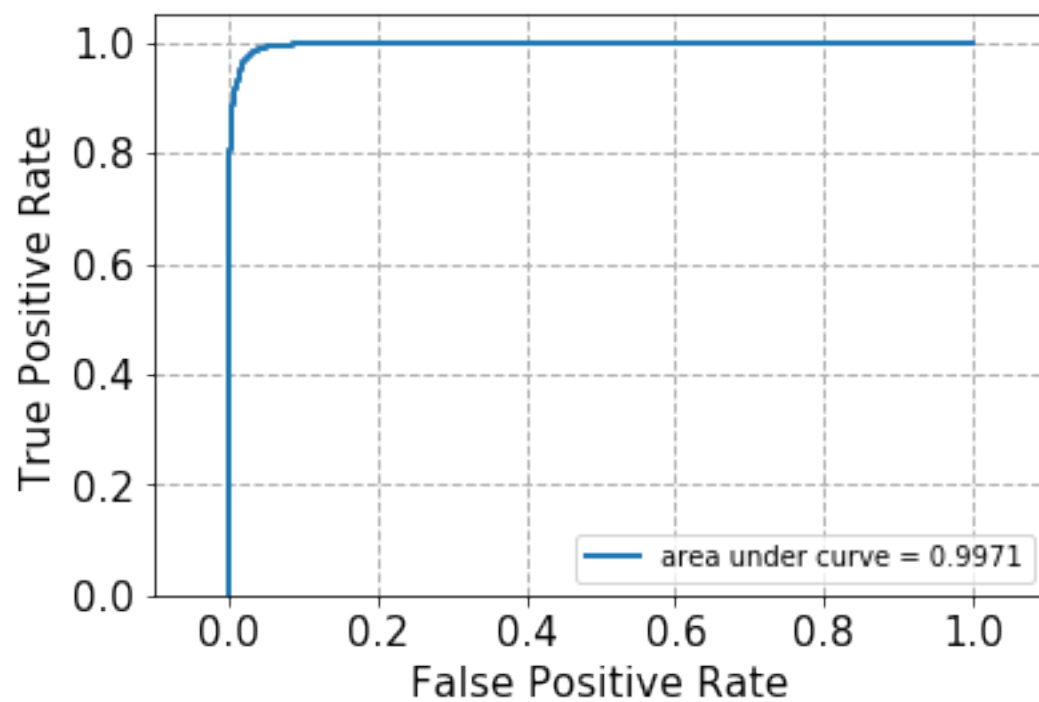
Other Evaluations for Hard margin SVM(C=1000)

Accuracy = 0.9759

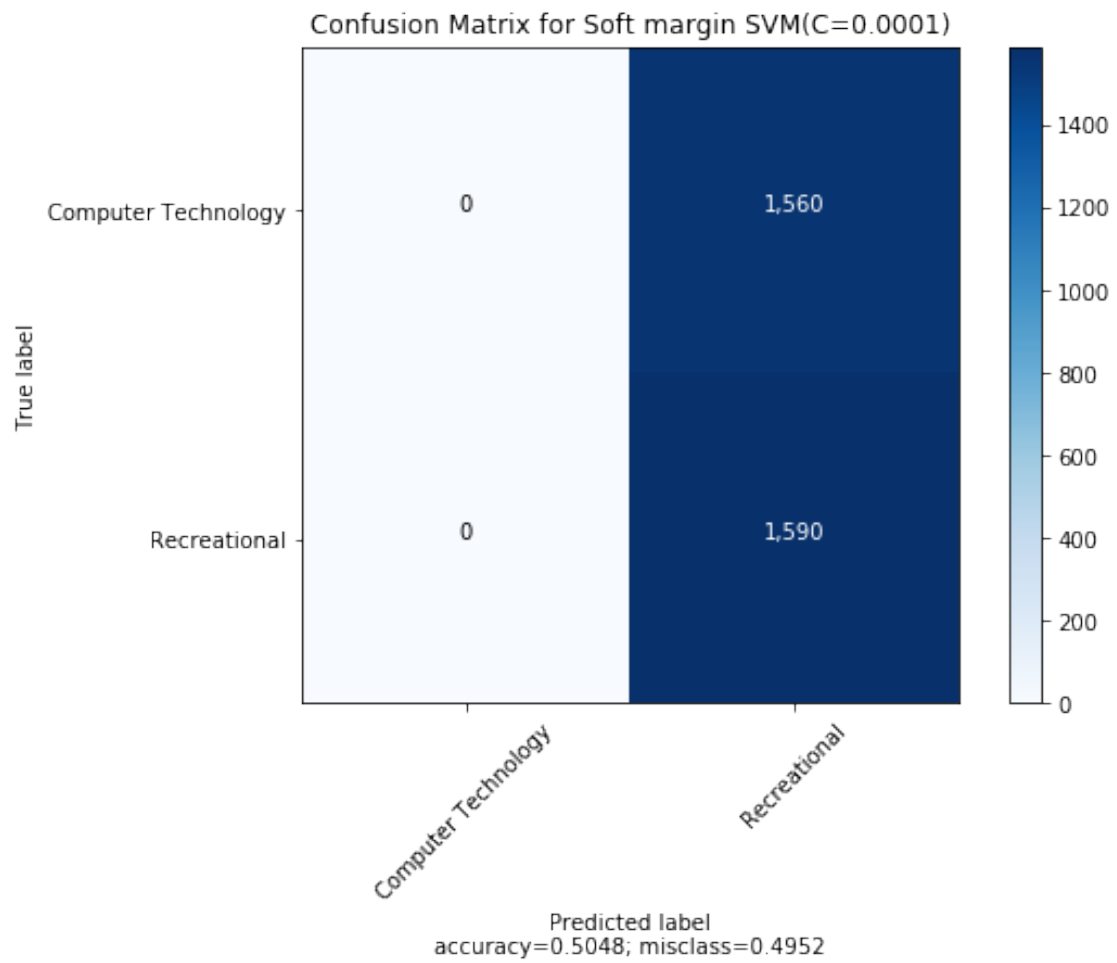
Recall = 0.9843

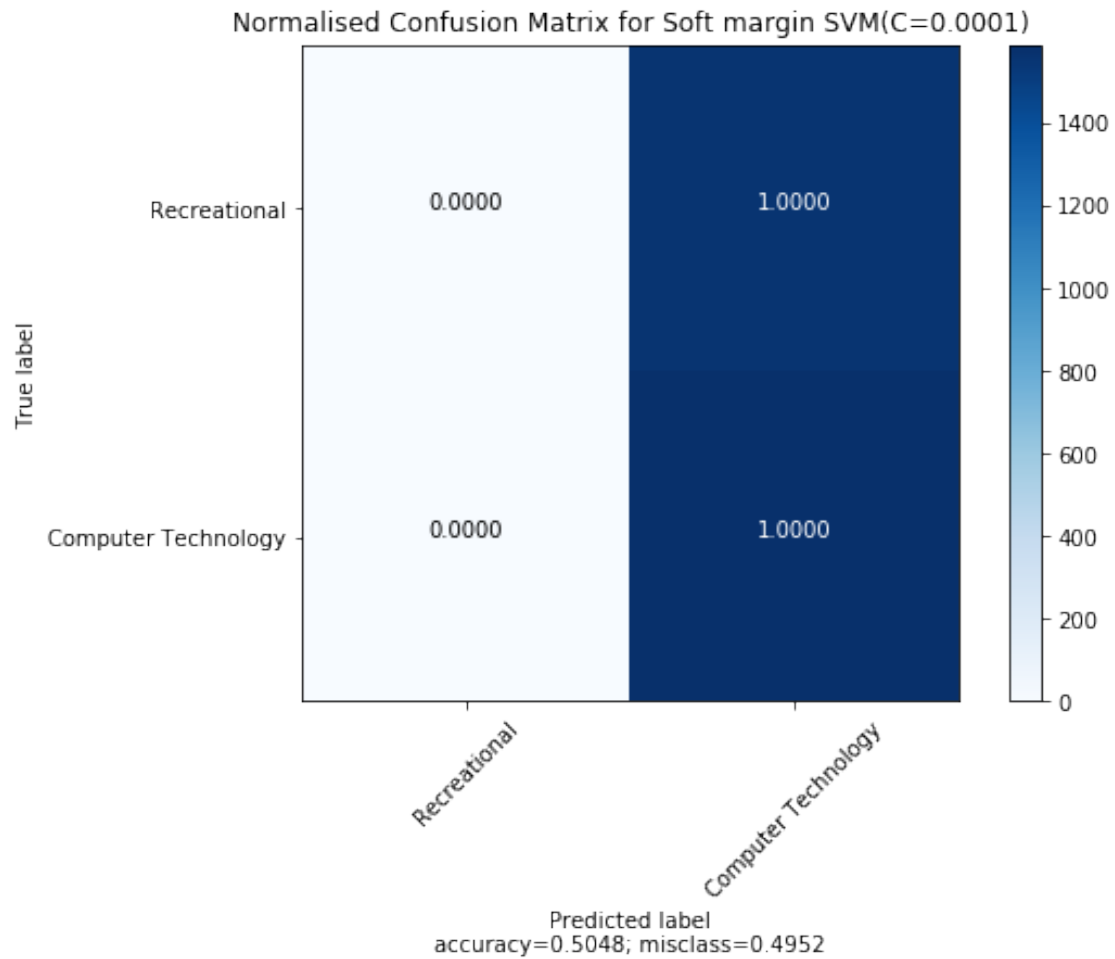
Precision = 0.9684

F1_score = 0.9763



```
[138]: EvaluationReport(svc_soft, X_test_lsi, Y_test, '0', 'Soft margin SVM(C=0.0001)')
```



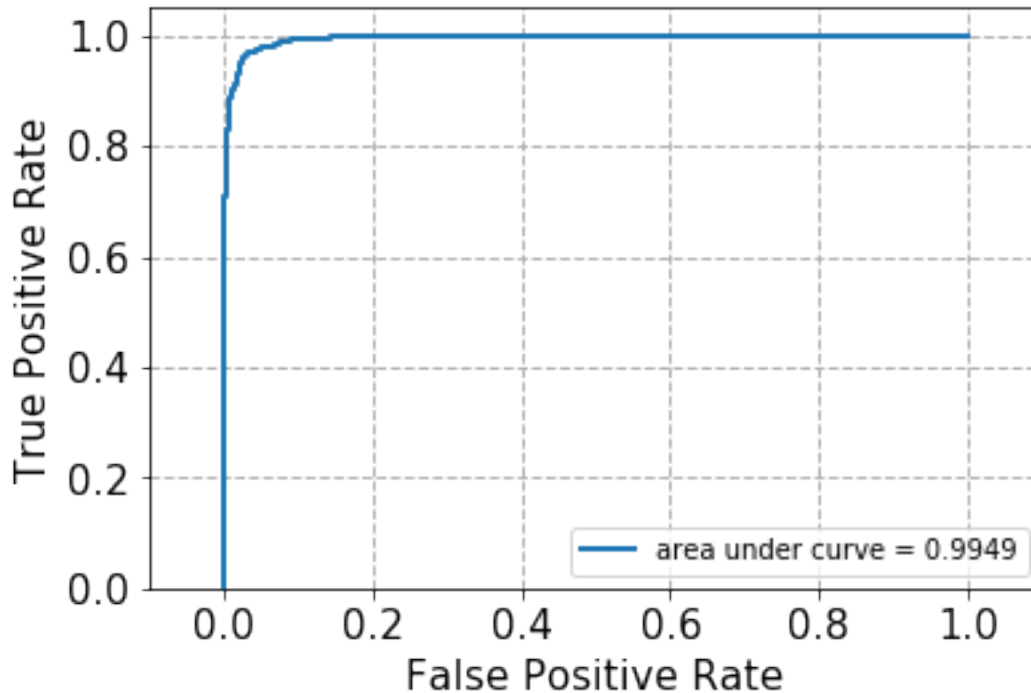
Other Evaluations for Soft margin SVM(C=0.0001)

Accuracy = 0.5048

Recall = 1.0000

Precision = 0.5048

F1_score = 0.6709



Use 5-fold cross-validation to choose (use average validation accuracy to compare), use c from $10e-3 \sim 10e3$

```
[139]: from sklearn.model_selection import cross_val_score
SVM_scores = []
for k in range(-3, 4):
    SVM_clf = SVC(C = 10**k, kernel = 'linear', random_state = 42).
    fit(X_train_lsi, Y_train)
    SVM_scores.append(cross_val_score(SVM_clf, X_train_lsi, Y_train, cv=5,
    scoring='accuracy'))
SVM_averaged = [np.average(data) for data in SVM_scores]
SVM_averaged
```

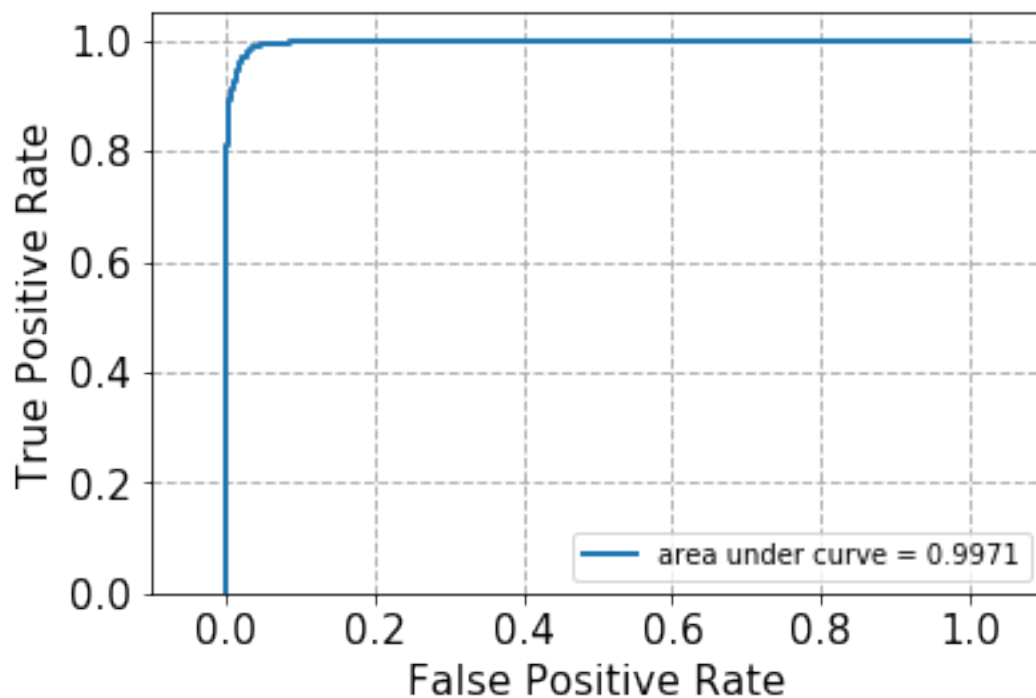
```
[139]: [0.5048605721693318,
0.5065512348196959,
0.9666138207534539,
0.9729520756332475,
0.9780247333303496,
0.9795035334653713,
0.9788710709282405]
```

```
[140]: max_SVMscore = np.max(SVM_averaged)
max_SVMindex = SVM_averaged.index(max_SVMscore)
C_best = 10**(range(-3,4)[max_SVMindex])
```

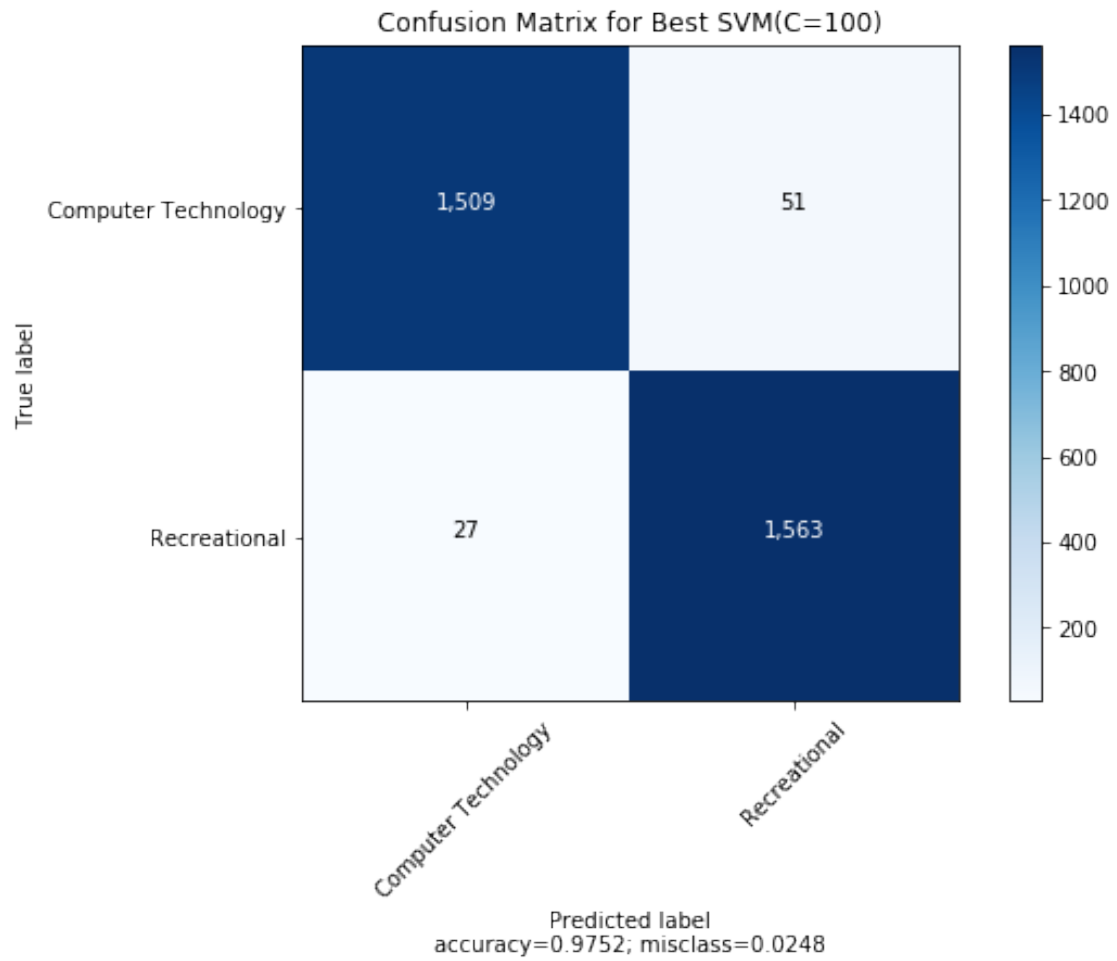
```
print('when C = '+str(C_best)+' , highest accuracy is achieved.')
```

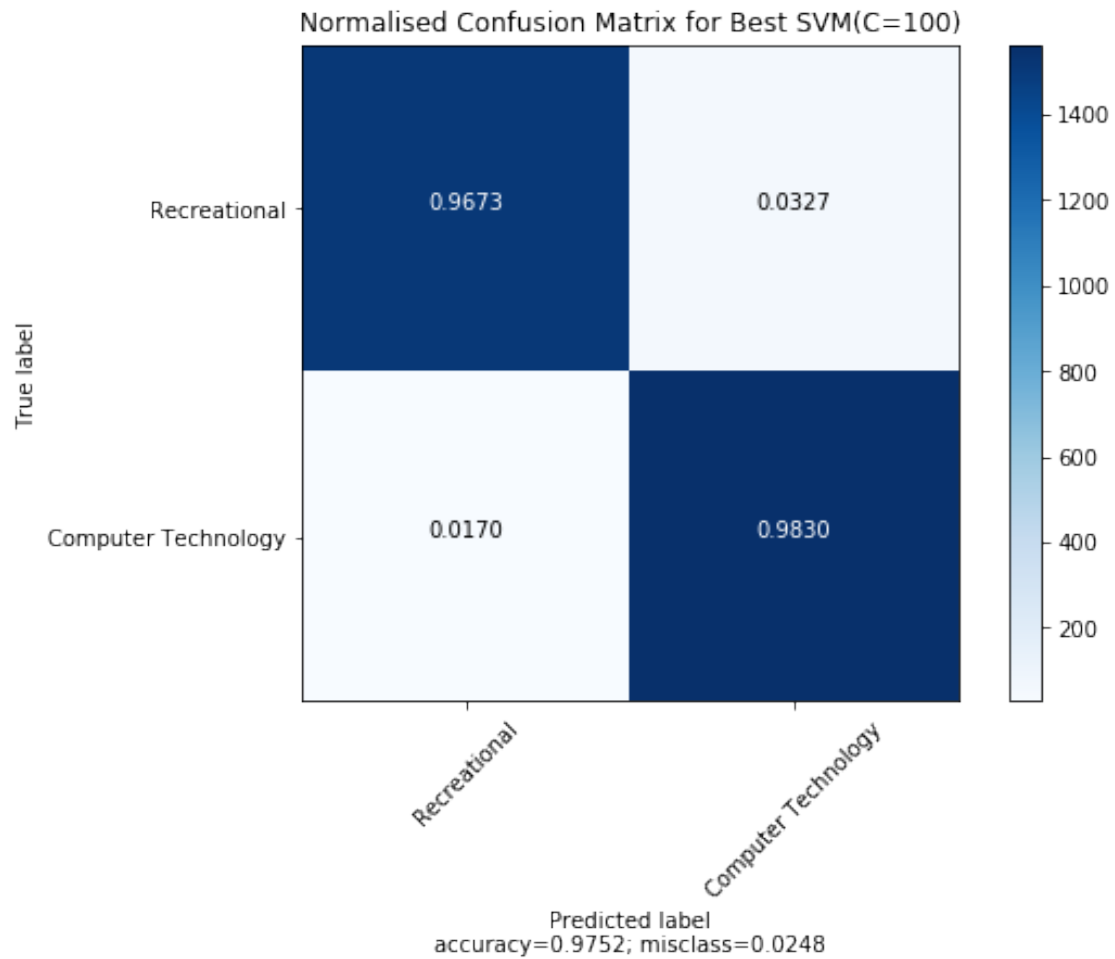
when C = 100, highest accuracy is achieved.

```
[141]: svc_best = SVC(C = C_best, kernel = 'linear', random_state = 42).  
        →fit(X_train_lsi, Y_train)  
        #ROC plot for svm_best  
        score_best = svc_best.decision_function(X_test_lsi)  
        #print(len(score_best))  
        fpr_best, tpr_best, threshold = metrics.roc_curve(Y_test, score_best)  
        # draw the ROC for svm_best  
        plot_roc(fpr_best, tpr_best)
```



```
[142]: #evaluate the highest accuracy model.  
svc_best = SVC(C = C_best, kernel = 'linear', random_state = 42).  
        →fit(X_train_lsi, Y_train)  
EvaluationReport(svc_best, X_test_lsi,Y_test,'0','Best SVM(C=100)')
```





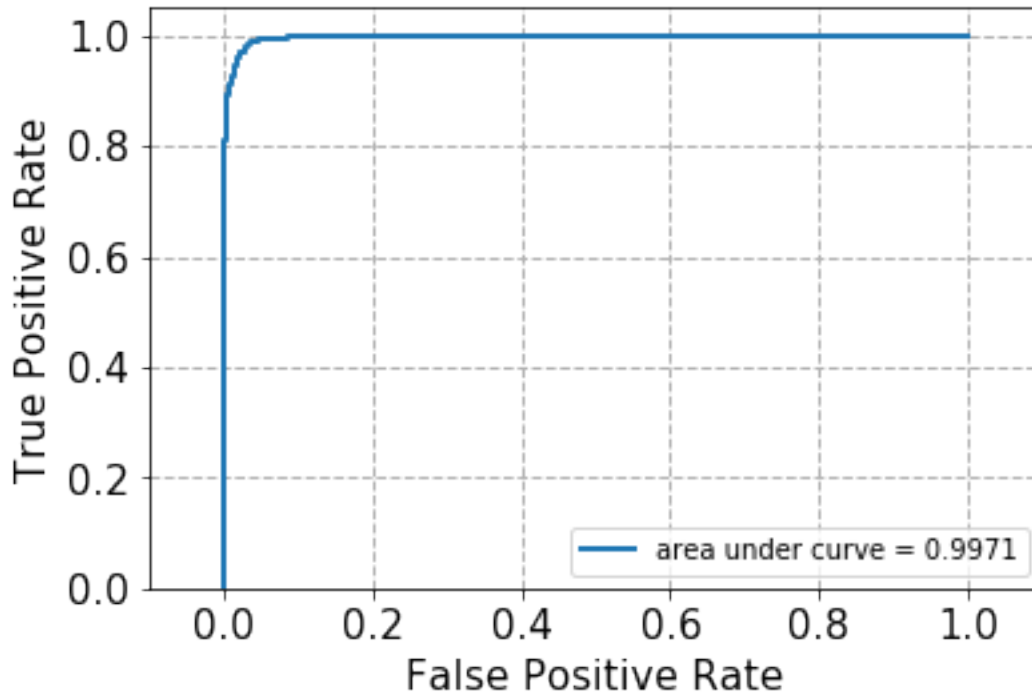
Other Evaluations for Best SVM(C=100)

Accuracy = 0.9752

Recall = 0.9830

Precision = 0.9684

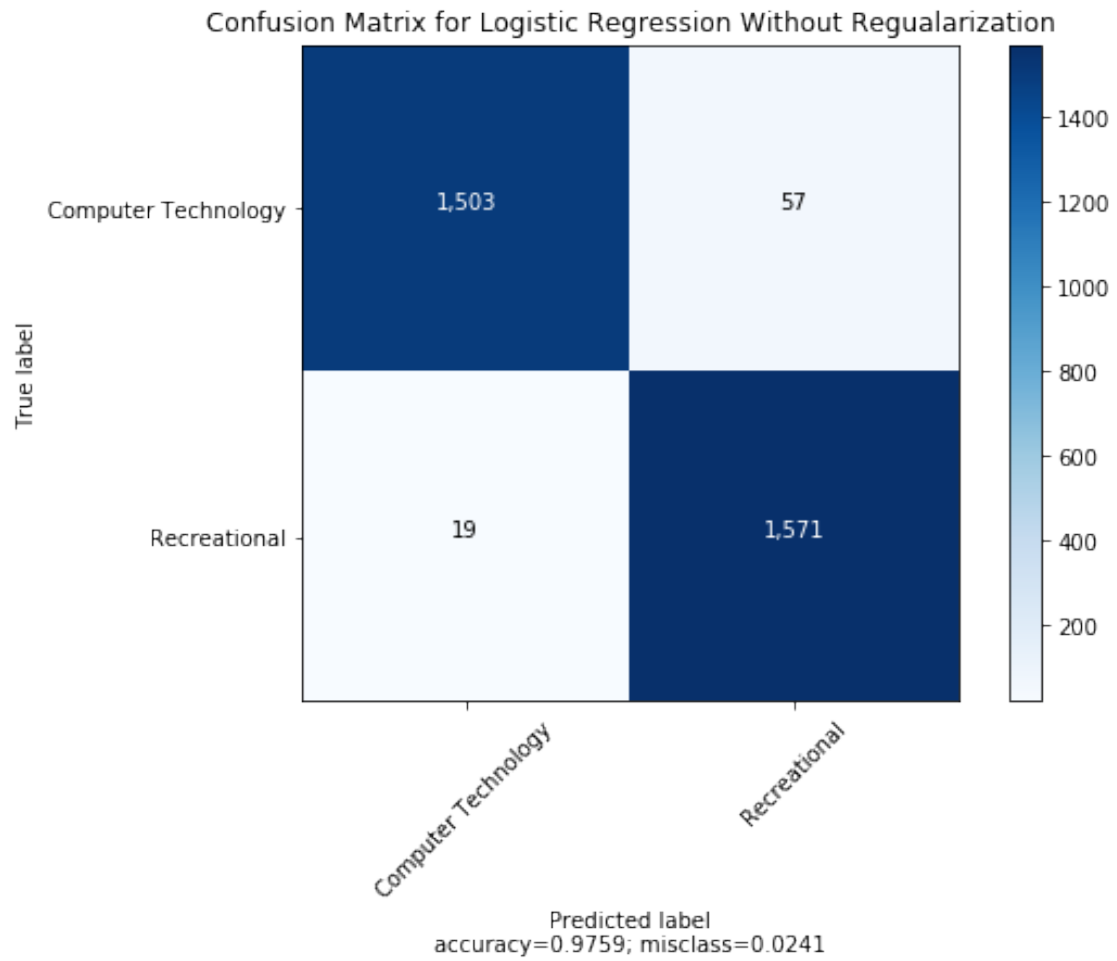
F1_score = 0.9757

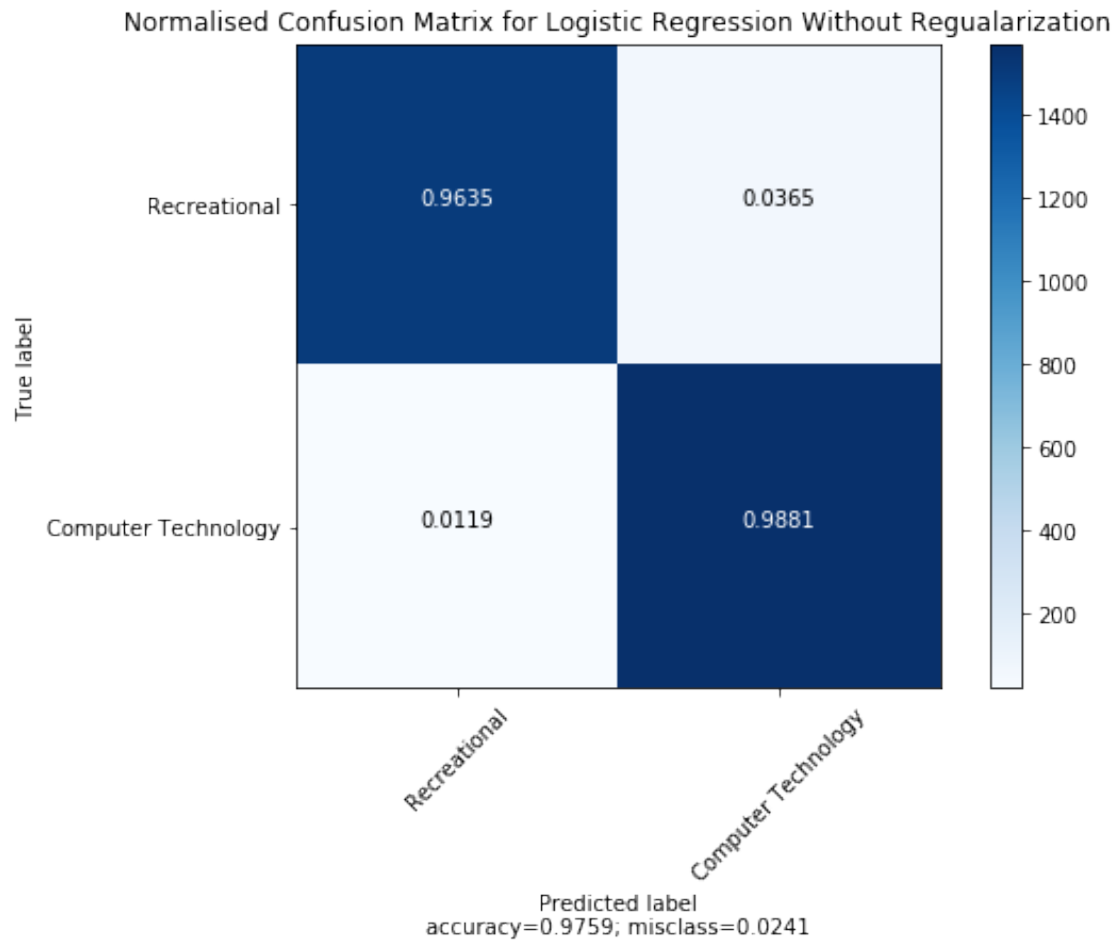


5 Question 5 Logistic Regression (WCY)

```
[143]: from sklearn.linear_model import LogisticRegression
# wo is the notion for w/o (without regularization) in the project1 document
LR_wo = LogisticRegression(penalty='l2', solver='liblinear', C = 1e9) # use a
    ↳ large number of C as 1e9 to approximate none regularization
clf_LR_wo = LR_wo.fit(X_train_lsi, Y_train)

EvaluationReport(clf_LR_wo, X_test_lsi, Y_test, '0', 'Logistic Regression Without,
    ↳ Regularization')
```





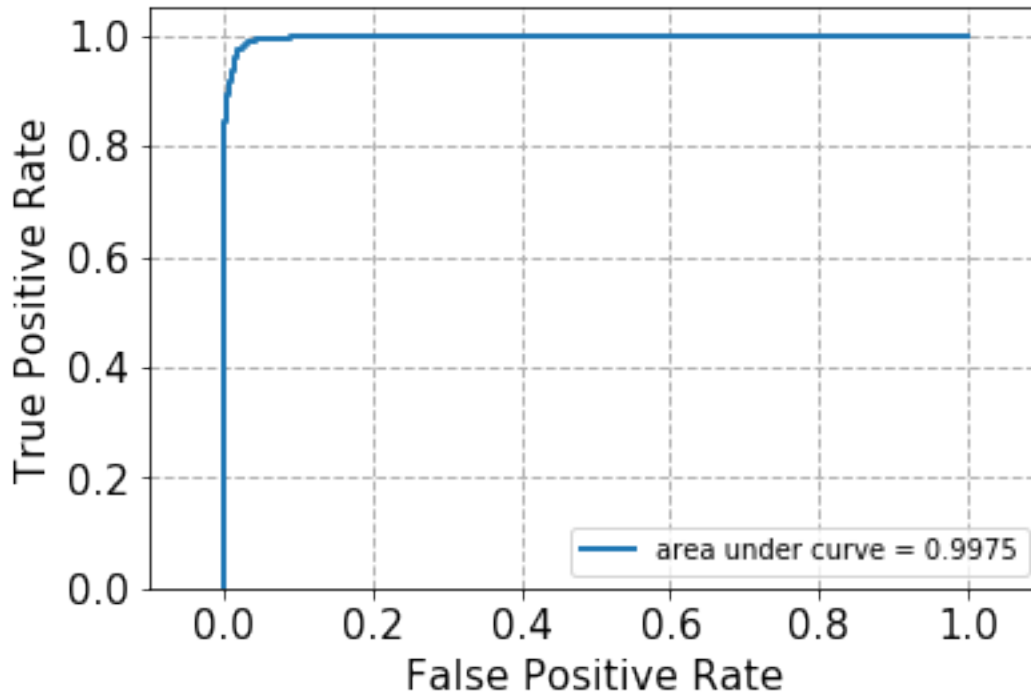
Other Evaluations for Logistic Regression Without Regularization

Accuracy = 0.9759

Recall = 0.9881

Precision = 0.9650

F1_score = 0.9764



5-fold cross-validation

```
[207]: import pandas as pd
from sklearn.model_selection import cross_val_score
gamma = [10**(-3), 10**(-2), 10**(-1), 10**0, 10**1, 10**2, 10**3]

Coef_matrix_temp = []
L1_scores = []
for i in range(7):
    LR_wL1 = LogisticRegression(penalty='l1', solver='liblinear', C = gamma[i])
    L1_scores.append(cross_val_score(LR_wL1, X_train_lsi, Y_train, cv=5,
    →scoring='accuracy'))
    clf_L1 = LR_wL1.fit(X_train_lsi, Y_train)
    Coef_matrix_temp.append(clf_L1.coef_)

L1_averaged = [np.average(data) for data in L1_scores]
#L1_averaged
#Coef_L1 = pd.DataFrame(Coef_matrix)
Coef_matrix = []
for sub_list in Coef_matrix_temp:
    for subsub_list in sub_list:
        Coef_matrix.append(subsub_list)
Coef_matrix
#Coef_L1 = pd.DataFrame(Coef_matrix)
```

```
#EvaluationReport(LR_wo, X_test_lsi, Y_test, '0', 'Logistic Regression Without  
→Regularization')
```

```
[207]: [array([0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,  
0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,  
0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.]),  
array([0. , 5.81, 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ,  
0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ,  
0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ,  
0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ,  
0. , 0. , 0. , 0. , 0. , 0. ]),  
array([ 0. , 42.58, 5.14, -11.63, 0. , 0. , 0. , 0. ,  
0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ,  
0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ,  
0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ,  
0. , 0. ]),  
array([ 0. , 74.42, 21.76, -30.72, 0. , 7.54, 16.4 , 0. ,  
0. , -13.75, 0. , -4.43, 0. , 10.87, 5.19, -0.81,  
5.22, -0.97, 0. , 0. , 6.18, 0. , 0. , -1.31,  
0. , 0. , 0. , 0. , 0. , 0. , 0. , 0. ,  
8.37, 0. , 0. , 0. , 0. , 0. , 0. , 0. ,  
-1.98, 0. , 0. , 0. , 0. , 0. , 0. , 0. ,  
0. , 0. ]),  
array([-8.50e-01, 1.07e+02, 3.94e+01, -6.00e+01, -2.01e+00, 2.47e+01,  
3.30e+01, 1.16e+00, -1.37e+00, -2.54e+01, -6.57e+00, -1.25e+01,  
-6.31e+00, 1.75e+01, 1.74e+01, -1.42e+01, 1.18e+01, -3.38e+00,  
-9.47e+00, 6.65e+00, 2.22e+01, 8.11e-02, 0.00e+00, -3.53e+00,  
4.57e+00, 1.06e+01, -2.76e+00, -2.24e+00, -1.11e+00, 0.00e+00,  
3.71e+00, 5.89e+00, 1.26e+01, 1.85e+00, 0.00e+00, -4.72e+00,  
1.04e+00, 0.00e+00, -7.40e+00, -1.40e+00, -8.50e+00, -3.51e+00,  
0.00e+00, 3.83e-01, -6.52e+00, 0.00e+00, 5.37e+00, -1.30e+00,  
0.00e+00, -7.81e+00]),  
array([ -2.64, 123.67, 46.54, -73.29, -5.35, 31.06, 39.68, 2.95,  
-2.71, -31.28, -9.9 , -15.71, -6.51, 21.11, 17.71, -18.1 ,  
15.8 , -22.86, -14.21, 12.79, 29.01, 1.15, -0.94, -3.69,  
8.36, 13.18, -7.06, -4.75, -2.99, 0.2 , 3.4 , 4.82,  
13.32, 5.93, 0.95, -6.25, 6.92, -0.52, -10.7 , -5.45,  
-12.35, -6.45, 0.34, 2.63, -9.62, -0.58, 7.76, -3.9 ,  
2.01, -11.06]),  
array([ -2.95, 126.3 , 47.68, -75.28, -5.77, 31.93, 40.74, 3.04,  
-2.96, -32.17, -10.4 , -16.19, -6.49, 21.66, 17.69, -18.67,  
16.4 , -25.83, -14.95, 13.89, 29.86, 1.24, -1.4 , -3.71,  
9.09, 13.52, -7.87, -5.18, -3.17, 0.79, 3.31, 4.73,  
13.44, 6.62, 1.17, -6.55, 7.81, -0.77, -11.23, -6.05,  
-12.8 , -6.88, 0.79, 3.01, -10. , -0.9 , 8.28, -4.35,
```

```
2.48, -11.5 ])]
```

```
[208]: Coef2_matrix_temp = []
L2_scores = []
for i in range(7):
    LR_wL2 = LogisticRegression(penalty='l2', solver='liblinear', C = gamma[i])
    L2_scores.append(cross_val_score(LR_wL2, X_train_lsi, Y_train, cv=5,
    →scoring='accuracy'))
    clf_L2 = LR_wL2.fit(X_train_lsi, Y_train)
    Coef2_matrix_temp.append(clf_L2.coef_)

L2_averaged = [np.average(data) for data in L2_scores]
#L1_averaged
#Coef_L1 = pd.DataFrame(Coef_matrix)
Coef2_matrix = []
for sub_list in Coef2_matrix_temp:
    for subsub_list in sub_list:
        Coef2_matrix.append(subsub_list)
Coef2_matrix
```

```
[208]: [array([-9.99e-03,  1.44e-01,  3.60e-02, -4.36e-02,  4.56e-03,  1.52e-02,
        1.60e-02, -5.58e-03, -1.87e-03, -1.41e-02, -5.55e-03,  1.83e-04,
       -1.72e-03,  9.00e-03,  5.85e-03,  1.03e-03,  9.99e-03, -4.58e-03,
       -2.70e-03,  1.71e-03,  6.90e-03,  5.00e-03, -7.50e-04, -6.47e-04,
        9.17e-04,  2.77e-03, -2.79e-03, -2.55e-03,  1.17e-03, -2.79e-03,
        1.30e-03, -3.15e-05,  5.72e-03,  3.19e-05,  5.07e-05, -3.99e-03,
        7.26e-04, -1.06e-03, -5.93e-04, -1.16e-04, -3.73e-03,  2.28e-03,
       -1.01e-03,  1.64e-03, -1.25e-03, -8.06e-04,  3.01e-03, -2.28e-04,
        2.82e-03, -1.72e-03]),
 array([-1.03e-01,  1.34e+00,  3.43e-01, -4.16e-01,  4.39e-02,  1.48e-01,
        1.55e-01, -5.43e-02, -1.81e-02, -1.37e-01, -5.41e-02,  2.44e-03,
       -1.65e-02,  8.75e-02,  5.69e-02,  1.02e-02,  9.75e-02, -4.52e-02,
       -2.64e-02,  1.67e-02,  6.78e-02,  4.86e-02, -7.30e-03, -6.04e-03,
        8.96e-03,  2.71e-02, -2.75e-02, -2.48e-02,  1.13e-02, -2.71e-02,
        1.25e-02, -4.93e-04,  5.60e-02,  4.64e-04,  5.33e-04, -3.92e-02,
        6.98e-03, -1.03e-02, -5.83e-03, -9.48e-04, -3.67e-02,  2.24e-02,
       -1.01e-02,  1.61e-02, -1.22e-02, -7.89e-03,  2.97e-02, -2.47e-03,
        2.76e-02, -1.69e-02]),
 array([-6.45e-01,  8.28e+00,  2.40e+00, -2.93e+00,  3.18e-01,  1.16e+00,
        1.20e+00, -4.13e-01, -1.48e-01, -1.08e+00, -4.34e-01,  1.82e-02,
       -1.30e-01,  7.00e-01,  4.56e-01,  6.98e-02,  7.97e-01, -3.80e-01,
       -2.15e-01,  1.37e-01,  5.61e-01,  3.92e-01, -5.44e-02, -5.21e-02,
        7.49e-02,  2.32e-01, -2.24e-01, -2.00e-01,  8.27e-02, -2.18e-01,
        9.31e-02, -5.24e-04,  4.74e-01,  6.35e-03,  2.32e-03, -3.28e-01,
        5.26e-02, -8.87e-02, -5.14e-02, -3.87e-03, -3.15e-01,  1.83e-01,
       -8.81e-02,  1.34e-01, -9.99e-02, -6.57e-02,  2.54e-01, -3.06e-02,
        2.33e-01, -1.48e-01]),
```

```

array([-1.72e+00,  2.45e+01,  8.13e+00, -1.01e+01,  9.96e-01,  4.43e+00,
        4.89e+00, -1.17e+00, -6.77e-01, -4.37e+00, -1.85e+00, -4.29e-01,
       -7.47e-01,  3.01e+00,  1.95e+00, -2.71e-01,  3.49e+00, -1.52e+00,
       -8.74e-01,  6.55e-01,  2.44e+00,  1.55e+00, -1.05e-01, -5.17e-01,
        4.23e-01,  1.28e+00, -8.86e-01, -7.36e-01,  1.35e-01, -8.43e-01,
        4.28e-01,  2.97e-01,  2.37e+00,  8.40e-03, -3.52e-02, -1.40e+00,
        9.16e-02, -4.76e-01, -3.48e-01, -4.10e-02, -1.46e+00,  5.43e-01,
       -3.85e-01,  5.09e-01, -4.54e-01, -1.80e-01,  1.10e+00, -3.93e-01,
        1.01e+00, -8.43e-01]),
array([ -1.8 ,  49.75,  17.6 , -23.59,   1.41,  10.17,  12.55,  -0.7 ,
       -1.73, -10.54,  -4.17,  -3.1 ,  -2.62,   7.82,   5.68,  -3.11,
        8.42,  -2.88,  -2.71,   2.47,   6.59,   2.89,   0.08,  -2.14,
        1.54,   4.12,  -2.34,  -1.47,  -0.32,  -1.5 ,   1.9 ,   1.98,
        6.5 ,   0.18,   0.05,  -3.07,   0.26,  -1.23,  -1.76,  -0.54,
       -3.6 ,  -0.15,  -0.75,   0.63,  -1.45,   0.25,   2.71,  -1.69,
        2.17,  -2.91]),
array([ -1.19,  85.11,  31.05, -45.66,  -0.39,  19.97,  24.62,   1.58,
       -2.71, -19.73,  -6.43,  -8.59,  -5.4 ,  14.97,  12.37, -10.16,
       13.4 ,  -7.06,  -7.52,   6.93,  14.95,   2.59,  -0.31,  -3.46,
        4.25,   8.58,  -4.8 ,  -2.53,  -1.84,  -0.8 ,   4.05,   4.38,
       10.6 ,   2.56,   0.56,  -4.8 ,   2.78,  -1.55,  -5.77,  -2.29,
       -7.46,  -2.93,  -0.2 ,   0.86,  -4.57,   0.72,   5.56,  -2.89,
        2.6 ,  -6.6 ]),
array([ -2.25, 115.9 ,  43.28, -67.42,  -4.23,  28.92,  36.28,   2.99,
       -2.96, -28.77,  -9.28, -14.15,  -6.47,  20.19,  16.7 , -16.58,
       15.76, -19.71, -13.02,  12.01,  25.61,   1.57,  -1.26,  -3.68,
        7.78,  12.22,  -7.05,  -4.28,  -2.96,   0.45,   3.75,   4.95,
       12.75,   5.73,   1.06,  -6.1 ,   6.47,  -1.06,  -9.88,  -4.97,
      -11.49,  -5.82,   0.6 ,   2.3 ,  -8.6 ,  -0.28,   7.7 ,  -3.85,
        2.45, -10.24]])

```

5.0.1 We achieve the best accuracy at the regularization strength of $1/10^1 = 0.1$ while using L1 regularization

```

[145]: L2_scores = []
for i in range(7):
    LR_wL2 = LogisticRegression(penalty='l2', solver='liblinear', C = gamma[i])
    L2_scores.append(cross_val_score(LR_wL2, X_train_lsi, Y_train, cv=5,
    ↪scoring='accuracy'))
L2_averaged = [np.average(data) for data in L2_scores]
L2_averaged

```

```

[145]: [0.7147079384711075,
        0.9480174212867418,
        0.9649213697513102,
        0.9706278327849507,

```

```
0.9756993742387028,  
0.9782348103288159,  
0.9771786208710646]
```

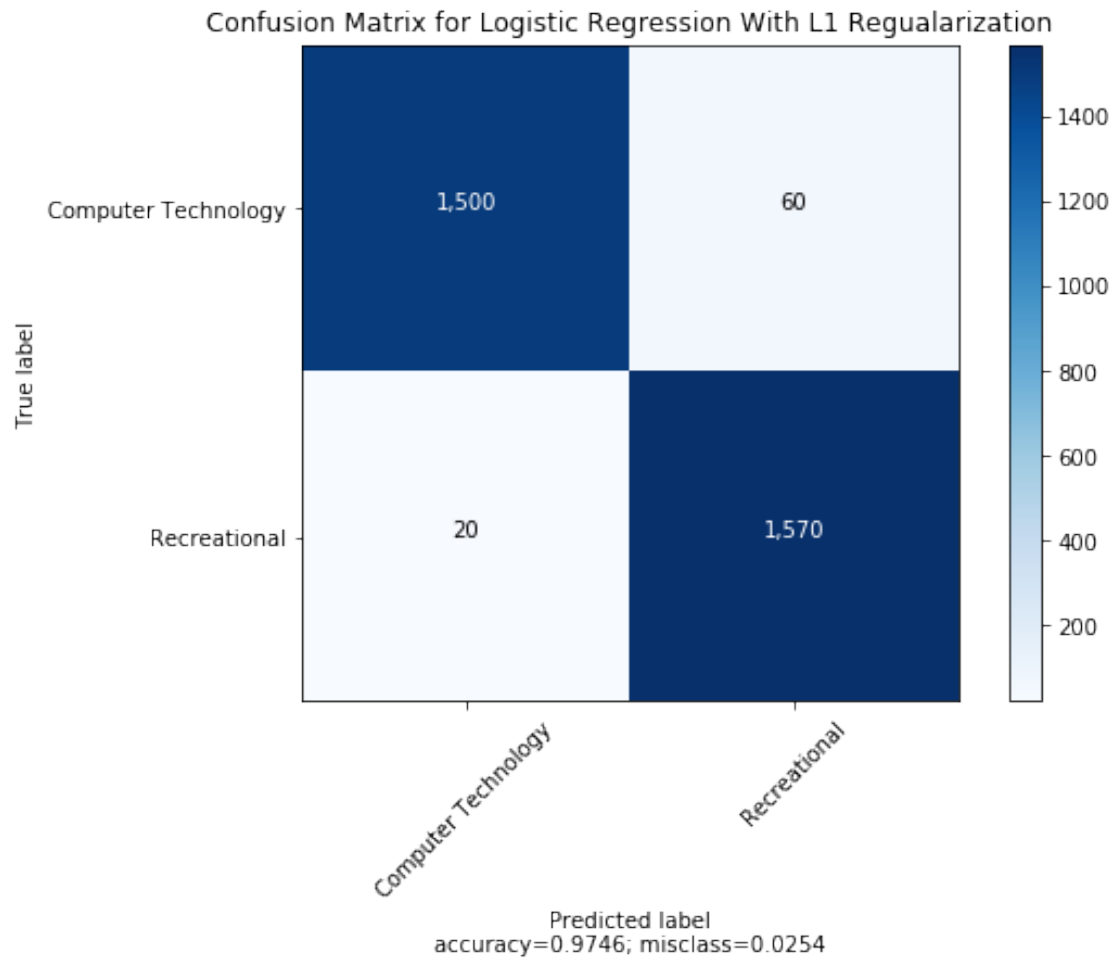
5.0.2 We achieve the best accuracy at the regularization strength of $1/10^2 = 0.01$ while using L2 regularization

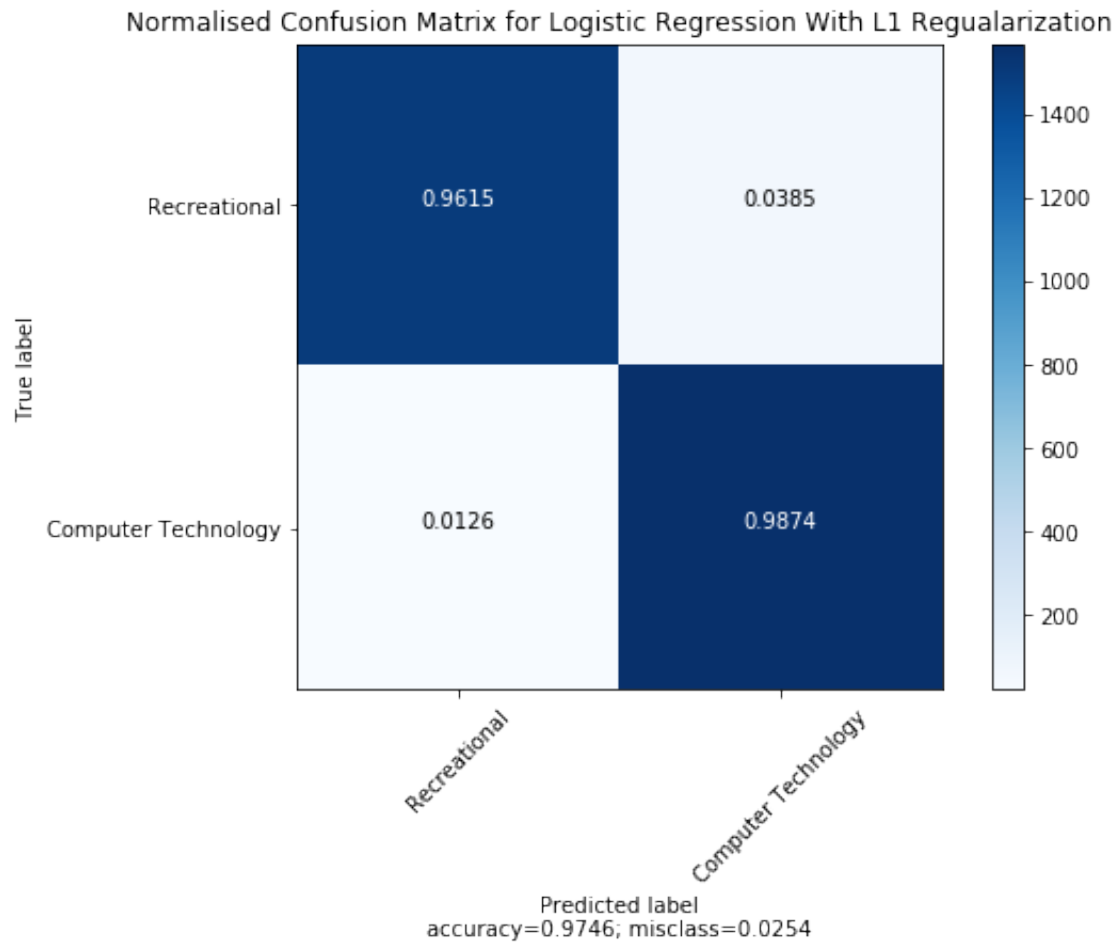
best model selected above

```
[ ]: print(clf_L1.coef_)
```

```
[185]: LR_wL1 = LogisticRegression(penalty='l1',solver='liblinear',C = 10)  
clf_L1 = LR_wL1.fit(X_train_lsi, Y_train)  
EvaluationReport(clf_L1, X_test_lsi, Y_test, '0','Logistic Regression With L1_  
→Regularization')
```

```
[[-8.56e-01  1.07e+02  3.94e+01 -6.00e+01 -2.01e+00  2.47e+01  3.30e+01  
 1.16e+00 -1.37e+00 -2.54e+01 -6.57e+00 -1.25e+01 -6.31e+00  1.75e+01  
 1.74e+01 -1.42e+01  1.18e+01 -3.38e+00 -9.47e+00  6.65e+00  2.22e+01  
 8.03e-02  0.00e+00 -3.53e+00  4.57e+00  1.06e+01 -2.76e+00 -2.24e+00  
-1.11e+00  0.00e+00  3.70e+00  5.89e+00  1.26e+01  1.85e+00  0.00e+00  
-4.72e+00  1.04e+00  0.00e+00 -7.40e+00 -1.41e+00 -8.50e+00 -3.51e+00  
 0.00e+00  3.83e-01 -6.52e+00  0.00e+00  5.37e+00 -1.30e+00  0.00e+00  
-7.81e+00]]
```





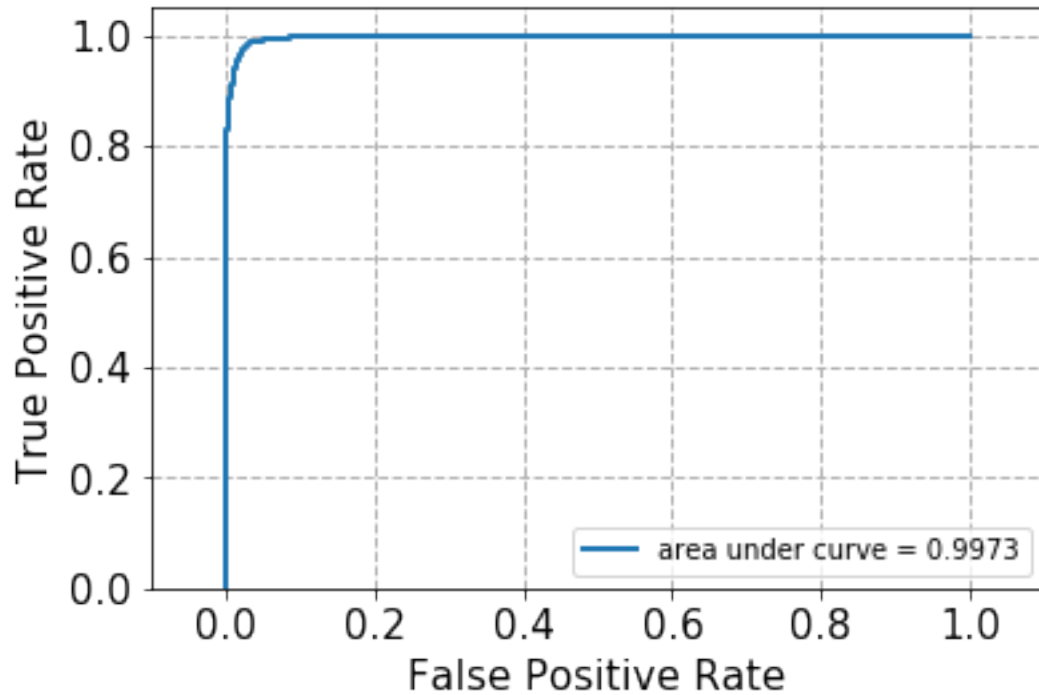
Other Evaluations for Logistic Regression With L1 Regularization

Accuracy = 0.9746

Recall = 0.9874

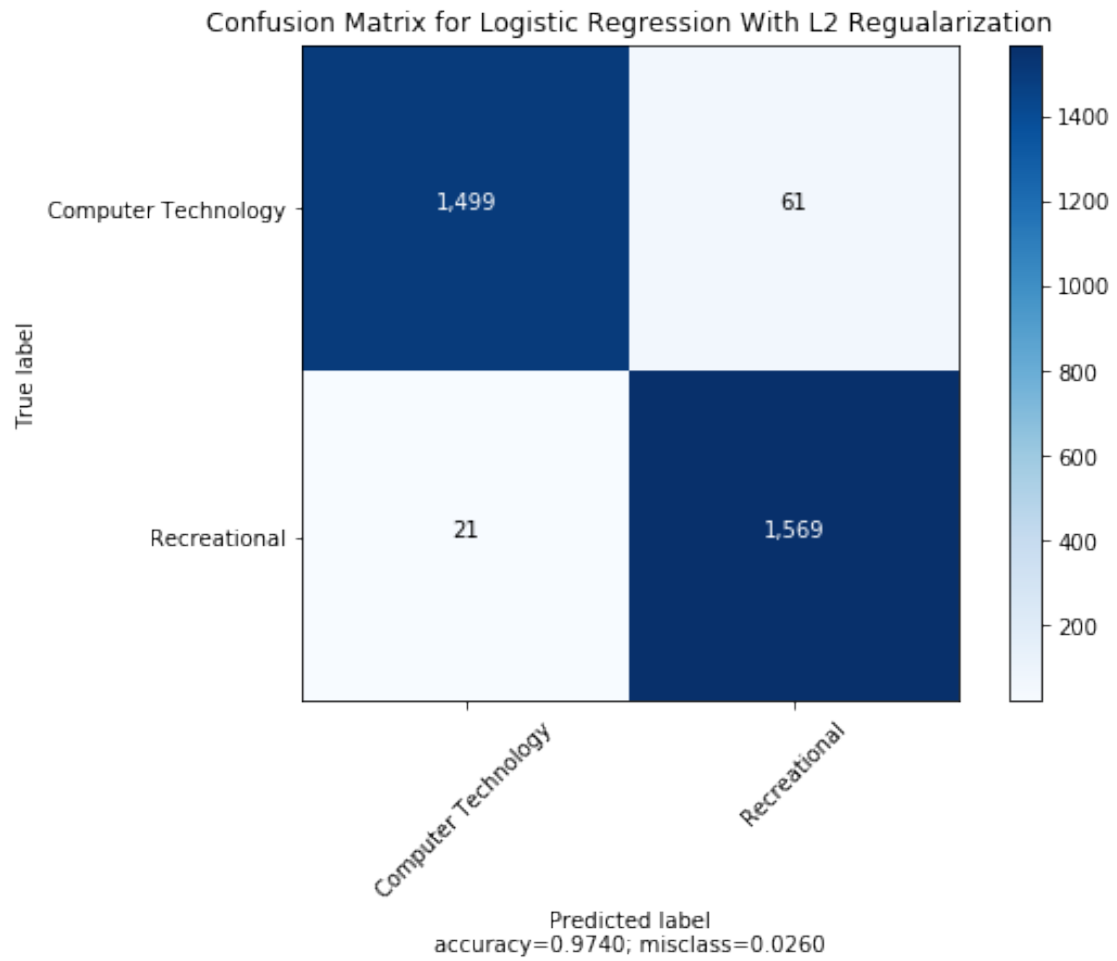
Precision = 0.9632

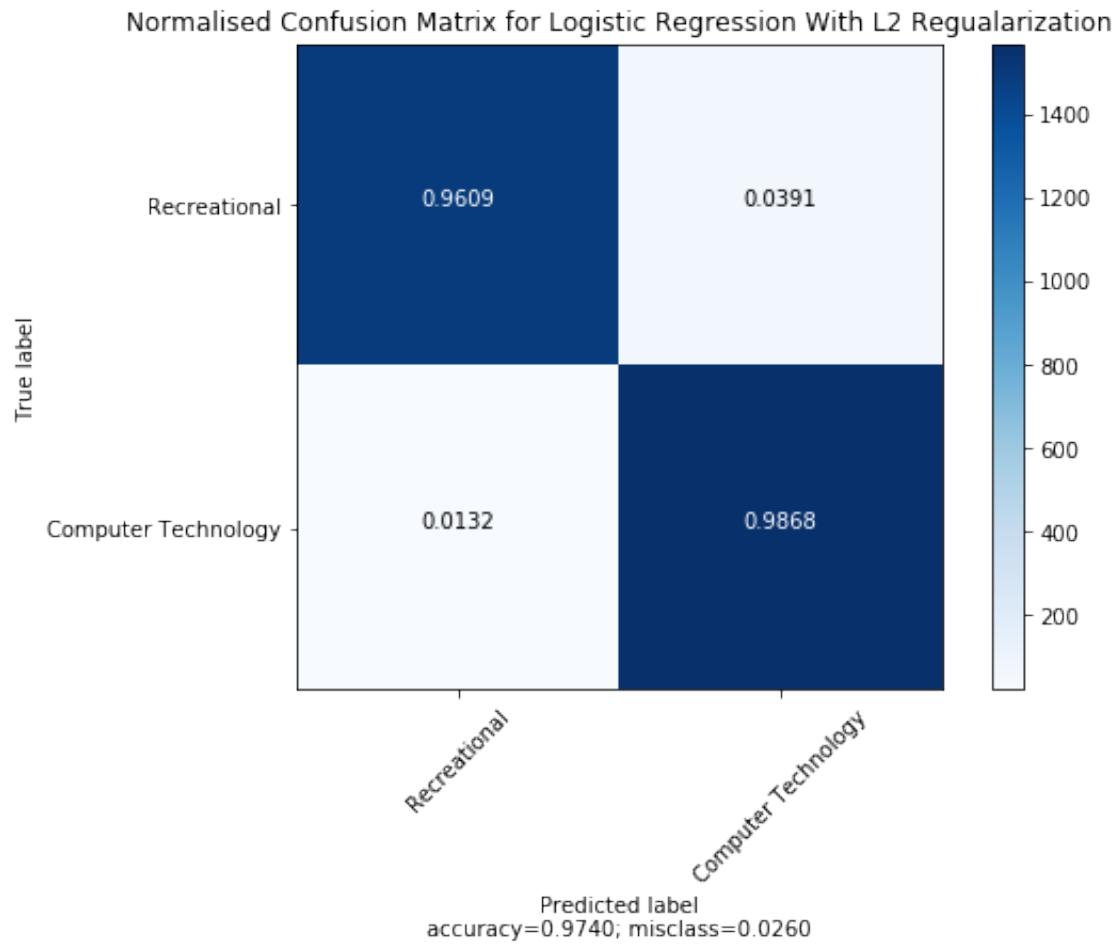
F1_score = 0.9752



```
[186]: LR_wL2 = LogisticRegression(penalty='l2',solver='liblinear',C = 100)
clf_L2 = LR_wL2.fit(X_train_lsi, Y_train)
print(clf_L2.coef_)
EvaluationReport(clf_L2, X_test_lsi, Y_test, '0','Logistic Regression With L2_
→Regularization')
```

```
[[ -1.19  85.11  31.05 -45.66 -0.39  19.97  24.62   1.58 -2.71 -19.73
  -6.43 -8.59 -5.4   14.97  12.37 -10.16  13.4   -7.06 -7.52   6.93
  14.95   2.59 -0.31 -3.46   4.25   8.58  -4.8   -2.53 -1.84  -0.8
    4.05   4.38  10.6   2.56   0.56  -4.8    2.78  -1.55 -5.77  -2.29
  -7.46  -2.93 -0.2   0.86  -4.57   0.72   5.56  -2.89   2.6   -6.6 ]]
```





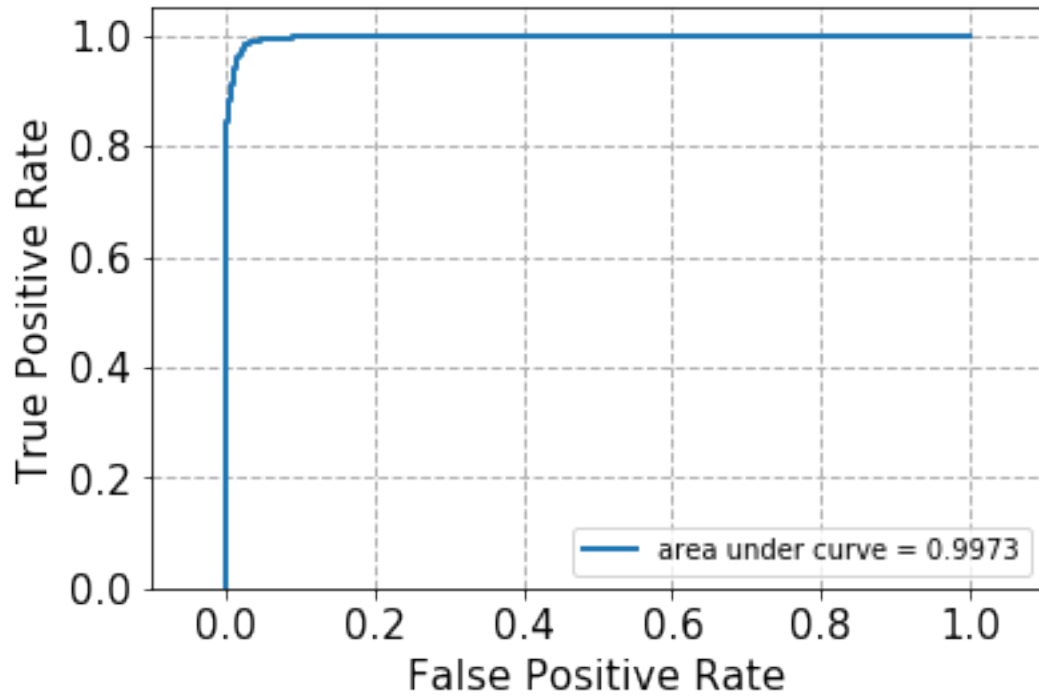
Other Evaluations for Logistic Regression With L2 Regularization

Accuracy = 0.9740

Recall = 0.9868

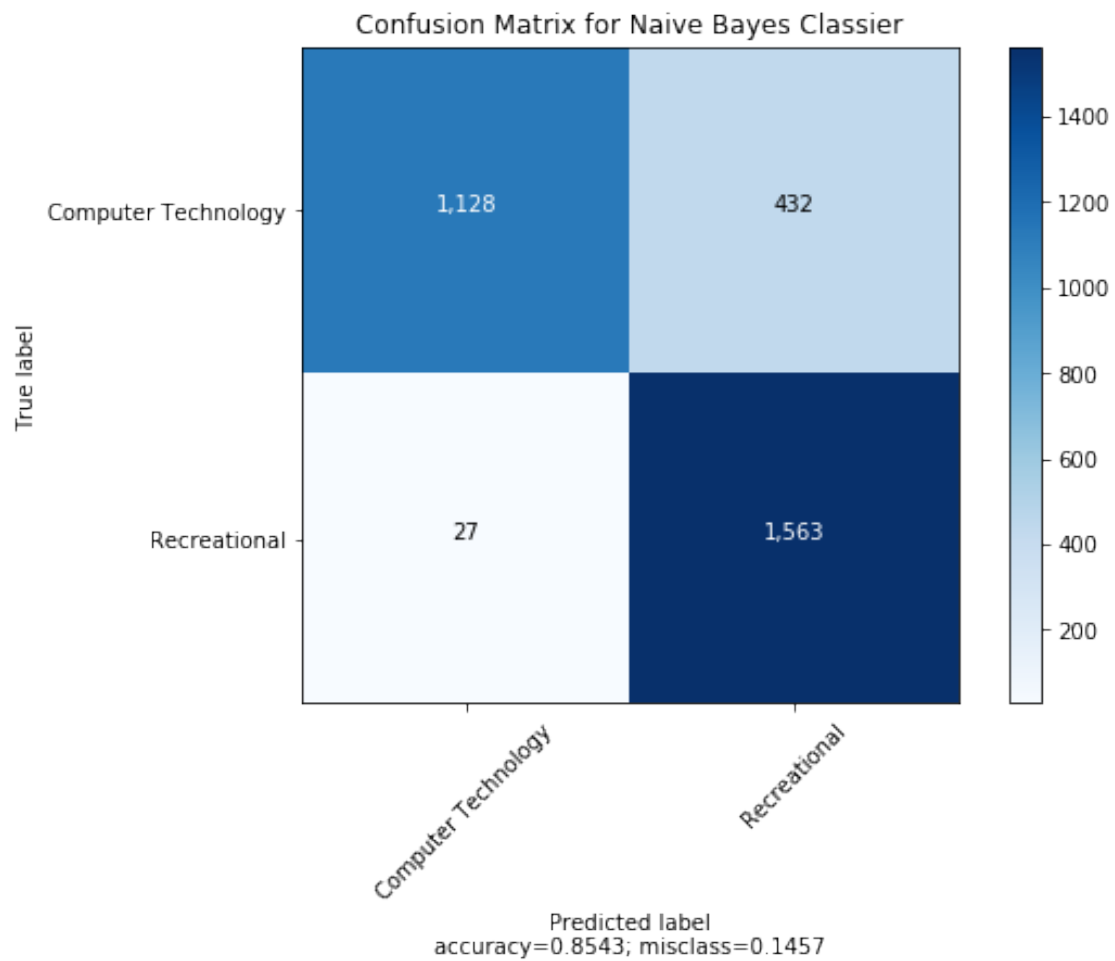
Precision = 0.9626

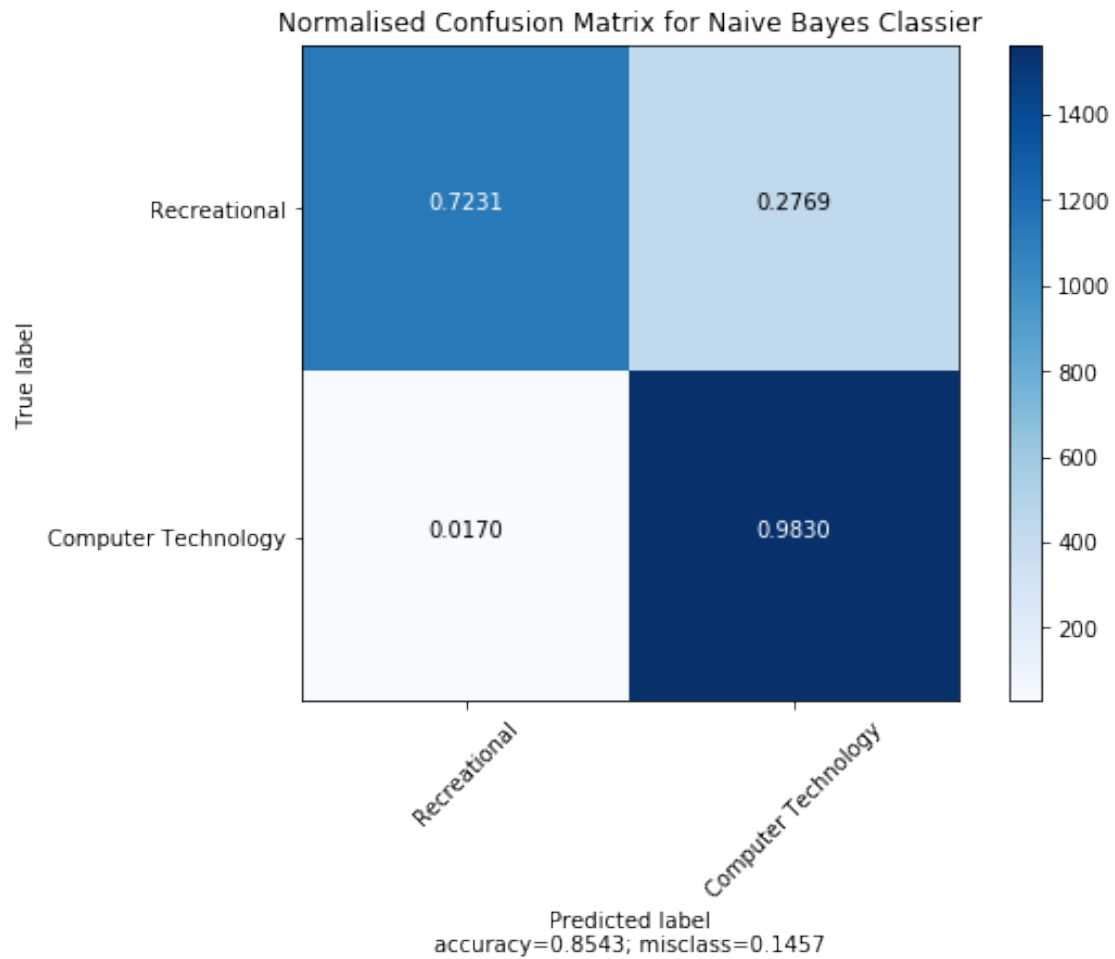
F1_score = 0.9745



6 Question 6 Naive Bayes classifier (XH)

```
[148]: from sklearn.naive_bayes import GaussianNB
clf_NB = GaussianNB().fit(X_train_lsi, Y_train)
EvaluationReport(clf_NB, X_test_lsi, Y_test, '0', 'Naive Bayes Classifier')
```





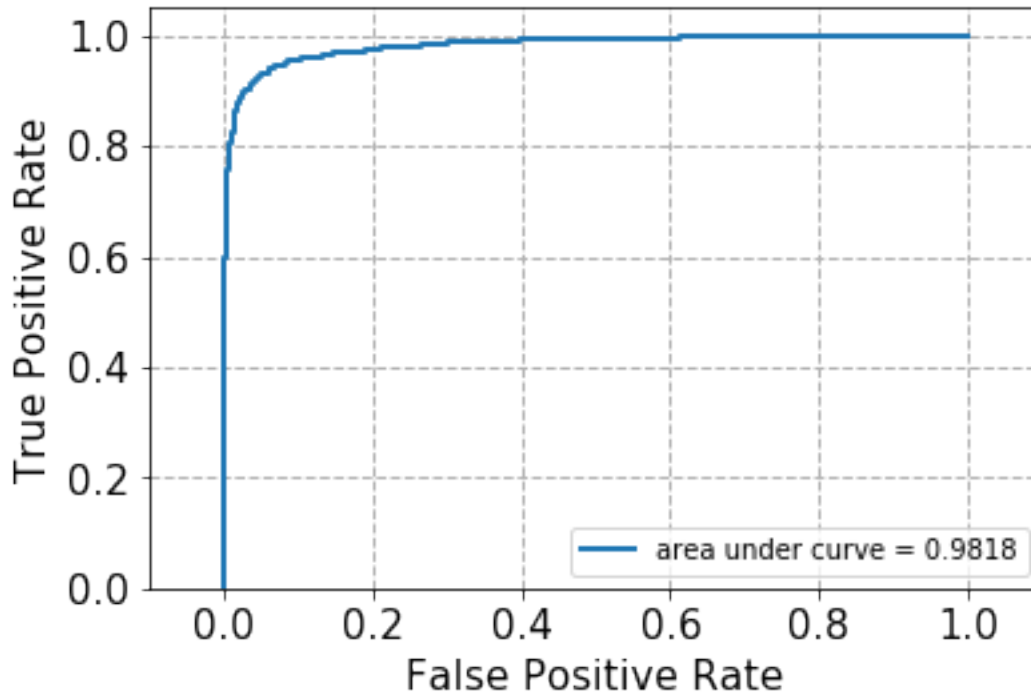
Other Evaluations for Naive Bayes Classifier

Accuracy = 0.8543

Recall = 0.9830

Precision = 0.7835

F1_score = 0.8720



```
[149]: from sklearn.pipeline import Pipeline
pipeline_soft_svc = Pipeline([
    ('feature extraction', CountVectorizer(stop_words='english', min_df=3)),
    ('TF_IDF', TfidfTransformer()),
    ('dim reduction', TruncatedSVD(n_components=k, random_state=42)),
    ('classification', svc_soft)
])
```

7 Question 7 Grid Search of Parameters

```
[150]: #example from discussion
from sklearn.pipeline import Pipeline
pipeline = Pipeline([
    ('vect', CountVectorizer(min_df=1, stop_words='english')),
    ('tfidf', TfidfTransformer()),
    ('reduce_dim', TruncatedSVD(n_components=50, random_state=42)),
    ('clf', GaussianNB()),
])
pipeline.fit(train_dataset.data, train_dataset.target)
predict = pipeline.predict(test_dataset.data)
print("accuracy:{}".format(accuracy_score(test_dataset.target, predict)))
```

accuracy:0.6253968253968254

```
[151]: # preparing data: perform grid search on four different sets of data:
        #1. headremoved, lemmatized
        #2. headremoved, not lemmatized
        #3. head not removed, lemmatized
        #4. head not removed, not lemmatized
train_dataset_headerremoved = fetch_20newsgroups(subset = 'train', categories =_
→categories, shuffle=True,random_state=None, remove=['headers', 'footers'])
test_dataset_headerremoved = fetch_20newsgroups(subset = 'test', categories =_
→categories, shuffle=True,random_state=None, remove=['headers', 'footers'])
```

```
[155]: import re
from nltk.corpus import stopwords
train_dataset_headerremoved_lammed = []
for line in train_dataset_headerremoved.data:
    wordlist = lemmatize_sent_demo(line)
    wordlist_cleaned = [re.sub(r"[\w]", "", word) for word in wordlist]
    removedtrain = [word for word in wordlist_cleaned if word not in stopwords.
→words('english') and not word.isdigit()]
    each_line = " ".join(removedtrain)
    train_dataset_headerremoved_lammed.append(each_line)
```

```
[156]: len(train_dataset_headerremoved_lammed)
```

```
[156]: 4732
```

```
[157]: import numpy as np
import matplotlib.pyplot as plt
from sklearn.model_selection import GridSearchCV
from sklearn.pipeline import Pipeline
from sklearn.svm import LinearSVC
from sklearn.decomposition import TruncatedSVD, NMF
# used to cache results
from tempfile import mkdtemp
from shutil import rmtree
from sklearn.externals.joblib import Memory
# print(__doc__)
cachedir = mkdtemp()
memory = Memory(cachedir=cachedir, verbose=10)

pipeline = Pipeline([
    ('vect', CountVectorizer(min_df=1, stop_words='english')),
    ('tfidf', TfidfTransformer()),
    ('reduce_dim', TruncatedSVD(random_state=42)),
    ('clf', GaussianNB()),
],
memory=memory
)
```



```

#MIN_DF_OPTIONS = [3, 5]      #min_df 3 vs 5
#N_FEATURES_OPTIONS = [50]
#C_OPTIONS = [100]           #SVM with C = 100
#REG_OPTIONS = ['l1', 'l2']   #l1 with 0.1 strength and l2 with 0.01 strength
#REG_STRENGTH_OPTIONS = [0.1, 0.01]

param_grid = [
    {
        'vect': [
            CountVectorizer(min_df=3, stop_words='english'),
            CountVectorizer(min_df=5, stop_words='english'),
        ],
        'reduce_dim': [TruncatedSVD(n_components=50, random_state=42),
                        NMF(n_components=50, init='random', random_state=42)],
        'clf': [SVC(kernel='linear', C=100, random_state=42),
                LogisticRegression(penalty='l1', C=10, random_state=42),
                LogisticRegression(penalty='l2', C=100, random_state=42),
                GaussianNB()]
    ]
]

```

C:\Users\SANDS\Anaconda3\lib\site-packages\ipykernel_launcher.py:13:
DeprecationWarning: The 'cachedir' parameter has been deprecated in version 0.12
and will be removed in version 0.14.
You provided "cachedir='C:\\Users\\SANDS\\AppData\\Local\\Temp\\tmpjb09h9fn'",
use "location='C:\\Users\\SANDS\\AppData\\Local\\Temp\\tmpjb09h9fn'" instead.
del sys.path[0]

```

[163]: # Perform grid search on train_data_lammed, train_dataset,
        ↳train_dataset_headerremoved, train_dataset_headerremoved_lammed
grid = GridSearchCV(pipeline, cv=5, n_jobs=1, param_grid=param_grid,
        ↳scoring='accuracy')
grid.fit(train_dataset.data, Y_train) # with header, no lamm
rmtree(cachedir)

```

```

-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                                dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                                lowercase=True, max_df=1.0, max_features=None, min_df=3,
                                ngram_range=(1, 1), preprocessor=None, stop_words='english',
                                strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                                tokenizer=None, vocabulary=None),

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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'From: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'

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Persisting input arguments took 1.55s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

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n_iter=5, random_state=42,
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_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'From: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Subject: Re: LCIII->PowerPC?\n'

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Persisting input arguments took 1.52s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

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n_iter=5, random_state=42,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.3s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                                dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                                lowercase=True, max_df=1.0, max_features=None, min_df=3,
                                ngram_range=(1, 1), preprocessor=None, stop_words='english',
                                strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                                tokenizer=None, vocabulary=None),
[ 'From: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Subject: Re: LCIII->PowerPC?\n'
  'Reply-To: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'

```

```

'Organization: Pyramid Technologies, Mt. View, California.\n'
'Lines: 34\n'
'\n'
'In article <1qksuq$1tt8@hal.gnu.ai.mit.edu>, mirsky@hal.gnu.ai.mit.edu\n'
'(David Joshua Mirsky) writes:\n'
'|> Hi. I own an LCIII and I recently heard an interesting rumor.\n'
'|> I heard that the LCIII has a built in slot for a PowerPC chip.\n'
'|> Is this true? I heard that the slot is not the same as the PDS\n'
'|> slot. Is that true?\n'
'|> \n'
'|> Thanks\n'
'|> David Mirsky\n'
'|> mirsky@gnu.ai.mit.edu\n'
'\n'
'Well, I...,
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.57s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----_fit_transform_one - 1.5s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3786x17284 sparse matrix of type '<class
'numpy.int64'>'
    with 324758 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.2s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'From: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Subject: Re: LCIII->PowerPC?\n'
  'Reply-To: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Organization: Pyramid Technologies, Mt. View, California.\n'

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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.60s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.5s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x17667 sparse matrix of type '<class
'numpy.int64'>'
    with 330448 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<3787x17667 sparse matrix of type '<class 'numpy.float64'>'
    with 330448 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.3s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'From: whiles@nswc.navy.mil (William Scott Hiles x1568)\n'
  'Subject: Re: Tape Drive Problems\n'
  'Reply-To: whiles@nswc.navy.mil\n'
  'Organization: Naval Surface Warfare Center, Dahlgren Division\n'
  'Lines: 62\n'

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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.2s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'From: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Subject: Re: LCIII->PowerPC?\n'
  'Reply-To: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Organization: Pyramid Technologies, Mt. View, California.\n'
  'Lines: 34\n'
  '\n'

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```

'In article <1qksuq$1tt8@hal.gnu.ai.mit.edu>, mirsky@hal.gnu.ai.mit.edu\n'
'(David Joshua Mirsky) writes:\n'
'|> Hi. I own an LCIII and I recently heard an interesting rumor.\n'
'|> I heard that the LCIII has a built in slot for a PowerPC chip.\n'
'|> Is this true? I heard that the slot is not the same as the PDS\n'
'|> slot. Is that true?\n'
'|> \n'
'|> Thanks\n'
'|> David Mirsky\n'
'|> mirsky@gnu.ai.mit.edu\n'
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<3785x10997 sparse matrix of type '<class 'numpy.float64'>'
    with 304402 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.2s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'From: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Subject: Re: LCIII->PowerPC?\n'
  'Reply-To: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Organization: Pyramid Technologies, Mt. View, California.\n'
  'Lines: 34\n'
  '\n'
  'In article <1qksuq$1tt8@hal.gnu.ai.mit.edu>, mirsky@hal.gnu.ai.mit.edu\n'

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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.05s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----_fit_transform_one - 1.4s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x10961 sparse matrix of type '<class
'numpy.int64'>'
    with 305704 stored elements in Compressed Sparse Row format>,
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-----fit_transform_one - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.2s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'From: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Subject: Re: LCIII->PowerPC?\n'
  'Reply-To: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Organization: Pyramid Technologies, Mt. View, California.\n'
  'Lines: 34\n'
  '\n'
  'In article <1qksuq$1tt8@hal.gnu.ai.mit.edu>, mirsky@hal.gnu.ai.mit.edu\n'
  '(David Joshua Mirsky) writes:\n'

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None, message_clsname='Pipeline', message=None)
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
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-----fit_transform_one - 0.2s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'From: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Subject: Re: LCIII->PowerPC?\n'
  'Reply-To: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Organization: Pyramid Technologies, Mt. View, California.\n'
  'Lines: 34\n'
  '\n'
  'In article <1qksuq$1tt8@hal.gnu.ai.mit.edu>, mirsky@hal.gnu.ai.mit.edu\n'
  '(David Joshua Mirsky) writes:\n'
  '|> Hi. I own an LCIII and I recently heard an interesting rumor.\n'

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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.09s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----_fit_transform_one - 1.4s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x11185 sparse matrix of type '<class
'numpy.int64'>'
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_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
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None, message_clsname='Pipeline', message=None)
-----_fit_transform_one - 0.2s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\a5505fd9c2251
4f66f4727620a45d55d
-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\a71ca6596110c
ade752c6d8b68917a26
-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3785x17497 sparse matrix of type '<class 'numpy.float64'>'
    with 329496 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\d690af9ef4082
21627c2b27a2e19b8c3
-----fit_transform_one cache loaded - 0.2s, 0.0min

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[Memory]0.2s, 0.0min      : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\78293fa99d54e
64e9d95fc96f485570f
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2335ce5bcabf6
4e262c3742dcfaa5249
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\953e3cbcbf0b4
c56584fc5db80cdddd4
-----fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\f36216b68e0af
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\e9c0ced997e64
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\74e04ae2f2a95
e1ca6be7ab6c945ed05
-----fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\dca88290e1265
14b5789aeae38e4cc10
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 10.3s, 0.2min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2ffac9719cf55
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-----fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\717abacb3dd07
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[Memory] Calling sklearn.pipeline._fit_transform_one...

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ade752c6d8b68917a26
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880c27e5eca445b7557
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
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FutureWarning)
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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-----_fit_transform_one cache loaded - 0.2s, 0.0min
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.3s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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40683aa6e3ff463ae18
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
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FutureWarning)
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2335ce5bcabf6
4e262c3742dcfaa5249
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\d80d410fad9ec
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42f46cb9a77d2c79cbc

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dde8596fd89e8b49b1d

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e1ca6be7ab6c945ed05

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c6bc86d295b02304c22

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c56584fc5db80cdddd4

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.3s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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c5d5342f93d8c0785b2

-----_fit_transform_one cache loaded - 0.0s, 0.0min
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0608b2f480fa02f570a

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85951fe9bd6f3eab588

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42f46cb9a77d2c79cbc

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634ca92adf3642450c2

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-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\dca88290e1265
14b5789aeae38e4cc10

-----_fit_transform_one cache loaded - 0.0s, 0.0min
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\50c80eb7f0473
794758367a332da01f3

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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df0b06822b493525435

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\7d63eb7e1f474
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\556a60e6e91d8
d4a072b058c775f4f87

-----_fit_transform_one cache loaded - 0.0s, 0.0min
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da433d9cd5d3b718dbd

-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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e5bb70d6e67c33fb8b5

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\1d411ddd881b1
9411f4c2f22e5ec7f77

-----_fit_transform_one cache loaded - 0.0s, 0.0min

[Memory] Calling sklearn.pipeline._fit_transform_one...

```

_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                                dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                                lowercase=True, max_df=1.0, max_features=None, min_df=3,
                                ngram_range=(1, 1), preprocessor=None, stop_words='english',
                                strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                                tokenizer=None, vocabulary=None),
[ 'From: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Subject: Re: LCIII->PowerPC?\n'
  'Reply-To: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Organization: Pyramid Technologies, Mt. View, California.\n'
  'Lines: 34\n'
  '\n'
  'In article <1qksuq$1tt8@hal.gnu.ai.mit.edu>, mirsky@hal.gnu.ai.mit.edu\n'
  '(David Joshua Mirsky) writes:\n'
  '|> Hi. I own an LCIII and I recently heard an interesting rumor.\n'
  '|> I heard that the LCIII has a built in slot for a PowerPC chip.\n'
  '|> Is this true? I heard that the slot is not the same as the PDS\n'
  '|> slot. Is that true?\n'
  '|> \n'
  '|> Thanks\n'
  '|> David Mirsky\n'
  '|> mirsky@gnu.ai.mit.edu\n'
  '\n'
  'Well, I...,
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None, message_clsname='Pipeline', message=None)
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.75s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.8s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <4732x20297 sparse matrix of type '<class
'numpy.int64'>'
    with 415953 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<4732x20297 sparse matrix of type '<class 'numpy.float64'>'
    with 415953 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.4s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a

```

```
solver to silence this warning.
FutureWarning)
```

```
[164]: #1. w header, w/o lemm
#2. w/o header, w/o lemm
#3. w header, w lemm
#4. w/o header w lemm
import pandas as pd
result_1 = pd.DataFrame(grid.cv_results_)
result_1
```

```
[164]:
```

	mean_fit_time	std_fit_time	mean_score_time	std_score_time	\
0	3.771753	0.032689	0.172963	0.008714	
1	3.007568	0.027346	0.163376	0.009291	
2	15.234007	0.385409	0.226701	0.007068	
3	10.515221	0.997927	0.219014	0.003129	
4	0.418923	0.010548	0.157154	0.003366	
5	0.395370	0.035204	0.162521	0.016326	
6	0.393174	0.025245	0.193597	0.005284	
7	0.339742	0.008382	0.187472	0.008539	
8	0.383201	0.003799	0.153596	0.004389	
9	0.339707	0.008669	0.153177	0.007882	
10	0.373826	0.010660	0.195052	0.007033	
11	0.335123	0.010622	0.184294	0.006967	
12	0.345078	0.012199	0.150970	0.002785	
13	0.298588	0.004301	0.147001	0.003930	
14	0.356578	0.010089	0.193786	0.005826	
15	0.313582	0.009934	0.182662	0.005293	

	param_clf	\
0	SVC(C=100, cache_size=200, class_weight=None, ...	
1	SVC(C=100, cache_size=200, class_weight=None, ...	
2	SVC(C=100, cache_size=200, class_weight=None, ...	
3	SVC(C=100, cache_size=200, class_weight=None, ...	
4	LogisticRegression(C=10, class_weight=None, du...	
5	LogisticRegression(C=10, class_weight=None, du...	
6	LogisticRegression(C=10, class_weight=None, du...	
7	LogisticRegression(C=10, class_weight=None, du...	
8	LogisticRegression(C=100, class_weight=None, d...	
9	LogisticRegression(C=100, class_weight=None, d...	
10	LogisticRegression(C=100, class_weight=None, d...	
11	LogisticRegression(C=100, class_weight=None, d...	
12	GaussianNB(priors=None, var_smoothing=1e-09)	
13	GaussianNB(priors=None, var_smoothing=1e-09)	
14	GaussianNB(priors=None, var_smoothing=1e-09)	
15	GaussianNB(priors=None, var_smoothing=1e-09)	

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                                param_reduce_dim \
0  TruncatedSVD(algorithm='randomized', n_compone...
1  TruncatedSVD(algorithm='randomized', n_compone...
2  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
3  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
4  TruncatedSVD(algorithm='randomized', n_compone...
5  TruncatedSVD(algorithm='randomized', n_compone...
6  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
7  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
8  TruncatedSVD(algorithm='randomized', n_compone...
9  TruncatedSVD(algorithm='randomized', n_compone...
10 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
11 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
12 TruncatedSVD(algorithm='randomized', n_compone...
13 TruncatedSVD(algorithm='randomized', n_compone...
14 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
15 NMF(alpha=0.0, beta_loss='frobenius', init='ra...

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                                param_vect \
0  CountVectorizer(analyzer='word', binary=False,...
1  CountVectorizer(analyzer='word', binary=False,...
2  CountVectorizer(analyzer='word', binary=False,...
3  CountVectorizer(analyzer='word', binary=False,...
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11 CountVectorizer(analyzer='word', binary=False,...
12 CountVectorizer(analyzer='word', binary=False,...
13 CountVectorizer(analyzer='word', binary=False,...
14 CountVectorizer(analyzer='word', binary=False,...
15 CountVectorizer(analyzer='word', binary=False,...

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                                params  split0_test_score \
0  {'clf': SVC(C=100, cache_size=200, class_weigh...  0.969377
1  {'clf': SVC(C=100, cache_size=200, class_weigh...  0.969377
2  {'clf': SVC(C=100, cache_size=200, class_weigh...  0.959873
3  {'clf': SVC(C=100, cache_size=200, class_weigh...  0.966209
4  {'clf': LogisticRegression(C=10, class_weight=...  0.969377
5  {'clf': LogisticRegression(C=10, class_weight=...  0.970433
6  {'clf': LogisticRegression(C=10, class_weight=...  0.960929
7  {'clf': LogisticRegression(C=10, class_weight=...  0.966209
8  {'clf': LogisticRegression(C=100, class_weight...  0.970433
9  {'clf': LogisticRegression(C=100, class_weight...  0.967265

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10 {'clf': LogisticRegression(C=100, class_weight...      0.953537
11 {'clf': LogisticRegression(C=100, class_weight...      0.960929
12 {'clf': GaussianNB(priors=None, var_smoothing=...      0.918691
13 {'clf': GaussianNB(priors=None, var_smoothing=...      0.910243
14 {'clf': GaussianNB(priors=None, var_smoothing=...      0.930306
15 {'clf': GaussianNB(priors=None, var_smoothing=...      0.940866

```

	split1_test_score	split2_test_score	split3_test_score \
0	0.975713	0.978881	0.968288
1	0.976769	0.975713	0.973573
2	0.963041	0.961985	0.966173
3	0.961985	0.964097	0.966173
4	0.975713	0.976769	0.969345
5	0.975713	0.978881	0.970402
6	0.968321	0.967265	0.965116
7	0.960929	0.965153	0.965116
8	0.976769	0.977825	0.972516
9	0.973601	0.975713	0.972516
10	0.963041	0.957761	0.965116
11	0.961985	0.963041	0.965116
12	0.917635	0.931362	0.854123
13	0.919747	0.906019	0.923890
14	0.937698	0.944034	0.945032
15	0.937698	0.940866	0.933404

	split4_test_score	mean_test_score	std_test_score	rank_test_score
0	0.979894	0.974429	0.004786	4
1	0.978836	0.974852	0.003222	3
2	0.973545	0.964920	0.004764	10
3	0.972487	0.966188	0.003512	8
4	0.979894	0.974218	0.004198	5
5	0.979894	0.975063	0.004037	2
6	0.970370	0.966399	0.003218	7
7	0.969312	0.965342	0.002686	9
8	0.980952	0.975697	0.003771	1
9	0.979894	0.973795	0.004127	6
10	0.974603	0.962806	0.007152	12
11	0.971429	0.964497	0.003729	11
12	0.922751	0.908918	0.027814	16
13	0.936508	0.919273	0.010729	15
14	0.955556	0.942519	0.008376	13
15	0.957672	0.942096	0.008248	14

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[165]: grid.fit(train_dataset_headerremoved.data, Y_train) #2. w/o header, w/o lemm
rmtree(cachedir)

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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.23s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.2s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x14213 sparse matrix of type '<class
'numpy.int64'>'
      with 237351 stored elements in Compressed Sparse Row format>,
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-----fit_transform_one - 0.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<3785x14213 sparse matrix of type '<class 'numpy.float64'>'
    with 237351 stored elements in Compressed Sparse Row format>,
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-----fit_transform_one - 0.2s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...

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-----fit_transform_one - 0.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<3785x14794 sparse matrix of type '<class 'numpy.float64'>'
    with 240228 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.2s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,

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ngram_range=(1, 1), preprocessor=None, stop_words='english',
strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
tokenizer=None, vocabulary=None),
[ 'Hi, maybe someone can help me here...\n'
'I am looking to buy this 1990 Nissan Maxima GXE for CDN$14000 right now.\n'
'The car has 96000 km (or about 60000 miles) on it.\n'
'A typical mileage for 1990 cars seem to be about 70000 km (or about 43K '
'mi).\n'
'The seller just informed me that when he brought the car in for '
'certification\n'
'he was told that the front break pads and the exhausts had to be replaced\n'
'to meet the legal standards. (He said he will replace the components '
'before\n'
'selling the car to me.)\n'
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"Being completely ignorant to the technical stuff on cars, I don't know\n"
'what this could mean...\n'
'Is 96K km about the time typ...,
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.25s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----_fit_transform_one - 1.2s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x14531 sparse matrix of type '<class
'numpy.int64'>'
    with 242171 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<3785x14531 sparse matrix of type '<class 'numpy.float64'>'
with 242171 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.2s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'Hi, maybe someone can help me here...\n'

```

'I am looking to buy this 1990 Nissan Maxima GXE for CDN\$14000 right now.\n'
 'The car has 96000 km (or about 60000 miles) on it.\n'
 'A typical mileage for 1990 cars seem to be about 70000 km (or about 43K '
 'mi).\n'
 'The seller just informed me that when he brought the car in for '
 'certification\n'
 'he was told that the front break pads and the exhausts had to be replaced\n'
 'to meet the legal standards. (He said he will replace the components '
 'before\n'
 'selling the car to me.)\n'
 '\n'
 "Being copmletely ignorant to the technical stuff on cars, I don't know\n"
 'what this could mean...\n'
 'Is 96K km about the time typ...,

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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.24s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.1s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3786x14662 sparse matrix of type '<class
'numpy.int64'>'
    with 240643 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<3786x14662 sparse matrix of type '<class 'numpy.float64'>'
    with 240643 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.2s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'Hi, maybe someone can help me here...\n'
  'I am looking to buy this 1990 Nissan Maxima GXE for CDN$14000 right now.\n'
  'The car has 96000 km (or about 60000 miles) on it.\n'
  'A typical mileage for 1990 cars seem to be about 70000 km (or about 43K '
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.29s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.2s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x14978 sparse matrix of type '<class
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      with 243511 stored elements in Compressed Sparse Row format>,
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_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'hi all,\n'
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'IN SHORT: looking for very fast assembly code for line/circle drawing\n'
'\t on SVGA graphics.\n'
'\n'
'COMPLETE:\n'
'\tI am thinking of a simple but fast molecular\n'
'graphics program to write on PC or clones. (ball-and-stick type)\n'
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None, message_clsname='Pipeline', message=None)
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
['Hi, maybe someone can help me here...\n'
'I am looking to buy this 1990 Nissan Maxima GXE for CDN$14000 right now.\n'
'The car has 96000 km (or about 60000 miles) on it.\n'
'A typical mileage for 1990 cars seem to be about 70000 km (or about 43K '
'mi).\n'
'The seller just informed me that when he brought the car in for '
'certification\n'
'he was told that the front break pads and the exhausts had to be replaced\n'
'to meet the legal standards. (He said he will replace the components '
'before\n']
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'selling the car to me.)\n'
'\n'
"Being completely ignorant to the technical stuff on cars, I don't know\n"
'what this could mean...\n'
'Is 96K km about the time typ...',
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.90s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----_fit_transform_one - 1.1s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x9161 sparse matrix of type '<class
'numpy.int64'>'
    with 221249 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
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    with 221249 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.1s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'Hi, maybe someone can help me here...\n'
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  'A typical mileage for 1990 cars seem to be about 70000 km (or about 43K '
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  'he was told that the front break pads and the exhausts had to be replaced\n'
  'to meet the legal standards. (He said he will replace the components '
  'before\n'
  'selling the car to me.)\n'
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  "Being completely ignorant to the technical stuff on cars, I don't know\n"
  'what this could mean...\n'

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`**fit_params_steps[name])`

-----_fit_transform_one - 1.1s, 0.0min

[Memory] Calling sklearn.pipeline._fit_transform_one...

_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x9123 sparse matrix of type '<class
'numpy.int64'>'

with 223930 stored elements in Compressed Sparse Row format>,

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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
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                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
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                        tokenizer=None, vocabulary=None),
[ 'Hi, maybe someone can help me here...\n'
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  'The seller just informed me that when he brought the car in for '
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  'he was told that the front break pads and the exhausts had to be replaced\n'
  'to meet the legal standards. (He said he will replace the components '
  'before\n'
  'selling the car to me.)\n'
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  "Being completely ignorant to the technical stuff on cars, I don't know\n"
  'what this could mean...\n'
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.79s to run.
If this happens often in your code, it can cause performance problems

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**fit_params_steps[name])
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-----fit_transform_one - 1.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
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_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,  
sublinear_tf=False, use_idf=True), <3786x8951 sparse matrix of type '<class  
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with 221395 stored elements in Compressed Sparse Row format>,
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...
None, message_clsname='Pipeline', message=None)
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.92s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).

```

THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an example so that they can fix the problem.

```
**fit_params_steps[name])
```

```
-----_fit_transform_one - 1.1s, 0.0min
```

```
-----  
[Memory] Calling sklearn.pipeline._fit_transform_one...
```

```
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,  
sublinear_tf=False, use_idf=True), <3787x9266 sparse matrix of type '<class  
'numpy.int64'>'
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with 224282 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 7.0s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\65511296968a6
5fed14ec04b40c9674a
-----fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\29fc85ce57e3b
86c2eb89ce15067d538
-----fit_transform_one cache loaded - 0.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3785x14794 sparse matrix of type '<class 'numpy.float64'>'
    with 240228 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 8.4s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\ef82852815e42

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```
-----_fit_transform_one cache loaded - 0.1s, 0.0min  
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\LocalTemp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\73b0a8281607e  
eeeff5e30cf06a6d405
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...  
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',  
l1_ratio=0.0, max_iter=200,  
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,  
    verbose=0),
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<3785x14531 sparse matrix of type '<class 'numpy.float64'>'
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    with 242171 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----_fit_transform_one - 10.4s, 0.2min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\97f559255d22f
638f864e6530338a459
-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\f1686add54b27
5a9e3f4757ecea30882
-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3786x14662 sparse matrix of type '<class 'numpy.float64'>'
    with 240643 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 12.1s, 0.2min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\be287e355ee0e
1a39d3bb0085abdfef
-----fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\be2e7c1f22a06
61a8c14261aeeb39690
-----fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3787x14978 sparse matrix of type '<class 'numpy.float64'>'
    with 243511 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 11.8s, 0.2min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\144173d441323
be319863fcec543cbfc
-----fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData

```

\\Local\\Temp\\tmpjb09h9fn\\joblib\\sklearn\\pipeline_fit_transform_one\\a278354b0af60a7867af78664116c834

```
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
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with 219720 stored elements in Compressed Sparse Row format>
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None, message_clsname='Pipeline', message=None)
-----_fit_transform_one - 8.7s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\9dc13b3185c48
12dfdf83193f26d896a
-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\74bf5502304ce
ebc7ab1472ef9de38bc
-----_fit_transform_one cache loaded - 0.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3785x9161 sparse matrix of type '<class 'numpy.float64'>'
    with 221249 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----_fit_transform_one - 8.9s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\3b91fe9d019ba
c69839629fb311e962b
-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\62464a1f43a6d
1695e64d65685aac382
-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3785x9123 sparse matrix of type '<class 'numpy.float64'>'
    with 223930 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 7.8s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\9954b6001e8d7
f6b9bfcd5755e88632a
-----fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\fa7fc4e3334d1
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-----fit_transform_one cache loaded - 0.0s, 0.0min

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-----_fit_transform_one - 8.9s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\882104738f869
998601cd248a6353b11
-----_fit_transform_one cache loaded - 0.0s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
    FutureWarning)

[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\65511296968a6
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\5ebd427487af0e1624ead7a04dc05307

-----_fit_transform_one cache loaded - 0.0s, 0.0min

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\ef82852815e42
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
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-----_fit_transform_one cache loaded - 0.0s, 0.0min

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
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FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a  
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:  
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:  
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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709a6b792ba0c53cc39
-----_fit_transform_one cache loaded - 0.0s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:

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FutureWarning)

[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\97f559255d22f638f864e6530338a459

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-----_fit_transform_one cache loaded - 0.0s, 0.0min

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:

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FutureWarning)

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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:

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FutureWarning)

[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\144173d441323be319863fcec543cbfc

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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
FutureWarning)
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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FutureWarning)

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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\b\w+\b',
                        tokenizer=None, vocabulary=None),
[ 'Hi, maybe someone can help me here...\n'
  'I am looking to buy this 1990 Nissan Maxima GXE for CDN$14000 right now.\n'

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'The car has 96000 km (or about 60000 miles) on it.\n'
'A typical mileage for 1990 cars seem to be about 70000 km (or about 43K '
'mi).\n'
'The seller just informed me that when he brought the car in for '
'certification\n'
'he was told that the front break pads and the exhausts had to be replaced\n'
'to meet the legal standards. (He said he will replace the components '
'before\n'
'selling the car to me.)\n'
'\n'
"Being completely ignorant to the technical stuff on cars, I don't know\n"
'what this could mean...\n'
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.48s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.5s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <4732x17131 sparse matrix of type '<class
'numpy.int64'>'
    with 306546 stored elements in Compressed Sparse Row format>,
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-----fit_transform_one - 0.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<4732x17131 sparse matrix of type '<class 'numpy.float64'>'
    with 306546 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.2s, 0.0min

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[166]: result_2 = pd.DataFrame(grid.cv_results_)
result_2
```

```
[166]:
```

	mean_fit_time	std_fit_time	mean_score_time	std_score_time	\
0	3.844841	0.061279	0.235802	0.006559	
1	3.267063	0.078313	0.234798	0.003369	
2	11.024493	1.967220	0.281552	0.004961	
3	9.689156	0.465397	0.274591	0.009514	
4	0.353852	0.016673	0.122453	0.007054	
5	0.317563	0.017081	0.120272	0.006853	
6	0.325969	0.007741	0.146974	0.006231	
7	0.293053	0.013539	0.140990	0.007843	
8	0.320153	0.004879	0.120452	0.006480	

9	0.285453	0.012241	0.118087	0.007328
10	0.327768	0.006977	0.146106	0.007130
11	0.285856	0.011577	0.140317	0.007951
12	0.297607	0.008889	0.121867	0.004950
13	0.254133	0.007942	0.118876	0.007740
14	0.308582	0.017357	0.147404	0.006993
15	0.275675	0.005151	0.141403	0.007060

```

                                param_clf \
0  SVC(C=100, cache_size=200, class_weight=None, ...
1  SVC(C=100, cache_size=200, class_weight=None, ...
2  SVC(C=100, cache_size=200, class_weight=None, ...
3  SVC(C=100, cache_size=200, class_weight=None, ...
4  LogisticRegression(C=10, class_weight=None, du...
5  LogisticRegression(C=10, class_weight=None, du...
6  LogisticRegression(C=10, class_weight=None, du...
7  LogisticRegression(C=10, class_weight=None, du...
8  LogisticRegression(C=100, class_weight=None, d...
9  LogisticRegression(C=100, class_weight=None, d...
10 LogisticRegression(C=100, class_weight=None, d...
11 LogisticRegression(C=100, class_weight=None, d...
12     GaussianNB(priors=None, var_smoothing=1e-09)
13     GaussianNB(priors=None, var_smoothing=1e-09)
14     GaussianNB(priors=None, var_smoothing=1e-09)
15     GaussianNB(priors=None, var_smoothing=1e-09)

```

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                                param_reduce_dim \
0  TruncatedSVD(algorithm='randomized', n_compone...
1  TruncatedSVD(algorithm='randomized', n_compone...
2  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
3  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
4  TruncatedSVD(algorithm='randomized', n_compone...
5  TruncatedSVD(algorithm='randomized', n_compone...
6  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
7  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
8  TruncatedSVD(algorithm='randomized', n_compone...
9  TruncatedSVD(algorithm='randomized', n_compone...
10 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
11 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
12 TruncatedSVD(algorithm='randomized', n_compone...
13 TruncatedSVD(algorithm='randomized', n_compone...
14 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
15 NMF(alpha=0.0, beta_loss='frobenius', init='ra...

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                                param_vect \
0  CountVectorizer(analyzer='word', binary=False,...
1  CountVectorizer(analyzer='word', binary=False,...

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2 CountVectorizer(analyzer='word', binary=False,...
3 CountVectorizer(analyzer='word', binary=False,...
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13 CountVectorizer(analyzer='word', binary=False,...
14 CountVectorizer(analyzer='word', binary=False,...
15 CountVectorizer(analyzer='word', binary=False,...

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	params	split0_test_score \
0	{'clf': SVC(C=100, cache_size=200, class_weigh...	0.483633
1	{'clf': SVC(C=100, cache_size=200, class_weigh...	0.488912
2	{'clf': SVC(C=100, cache_size=200, class_weigh...	0.493136
3	{'clf': SVC(C=100, cache_size=200, class_weigh...	0.494192
4	{'clf': LogisticRegression(C=10, class_weight=...	0.483633
5	{'clf': LogisticRegression(C=10, class_weight=...	0.476241
6	{'clf': LogisticRegression(C=10, class_weight=...	0.476241
7	{'clf': LogisticRegression(C=10, class_weight=...	0.486800
8	{'clf': LogisticRegression(C=100, class_weight...	0.485744
9	{'clf': LogisticRegression(C=100, class_weight...	0.480465
10	{'clf': LogisticRegression(C=100, class_weight...	0.481521
11	{'clf': LogisticRegression(C=100, class_weight...	0.492080
12	{'clf': GaussianNB(priors=None, var_smoothing=...	0.504752
13	{'clf': GaussianNB(priors=None, var_smoothing=...	0.485744
14	{'clf': GaussianNB(priors=None, var_smoothing=...	0.495248
15	{'clf': GaussianNB(priors=None, var_smoothing=...	0.493136

	split1_test_score	split2_test_score	split3_test_score \
0	0.507920	0.499472	0.508457
1	0.502640	0.503696	0.495772
2	0.469905	0.504752	0.479915
3	0.488912	0.511088	0.485201
4	0.506864	0.512144	0.483087
5	0.485744	0.510032	0.493658
6	0.498416	0.499472	0.497886
7	0.488912	0.488912	0.491543
8	0.496304	0.517423	0.479915
9	0.491024	0.505808	0.496829
10	0.489968	0.506864	0.496829
11	0.481521	0.489968	0.496829
12	0.497360	0.494192	0.490486

13	0.488912	0.484688	0.476744
14	0.491024	0.486800	0.473573
15	0.484688	0.460401	0.471459

	split4_test_score	mean_test_score	std_test_score	rank_test_score
0	0.488889	0.497675	0.009988	1
1	0.497354	0.497675	0.005320	1
2	0.484656	0.486475	0.011830	13
3	0.496296	0.495139	0.008880	4
4	0.492063	0.495562	0.011943	3
5	0.484656	0.490068	0.011410	9
6	0.476190	0.489645	0.010973	10
7	0.475132	0.486264	0.005760	14
8	0.496296	0.495139	0.012803	4
9	0.485714	0.491970	0.008805	7
10	0.477249	0.490490	0.010623	8
11	0.486772	0.489434	0.005132	11
12	0.488889	0.495139	0.005638	4
13	0.489947	0.485207	0.004654	15
14	0.497354	0.488800	0.008431	12
15	0.481481	0.478233	0.011301	16

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[167]: grid.fit(train_data_lammed, Y_train) #3. w header, w lemm
rmtree(cachedir)
```

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-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                                dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                                lowercase=True, max_df=1.0, max_features=None, min_df=3,
                                ngram_range=(1, 1), preprocessor=None, stop_words='english',
                                strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                                tokenizer=None, vocabulary=None),
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'backup system one place employment eat two tape wind tape spool easy '
'fix tape drive fry simply need clean comment appreciate stephen '
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.25s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).

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**fit_params_steps[name])
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-----fit_transform_one - 1.4s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x14260 sparse matrix of type '<class
'numpy.int64'>'
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with 267097 stored elements in Compressed Sparse Row format>
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decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.28s to run.
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(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
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example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.4s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
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_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x14270 sparse matrix of type '<class
'numpy.int64'>'
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    with 264926 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.2s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
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None, message_clsname='Pipeline', message=None)

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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x14095 sparse matrix of type '<class
'numpy.int64'>'
      with 265819 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
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<3785x14095 sparse matrix of type '<class 'numpy.float64'>'

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Persisting input arguments took 1.23s to run.
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**fit_params_steps[name])

-----_fit_transform_one - 1.4s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3786x14193 sparse matrix of type '<class
'numpy.int64'>'
      with 264755 stored elements in Compressed Sparse Row format>,
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-----
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                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),

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-----fit_transform_one - 0.2s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
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-----fit_transform_one - 0.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
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None, message_clsname='Pipeline', message=None)

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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.89s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.

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**fit_params_steps[name])
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-----fit_transform_one - 1.3s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
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_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x8586 sparse matrix of type '<class
'numpy.int64'>'
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with 245758 stored elements in Compressed Sparse Row format>

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[Memory] Calling sklearn.pipeline._fit_transform_one...  
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,  
n_iter=5, random_state=42,  
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
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'chip true hear slot pd slot true thanks david mirsky '
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.80s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.3s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x8573 sparse matrix of type '<class
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      with 247230 stored elements in Compressed Sparse Row format>,

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decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
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'lciii recently hear interesting rumor hear lciii build slot powerpc '
'chip true hear slot pd slot true thanks david mirsky '
'mirsky gnuaimitedu well also lc iii pop top reveal one socket '
'additional vram simm one socket 72pin ram simm one socket flatpack fpu '
'processordirect slot pd identical lclc ii additional set connetions one '
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None, message_clsname='Pipeline', message=None)
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.88s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----_fit_transform_one - 1.3s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3786x8556 sparse matrix of type '<class
'numpy.int64'>'
    with 245795 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<3786x8556 sparse matrix of type '<class 'numpy.float64'>'
    with 245795 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',

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dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
lowercase=True, max_df=1.0, max_features=None, min_df=5,
ngram_range=(1, 1), preprocessor=None, stop_words='english',
strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
tokenizer=None, vocabulary=None),
[ ' andrem pyrtechmispyramidcom andre molyneux subject lciii powerpc '
'replyto andrem pyrtechmispyramidcom andre molyneux organization '
'pyramid technology mt view california line article lqksuq 1tt8 '
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'lciii recently hear interesting rumor hear lciii build slot powerpc '
'chip true hear slot pd slot true thanks david mirsky '
'mirsky gnuaimitedu well also lc iii pop top reveal one socket '
'additional vram simm one socket 72pin ram simm one socket flatpack fpu '
'processordirect slot pd identical lclc ii additional set connetions one '
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.83s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----_fit_transform_one - 1.3s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x8689 sparse matrix of type '<class
'numpy.int64'>'
    with 249060 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.1s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\c3cdf817112d0
0edebe0c1398758a085
-----fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2aa5be25d8f93
e90936e20bfbf1277e9
-----fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\829f72880cecb
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-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\320c13d52ee56
a6d35ed2d0dd6f59b1a
-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3785x14095 sparse matrix of type '<class 'numpy.float64'>'
    with 265819 stored elements in Compressed Sparse Row format>,
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-----_fit_transform_one - 11.9s, 0.2min
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\3362f80c103d4
d2aa6e6511425db2509
-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\97809a094d4ce
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3786x14193 sparse matrix of type '<class 'numpy.float64'>'
    with 264755 stored elements in Compressed Sparse Row format>,

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-----fit_transform_one - 12.0s, 0.2min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\6982e0ee8ad14d104ec0fd6f379f0c6a
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-----_fit_transform_one cache loaded - 0.2s, 0.0min  
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\3f7e04ddc753a08b343362967e3a0c7f
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...  
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',  
l1_ratio=0.0, max_iter=200,  
n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,  
verbose=0),  
<3787x14257 sparse matrix of type '<class 'numpy.float64'>'  
with 267797 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----_fit_transform_one - 8.9s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\ea3e350580c24
f7bd0745efaf238d929
-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\5b22a01e2be17
cff2fc7fbb0444103c2
-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3785x8586 sparse matrix of type '<class 'numpy.float64'>'
    with 245758 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 4.2s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\acc235c7d0bcc
8c16369671be63ff2cc
-----fit_transform_one cache loaded - 0.1s, 0.0min

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\0b6b0ed5be45e
1c80a41928faf38800f
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 5.7s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\9d1a0cb3af844
5de29a01a3a99300b8d
-----fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2683c5b148e4c
7a221d7a196d7299e76
-----fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3786x8556 sparse matrix of type '<class 'numpy.float64'>'
    with 245795 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----_fit_transform_one - 8.8s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\4ba8836eb98ea
3d9d2db72792ea93378
-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\b0371b4813bc9
8db56911823c4952b68
-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3787x8689 sparse matrix of type '<class 'numpy.float64'>'
    with 249060 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----_fit_transform_one - 8.9s, 0.1min
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\c3cdf817112d0
0edebe0c1398758a085
-----_fit_transform_one cache loaded - 0.2s, 0.0min
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2aa5be25d8f93
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\ab33ab0f81d6c
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2e095b8ad6d38
9019bc3c8fb51db2467
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
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FutureWarning)
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-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\c96e073b96253
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\7113e8eff0600
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
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FutureWarning)
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\829f72880cecb
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-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\320c13d52ee56
a6d35ed2d0dd6f59b1a
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\699050301790b
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
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FutureWarning)
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\3362f80c103d4
d2aa6e6511425db2509
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-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\97809a094d4ce
4b08a871848c0b75f3d
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\bb2d1e88f1712
1a0e70da7be001d5116
-----_fit_transform_one cache loaded - 0.0s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
FutureWarning)

[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\3f7e04ddc753a
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\00780af1d8a18
88cf90d9e9776a61776
-----_fit_transform_one cache loaded - 0.0s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
FutureWarning)

[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\95ec8ae26a2af
35889207f69464ce13d
-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\8e4262752ad26
9a2e132a71aee7fac83
-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\762fa56e37359
ae962969cdb627af7d0
-----_fit_transform_one cache loaded - 0.0s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
FutureWarning)

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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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f7bd0745efaf238d929
-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\5b22a01e2be17
cff2fc7fbb0444103c2
-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\4342ec39b8a2c
28c95bf43edfc6e0954
-----_fit_transform_one cache loaded - 0.0s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
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    FutureWarning)

[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\539f3b1cfcc48
6e6fc3e63454507927b
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\9d1a0cb3af844
5de29a01a3a99300b8d
```

```
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
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FutureWarning)
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-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2683c5b148e4c
7a221d7a196d7299e76
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\4ba8836eb98ea
3d9d2db72792ea93378
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8db56911823c4952b68
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0edebe0c1398758a085
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```
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FutureWarning)
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e90936e20bfbf1277e9
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a7ed9b9e26d2387b855
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FutureWarning)

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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\829f72880cecb35175f54d9dcefe5e16

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d8a64f40e8f3cb419b7
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\2aa5be25d8f93e90936e20bfbf1277e9

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData

\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\2fa44dea80f44a7ed9b9e26d2387b855

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\2e095b8ad6d389019bc3c8fb51db2467

-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\c96e073b96253a4c96ace19d046b1eae

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\c54215fbaf55914d25e890a5222f9034

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\829f72880cecb35175f54d9dcefe5e16

-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\320c13d52ee56a6d35ed2d0dd6f59b1a

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\549161c703cb7053922334e50c3c33e7

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\3362f80c103d4d2aa6e6511425db2509

-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\97809a094d4ce4b08a871848c0b75f3d

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\e8ff1d060aef0d8a64f40e8f3cb419b7

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\6982e0ee8ad14d104ec0fd6f379f0c6a

-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\3f7e04ddc753a08b343362967e3a0c7f

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData

\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\efa702ff1ee4a
0da8680a2a06cce52d0

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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35889207f69464ce13d

-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\8e4262752ad26
9a2e132a71aee7fac83

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\45d0a7605f9ef
2351561c03a0d8e99c5

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\ea3e350580c24
f7bd0745efaf238d929

-----_fit_transform_one cache loaded - 0.2s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\5b22a01e2be17
cff2fc7fbb0444103c2

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.3s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\8d420bac38db1
0fba79a71648c49e834

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\acc235c7d0bcc
8c16369671be63ff2cc

-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\0b6b0ed5be45e
1c80a41928faf38800f

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\d7576035f9f5d
10c8f13d6b6718f1646

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\9d1a0cb3af844
5de29a01a3a99300b8d

-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\2683c5b148e4c
7a221d7a196d7299e76

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\b0c14303b8b527102e4359a157fc339c
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-----_fit_transform_one cache loaded - 0.0s, 0.0min  
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\4ba8836eb98ea  
3d9d2db72792ea93378
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-----_fit_transform_one cache loaded - 0.1s, 0.0min  
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\b0371b4813bc9  
8db56911823c4952b68
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-----_fit_transform_one cache loaded - 0.0s, 0.0min  
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\7c278df91d9f0  
586197e59bb8267bb02
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
```

```
-----  
[Memory] Calling sklearn.pipeline._fit_transform_one...
```

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_fit_transform_one(CountVectorizer(analyzer='word', binary=False,  
decode_error='strict',
```

```
dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',  
lowercase=True, max_df=1.0, max_features=None, min_df=3,  
ngram_range=(1, 1), preprocessor=None, stop_words='english',  
strip_accents=None, token_pattern='(?u)\b\w+\b',  
tokenizer=None, vocabulary=None),
```

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'pyramid technology mt view california line article 1qksuq 1tt8 '  
'halgnaumitedu mirsky halgnaumitedu david joshua mirsky write hi '  
'lciii recently hear interesting rumor hear lciii build slot powerpc '  
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.48s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.7s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <4732x16741 sparse matrix of type '<class
'numpy.int64'>'

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with 338304 stored elements in Compressed Sparse Row format>,  
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min

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-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<4732x16741 sparse matrix of type '<class 'numpy.float64'>'
    with 338304 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.3s, 0.0min

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```

[168]: result_3 = pd.DataFrame(grid.cv_results_)
      result_3

```

```

[168]:
      mean_fit_time  std_fit_time  mean_score_time  std_score_time \
0          3.246312      0.049859          0.116301          0.005797
1          2.667867      0.036510          0.112902          0.007639
2         12.178631      0.961218          0.171522          0.008025
3          7.842705      1.962592          0.163960          0.004703
4          0.388750      0.010021          0.106707          0.004237
5          0.350659      0.015777          0.102713          0.004768
6          0.360250      0.004560          0.134427          0.003585
7          0.327132      0.007345          0.128849          0.004778
8          0.362226      0.004428          0.104509          0.005627
9          0.321542      0.006789          0.101909          0.005436
10         0.350085      0.006848          0.133611          0.006616
11         0.313986      0.012083          0.129821          0.005367
12         0.327917      0.015445          0.103111          0.004496
13         0.283245      0.004178          0.099911          0.004428
14         0.340914      0.008299          0.132819          0.003972
15         0.313972      0.027435          0.129455          0.004695

```

```

                                param_clf \
0  SVC(C=100, cache_size=200, class_weight=None, ...
1  SVC(C=100, cache_size=200, class_weight=None, ...
2  SVC(C=100, cache_size=200, class_weight=None, ...
3  SVC(C=100, cache_size=200, class_weight=None, ...
4  LogisticRegression(C=10, class_weight=None, du...
5  LogisticRegression(C=10, class_weight=None, du...
6  LogisticRegression(C=10, class_weight=None, du...
7  LogisticRegression(C=10, class_weight=None, du...
8  LogisticRegression(C=100, class_weight=None, d...
9  LogisticRegression(C=100, class_weight=None, d...
10 LogisticRegression(C=100, class_weight=None, d...
11 LogisticRegression(C=100, class_weight=None, d...
12      GaussianNB(priors=None, var_smoothing=1e-09)
13      GaussianNB(priors=None, var_smoothing=1e-09)
14      GaussianNB(priors=None, var_smoothing=1e-09)
15      GaussianNB(priors=None, var_smoothing=1e-09)

```

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                                param_reduce_dim \

```

```

0 TruncatedSVD(algorithm='randomized', n_compone...
1 TruncatedSVD(algorithm='randomized', n_compone...
2 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
3 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
4 TruncatedSVD(algorithm='randomized', n_compone...
5 TruncatedSVD(algorithm='randomized', n_compone...
6 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
7 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
8 TruncatedSVD(algorithm='randomized', n_compone...
9 TruncatedSVD(algorithm='randomized', n_compone...
10 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
11 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
12 TruncatedSVD(algorithm='randomized', n_compone...
13 TruncatedSVD(algorithm='randomized', n_compone...
14 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
15 NMF(alpha=0.0, beta_loss='frobenius', init='ra...

```

```

                                param_vect \
0 CountVectorizer(analyzer='word', binary=False,...
1 CountVectorizer(analyzer='word', binary=False,...
2 CountVectorizer(analyzer='word', binary=False,...
3 CountVectorizer(analyzer='word', binary=False,...
4 CountVectorizer(analyzer='word', binary=False,...
5 CountVectorizer(analyzer='word', binary=False,...
6 CountVectorizer(analyzer='word', binary=False,...
7 CountVectorizer(analyzer='word', binary=False,...
8 CountVectorizer(analyzer='word', binary=False,...
9 CountVectorizer(analyzer='word', binary=False,...
10 CountVectorizer(analyzer='word', binary=False,...
11 CountVectorizer(analyzer='word', binary=False,...
12 CountVectorizer(analyzer='word', binary=False,...
13 CountVectorizer(analyzer='word', binary=False,...
14 CountVectorizer(analyzer='word', binary=False,...
15 CountVectorizer(analyzer='word', binary=False,...

```

```

                                params  split0_test_score \
0 {'clf': SVC(C=100, cache_size=200, class_weigh... 0.970433
1 {'clf': SVC(C=100, cache_size=200, class_weigh... 0.970433
2 {'clf': SVC(C=100, cache_size=200, class_weigh... 0.967265
3 {'clf': SVC(C=100, cache_size=200, class_weigh... 0.969377
4 {'clf': LogisticRegression(C=10, class_weight=... 0.969377
5 {'clf': LogisticRegression(C=10, class_weight=... 0.971489
6 {'clf': LogisticRegression(C=10, class_weight=... 0.972545
7 {'clf': LogisticRegression(C=10, class_weight=... 0.969377
8 {'clf': LogisticRegression(C=100, class_weight... 0.972545
9 {'clf': LogisticRegression(C=100, class_weight... 0.970433
10 {'clf': LogisticRegression(C=100, class_weight... 0.969377

```

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11 {'clf': LogisticRegression(C=100, class_weight...      0.969377
12 {'clf': GaussianNB(priors=None, var_smoothing=...    0.879620
13 {'clf': GaussianNB(priors=None, var_smoothing=...    0.878564
14 {'clf': GaussianNB(priors=None, var_smoothing=...    0.952482
15 {'clf': GaussianNB(priors=None, var_smoothing=...    0.947202

```

	split1_test_score	split2_test_score	split3_test_score \
0	0.974657	0.983105	0.970402
1	0.971489	0.980993	0.971459
2	0.971489	0.969377	0.964059
3	0.971489	0.978881	0.965116
4	0.972545	0.979937	0.973573
5	0.971489	0.979937	0.969345
6	0.969377	0.975713	0.969345
7	0.974657	0.978881	0.961945
8	0.972545	0.982049	0.971459
9	0.972545	0.979937	0.970402
10	0.966209	0.970433	0.961945
11	0.965153	0.977825	0.966173
12	0.904963	0.877508	0.911205
13	0.891235	0.884900	0.880550
14	0.959873	0.957761	0.960888
15	0.952482	0.959873	0.953488

	split4_test_score	mean_test_score	std_test_score	rank_test_score
0	0.984127	0.976543	0.005985	1
1	0.980952	0.975063	0.004838	4
2	0.984127	0.971260	0.006881	11
3	0.982011	0.973373	0.006205	9
4	0.980952	0.975275	0.004452	3
5	0.982011	0.974852	0.005099	6
6	0.985185	0.974429	0.005867	7
7	0.985185	0.974007	0.007948	8
8	0.983069	0.976331	0.005108	2
9	0.982011	0.975063	0.004929	4
10	0.977778	0.969146	0.005226	12
11	0.982011	0.972105	0.006659	10
12	0.913228	0.897295	0.015557	15
13	0.889947	0.885038	0.004992	16
14	0.967196	0.959637	0.004763	13
15	0.944974	0.951606	0.005216	14

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[169]: grid.fit(train_dataset_headerremoved_lammed, Y_train) #4. w/o header w lemm
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[Memory] Calling sklearn.pipeline._fit_transform_one...

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None, message_clsname='Pipeline', message=None)  
-----fit_transform_one - 0.0s, 0.0min  
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[Memory] Calling sklearn.pipeline._fit_transform_one...  
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,  
n_iter=5, random_state=42,  
tol=0.0),  
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with 196340 stored elements in Compressed Sparse Row format>,  
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-----_fit_transform_one - 0.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'hi maybe someone help look buy nissan maximum gxe cdn right car km '
'mile typical mileage car seem km 43k mi seller inform bring car '

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None, message_clsname='Pipeline', message=None)
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.05s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.1s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x11752 sparse matrix of type '<class
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
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    with 198252 stored elements in Compressed Sparse Row format>,
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'hi maybe someone help look buy nissan maximum gxe cdn right car km '
'mile typical mileage car seem km 43k mi seller inform bring car '
'certification tell front break pad exhaust replace meet legal standard '
'say replace component sell car copmletely ignorant technical stuff car '
'nt know could mean 96k km time typical replace mention item indication '
'car abuse would thing break replace soon seller tell use car highway '
'lot nt know verify see paint chip away tiny dot front edge hood though '
'although maximum excellent car car clean well keep currently warranty '
'similarly price accord 70k km year 30k km worth warranty leave nt want '
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None, message_clsname='Pipeline', message=None)  
  
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:  
Persisting input arguments took 1.03s to run.
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If this happens often in your code, it can cause performance problems (results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an example so that they can fix the problem.

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**fit_params_steps[name])
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-----_fit_transform_one - 1.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
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_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x11595 sparse matrix of type '<class
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with 199940 stored elements in Compressed Sparse Row format>,
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[Memory] Calling sklearn.pipeline._fit_transform_one...  
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,  
n_iter=5, random_state=42,  
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'hi maybe someone help look buy nissan maximum gxe cdn right car km '
'mile typical mileage car seem km 43k mi seller inform bring car '
'certification tell front break pad exhaust replace meet legal standard '
'say replace component sell car copmpletely ignorant technical stuff car '
'nt know could mean 96k km time typical replace mention item indication '
'car abuse would thing break replace soon seller tell use car highway '
'lot nt know verify see paint chip away tiny dot front edge hood though '
'although maximum excellent car car clean well keep currently warranty '
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.02s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.1s, 0.0min

```

[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3786x11490 sparse matrix of type '<class
'numpy.int64'>'

with 198316 stored elements in Compressed Sparse Row format>,

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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=3,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'hi maybe someone help look buy nissan maximum gxe cdn right car km '
'mile typical mileage car seem km 43k mi seller inform bring car '
'certification tell front break pad exhaust replace meet legal standard '
'say replace component sell car copmpletely ignorant technical stuff car '
'nt know could mean 96k km time typical replace mention item indication '
'car abuse would thing break replace soon seller tell use car highway '
'lot nt know verify see paint chip away tiny dot front edge hood though '
'although maximum excellent car car clean well keep currently warranty '
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.08s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.2s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x11847 sparse matrix of type '<class
'numpy.int64'>'
    with 200555 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,

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tol=0.0),  
<3787x11847 sparse matrix of type '<class 'numpy.float64'>'  
  with 200555 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<3785x6869 sparse matrix of type '<class 'numpy.float64'>'
    with 181303 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',

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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.75s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----_fit_transform_one - 1.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x7003 sparse matrix of type '<class
'numpy.int64'>'
      with 182283 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'hi maybe someone help look buy nissan maximum gxe cdn right car km '
'mile typical mileage car seem km 43k mi seller inform bring car '
'certification tell front break pad exhaust replace meet legal standard '
'say replace component sell car copmletely ignorant technical stuff car '
'nt know could mean 96k km time typical replace mention item indication '
'car abuse would thing break replace soon seller tell use car highway '
'lot nt know verify see paint chip away tiny dot front edge hood though '

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'although maximum excellent car car clean well keep currently warranty '
'similarly price accord 70k km year 30k km worth warranty leave nt want '
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.64s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

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-----fit_transform_one - 1.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x6898 sparse matrix of type '<class
'numpy.int64'>'

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    with 184090 stored elements in Compressed Sparse Row format>,

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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
                        lowercase=True, max_df=1.0, max_features=None, min_df=5,
                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
                        tokenizer=None, vocabulary=None),
[ 'hi maybe someone help look buy nissan maximum gxe cdn right car km '
'mile typical mileage car seem km 43k mi seller inform bring car '
'certification tell front break pad exhaust replace meet legal standard '
'say replace component sell car copmpletely ignorant technical stuff car '
'nt know could mean 96k km time typical replace mention item indication '
'car abuse would thing break replace soon seller tell use car highway '
'lot nt know verify see paint chip away tiny dot front edge hood though '
'although maximum excellent car car clean well keep currently warranty '
'similarly price accord 70k km year 30k km worth warranty leave nt want '
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None, message_clsname='Pipeline', message=None)
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.71s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
The reason for this is probably some large input arguments for a wrapped
function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an

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**fit_params_steps[name])
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-----_fit_transform_one - 1.0s, 0.0min-----  
[Memory] Calling sklearn.pipeline._fit_transform_one...  
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,  
sublinear_tf=False, use_idf=True), <3786x6757 sparse matrix of type '<class  
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-----fit_transform_one - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
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decode_error='strict',
                        dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
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                        ngram_range=(1, 1), preprocessor=None, stop_words='english',
                        strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
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[ 'hi maybe someone help look buy nissan maximum gxe cdn right car km '
'mile typical mileage car seem km 43k mi seller inform bring car '
'certification tell front break pad exhaust replace meet legal standard '
'say replace component sell car copmletely ignorant technical stuff car '
'nt know could mean 96k km time typical replace mention item indication '
'car abuse would thing break replace soon seller tell use car highway '
'lot nt know verify see paint chip away tiny dot front edge hood though '
'although maximum excellent car car clean well keep currently warranty '
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None, message_clsname='Pipeline', message=None)

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.76s to run.
If this happens often in your code, it can cause performance problems
(results will be correct in all cases).
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function (e.g. large strings).
THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
example so that they can fix the problem.
**fit_params_steps[name])

-----fit_transform_one - 1.1s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='l2', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x7070 sparse matrix of type '<class
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None, message_clsname='Pipeline', message=None)
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 9.9s, 0.2min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\3c349532d03a3
d5fc2b9d9585cbf81ff
-----fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\4b3f266c62aee
0379029d6a9282f4ab1
-----fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,

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        n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
        verbose=0),
<3785x11595 sparse matrix of type '<class 'numpy.float64'>'
    with 199940 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----_fit_transform_one - 9.9s, 0.2min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\8b4a920563ea0
7acb89168ff4f5d19b8
-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\f5620c4d86f44
754867fefe7abb0af98
-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3787x11847 sparse matrix of type '<class 'numpy.float64'>'
    with 200555 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----_fit_transform_one - 8.2s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\9b8dd22e625d4
8e9e981539d8597843d
-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\bc67b2430b1cd
fb706f64699fa26368f
-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3785x6869 sparse matrix of type '<class 'numpy.float64'>'

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with 181303 stored elements in Compressed Sparse Row format>
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 5.3s, 0.1min
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2dab35f3d9527
c730e624a139d4d4931
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-----_fit_transform_one cache loaded - 0.1s, 0.0min
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\6a040b366bea0
ed5541bbe6de4e38bed
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
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_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
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    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
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<3785x7003 sparse matrix of type '<class 'numpy.float64'>'
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    with 182283 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----_fit_transform_one - 4.3s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\dbacd5c24df7c
0b926f7281e3277246c
-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\cae5d439f85ba
f61a942da123c89736f
-----_fit_transform_one cache loaded - 0.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
l1_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
    verbose=0),
<3786x6757 sparse matrix of type '<class 'numpy.float64'>'
    with 182351 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 7.1s, 0.1min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\451781fedf797
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-----_fit_transform_one - 6.6s, 0.1min
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\59e27f40b30d7
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-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\274bbeb2e47df
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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25bc047f9a32ebd33e3

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
    FutureWarning)

-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\b3a4a265a7b9f
000d6ebbc4b0c725a90

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\85b66d576c9fa
4daea6dc214a74a4c74

-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\3c349532d03a3
d5fc2b9d9585cbf81ff

C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.

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FutureWarning)

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-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\4b3f266c62aee
0379029d6a9282f4ab1
```

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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\1a4c6384369a5
fd7d31c6b2132b34fc5
```

```
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\f8e4a6ef7a7c5
05cc3c7c7f0c2065635
```

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FutureWarning)

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\6efa36efe2c27
dddbf200952372f372b
```

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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\a985515154662
9ce5bf5736f085e99df
```

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\8b4a920563ea0
7acb89168ff4f5d19b8
```

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\f5620c4d86f44
754867fefe7abb0af98
```

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\701077c3ec048
3b6545a9c35d2e9713d
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\9b8dd22e625d4
8e9e981539d8597843d
```

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```
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[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\bc67b2430b1cd
fb706f64699fa26368f
```

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[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\673d5ed3ddb38
87087e73d20850d6c58
```

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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2dab35f3d9527
c730e624a139d4d4931
```

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```
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\6a040b366bea0
ed5541bbe6de4e38bed
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\56e8f9862ec36
b8aabd914991935cfd2
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\bd9d58c2f4c02
8765d87e938abd78847
```

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\e4b57a0b8dd86
62fd337e826848c1d3b
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[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\b09edd88a52ed
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49ce90953bf3874c07d

```
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\dbacd5c24df7c  
0b926f7281e3277246c
```

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\cae5d439f85ba  
f61a942da123c89736f
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\23a6274e80b45  
a9abdb92b9e483f2af2
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\451781fedf797  
72b5f119ba6e614fa9f
```

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\4411c10506f45  
3094657a7c7564bd369
```

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
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e1bf280cd76a86bade1
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\59e27f40b30d7  
1aea0563686418e8e1a
```

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\274bbeb2e47df
67569885129aa73081f
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\0c7fce82b6e0a
0ffcc0d0df5374089a4
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\d50b38921aee8
25bc047f9a32ebd33e3
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\b3a4a265a7b9f
000d6ebbc4b0c725a90
```

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2593317f9b13f
a3bf9a6f81f7324807a
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\3c349532d03a3
d5fc2b9d9585cbf81ff
```

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0379029d6a9282f4ab1
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3c240a8f76e8e4226a7
```

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05cc3c7c7f0c2065635
```

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\6efa36efe2c27dddbf200952372f372b

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\d51c39ad2ca8a83b41c4e42c73d184cc

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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\8b4a920563ea07acb89168ff4f5d19b8

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\33bb0bc4094beb591909b98c4cc818bb

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[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\ce300f191ecb65cef9fb2fe30740a4d1

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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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c730e624a139d4d4931
```

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ed5541bbe6de4e38bed
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\7646e838e673c
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62fd337e826848c1d3b
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8e2befa5137b0ac6fe1
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0b926f7281e3277246c
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\8a1c7776da37b383c52d7953828ff746

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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\451781fedf79772b5f119ba6e614fa9f

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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\59e27f40b30d71aea0563686418e8e1a

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000d6ebbc4b0c725a90

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\85b66d576c9fa  
4daea6dc214a74a4c74
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\4b3f266c62aee  
0379029d6a9282f4ab1
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\1a4c6384369a5  
fd7d31c6b2132b34fc5
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\f8e4a6ef7a7c5  
05cc3c7c7f0c2065635
```

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\6efa36efe2c27  
dddbf200952372f372b
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\a985515154662  
9ce5bf5736f085e99df
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData  
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\8b4a920563ea0  
7acb89168ff4f5d19b8
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\f5620c4d86f44
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\9b8dd22e625d4
8e9e981539d8597843d
```

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\bc67b2430b1cd
fb706f64699fa26368f
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\673d5ed3ddb38
87087e73d20850d6c58
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2dab35f3d9527
c730e624a139d4d4931
```

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\6a040b366bea0
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\56e8f9862ec36
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\bd9d58c2f4c02
8765d87e938abd78847
```

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[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\e4b57a0b8dd8662fd337e826848c1d3b

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\59e27f40b30d71aea0563686418e8e1a
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FutureWarning)
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\274bbeb2e47df67569885129aa73081f
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\3c349532d03a3d5fc2b9d9585cbf81ff
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8765d87e938abd78847

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72b5f119ba6e614fa9f
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1aea0563686418e8e1a
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d5fc2b9d9585cbf81ff

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dddbf200952372f372b

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9ce5bf5736f085e99df

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7acb89168ff4f5d19b8

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62fd337e826848c1d3b

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0b926f7281e3277246c

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a9abdb92b9e483f2af2

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0ffcc0d0df5374089a4

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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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25bc047f9a32ebd33e3

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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\b3a4a265a7b9f
000d6ebbc4b0c725a90

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\2593317f9b13f
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3c240a8f76e8e4226a7

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05cc3c7c7f0c2065635

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dddbf200952372f372b

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\d51c39ad2ca8a
83b41c4e42c73d184cc

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\8b4a920563ea0
7acb89168ff4f5d19b8

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754867fefe7abb0af98

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\33bb0bc4094be
b591909b98c4cc818bb

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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\9b8dd22e625d4
8e9e981539d8597843d

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[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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fb706f64699fa26368f

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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\ce300f191ecb6
5cef9fb2fe30740a4d1

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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline_fit_transform_one\6a040b366bea0
ed5541bbe6de4e38bed

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eac6de53991ea682e74

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-----_fit_transform_one cache loaded - 0.1s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\e4b57a0b8dd86
62fd337e826848c1d3b
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\4c4e3c6f9a77b
8e2befa5137b0ac6fe1
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\dbacd5c24df7c
0b926f7281e3277246c
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-----_fit_transform_one cache loaded - 0.1s, 0.0min
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\cae5d439f85ba
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.1s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\8a1c7776da37b
383c52d7953828ff746
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\e31a705089e4f
2170f93317d93aed13f
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-----_fit_transform_one cache loaded - 0.0s, 0.0min
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-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
```

```
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
```

```
dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
lowercase=True, max_df=1.0, max_features=None, min_df=5,
ngram_range=(1, 1), preprocessor=None, stop_words='english',
strip_accents=None, token_pattern='(?u)\b\w\w+\b',
tokenizer=None, vocabulary=None),
```

```
[ 'hi maybe someone help look buy nissan maximum gxe cdn right car km '
'mile typical mileage car seem km 43k mi seller inform bring car '
'certification tell front break pad exhaust replace meet legal standard '
'say replace component sell car copmletely ignorant technical stuff car '
'nt know could mean 96k km time typical replace mention item indication ']
```

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'car abuse  would thing break replace soon  seller tell use car highway '
'lot  nt know verify  see paint chip away tiny dot front edge hood  though  '
'although maximum excellent car car clean well keep  currently warranty  '
'similarly price accord 70k km year 30k km worth warranty leave  nt want  '
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.0s, 0.0min
-----
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
                        tol=0.0),
<4732x8275 sparse matrix of type '<class 'numpy.float64'>'
    with 234711 stored elements in Compressed Sparse Row format>,
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None, message_clsname='Pipeline', message=None)
-----fit_transform_one - 0.1s, 0.0min
C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
FutureWarning: Default solver will be changed to 'lbfgs' in 0.22. Specify a
solver to silence this warning.
FutureWarning)

```

```
[170]: result_4 = pd.DataFrame(grid.cv_results_)
result_4
```

```
[170]:
```

	mean_fit_time	std_fit_time	mean_score_time	std_score_time	\
0	3.471629	0.076883	0.198880	0.008854	
1	3.008759	0.093317	0.197093	0.006327	
2	10.367258	0.735506	0.233771	0.007726	
3	7.215198	1.192269	0.241551	0.014476	
4	0.335490	0.014614	0.083379	0.008650	
5	0.303390	0.012213	0.081967	0.006743	
6	0.316367	0.009913	0.105705	0.006262	
7	0.282663	0.017267	0.103308	0.006705	
8	0.309973	0.012847	0.083359	0.005977	
9	0.273657	0.008853	0.082585	0.009393	
10	0.305197	0.008597	0.106895	0.006033	
11	0.271705	0.011028	0.103118	0.006541	
12	0.279287	0.011205	0.082565	0.007085	

13	0.238356	0.009309	0.080385	0.007001
14	0.300339	0.022669	0.105099	0.007638
15	0.267114	0.019855	0.103354	0.005407

```

                                param_clf \
0  SVC(C=100, cache_size=200, class_weight=None, ...
1  SVC(C=100, cache_size=200, class_weight=None, ...
2  SVC(C=100, cache_size=200, class_weight=None, ...
3  SVC(C=100, cache_size=200, class_weight=None, ...
4  LogisticRegression(C=10, class_weight=None, du...
5  LogisticRegression(C=10, class_weight=None, du...
6  LogisticRegression(C=10, class_weight=None, du...
7  LogisticRegression(C=10, class_weight=None, du...
8  LogisticRegression(C=100, class_weight=None, d...
9  LogisticRegression(C=100, class_weight=None, d...
10 LogisticRegression(C=100, class_weight=None, d...
11 LogisticRegression(C=100, class_weight=None, d...
12     GaussianNB(priors=None, var_smoothing=1e-09)
13     GaussianNB(priors=None, var_smoothing=1e-09)
14     GaussianNB(priors=None, var_smoothing=1e-09)
15     GaussianNB(priors=None, var_smoothing=1e-09)

```

```

                                param_reduce_dim \
0  TruncatedSVD(algorithm='randomized', n_compone...
1  TruncatedSVD(algorithm='randomized', n_compone...
2  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
3  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
4  TruncatedSVD(algorithm='randomized', n_compone...
5  TruncatedSVD(algorithm='randomized', n_compone...
6  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
7  NMF(alpha=0.0, beta_loss='frobenius', init='ra...
8  TruncatedSVD(algorithm='randomized', n_compone...
9  TruncatedSVD(algorithm='randomized', n_compone...
10 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
11 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
12 TruncatedSVD(algorithm='randomized', n_compone...
13 TruncatedSVD(algorithm='randomized', n_compone...
14 NMF(alpha=0.0, beta_loss='frobenius', init='ra...
15 NMF(alpha=0.0, beta_loss='frobenius', init='ra...

```

```

                                param_vect \
0  CountVectorizer(analyzer='word', binary=False,...
1  CountVectorizer(analyzer='word', binary=False,...
2  CountVectorizer(analyzer='word', binary=False,...
3  CountVectorizer(analyzer='word', binary=False,...
4  CountVectorizer(analyzer='word', binary=False,...
5  CountVectorizer(analyzer='word', binary=False,...

```



```

6 CountVectorizer(analyzer='word', binary=False,...
7 CountVectorizer(analyzer='word', binary=False,...
8 CountVectorizer(analyzer='word', binary=False,...
9 CountVectorizer(analyzer='word', binary=False,...
10 CountVectorizer(analyzer='word', binary=False,...
11 CountVectorizer(analyzer='word', binary=False,...
12 CountVectorizer(analyzer='word', binary=False,...
13 CountVectorizer(analyzer='word', binary=False,...
14 CountVectorizer(analyzer='word', binary=False,...
15 CountVectorizer(analyzer='word', binary=False,...

```

	params	split0_test_score \
0	{'clf': SVC(C=100, cache_size=200, class_weigh...	0.496304
1	{'clf': SVC(C=100, cache_size=200, class_weigh...	0.483633
2	{'clf': SVC(C=100, cache_size=200, class_weigh...	0.493136
3	{'clf': SVC(C=100, cache_size=200, class_weigh...	0.485744
4	{'clf': LogisticRegression(C=10, class_weight=...	0.485744
5	{'clf': LogisticRegression(C=10, class_weight=...	0.492080
6	{'clf': LogisticRegression(C=10, class_weight=...	0.492080
7	{'clf': LogisticRegression(C=10, class_weight=...	0.496304
8	{'clf': LogisticRegression(C=100, class_weight...	0.481521
9	{'clf': LogisticRegression(C=100, class_weight...	0.498416
10	{'clf': LogisticRegression(C=100, class_weight...	0.500528
11	{'clf': LogisticRegression(C=100, class_weight...	0.510032
12	{'clf': GaussianNB(priors=None, var_smoothing=...	0.506864
13	{'clf': GaussianNB(priors=None, var_smoothing=...	0.514256
14	{'clf': GaussianNB(priors=None, var_smoothing=...	0.476241
15	{'clf': GaussianNB(priors=None, var_smoothing=...	0.492080

	split1_test_score	split2_test_score	split3_test_score \
0	0.501584	0.491024	0.483087
1	0.488912	0.506864	0.486258
2	0.488912	0.492080	0.494715
3	0.469905	0.497360	0.487315
4	0.507920	0.498416	0.477801
5	0.499472	0.492080	0.482030
6	0.494192	0.497360	0.463002
7	0.487856	0.478353	0.476744
8	0.507920	0.501584	0.482030
9	0.501584	0.497360	0.483087
10	0.486800	0.495248	0.469345
11	0.480465	0.481521	0.473573
12	0.500528	0.498416	0.472516
13	0.511088	0.497360	0.463002
14	0.493136	0.469905	0.461945
15	0.489968	0.473073	0.466173

	split4_test_score	mean_test_score	std_test_score	rank_test_score
0	0.467725	0.487954	0.011810	7
1	0.461376	0.485418	0.014516	11
2	0.478307	0.489434	0.005874	5
3	0.495238	0.487109	0.009687	9
4	0.467725	0.487532	0.014311	8
5	0.484656	0.490068	0.006171	4
6	0.473016	0.483939	0.013484	13
7	0.476190	0.483094	0.007845	14
8	0.470899	0.488800	0.013770	6
9	0.485714	0.493238	0.007390	1
10	0.476190	0.485630	0.011577	10
11	0.469841	0.483094	0.014153	14
12	0.474074	0.490490	0.014311	3
13	0.476190	0.492392	0.019891	2
14	0.508995	0.482037	0.016931	16
15	0.503704	0.484996	0.013571	12

```
[173]: #show the parameters with highest score from 4 searches.
result_3.loc[result_3['rank_test_score'] == 1]
```

```
[173]: mean_fit_time std_fit_time mean_score_time std_score_time \
0      3.246312      0.049859      0.116301      0.005797

                                param_clf \
0  SVC(C=100, cache_size=200, class_weight=None, ...

                                param_reduce_dim \
0  TruncatedSVD(algorithm='randomized', n_compone...

                                param_vect \
0  CountVectorizer(analyzer='word', binary=False,...

                                params  split0_test_score \
0  {'clf': SVC(C=100, cache_size=200, class_weigh...      0.970433

split1_test_score split2_test_score split3_test_score split4_test_score \
0      0.974657      0.983105      0.970402      0.984127

mean_test_score std_test_score rank_test_score
0      0.976543      0.005985      1
```

```
[179]: print(result_3.params[0])
```

```
{'clf': SVC(C=100, cache_size=200, class_weight=None, coef0=0.0,
decision_function_shape='ovr', degree=3, gamma='auto_deprecated',
kernel='linear', max_iter=-1, probability=False, random_state=42,
```

```

        shrinking=True, tol=0.001, verbose=False), 'reduce_dim':
TruncatedSVD(algorithm='randomized', n_components=50, n_iter=5, random_state=42,
              tol=0.0), 'vect': CountVectorizer(analyzer='word', binary=False,
        decode_error='strict',
              dtype=<class 'numpy.int64'>, encoding='utf-8', input='content',
              lowercase=True, max_df=1.0, max_features=None, min_df=3,
              ngram_range=(1, 1), preprocessor=None, stop_words='english',
              strip_accents=None, token_pattern='(?u)\\b\\w+\\b',
              tokenizer=None, vocabulary=None)}

```

8 QUESTION 8: learn classifiers on the documents belonging to the classes:

comp.sys.ibm.pc.hardware, comp.sys.mac.hardware, misc.forsale, soc.religion.christian

```

[180]: Q8categories = ['comp.sys.ibm.pc.hardware', 'comp.sys.mac.hardware', 'misc.
        ↳forsale', 'soc.religion.christian']

Q8train_dataset = fetch_20newsgroups(subset = 'train', categories = Q8categories,
        ↳shuffle = True, random_state = None)
Q8test_dataset = fetch_20newsgroups(subset = 'test', categories = Q8categories,
        ↳shuffle = True, random_state = None)

print(np.unique(Q8train_dataset.target))
print(Q8train_dataset.target_names)
print(len(Q8train_dataset.target))
print(len(Q8test_dataset.target))

```

```

[0 1 2 3]
['comp.sys.ibm.pc.hardware', 'comp.sys.mac.hardware', 'misc.forsale',
'soc.religion.christian']
2352
1565

```

```

[181]: import re
        from nltk.corpus import stopwords
Q8train_data_lammed = []
        for line in Q8train_dataset.data:
            wordlist = lemmatize_sent_demo(line)
            wordlist_cleaned = [re.sub(r"^\w", "", word) for word in wordlist]
            removedtrain = [word for word in wordlist_cleaned if word not in stopwords.
        ↳words('english') and not word.isdigit()]
            each_line = " ".join(removedtrain)
            Q8train_data_lammed.append(each_line)

```

```

[182]: Q8train_data_lammed[0]

```

```
[182]: ' petrack vnetibmcom subject serial line connection duo pc replyto petrack
vnetibmcom disclaimer posting may contain view newssoftware usenet line try
almost everything sun get null modem connection mac duo pc use mackermi
versaterm mac side use procomm kermit softerm os2 pc p side use
nonhardware handshaking hardware ahdshaking cable know hand shake effort
nothing allow file transfer mac p general type back forth trouble side set
speed baud send file mac p file transfer duo p possible straight ascii send
send p duo flawlessly send binhex file way quite fast know transmission error
free straight ascii send mac p full error unless course text pace slow like
human typing well like time faster human type would like hear anyone able
transfer file duo p via modem null modem please tell exact combination
hardware software obviously talk true serial port modem express modem maybe
kind soul access modem duo check right opinion wo nt work high speed power
interrupt duo wo nt work low speed crazy reason nt understand could hear
someone attest really pump information serial port duo fast like via modem via
sysex dump could anyone duo help go absolutely insane wan na know problem
duo duo 210s duo yes check cable time type back forth zterm alert user us
hardware handshaking ct know hardware handshaking work also accord zterm port
stats buffer never overflow please help figure go scott petrack petrack
haifasc3vnetibmcom'
```

```
[183]: Q8test_data_lammed = []
for line in Q8test_dataset.data:
    wordlist = lemmatize_sent_demo(line)
    wordlist_cleaned = [re.sub(r"^[^w]", "", word) for word in wordlist]
    removedtest = [word for word in wordlist_cleaned if word not in stopwords.
↳words('english') and not word.isdigit()]
    each_line = " ".join(removedtest)
    Q8test_data_lammed.append(each_line)
```

```
[184]: Q8test_data_lammed[0]
```

```
[184]: ' chbeck anlgov chuck beck subject need device ntsc video scsi bus
organization anl line ha anyone heard scsi device capture video need sort
device capture frame per second work scsi bus idea use sort video conferencing
application
----- tell go
would burn ear
----- thought
chbeck anlgov'
```

```
[187]: cv = CountVectorizer(stop_words='english', min_df=3)
Q8training_vectors = cv.fit_transform(Q8train_data_lammed)
Q8testing_vectors = cv.transform(Q8test_data_lammed)

# TF-IDF from notes
from sklearn.feature_extraction.text import TfidfTransformer
```

```
tfidf_transformer = TfidfTransformer()
Q8X_train_tfidf = tfidf_transformer.fit_transform(Q8training_vectors)
Q8X_test_tfidf = tfidf_transformer.transform(Q8testing_vectors)
print(Q8X_train_tfidf.shape)
print(Q8X_test_tfidf.shape)
```

(2352, 8417)

(1565, 8417)

```
[209]: #store the train and test data into pickle file
import pickle
pickle_out = open("Q8X_train_tfidf.pickle","wb")
pickle.dump(Q8X_train_tfidf, pickle_out)
pickle_out.close()
pickle_out = open("Q8X_test_tfidf.pickle","wb")
pickle.dump(Q8X_test_tfidf, pickle_out)
pickle_out.close()
```

```
[210]: import pickle
#extract files:
pickle_in = open("Q8X_train_tfidf.pickle","rb")
Q8train_tfidf_local = pickle.load(pickle_in)
pickle_in = open("Q8X_test_tfidf.pickle","rb")
Q8test_tfidf_local = pickle.load(pickle_in)
```

```
[217]: #LSI
#from sklearn.decomposition import TruncatedSVD
#from sklearn.utils.extmath import randomized_svd
k = 50
svd = TruncatedSVD(n_components=k, random_state=42)
Q8X_train_lsi = svd.fit_transform(Q8train_tfidf_local)
Q8X_test_lsi = svd.transform(Q8test_tfidf_local)

print('the shape of Q8training data after LSI is:',Q8X_train_lsi.shape)
print('the shape of Q8testing data after LSI is:',Q8X_test_lsi.shape)
```

the shape of Q8training data after LSI is: (2352, 50)

the shape of Q8testing data after LSI is: (1565, 50)

```
[218]: print(np.unique(Q8train_dataset.target))
```

[0 1 2 3]

```
[223]: Q8train_dataset.target_names
```

```
[223]: ['comp.sys.ibm.pc.hardware',
       'comp.sys.mac.hardware',
```

```
'misc.forsale',
'soc.religion.christian']
```

```
[221]: #define new evaluation function
import numpy as np
from matplotlib import pyplot as plt
def Q8plot_confusion_matrix(cm,
                            target_names,
                            title='Confusion matrix',
                            cmap=None,
                            normalize=True):

    """
    title:          the text to display at the top of the matrix

    cmap:           the gradient of the values displayed from matplotlib.pyplot.cm
                    see http://matplotlib.org/examples/color/colormaps_reference.
    →html          plt.get_cmap('jet') or plt.cm.Blues

    """
    import matplotlib.pyplot as plt
    import numpy as np
    import itertools

    accuracy = np.trace(cm) / float(np.sum(cm))
    misclass = 1 - accuracy

    if cmap is None:
        cmap = plt.get_cmap('Blues')

    plt.figure(figsize=(8, 6))
    plt.imshow(cm, interpolation='nearest', cmap=cmap)
    plt.title(title)
    plt.colorbar()

    if target_names is not None:
        tick_marks = np.arange(len(target_names))
        plt.xticks(tick_marks, target_names, rotation=45)
        plt.yticks(tick_marks, target_names)

    if normalize:
        cm = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]

    thresh = cm.max() / 1.5 if normalize else cm.max() / 2
    for i, j in itertools.product(range(cm.shape[0]), range(cm.shape[1])):
        if normalize:
            plt.text(j, i, "{:0.4f}".format(cm[i, j]),
                    horizontalalignment="center",
```

```

        color="white" if cm[i, j] > thresh else "black")
    else:
        plt.text(j, i, "{:,}".format(cm[i, j]),
                  horizontalalignment="center",
                  color="white" if cm[i, j] > thresh else "black")

plt.tight_layout()
plt.ylabel('True label')
plt.xlabel('Predicted label\naccuracy={:0.4f}; misclass={:0.4f}'.
→format(accuracy, misclass))
plt.show()

def Q8EvaluationReport(clf, testset, Y_test, Averagetype, report_title):
    Y_predict = clf.predict(testset)
    cm = confusion_matrix(Q8test_dataset.target, Y_predict)
    np.set_printoptions(precision=4)
    print('Confusion matrix, without normalization')
    print(cm)
    plot_confusion_matrix(cm = cm,
                          normalize    = False,
                          target_names = ['comp.sys.ibm.pc.hardware', 'comp.sys.
→mac.hardware', 'misc.forsale', 'soc.religion.christian'],
                          title        = "Confusion Matrix for " + report_title)
    # Normalize the confusion matrix by row (i.e by the number of samples
    # in each class)
    cm_normalized = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]
    print('Normalized confusion matrix')
    print(cm_normalized)
    plot_confusion_matrix(cm = cm,
                          normalize    = True,
                          target_names = ['comp.sys.ibm.pc.hardware', 'comp.sys.
→mac.hardware', 'misc.forsale', 'soc.religion.christian'],
                          title        = "Normalised Confusion Matrix for " +
→report_title)
    accuracy = metrics.accuracy_score(Q8test_dataset.target, Y_predict)
    if Averagetype == '0':
        recall = metrics.recall_score(Q8test_dataset.target, Y_predict)
        precision = metrics.precision_score(Q8test_dataset.target, Y_predict)
        f1_score = metrics.f1_score(Q8test_dataset.target, Y_predict)
    else:
        recall = metrics.recall_score(Q8test_dataset.target, Y_predict, average=
→Averagetype)
        precision = metrics.precision_score(Q8test_dataset.target, Y_predict,
→average = Averagetype)
        f1_score = metrics.f1_score(Q8test_dataset.target, Y_predict, average =
→Averagetype)

```

```

print('Other Evaluations for ' + report_title)
print('Accuracy = {:.4f}'.format(accuracy))
print('Recall = {:.4f}'.format(recall))
print('Precision = {:.4f}'.format(precision))
print('F1_score = {:.4f}'.format(f1_score))

```

```

[225]: Q8clf_NB = GaussianNB().fit(Q8X_train_lsi, Q8train_dataset.target)
Y_predict = Q8clf_NB.predict(Q8X_test_lsi)
cm = confusion_matrix(Q8test_dataset.target, Y_predict)
np.set_printoptions(precision=4)
print('Confusion matrix, without normalization')
print(cm)

```

Confusion matrix, without normalization

```

[[233  27 129   3]
 [ 78 176 129   2]
 [ 45  22 316   7]
 [  0   1  10 387]]

```

8.0.1 Naive Bayesian

```

[233]: Q8clf_NB = GaussianNB().fit(Q8X_train_lsi, Q8train_dataset.target)
Q8EvaluationReport(Q8clf_NB, Q8X_test_lsi, Q8test_dataset.target,
    ↳ 'macro', 'Multi-Class Naive Bayes Classifier')

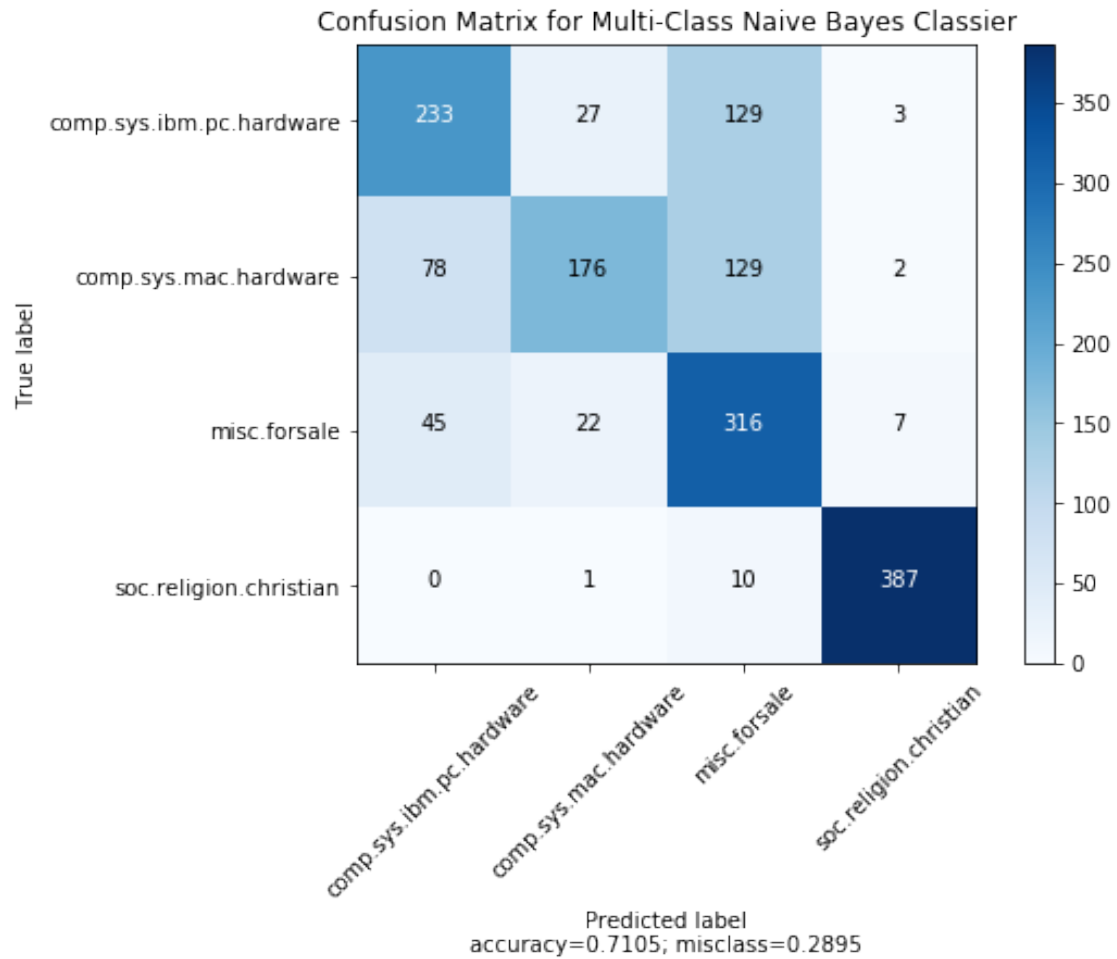
```

Confusion matrix, without normalization

```

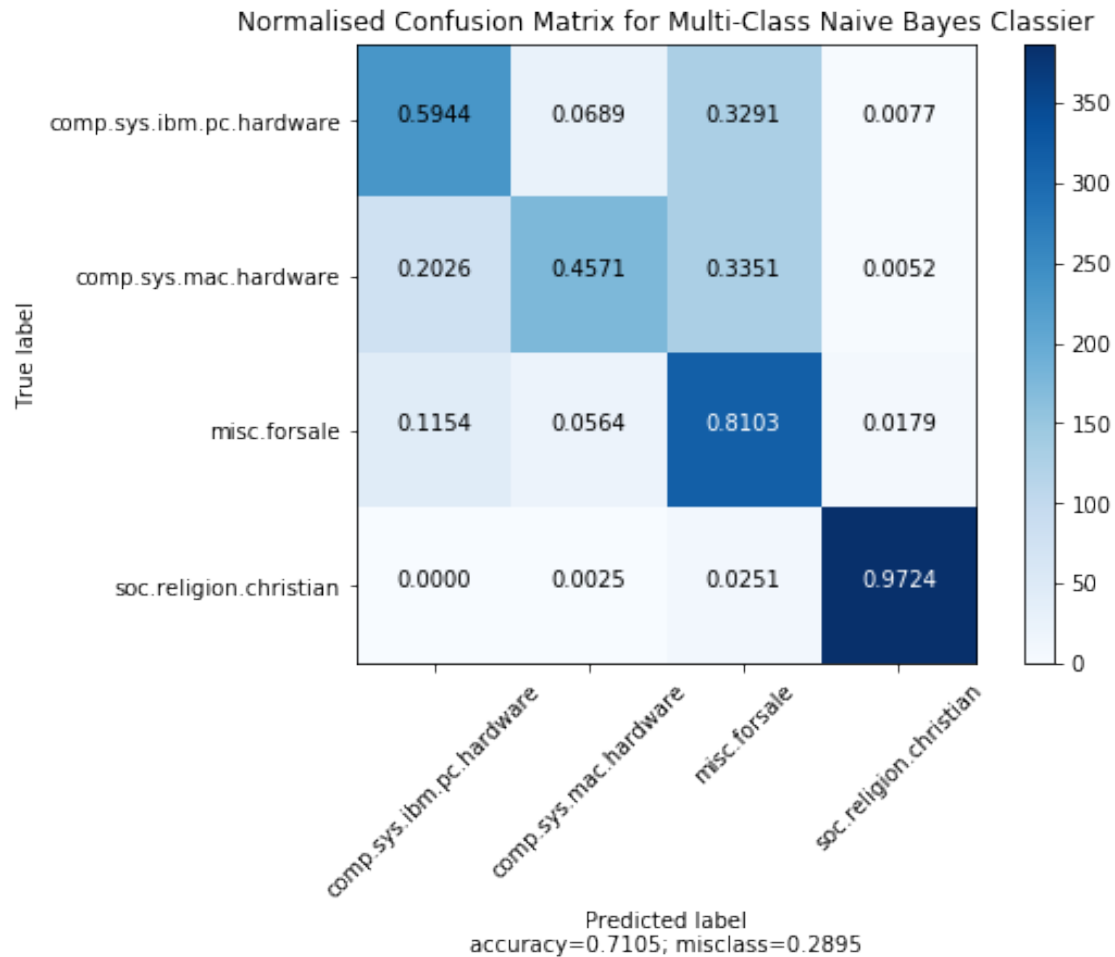
[[233  27 129   3]
 [ 78 176 129   2]
 [ 45  22 316   7]
 [  0   1  10 387]]

```

Normalized confusion matrix

```
[[0.5944 0.0689 0.3291 0.0077]
 [0.2026 0.4571 0.3351 0.0052]
 [0.1154 0.0564 0.8103 0.0179]
 [0.      0.0025 0.0251 0.9724]]
```



Other Evaluations for Multi-Class Naive Bayes Classifier

Accuracy = 0.7105

Recall = 0.7085

Precision = 0.7361

F1_score = 0.7048

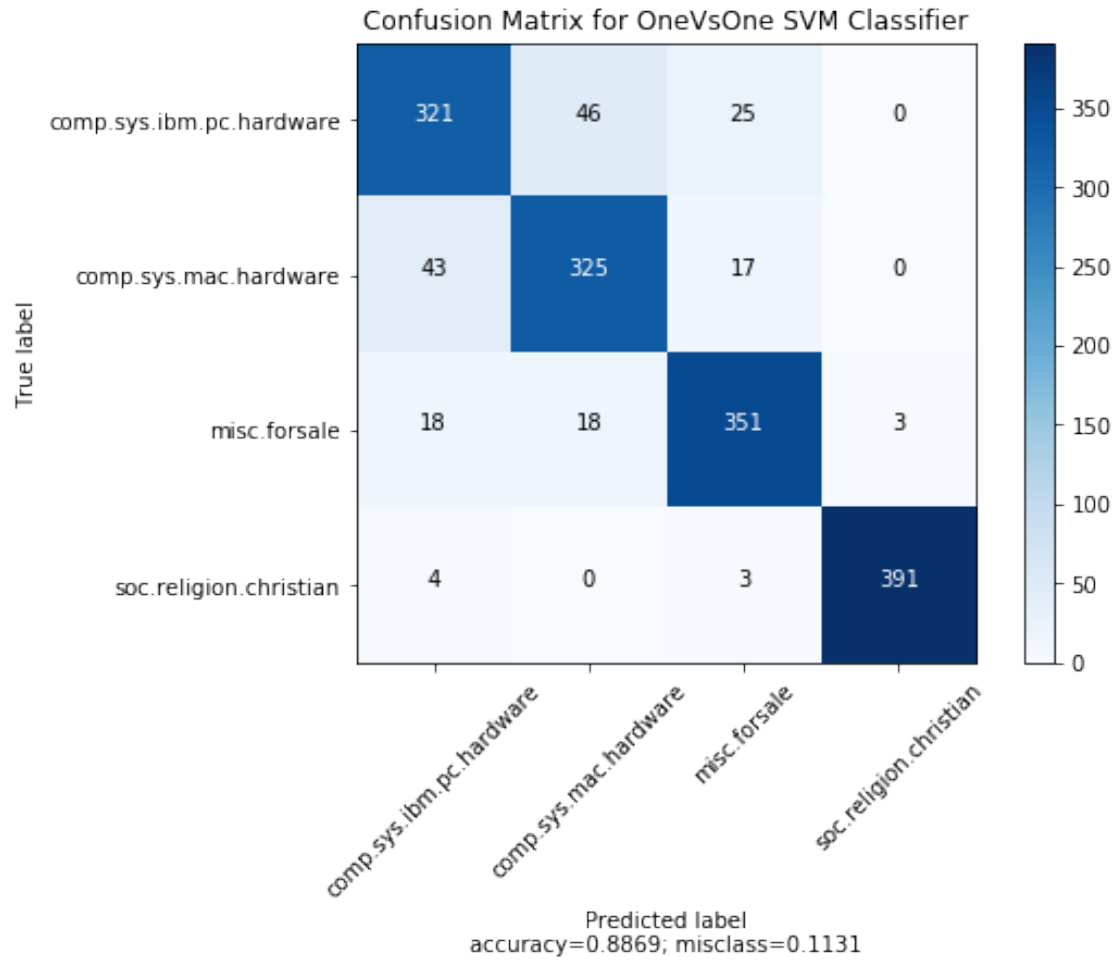
8.0.2 SVM One Vs One

```
[234]: from sklearn.multiclass import OneVsOneClassifier
SVM_OneVOne = OneVsOneClassifier(SVC(C = 100, kernel = 'linear', random_state = 42)).fit(Q8X_train_lsi, Q8train_dataset.target)
Q8EvaluationReport(SVM_OneVOne, Q8X_test_lsi, Q8test_dataset.target, 'weighted', 'OneVsOne SVM Classifier')
```

Confusion matrix, without normalization

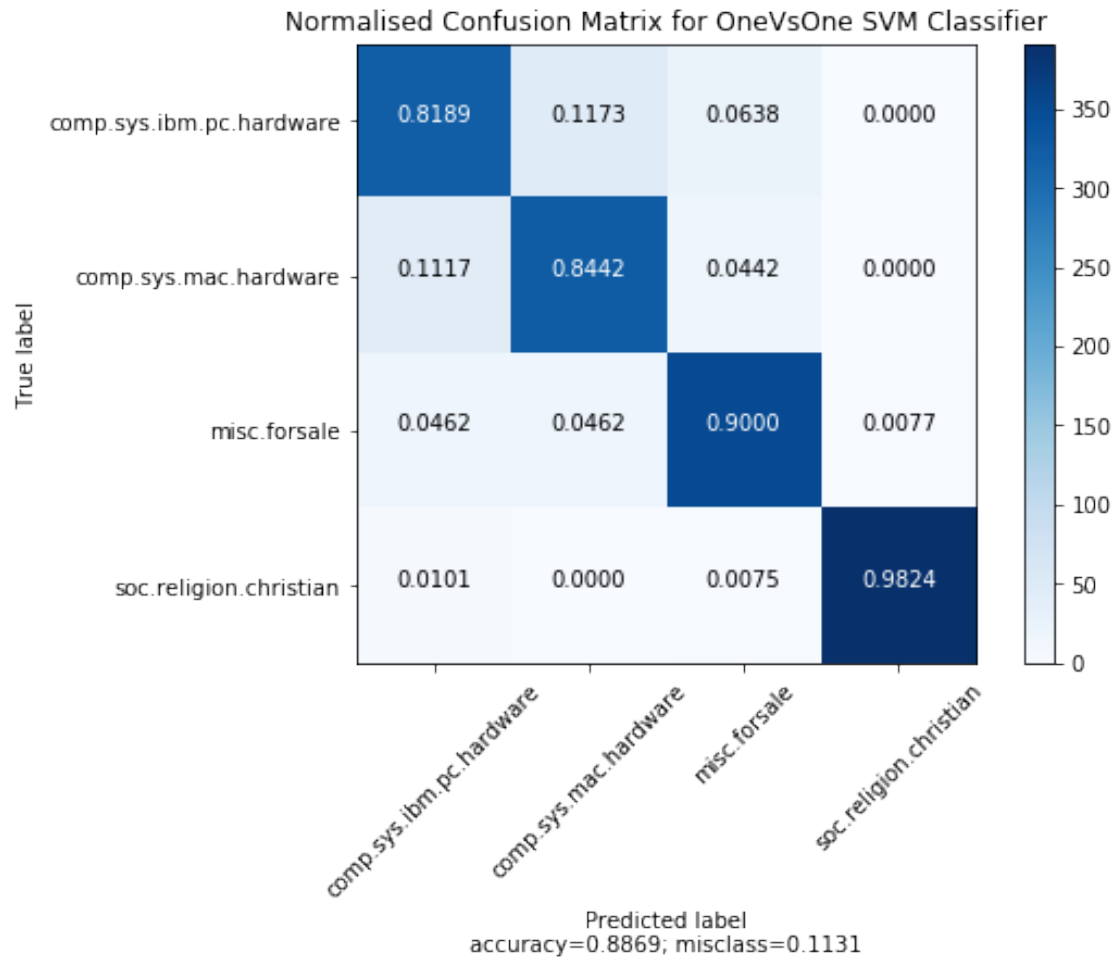
```
[[321  46  25  0]
 [ 43 325  17  0]]
```

```
[ 18  18 351   3]
[  4   0   3 391]]
```



Normalized confusion matrix

```
[[0.8189 0.1173 0.0638 0.    ]
 [0.1117 0.8442 0.0442 0.    ]
 [0.0462 0.0462 0.9    0.0077]
 [0.0101 0.    0.0075 0.9824]]
```



Other Evaluations for OneVsOne SVM Classifier

Accuracy = 0.8869

Recall = 0.8869

Precision = 0.8871

F1_score = 0.8870

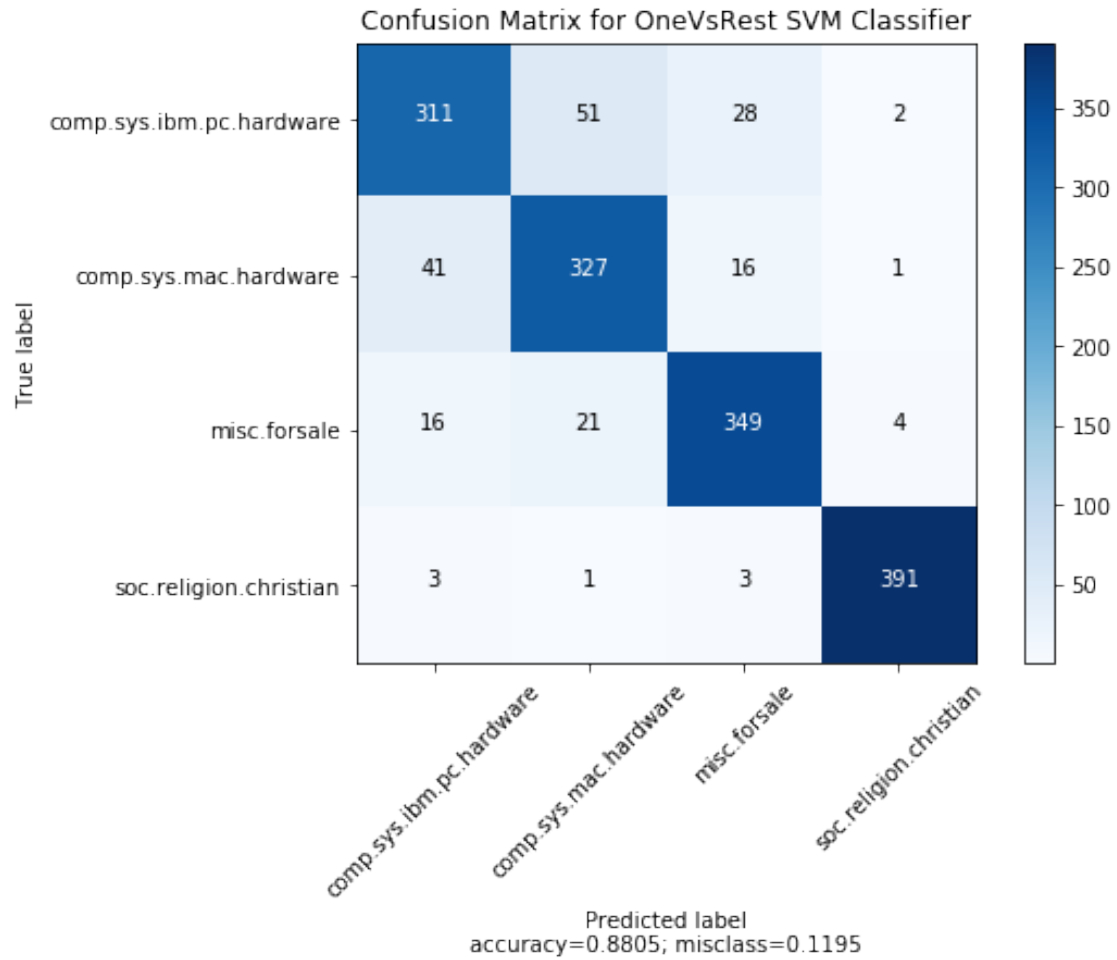
8.0.3 SVM One Vs Rest

```
[235]: from sklearn.multiclass import OneVsRestClassifier
SVM_OneVRest = OneVsRestClassifier(SVC(C = 100, kernel = 'linear', random_state=
    => 42)).fit(Q8X_train_lsi, Q8train_dataset.target)
Q8EvaluationReport(SVM_OneVRest, Q8X_test_lsi, Q8test_dataset.target,
    => 'weighted', 'OneVsRest SVM Classifier')
```

Confusion matrix, without normalization

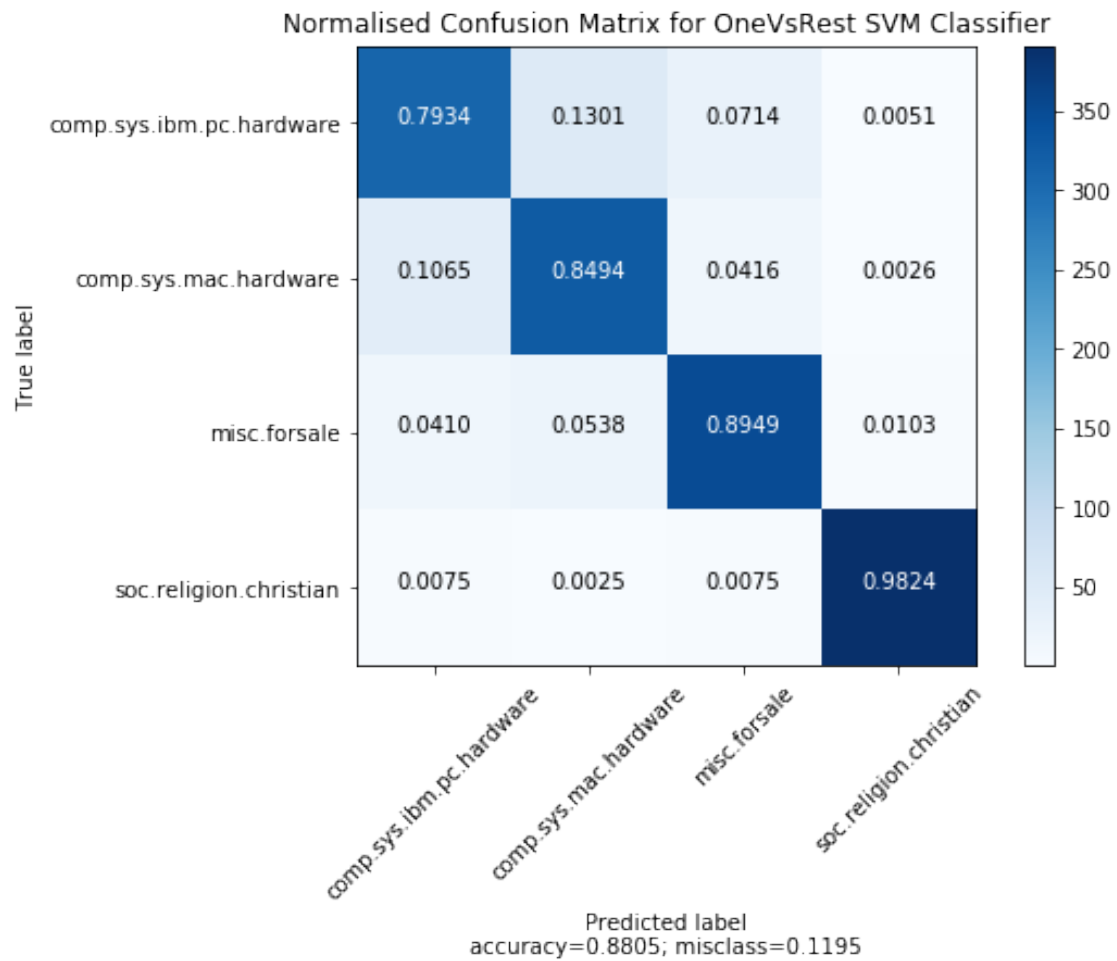
```
[[311  51  28  2]
 [ 41 327  16  1]
```

```
[ 16  21 349   4]
[   3   1   3 391]]
```



Normalized confusion matrix

```
[[0.7934 0.1301 0.0714 0.0051]
 [0.1065 0.8494 0.0416 0.0026]
 [0.041  0.0538 0.8949 0.0103]
 [0.0075 0.0025 0.0075 0.9824]]
```



Other Evaluations for OneVsRest SVM Classifier

Accuracy = 0.8805

Recall = 0.8805

Precision = 0.8805

F1_score = 0.8803

[]: