## Project1\_Q8Update

January 23, 2020

### 1 Getting familiar with the dataset

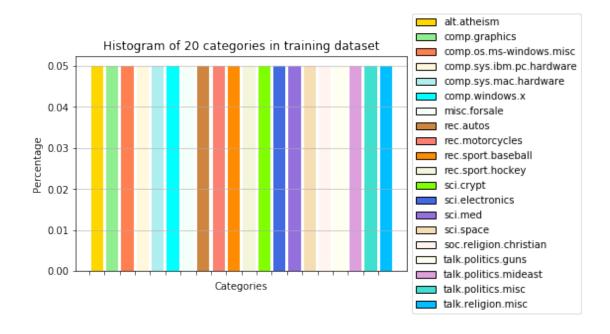
```
[1]: from sklearn.datasets import fetch_20newsgroups
     newsgroups_train = fetch_20newsgroups(subset='train')
     from pprint import pprint
     pprint(list(newsgroups_train.target_names))
     ['alt.atheism',
     'comp.graphics',
     'comp.os.ms-windows.misc',
     'comp.sys.ibm.pc.hardware',
     '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 = 11
     \hookrightarrow (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',u
      \rightarrowbbox_to_anchor=(1, 0.5))
     plt.savefig('Q1 .png', bbox_inches='tight')
```



#### **2** Feature Extraction

#### 2.0.1 QUESTION 2: extract features from the textual data

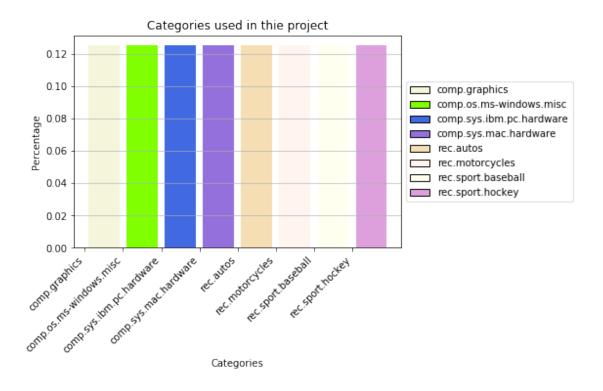
[nltk\_data] Downloading package punkt to

```
[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!
```

tokenize each line of each document, (lower), lemmatize with pos\_tag, vectorize;

```
[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',u
      \rightarrowbbox_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 penn2morphy(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=penn2morphy(tag))
                  for word, tag in pos_tag(nltk.word_tokenize(text))]
     [('He', 'PRP'), ('is', 'VBZ'), ('walking', 'VBG'), ('to', 'TO'), ('school',
     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 pyrtechmispyramidcom andre molyneux subject lciii powerpc replyto andrem pyrtechmispyramidcom 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

```
[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 sys71 mode32 32enabler boot tech support person say card upgrade mb ram 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 easy boot without mode32 control panel disable rather graphic happen reinstall 32bit clean patch run ok must 24bit adressing mode check macintosh see havce 12mb system please answer mail send seperately thank lot advice 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)
```

```
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:
```

```
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
```

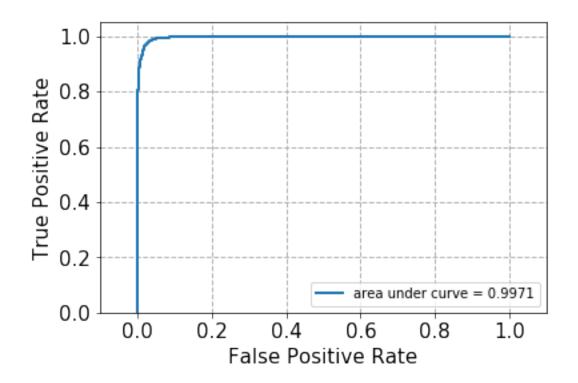
## 4 Classification Algorithms

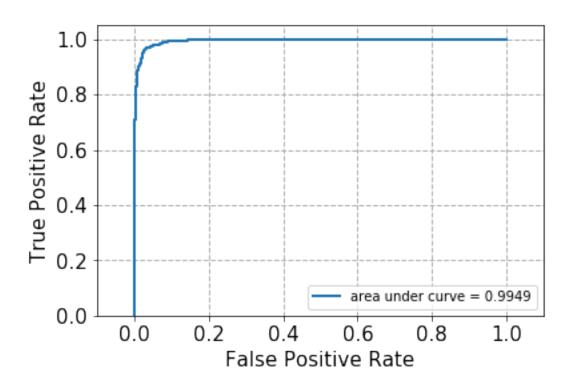
#### 4.0.1 QUESTION 4: Hard margin and soft margin linear SVMs:

```
[22]: | #data preparation: create two values for 2 classes - 'comp' and 'rec'
      len(train_dataset.target) #train_dataset.target contains the category in □
       \rightarrow 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)
```

```
[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 sum_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 sum_hard
    plot_roc(fpr_hard, tpr_hard)
    #ROC plot for sum_soft
    score_soft = svc_soft.decision_function(X_test_lsi)
    #print(len(score_hard))
    fpr_soft, tpr_soft, threshold = metrics.roc_curve(Y_test, score_soft)
    # draw the ROC for sum_soft
    plot_roc(fpr_soft, tpr_soft)
```





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

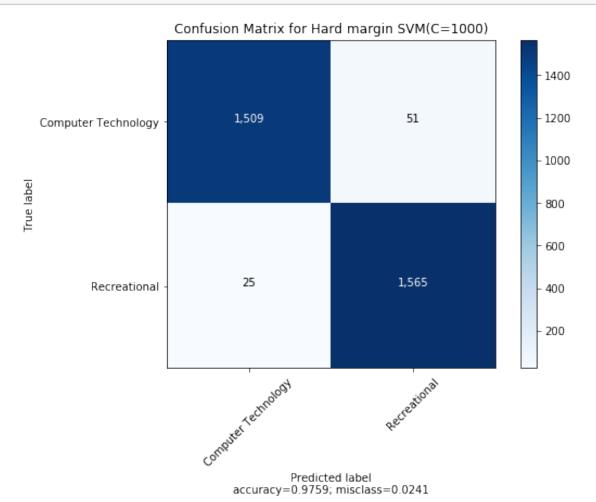
#### SVM classifier

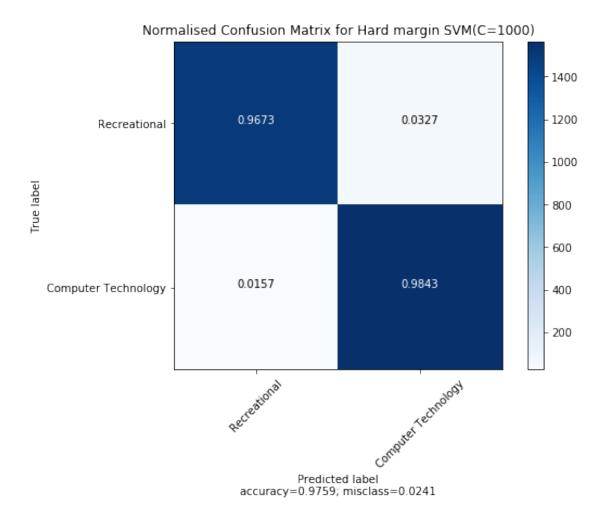
```
[59]: import numpy as np
      from matplotlib import pyplot as plt
      def plot_confusion_matrix(cm,
                                 target_names,
                                 title='Confusion matrix',
                                 cmap=None,
                                 normalize=True):
          11 11 11
          title:
                         the text to display at the top of the matrix
                         the gradient of the values displayed from matplotlib.pyplot.cm
          cmap:
                         see http://matplotlib.org/examples/color/colormaps_reference.
       \hookrightarrow html
                        plt.get_cmap('jet') or plt.cm.Blues
          n n n
          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:
```

```
[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 sum_best
          if(clf in {svc_hard,svc_soft,svc_best}):
              Prob_score = clf.decision_function(testset)
                                                           #use decision_function_
       → for sum
              fpr, tpr, threshold = metrics.roc_curve(Y_test, Prob_score)
          else:
```

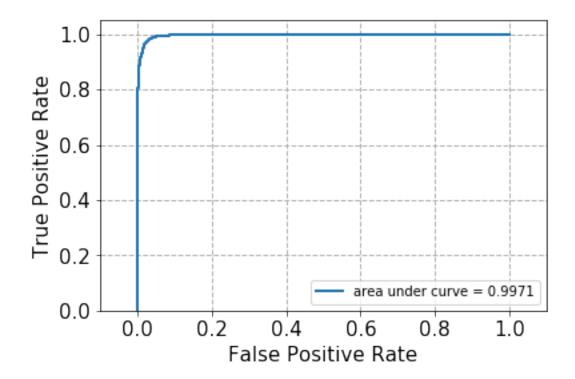
```
Prob_score = clf.predict_proba(testset) #use predict_proba for others
    fpr, tpr, threshold = metrics.roc_curve(Y_test, Prob_score[:,1])
plot_roc(fpr, tpr)
print('Other Evaluations for ' + report_title)
print('Accuracy = {:0.4f}'. format(accuracy))
print('Recall = {:0.4f}'.format(recall))
print('Precision = {:0.4f}'.format(precision))
print('F1_score = {:0.4f}'.format(f1_score))
```

[137]: EvaluationReport(svc\_hard, X\_test\_lsi,Y\_test,'0','Hard margin SVM(C=1000)')

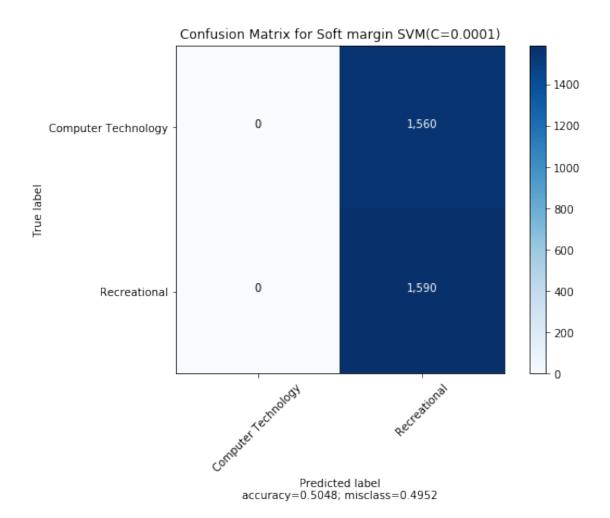


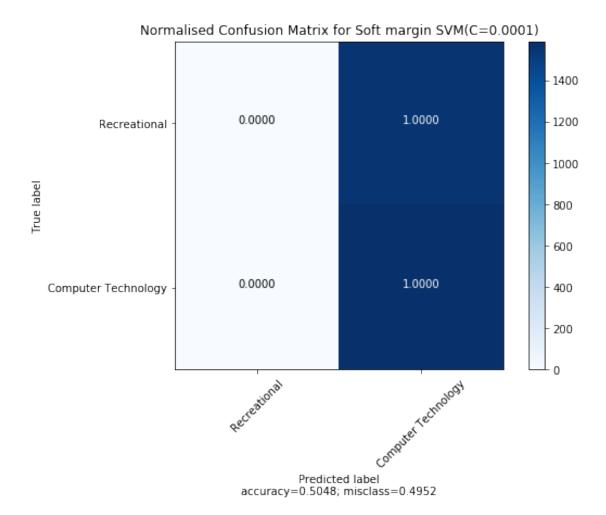


Other Evaluations for Hard margin SVM(C=1000) Accuracy = 0.9759 Recall = 0.9843 Precision = 0.9684



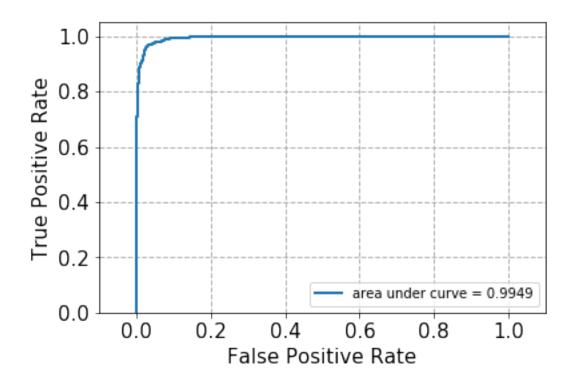
[138]: EvaluationReport(svc\_soft, X\_test\_lsi,Y\_test,'0','Soft margin SVM(C=0.0001)')





Other Evaluations for Soft margin SVM(C=0.0001)
Accuracy = 0.5048
Recall = 1.0000

Precision = 0.5048



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

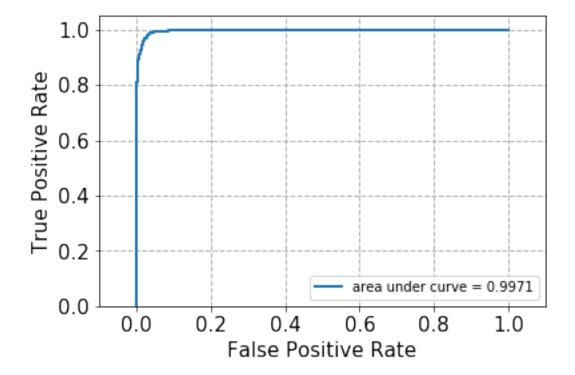
```
[139]: from sklearn.model_selection import cross_val_score
SVM_scores = []
for k in range(-3, 4):
        SVM_clf = SVC(C = 10**k, kernel = 'linear', random_state = 42).
        -fit(X_train_lsi, Y_train)
        SVM_scores.append(cross_val_score(SVM_clf, X_train_lsi, Y_train, cv=5,___
-scoring='accuracy'))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

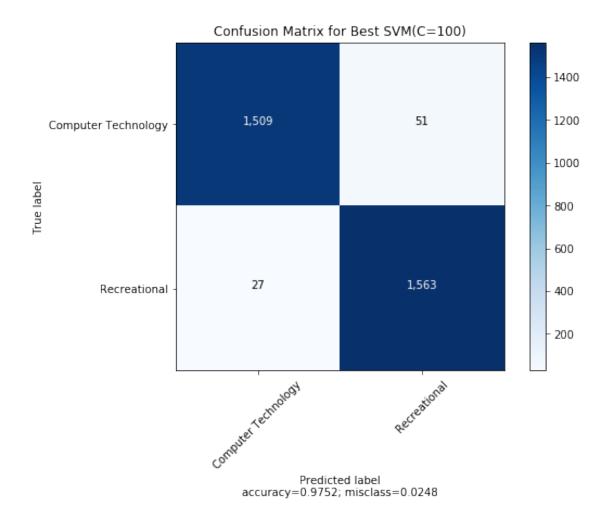
```
print('when C = '+str(C_best)+', highest accuracy is achieved.')
```

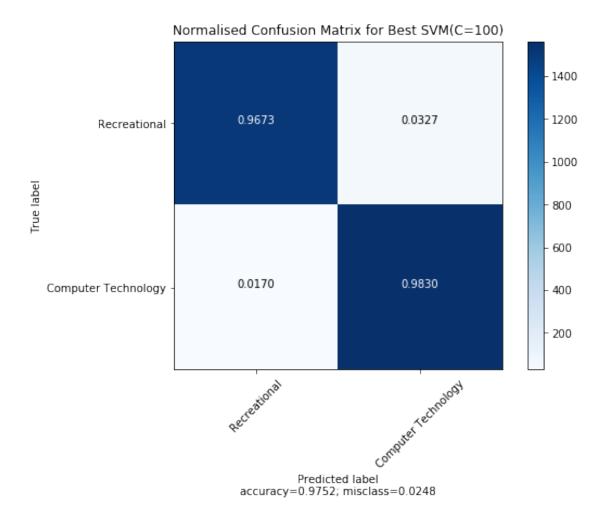
when C = 100, highest accuracy is achieved.



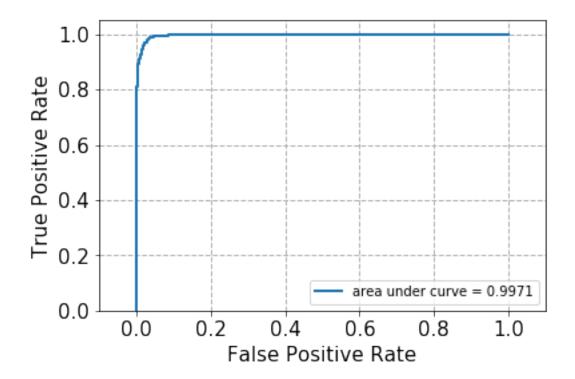
```
[142]: #evaluate the highest accuracy model.
svc_best = SVC(C = C_best, kernel = 'linear', random_state = 42).

→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

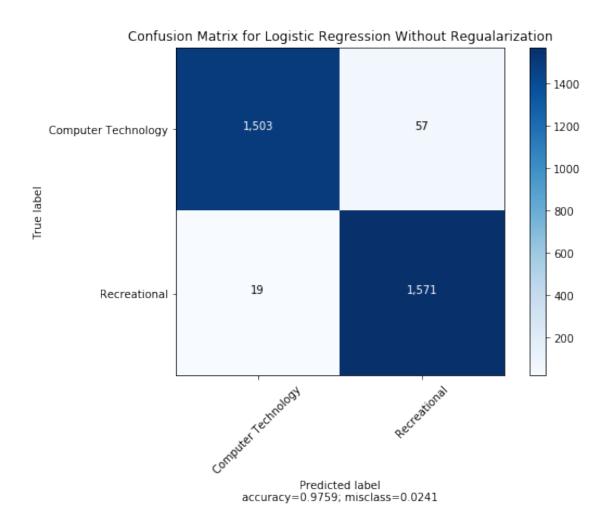
LR_wo = LogisticRegression(penalty='12',solver='liblinear',C = 1e9) # use a

→ large number of C as 1e9 to approximate none regularization

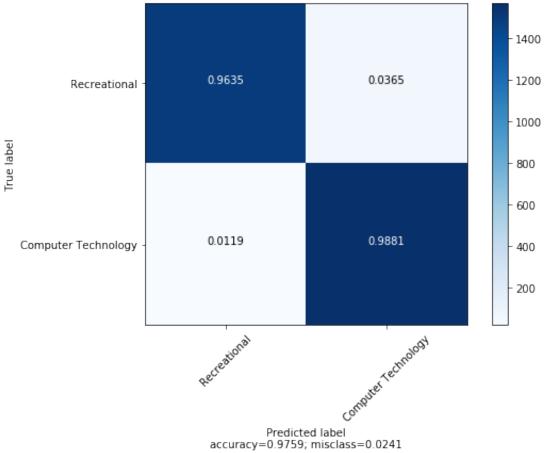
clf_LR_wo = LR_wo.fit(X_train_lsi, Y_train)

EvaluationReport(clf_LR_wo, X_test_lsi, Y_test, '0','Logistic Regression Without

→ Regualarization')
```





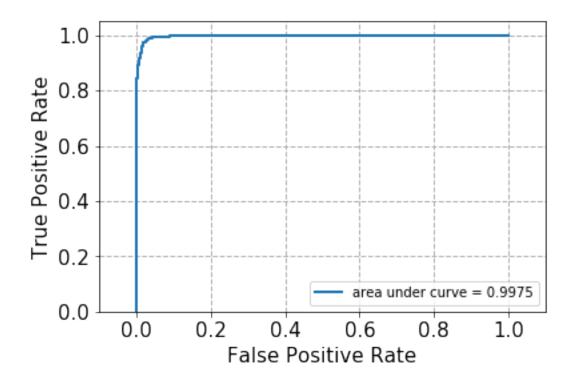


Other Evaluations for Logistic Regression Without Regualarization

Accuracy = 0.9759

Recall = 0.9881

Precision = 0.9650



#### 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,_
       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)
```

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            0., 0.
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                             , 0. , 0.
                                        ]),
                   42.58,
                           5.14, -11.63,
                                        0.,
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      array([ 0. ,
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                                               0.
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             0.,
                    0. ]),
                                        0.,
      array([ 0. ,
                  74.42, 21.76, -30.72,
                                               7.54, 16.4,
                                                            0.,
                                        0.,
                           0., -4.43,
              0., -13.75,
                                              10.87,
                                                      5.19,
                                                           -0.81,
              5.22, -0.97,
                           0.
                                 0.,
                                        6.18,
                                               0.,
                                                      0.,
                                                           -1.31,
                    0.
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                                  0.
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              0.,
             8.37,
                           0.
                                  0.
                                        0.,
                                               0.
                                                      0.,
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                    0.
             -1.98,
                           0.
                                  0. ,
                                        0. ,
                                               0.
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                    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,
                                        6.92, -0.52, -10.7,
                          0.95,
                                 -6.25,
             13.32,
                    5.93,
                                                           -5.45,
                                                     7.76,
            -12.35, -6.45,
                           0.34,
                                 2.63, -9.62, -0.58,
                                                           -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,
                                                      3.31,
                                               0.79,
                                                            4.73,
                          1.17, -6.55,
                                        7.81, -0.77, -11.23,
             13.44,
                    6.62,
                                                           -6.05,
                           0.79,
                                 3.01, -10. , -0.9 ,
            -12.8 , -6.88,
                                                      8.28,
                                                           -4.35,
```

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

```
[208]: Coef2_matrix_temp = []
      L2_scores = []
      for i in range(7):
          LR_wL2 = LogisticRegression(penalty='12',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,
                                                    1.9 ,
        1.54,
              4.12, -2.34, -1.47, -0.32, -1.5
                                                           1.98,
              0.18, 0.05, -3.07, 0.26, -1.23, -1.76, -0.54,
        6.5 ,
       -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,
              8.58, -4.8, -2.53, -1.84, -0.8,
        4.25,
                                                   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,
                                            0.45,
        7.78, 12.22, -7.05, -4.28, -2.96,
                                                    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])]
```

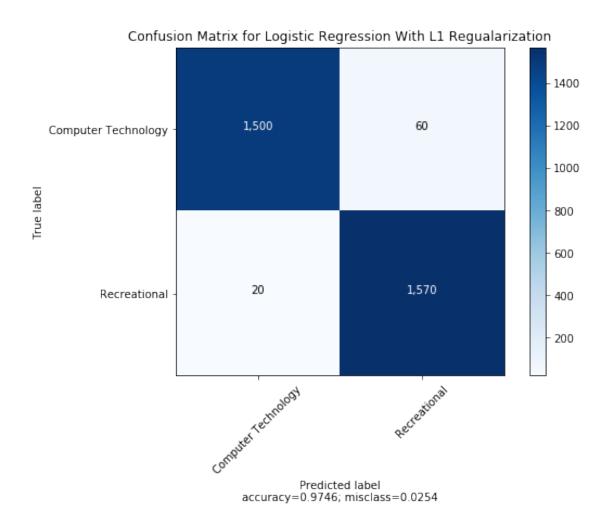
# 5.0.1 We achieve the best accuracy at the regularization strength of $1/10^1 = 0.1$ while using L1 regularization

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

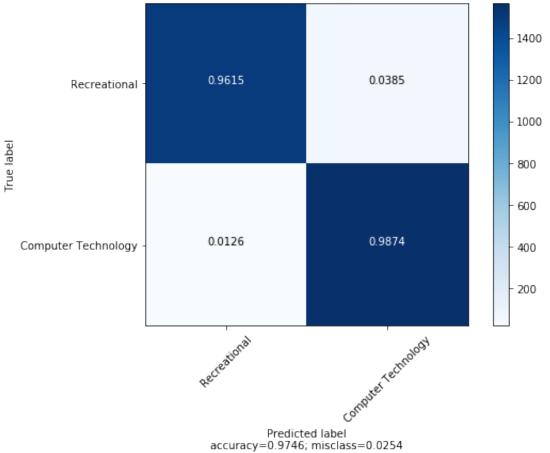
- 0.9756993742387028,
- 0.9782348103288159,
- 0.9771786208710646]

# 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





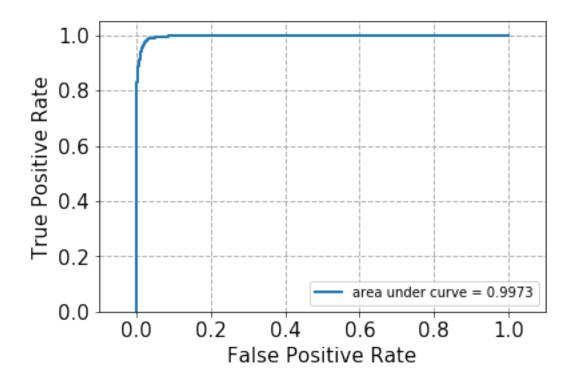


Other Evaluations for Logistic Regression With L1 Regualarization

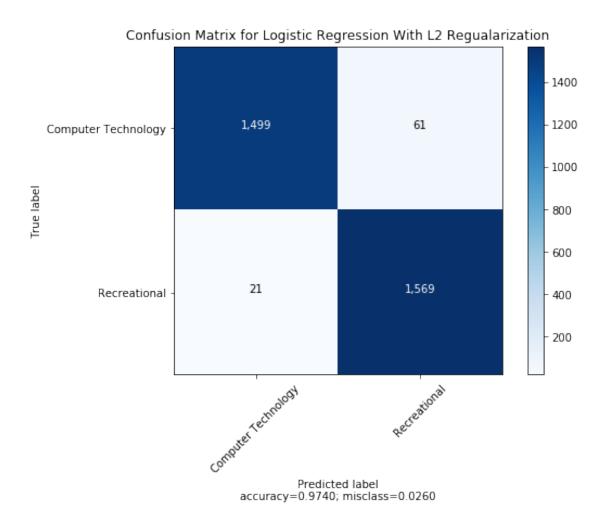
Accuracy = 0.9746

Recall = 0.9874

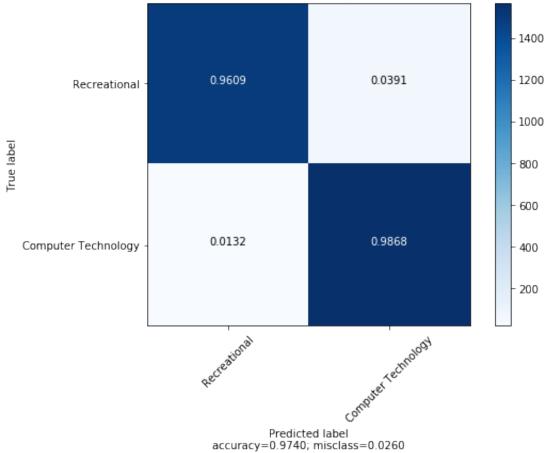
Precision = 0.9632



```
[186]: LR_wL2 = LogisticRegression(penalty='12',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_
       →Regualarization')
      [[ -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
                      -0.31 -3.46
                                     4.25
                                            8.58
                                                  -4.8
                                                         -2.53 -1.84
                                                                      -0.8
                2.59
         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]]
```





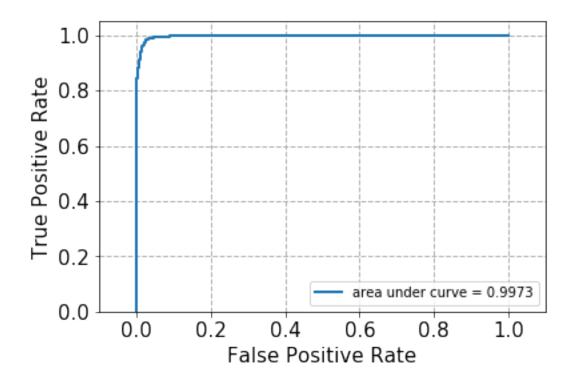


Other Evaluations for Logistic Regression With L2 Regualarization

Accuracy = 0.9740

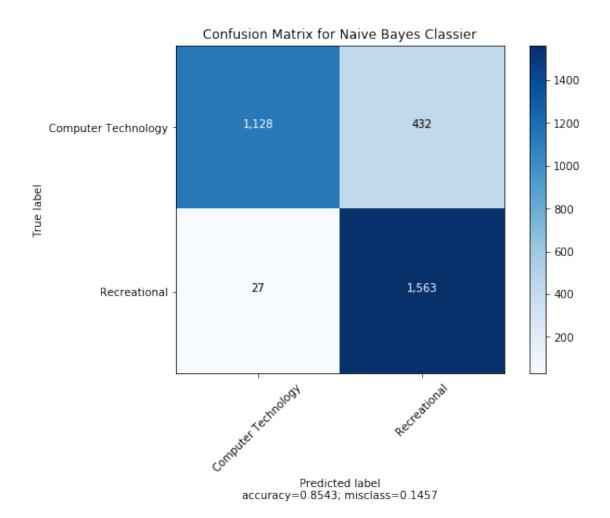
Recall = 0.9868

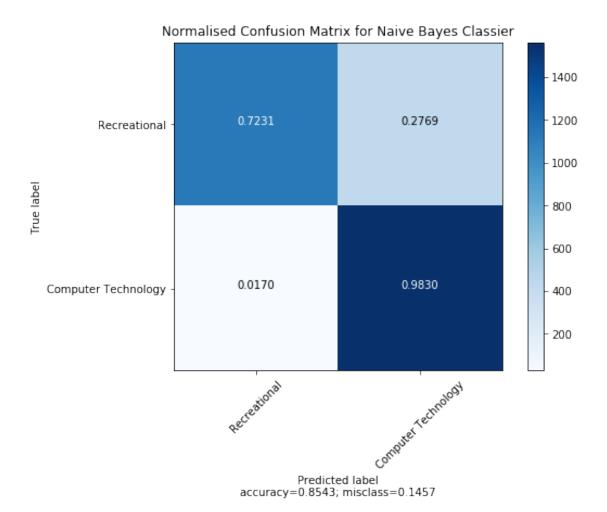
Precision = 0.9626



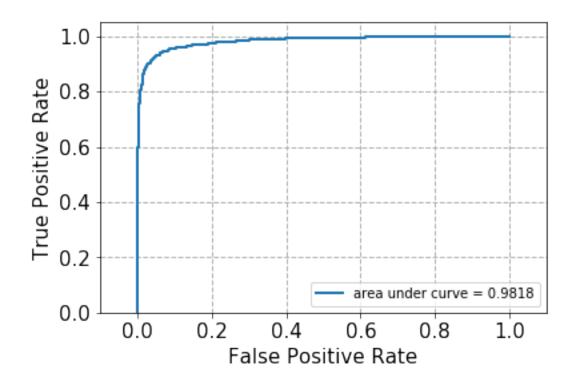
## 6 Question 6 Naive Bayes classifier (XH)

```
[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 Classier')
```





Other Evaluations for Naive Bayes Classier Accuracy = 0.8543 Recall = 0.9830 Precision = 0.7835 F1\_score = 0.8720



## 7 Question 7 Grid Search of Parameters

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='12', 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)
```

```
[ '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'
 '\n'
 'In article 489@ux1.cso.uiuc.edu, husak@ux1.cso.uiuc.edu (Stephen R. Husak ) '
 'writes:\n'
 '>Please reply via e-mail since this is job related: \n'
 '>\n'
 '>I have a Colorado Jumbo back-up system at one of my places of \n'
 '>employment and it has eaten two tapes by winding the tape off the spool.\n'
 '>\n'
 '>Is there an easy fix or is the tape drive fried? Does it simply need \n'
 '>cleaning?\n'
 '>\n'
 '>Any and all comments will be appreciated!\n'
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
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_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
           tol=0.0),
<3786x17284 sparse matrix of type '<class 'numpy.float64'>'
      with 324758 stored elements in Compressed Sparse Row format>,
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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'
  'Reply-To: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Organization: Pyramid Technologies, Mt. View, California.\n'
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'Lines: 34\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)
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
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x17667 sparse matrix of type '<class</pre>
'numpy.int64'>'
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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),
[ '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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'\n'
  'In article 489@ux1.cso.uiuc.edu, husak@ux1.cso.uiuc.edu (Stephen R. Husak ) '
  'writes:\n'
  '>Please reply via e-mail since this is job related: \n'
  '>\n'
  '>I have a Colorado Jumbo back-up system at one of my places of \n'
  '>employment and it has eaten two tapes by winding the tape off the spool.\n'
  '>\n'
  '>Is there an easy fix or is the tape drive fried? Does it simply need \n'
  '>cleaning?\n'
  '>\n'
 '>Any and all comments will be appreciated!\n'
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.00s 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])
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x11142 sparse matrix of type '<class
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_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
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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=5,
               ngram_range=(1, 1), preprocessor=None, stop_words='english',
               strip\_accents=None, token\_pattern='(?u)\\\\\\\\\\\\\),
               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'
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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'
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  '|> Thanks\n'
  '|> David Mirsky\n'
  '|> mirsky@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
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x10997 sparse matrix of type '<class
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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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'(David Joshua Mirsky) writes:\n'
  '|> Hi. I own an LCIII and I recently heard an interesting rumor.\n'
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  '|> 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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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
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
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      with 305704 stored elements in Compressed Sparse Row format>,
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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),
[ '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'
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'|> Hi. I own an LCIII and I recently heard an interesting rumor.\n'
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  '|> 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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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
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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='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3786x10934 sparse matrix of type '<class
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
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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,
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               tokenizer=None, vocabulary=None),
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  'Reply-To: andrem@pyrtech.mis.pyramid.com (Andre Molyneux)\n'
  'Organization: Pyramid Technologies, Mt. View, California.\n'
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  '|> mirsky@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 1.09s to run.
If this happens often in your code, it can cause performance problems
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function (e.g. large strings).
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example so that they can fix the problem.
 **fit_params_steps[name])
      ______fit_transform_one - 1.4s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\a5505fd9c2251
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_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_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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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_ratio=0.0, max_iter=200,
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             verbose=0),
<3785x17481 sparse matrix of type '<class 'numpy.float64'>'
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_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_ratio=0.0, max_iter=200,
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5966080de7ad0c83bd6
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_ratio=0.0, max_iter=200,
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          verbose=0),
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11_ratio=0.0, max_iter=200,
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\d9e7672a8f90e
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\74e04ae2f2a95
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\dca88290e1265
14b5789aeae38e4cc10
_____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',
11_ratio=0.0, max_iter=200,
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_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_ratio=0.0, max_iter=200,
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\7d63eb7e1f474
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\4d4b5a5ad2d62
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11_ratio=0.0, max_iter=200,
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[Memory]0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
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## 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 [Memory] 0.3s, 0.0min : Loading \_fit\_transform\_one from C:\Users\SANDS\AppData \Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\\_fit\_transform\_one\aa2801f7801e8 880c27e5eca445b7557 \_\_\_\_\_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\d690af9ef4082 21627c2b27a2e19b8c3 \_\_\_\_\_\_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\78293fa99d54e 64e9d95fc96f485570f \_\_\_\_\_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\73e2bee6eea12 40683aa6e3ff463ae18 \_\_\_\_\_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\2335ce5bcabf6 4e262c3742dcfaa5249 \_\_\_\_\_fit\_transform\_one cache loaded - 0.2s, 0.0min [Memory] 0.2s, 0.0min : Loading \_fit\_transform\_one from C:\Users\SANDS\AppData $\label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform\_one-953e3cbcbf0b4. The property of the p$ c56584fc5db80cdddd4 \_\_\_\_\_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\f49e81a82c337 6aab976634b2cb046a5 \_\_\_\_\_\_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\f36216b68e0af 5966080de7ad0c83bd6 \_\_\_\_\_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\c742d659898c4 0608b2f480fa02f570a \_\_\_\_\_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\fca54caa7f73a 824aedf059903fdf1f0 \_\_\_\_\_fit\_transform\_one cache loaded - 0.0s, 0.0min $[{\tt Memory}] \ 0.0 {\tt s}, \ 0.0 {\tt min} \qquad : \ {\tt Loading \_fit\_transform\_one \ from \ C:\ Vsers \ SANDS \ AppData}$

\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\\_fit\_transform\_one\e9c0ced997e64

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[Memory] Calling sklearn.pipelinefit_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\\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='12', 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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_____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
{\tt 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 \
                              0.032689
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                                                                 0.003366
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                                                                 0.005293
                0.313582
                              0.009934
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                                                    param_clf \
           SVC(C=100, cache_size=200, class_weight=None, ...
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           SVC(C=100, cache_size=200, class_weight=None, ...
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           SVC(C=100, cache_size=200, class_weight=None, ...
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           LogisticRegression(C=10, class_weight=None, du...
           LogisticRegression(C=10, class_weight=None, du...
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          LogisticRegression(C=100, class_weight=None, d...
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           LogisticRegression(C=100, class_weight=None, d...
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                GaussianNB(priors=None, var_smoothing=1e-09)
       13
                GaussianNB(priors=None, var_smoothing=1e-09)
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                GaussianNB(priors=None, var_smoothing=1e-09)
                GaussianNB(priors=None, var_smoothing=1e-09)
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```

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param_reduce_dim \
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    TruncatedSVD(algorithm='randomized', n_compone...
1
    TruncatedSVD(algorithm='randomized', n_compone...
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    NMF(alpha=0.0, beta_loss='frobenius', init='ra...
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    NMF(alpha=0.0, beta_loss='frobenius', init='ra...
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    CountVectorizer(analyzer='word', binary=False,...
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       15 {'clf': GaussianNB(priors=None, var_smoothing=...
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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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10 {'clf': LogisticRegression(C=100, class\_weight...

11 {'clf': LogisticRegression(C=100, class\_weight...

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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 all,\n'
  '\n'
  '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'
  "Reasons: programs that I've seen are far too slow for this purpose.\n"
  '\n'
  'Platform: 386/486 class machine.\n'
  '\t 800x600-16 or 1024x728-16 VGA graphics\n'
  '\t\t(speed is important, 16-color for non-rendering\n'
  '\t\t purpose is enough; may stay at 800x600 for\n'
  '\t\t speed reason.)\n'
            (hope the code would be generic enough for different SVGA\n'
             cards. My own card is based...,
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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='12', 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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[Memory] Calling sklearn.pipeline._fit_transform_one...
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n_iter=5, random_state=42,
           tol=0.0),
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      with 237351 stored elements in Compressed Sparse Row format>,
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[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\\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 copmletely 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 1.34s 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
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x14794 sparse matrix of type '<class
'numpy.int64'>'
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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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[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'
  "Being copmletely ignorant to the technical stuff on cars, I don't know\n"
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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.
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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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              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'
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'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 43 \mbox{K} '
  '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'
  \mbox{'to meet the legal standards}. \mbox{ (He said he will replace the components '}
  'before\n'
  'selling the car to me.)\n'
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  "Being copmletely ignorant to the technical stuff on cars, I don't know\n"
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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
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3786x14662 sparse matrix of type '<class</pre>
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
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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),
[ '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'
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'The seller just informed me that when he brought the car in for {}^{\shortmid}
  \verb|'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 copmletely 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 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])
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
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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',
               strip_accents=None, token_pattern='(?u)\\b\\w\\w+\\b',
               tokenizer=None, vocabulary=None),
[ 'hi all,\n'
  '\n'
  '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'
  '\n'
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"Reasons: programs that I've seen are far too slow for this purpose.\n"
  '\n'
  'Platform: 386/486 class machine.\n'
  '\t 800x600-16 or 1024x728-16 VGA graphics\n'
  '\t\t(speed is important, 16-color for non-rendering\n'
  '\t\t purpose is enough; may stay at 800x600 \text{ for}\n'
  '\t\t speed reason.)\n'
             (hope the code would be generic enough for different SVGA\n'
             cards. My own card is based...,
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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])
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
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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=5,
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              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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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).
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example so that they can fix the problem.
 **fit_params_steps[name])
  ______fit_transform_one - 1.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x9161 sparse matrix of type '<class
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n_iter=5, random_state=42,
          tol=0.0),
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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'
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  'A typical mileage for 1990 cars seem to be about 70000 km (or about 43K '
  'mi).\n'
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  'to meet the legal standards. (He said he will replace the components '
  'before\n'
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  'what this could mean...\n'
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x9123 sparse matrix of type '<class</pre>
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None, message_clsname='Pipeline', message=None)
{\tt C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317:\ UserWarning:}
Persisting input arguments took 0.79s to run.
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 **fit_params_steps[name])
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
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example so that they can fix the problem.
 **fit_params_steps[name])
_____fit_transform_one - 1.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x9266 sparse matrix of type '<class</pre>
'numpy.int64'>'
      with 224282 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),
<3787x9266 sparse matrix of type '<class 'numpy.float64'>'
       with 224282 stored elements in Compressed Sparse Row format>,
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\label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform_one-bdc5c44252cd5} \\ \label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform_one-bdc5c44252cd5} \\ \label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform_one-bdc5c44252cd5} \\ \label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform_one-bdc5c44252cd5} \\ \label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform_one-bdc5c44252cd5} \\ \label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform_one-bdc5c44252cd5} \\ \label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform-one-bdc5c44252cd5} \\ \label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform-one-bdc5c44252cd5} \\ \label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit-transform-one-bdc5c44252cd5} \\ \label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit-transform-one-bdc5c44252cd5}
f44359edad227279243
_____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\8b1cbdd1effe9
f3415119579fbf8e05e
_____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',
11_ratio=0.0, max_iter=200,
           n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
           verbose=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 cache loaded - 0.1s, 0.0min
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\29fc85ce57e3b
86c2eb89ce15067d538
_____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',
11_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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_____fit_transform_one - 8.4s, 0.1min
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## 52ae908a1f40dfbc4b3 \_\_\_\_\_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\73b0a8281607e eeeff5e30cf06a6d405 \_\_\_\_\_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', 11\_ratio=0.0, max\_iter=200, n\_components=50, random\_state=42, shuffle=False, solver='cd', tol=0.0001, verbose=0), <3785x14531 sparse matrix of type '<class 'numpy.float64'>' with 242171 stored elements in Compressed Sparse Row format>, [ 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, Ο, 1, 1, 0,

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______fit_transform_one - 10.4s, 0.2min
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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\f1686add54b27
5a9e3f4757ecea30882
_____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',
11_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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______fit_transform_one - 12.1s, 0.2min
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\label{localTemp} $$ \Docal\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit\_transform\_one\be287e355ee0e $$
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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\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',
11_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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\label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform\_one-144173d441323} \end{substitute}
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_____fit_transform_one cache loaded - 0.1s, 0.0min
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11_ratio=0.0, max_iter=200,
   n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
   verbose=0),
<3785x8979 sparse matrix of type '<class 'numpy.float64'>'
      with 219720 stored elements in Compressed Sparse Row format>,
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\label{temptmpjb09h9fn} $$ \c 13b3185c48 $$ Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit\_transform\_one\9dc13b3185c48 $$ $$
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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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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_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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_____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
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_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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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_ratio=0.0, max_iter=200,
    n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
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<3786x8951 sparse matrix of type '<class 'numpy.float64'>'
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_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
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f3415119579fbf8e05e
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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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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
[Memory] 0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\f7daef9bfc6b5
ebcb8f975fb7c254ba9
_____fit_transform_one cache loaded - 0.0s, 0.0min
[Memory] 0.0s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\label{localTemp} $$ \Dos = \frac{1}{t_{t_{t_{n}}}} 09h9fn \Dos = \frac{1}{t_{t_{n}}} 0954b6001e8d7 $$
f6b9bfcd5755e88632a
_____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\fa7fc4e3334d1
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5a9551a2dc6fde23ebb
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\a048f9dbc285b
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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\0e97107b1ec3d
b25abfbb68eadfa34c7
_____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=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 43 \mbox{K} '
  '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 1.48s 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
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', 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
[166]: result_2 = pd.DataFrame(grid.cv_results_)
      result_2
[166]:
          mean_fit_time std_fit_time mean_score_time std_score_time \
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    SVC(C=100, cache_size=200, class_weight=None, ...
    SVC(C=100, cache_size=200, class_weight=None, ...
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    SVC(C=100, cache_size=200, class_weight=None, ...
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    LogisticRegression(C=10, class_weight=None, du...
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    LogisticRegression(C=100, class_weight=None, d...
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         GaussianNB(priors=None, var_smoothing=1e-09)
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         GaussianNB(priors=None, var_smoothing=1e-09)
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         GaussianNB(priors=None, var_smoothing=1e-09)
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         GaussianNB(priors=None, var_smoothing=1e-09)
                                     param_reduce_dim \
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    TruncatedSVD(algorithm='randomized', n_compone...
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    NMF(alpha=0.0, beta_loss='frobenius', init='ra...
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   TruncatedSVD(algorithm='randomized', n_compone...
   NMF(alpha=0.0, beta_loss='frobenius', init='ra...
   NMF(alpha=0.0, beta_loss='frobenius', init='ra...
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    CountVectorizer(analyzer='word', binary=False,...
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    CountVectorizer(analyzer='word', binary=False,...
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    {'clf': SVC(C=100, cache_size=200, class_weigh...
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           split4_test_score mean_test_score std_test_score rank_test_score
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[167]: grid.fit(train_data_lammed, Y_train) #3. w header, w lemm
       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),
      [ ' nswcnavymil william scott hiles x1568 subject tape drive problem '
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                        please reply via email since job related
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None, message_clsname='Pipeline', message=None)
{\tt 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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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='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x14260 sparse matrix of type '<class</pre>
'numpy.int64'>'
       with 267097 stored elements in Compressed Sparse Row format>,
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The reason for this is probably some large input arguments for a wrapped

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_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
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      with 267097 stored elements in Compressed Sparse Row format>,
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              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),
[ 'andrem pyrtechmispyramidcom andre molyneux subject lciii powerpc '
  'replyto andrem pyrtechmispyramidcom 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 '
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.28s 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
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[Memory] Calling sklearn.pipeline.\_fit\_transform\_one...

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_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x14270 sparse matrix of type '<class</pre>
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_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=3,
              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 1qksuq 1tt8 '
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  'lciii recently hear interesting rumor hear lciii build slot powerpc '
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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.
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x14095 sparse matrix of type '<class</pre>
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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),
[ 'andrem pyrtechmispyramidcom andre molyneux subject lciii powerpc '
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  'pyramid technology mt view california line article 1qksuq 1tt8 '
  'halgnuaimitedu mirsky halgnuaimitedu david joshua mirsky write hi '
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 1.23s to run.
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(results will be correct in all cases).
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example so that they can fix the problem.
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_____fit_transform_one - 1.4s, 0.0min
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_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3786x14193 sparse matrix of type '<class
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_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
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              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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 'pyramid technology mt view california line article 1qksuq 1tt8 '
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 '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 1.34s 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
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x14257 sparse matrix of type '<class
'numpy.int64'>'
       with 267797 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,
          tol=0.0),
<3787x14257 sparse matrix of type '<class 'numpy.float64'>'
      with 267797 stored elements in Compressed Sparse Row format>,
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______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),
[ 'nswcnavymil william scott hiles x1568 subject tape drive problem '
  'replyto nswcnavymil organization naval surface warfare center dahlgren '
  'division line article ux1csouiucedu husak ux1csouiucedu stephen r '
  'husak write please reply via email since job related
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  'backup system one place employment eat two tape wind tape spool
  'fix tape drive fry simply need clean comment appreciate
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             try try say try tell anything nt know wake today
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Persisting input arguments took 0.81s 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='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x8723 sparse matrix of type '<class</pre>
'numpy.int64'>'
       with 248391 stored elements in Compressed Sparse Row format>,
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:

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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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      with 248391 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=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 '
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 'pyramid technology mt view california line article 1qksuq 1tt8 '
  'halgnuaimitedu mirsky halgnuaimitedu david joshua mirsky write hi '
  'lciii recently hear interesting rumor
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         true hear slot pd slot true
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  'additional vram simm one socket 72pin ram simm one socket flatpack fpu '
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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 0.89s 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
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THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an

function (e.g. large strings).

example so that they can fix the problem.

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**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='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x8586 sparse matrix of type '<class</pre>
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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...
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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',
             tokenizer=None, vocabulary=None),
[ 'andrem pyrtechmispyramidcom andre molyneux subject lciii powerpc '
 'replyto andrem pyrtechmispyramidcom 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 '
         true hear slot pd slot true
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                                                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 '
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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='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x8573 sparse matrix of type '<class
'numpy.int64'>'
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with 247230 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,
             tol=0.0),
<3785x8573 sparse matrix of type '<class 'numpy.float64'>'
        with 247230 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=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
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  'chip
         true hear slot pd slot true
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                                                 david mirsky '
 'mirsky gnuaimitedu well also lc iii pop top reveal one socket '
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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='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3786x8556 sparse matrix of type '<class
'numpy.int64'>'
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_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
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_fit_transform_one(CountVectorizer(analyzer='word', binary=False,
decode_error='strict',
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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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 'pyramid technology mt view california line article 1qksuq 1tt8 '
 'halgnuaimitedu mirsky halgnuaimitedu david joshua mirsky write
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 'chip
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 '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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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.
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      ______
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x8689 sparse matrix of type '<class</pre>
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\c3cdf817112d0
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_ratio=0.0, max_iter=200,
   n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
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verbose=0),
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2e095b8ad6d38
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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
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_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\829f72880cecb
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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\320c13d52ee56
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_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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d2aa6e6511425db2509
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_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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   verbose=0),
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   n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
   verbose=0),
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      with 248391 stored elements in Compressed Sparse Row format>,
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11_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\9d1a0cb3af844
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7a221d7a196d7299e76
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         n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
          verbose=0),
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[Memory] Calling sklearn.pipeline._fit_transform_one...
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   verbose=0),
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       with 249060 stored elements in Compressed Sparse Row format>,
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\2e095b8ad6d38
9019bc3c8fb51db2467
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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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 - 0.2s, 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 \_\_\_\_\_fit\_transform\_one cache loaded - 0.0s, 0.0min [Memory] 0.2s, 0.0min : Loading \_fit\_transform\_one from C:\Users\SANDS\AppData  $\label{localTemp} $$ \Docal\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit\_transform\_one\bb2d1e88f1712 $$$ 1a0e70da7be001d5116 \_\_\_\_\_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\6982e0ee8ad14 d104ec0fd6f379f0c6a 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 - 0.2s, 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 08b343362967e3a0c7f \_\_\_\_\_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 - 0.1s, 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

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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\linear_model\logistic.py:432:
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\label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform\_one-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2683c5b148e4c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686c-2686
7a221d7a196d7299e76
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\b0c14303b8b52
7102e4359a157fc339c
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3d9d2db72792ea93378
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\b0371b4813bc9
8db56911823c4952b68
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[Memory] 0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform\_one-7c278df91d9f0} \end{substitute}
586197e59bb8267bb02
_____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),
[ 'andrem pyrtechmispyramidcom andre molyneux subject lciii 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='12', 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>, [ 0, Ο, Ο, 1, Ο, 1, 1, Ο, 1,

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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),
<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
[168]: result_3 = pd.DataFrame(grid.cv_results_)
      result_3
[168]:
          mean_fit_time
                         std_fit_time
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                                                         std_score_time
                3.246312
                              0.049859
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                                                   param_clf \
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          SVC(C=100, cache_size=200, class_weight=None, ...
          SVC(C=100, cache_size=200, class_weight=None, ...
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          SVC(C=100, cache_size=200, class_weight=None, ...
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          LogisticRegression(C=10, class_weight=None, du...
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          LogisticRegression(C=10, class_weight=None, du...
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          LogisticRegression(C=100, class_weight=None, d...
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          LogisticRegression(C=100, class_weight=None, d...
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          LogisticRegression(C=100, class_weight=None, d...
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                GaussianNB(priors=None, var_smoothing=1e-09)
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                GaussianNB(priors=None, var_smoothing=1e-09)
                GaussianNB(priors=None, var_smoothing=1e-09)
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                GaussianNB(priors=None, var_smoothing=1e-09)
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                                            param_reduce_dim \
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    TruncatedSVD(algorithm='randomized', n_compone...
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    NMF(alpha=0.0, beta_loss='frobenius', init='ra...
    NMF(alpha=0.0, beta_loss='frobenius', init='ra...
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    TruncatedSVD(algorithm='randomized', n_compone...
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    TruncatedSVD(algorithm='randomized', n_compone...
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   NMF(alpha=0.0, beta_loss='frobenius', init='ra...
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    CountVectorizer(analyzer='word', binary=False,...
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11 {'clf': LogisticRegression(C=100, class_weight...
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       12 {'clf': GaussianNB(priors=None, var_smoothing=...
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           split1_test_score split2_test_score split3_test_score
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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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_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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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.93s 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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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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'certification tell front break pad exhaust replace meet legal standard '
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 'nt know could mean 96k km time typical replace mention item indication '
 'car abuse would thing break replace soon seller tell use car highway '
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Persisting input arguments took 1.05s to run.
If this happens often in your code, it can cause performance problems
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function (e.g. large strings).
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example so that they can fix the problem.
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              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',
              tokenizer=None, vocabulary=None),
[ 'hi maybe someone help look buy nissan maximum gxe cdn right car km '
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        nt know verify see paint chip away tiny dot front edge hood though '
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
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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 help look buy nissan maximum gxe cdn right car km '
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  '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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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).
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THIS IS A JOBLIB ISSUE. If you can, kindly provide the joblib's team with an
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  **fit_params_steps[name])
  ______fit_transform_one - 1.1s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
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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 '
       typical mileage car seem km 43k mi seller inform bring car '
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 '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 '
        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 1.08s 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
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x11847 sparse matrix of type '<class</pre>
'numpy.int64'>'
       with 200555 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,
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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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_____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 short look fast assembly code linecircle draw svga graphic complete '
  'think simple fast molecular graphic program write pc clone ballandstick '
  'type reason program see far slow purpose platform class machine
  '800x60016 1024x72816 vga graphic speed important 16color nonrendering '
  'purpose enough may stay 800x600 speed reason hope code would generic '
  'enough different svga card card base trident 8900c vesa
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  'fast routine draw linescirclessimpleshapes abovementioned svga resolution '
 'presumably assembly languagine yes fast please relate code help '
  'rotatingzoominganimating drawing screen drawing beginning would line '
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C:\Users\SANDS\Anaconda3\lib\site-packages\sklearn\pipeline.py:317: UserWarning:
Persisting input arguments took 0.65s 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='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x6869 sparse matrix of type '<class</pre>
'numpy.int64'>'
       with 181303 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),
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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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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 ' 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 ' ١..., [ 0, 0, 0, 1, Ο, 1, 0, 0, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 1, 1, Ο, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 1, 0,

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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='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x7003 sparse matrix of type '<class</pre>
'numpy.int64'>'
       with 182283 stored elements in Compressed Sparse Row format>,
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[Memory] Calling sklearn.pipeline._fit_transform_one...
\verb|_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
           tol=0.0),
<3785x7003 sparse matrix of type '<class 'numpy.float64'>'
      with 182283 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=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 '
       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 '
      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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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])
______fit_transform_one - 1.0s, 0.0min
   _____
[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3785x6898 sparse matrix of type '<class</pre>
'numpy.int64'>'
       with 184090 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,
          tol=0.0),
<3785x6898 sparse matrix of type '<class 'numpy.float64'>'
      with 184090 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=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 '
        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 '
        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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example so that they can fix the problem.
 **fit_params_steps[name])
_____fit_transform_one - 1.0s, 0.0min
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3786x6757 sparse matrix of type '<class</pre>
'numpy.int64'>'
      with 182351 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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_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 '
         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 '
        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).
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
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(TfidfTransformer(norm='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <3787x7070 sparse matrix of type '<class
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with 184467 stored elements in Compressed Sparse Row format>, [ 0, Ο, Ο, 1, Ο, Ο, Ο, Ο, Ο, 1, Ο, Ο, Ο, 1, Ο, Ο, Ο, 1, Ο, Ο, Ο, Ο, Ο, Ο, Ο, Ο, 1, 1, Ο, 1,

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_fit_transform_one(TruncatedSVD(algorithm='randomized', n_components=50,
n_iter=5, random_state=42,
             tol=0.0),
<3787x7070 sparse matrix of type '<class 'numpy.float64'>'
        with 184467 stored elements in Compressed Sparse Row format>,
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\label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform\_one-59e27f40b30d7} \end{substitute}
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_ratio=0.0, max_iter=200,
          n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
          verbose=0),
<3785x11333 sparse matrix of type '<class 'numpy.float64'>'
                    with 196340 stored elements in Compressed Sparse Row format>,
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\d50b38921aee8
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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
\label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9f} $$ Local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9f $$ Local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9f-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9f-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9f-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9f-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9f-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b9-joblib-sklearn-pipeline-fit_transform_one-b3a4a265a7b-joblib-
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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',
11_ratio=0.0, max_iter=200,
          n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
          verbose=0),
<3785x11752 sparse matrix of type '<class 'numpy.float64'>'
                    with 198252 stored elements in Compressed Sparse Row format>,
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\3c349532d03a3
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[Memory]0.2s, 0.0min : Loading _fit_transform_one from C:\Users\SANDS\AppData
\label{localTemp} $$ \Docal\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit\_transform\_one\4b3f266c62aee $$
0379029d6a9282f4ab1
_____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',
11_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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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\f8e4a6ef7a7c5
05cc3c7c7f0c2065635
_____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\6efa36efe2c27
dddbf200952372f372b
_____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',
11_ratio=0.0, max_iter=200,
   n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
   verbose=0),
<3786x11490 sparse matrix of type '<class 'numpy.float64'>'
      with 198316 stored elements in Compressed Sparse Row format>,
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______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
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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\f5620c4d86f44
754867fefe7abb0af98
_____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',
11_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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______fit_transform_one - 8.2s, 0.1min
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\label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform\_one-9b8dd22e625d4-based and the local-transform-one-based and the local-
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',
11_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>, [ 0, Ο, 1, 1, Ο,

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_____fit_transform_one - 5.3s, 0.1min
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\label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform\_one-2dab35f3d9527. The property of the p
c730e624a139d4d4931
_____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\6a040b366bea0
ed5541bbe6de4e38bed
_____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',
11_ratio=0.0, max_iter=200,
           n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
           verbose=0),
<3785x7003 sparse matrix of type '<class 'numpy.float64'>'
                      with 182283 stored elements in Compressed Sparse Row format>,
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8765d87e938abd78847
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\e4b57a0b8dd86
62fd337e826848c1d3b
_____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',
11_ratio=0.0, max_iter=200,
   n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
   verbose=0),
<3785x6898 sparse matrix of type '<class 'numpy.float64'>'
      with 184090 stored elements in Compressed Sparse Row format>,
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\dbacd5c24df7c
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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\cae5d439f85ba
f61a942da123c89736f
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[Memory] Calling sklearn.pipeline._fit_transform_one...
_fit_transform_one(NMF(alpha=0.0, beta_loss='frobenius', init='random',
11_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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\label{thm:local-Temp-tmp} $$ \cline{\cline-fit_transform_one} 451781fedf797 $$
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_____fit_transform_one cache loaded - 0.1s, 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',
11_ratio=0.0, max_iter=200,
   n_components=50, random_state=42, shuffle=False, solver='cd', tol=0.0001,
   verbose=0),
<3787x7070 sparse matrix of type '<class 'numpy.float64'>'
      with 184467 stored elements in Compressed Sparse Row format>,
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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit_transform_one\59e27f40b30d7
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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)
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\label{local-Temp-tmpjb09h9fn-joblib-sklearn-pipeline-fit_transform\_one\b3a4a265a7b9f
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\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
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
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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\4b3f266c62aee 0379029d6a9282f4ab1 \_\_\_\_\_fit\_transform\_one cache loaded - 0.0s, 0.0min [Memory] 0.2s, 0.0min : Loading \_fit\_transform\_one from C:\Users\SANDS\AppData $\label{localTemp} $$ \Docal\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\_fit\_transform\_one\1a4c6384369a5 $$$ fd7d31c6b2132b34fc5 \_\_\_\_\_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\f8e4a6ef7a7c5 05cc3c7c7f0c2065635 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\6efa36efe2c27 dddbf200952372f372b \_\_\_\_\_\_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 \_\_\_\_\_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\8b4a920563ea0 7acb89168ff4f5d19b8 \_\_\_\_\_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\f5620c4d86f44 754867fefe7abb0af98 \_\_\_\_\_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\701077c3ec048 3b6545a9c35d2e9713d \_\_\_\_\_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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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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\Local\Temp\tmpjb09h9fn\joblib\sklearn\pipeline\\_fit\_transform\_one\bd9d58c2f4c02

'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 '
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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
(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='12', smooth_idf=True,
sublinear_tf=False, use_idf=True), <4732x8275 sparse matrix of type '<class
'numpy.int64'>'
       with 234711 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),
<4732x8275 sparse matrix of type '<class 'numpy.float64'>'
       with 234711 stored elements in Compressed Sparse Row format>,
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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)
[170]: result_4 = pd.DataFrame(grid.cv_results_)
       result_4
[170]:
                                                          std_score_time \
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                                        mean_score_time
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    SVC(C=100, cache_size=200, class_weight=None, ...
   SVC(C=100, cache_size=200, class_weight=None, ...
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    TruncatedSVD(algorithm='randomized', n_compone...
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    NMF(alpha=0.0, beta_loss='frobenius', init='ra...
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             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
                                                      0.011810
       0
                    0.467725
                                     0.487954
       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
                    0.484656
                                     0.490068
                                                      0.006171
                                                                              4
       5
       6
                    0.473016
                                     0.483939
                                                      0.013484
                                                                             13
       7
                    0.476190
                                     0.483094
                                                      0.007845
                                                                              14
                    0.470899
                                     0.488800
                                                                              6
       8
                                                      0.013770
       9
                    0.485714
                                     0.493238
                                                      0.007390
                                                                              1
                    0.476190
                                     0.485630
                                                      0.011577
                                                                             10
       11
                    0.469841
                                     0.483094
                                                      0.014153
                                                                             14
       12
                    0.474074
                                     0.490490
                                                      0.014311
                                                                              3
                                                                              2
       13
                    0.476190
                                     0.492392
                                                      0.019891
       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 \
               3.246312
                             0.049859
                                              0.116301
                                                               0.005797
                                                   param_clf \
       O SVC(C=100, cache_size=200, class_weight=None, ...
                                            param_reduce_dim \
        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 split4_test_score \
       0
                   0.974657
                                      0.983105
                                                          0.970402
                                                                             0.984127
                                           rank_test_score
          mean_test_score std_test_score
                 0.976543
                                 0.005985
[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,
```

## 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 mackermit 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 and 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

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

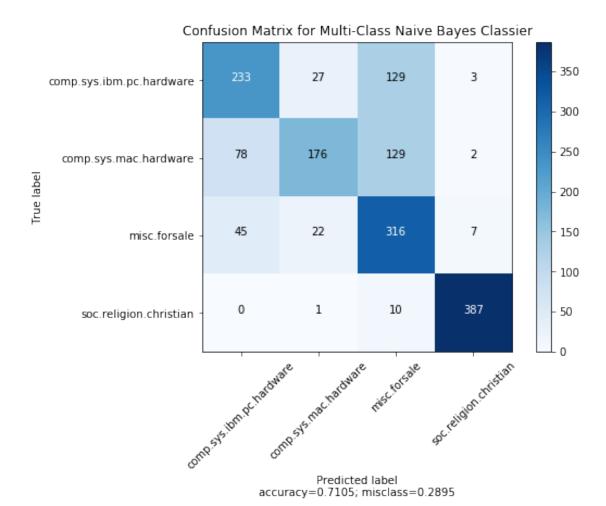
```
tfidf_transformer = TfidfTransformer()
      Q8X_train_tfidf = tfidf_transformer.fit_transform(Q8training_vectors)
      Q8X_test_tfidf = tfidf_transformer.transform(Q8testing_vectors)
      print(Q8X_train_tfidf.shape)
      print(Q8X_test_tfidf.shape)
      (2352, 8417)
      (1565, 8417)
[209]: #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):
           11 11 11
           title:
                         the text to display at the top of the matrix
                         the gradient of the values displayed from matplotlib.pyplot.cm
           cmap:
                         see http://matplotlib.org/examples/color/colormaps_reference.
        \hookrightarrow html
                         plt.get_cmap('jet') or plt.cm.Blues
           11 11 11
           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",
```

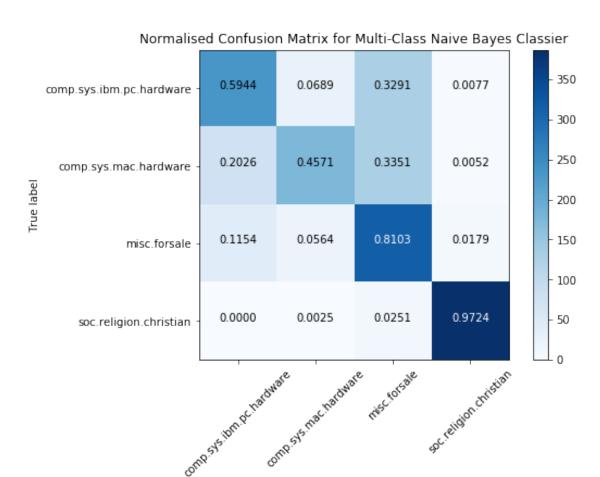
```
color="white" if cm[i, j] > thresh else "black")
        else:
            plt.text(j, i, "{:,}".format(cm[i, j]),
                     horizontalalignment="center",
                     color="white" if cm[i, j] > thresh else "black")
    plt.tight_layout()
    plt.ylabel('True label')
    plt.xlabel('Predicted 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,
                                       = False.
                          normalize
                          target_names = ['comp.sys.ibm.pc.hardware', 'comp.sys.
 →mac.hardware', 'misc.forsale', 'soc.religion.christian'],
                                       = "Confusion Matrix for " + report_title)
                          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'],
                                      = "Normalised Confusion Matrix for " +
                          title
 →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 = {:0.4f}'. format(accuracy))
          print('Recall = {:0.4f}'.format(recall))
          print('Precision = {:0.4f}'.format(precision))
          print('F1_score = {:0.4f}'.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
                      31
       [ 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 Classier')
      Confusion matrix, without normalization
      [[233 27 129
                      31
       [ 78 176 129
                      21
       [ 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]]



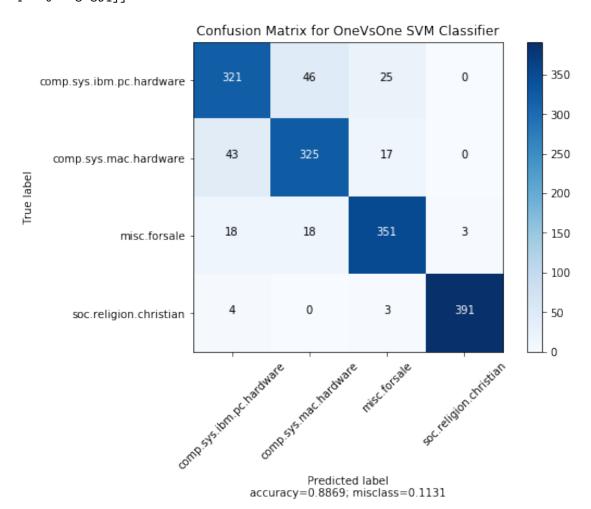
Predicted label accuracy=0.7105; misclass=0.2895

Other Evaluations for Multi-Class Naive Bayes Classier
Accuracy = 0.7105
Recall = 0.7085
Precision = 0.7361
F1\_score = 0.7048

## 8.0.2 SVM One Vs One

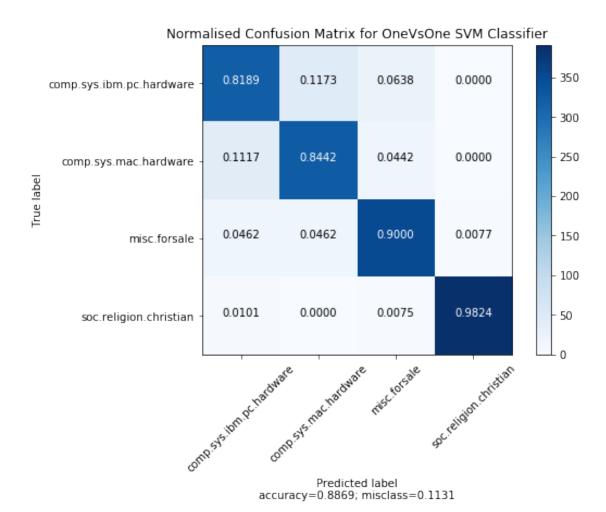
```
Confusion matrix, without normalization [[321 46 25 0] [43 325 17 0]
```

[ 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_

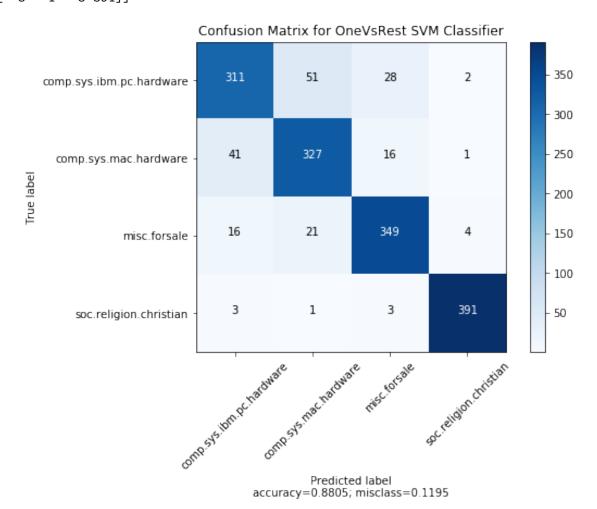
== 42)).fit(Q8X_train_lsi, Q8train_dataset.target)

Q8EvaluationReport(SVM_OneVRest, Q8X_test_lsi, Q8test_dataset.target,__

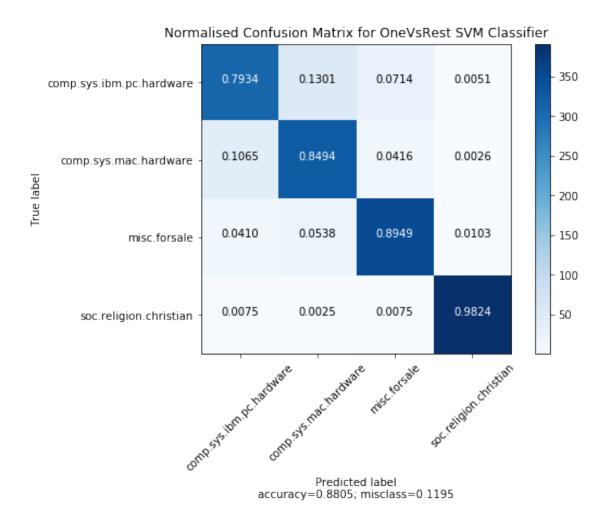
== 'weighted','OneVsRest SVM Classifier')
```

```
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

[]: