In [1]: ▶|

```python
import pandas as pd
# read the file as per original script but change the variable name

data = pd.read_csv('Consumer_Complaints.csv')

# Add the following code cells after you read the data...

# count entries by group (just to illustrate the observation distribution amo
data.groupby('Product').count()

# copy the small groups into a separate data frame
columns = ['Virtual currency','Other financial service']
smallGroupDf = data[data['Product'].isin(columns)]
smallGroupDf.shape

# select another data set where 'Virtual currency' and 'Other financial servi
sampleDf = data[~data['Product'].isin(columns)]
# take 2% (25,000 + rows)
sampleDf = sampleDf.sample(frac=0.02)
# combine the smallGroupDF with smapleDf to get working set
df = pd.concat([smallGroupDf,sampleDf])
df.shape

# release the memory removing full data set and temporary data sets
del data, sampleDf, smallGroupDf
df.head()
```

```
c:\users\finan\appdata\local\programs\python\python37\lib\site-packages\IPy
thon\core\interactiveshell.py:3049: DtypeWarning: Columns (5,6,11,16) have
mixed types. Specify dtype option on import or set low_memory=False.
  interactivity=interactivity, compiler=compiler, result=result)
```

Out[1]:

	Date received	Product	Sub-product	Issue	Sub-issue	Consumer complaint narrative	Company public response	Con
488366	04/21/2017	Other financial service	Debt settlement	Fraud or scam	NaN	NaN	Company believes it acted appropriately as aut...	Equ Accep Corpo
488426	04/21/2017	Other financial service	Credit repair	Disclosures	NaN	NaN	NaN	TIAA
488434	04/21/2017	Other financial service	Check cashing	Customer service/Customer relations	NaN	NaN	Company has responded to the consumer and the ...	F Na Inforn Ser I
488839	04/20/2017	Other financial service	Debt settlement	Fraud or scam	NaN	I attempted to contact Navient to discuss my s...	NaN	N Solu

	Date received	Product	Sub-product	Issue	Sub-issue	Consumer complaint narrative	Company public response	Com
489404	04/20/2017	Other financial service	Debt settlement	Fraud or scam	NaN	NaN	Company believes it acted appropriately as aut...	Equ Accep Corpo
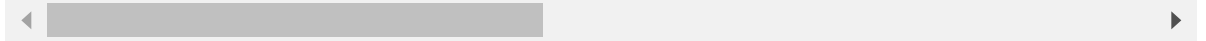
In [2]:

```
df = df[pd.notnull(df['Consumer complaint narrative'])]
```

In [3]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 7802 entries, 488839 to 590047
Data columns (total 18 columns):
Date received                  7802 non-null object
Product                        7802 non-null object
Sub-product                    6738 non-null object
Issue                          7802 non-null object
Sub-issue                      5284 non-null object
Consumer complaint narrative   7802 non-null object
Company public response        3705 non-null object
Company                        7802 non-null object
State                          7777 non-null object
ZIP code                       5929 non-null object
Tags                           1346 non-null object
Consumer consent provided?     7802 non-null object
Submitted via                  7802 non-null object
Date sent to company           7802 non-null object
Company response to consumer   7802 non-null object
Timely response?               7802 non-null object
Consumer disputed?             3536 non-null object
Complaint ID                   7802 non-null int64
dtypes: int64(1), object(17)
memory usage: 1.1+ MB
```

In [4]:

```
col = ['Product', 'Consumer complaint narrative']
df = df[col]
```

In [5]:

```
df.columns
```

Out[5]:   Index(['Product', 'Consumer complaint narrative'], dtype='object')

In [6]:

```
df.columns = ['Product', 'Consumer_complaint_narrative']
```

In [7]: ▶
```python
df['category_id'] = df['Product'].factorize()[0]
from io import StringIO
category_id_df = df[['Product', 'category_id']].drop_duplicates().sort_values
category_to_id = dict(category_id_df.values)
id_to_category = dict(category_id_df[['category_id', 'Product']].values)
```

In [8]: ▶
```python
df.head()
```

Out[8]:

	Product	Consumer_complaint_narrative	category_id
488839	Other financial service	I attempted to contact Navient to discuss my s...	0
490759	Other financial service	I was charged XXXX by The Student Loan Help ...	0
491513	Other financial service	I received a call from XXXX XXXX of Premie...	0
491519	Other financial service	Several checks were issued from XXXX for possi...	0
492705	Other financial service	I enrolled in National Budget Planners of Sout...	0

In [27]:
```python
import matplotlib.pyplot as plt
fig = plt.figure(figsize=(8,6))
df.groupby('Product').Consumer_complaint_narrative.count().plot.bar(ylim=0)
plt.show()
```
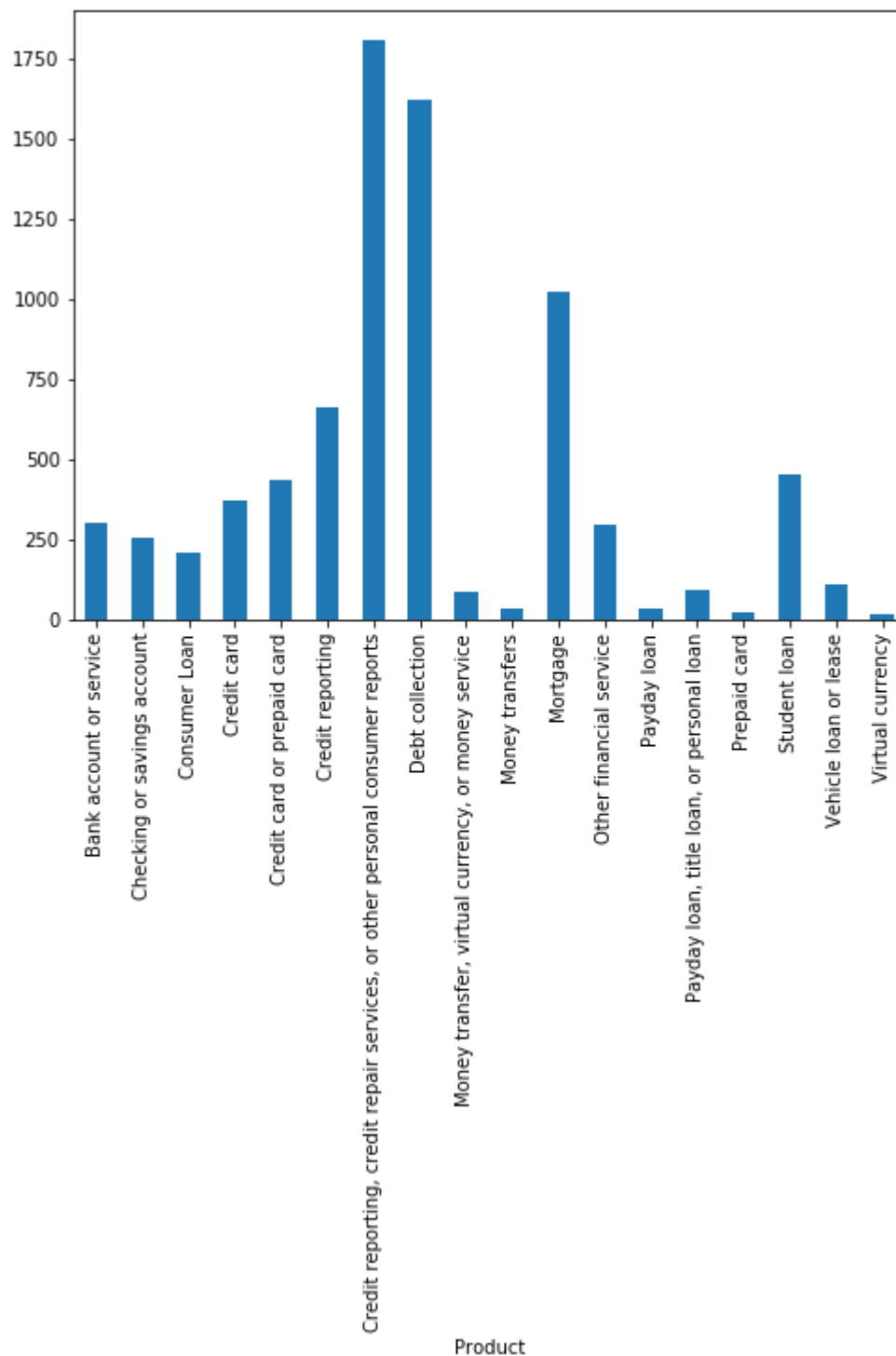
In [10]:

```
from sklearn.feature_extraction.text import TfidfVectorizer

tfidf = TfidfVectorizer(sublinear_tf=True, min_df=5, norm='l2', encoding='lat

features = tfidf.fit_transform(df.Consumer_complaint_narrative).toarray()
labels = df.category_id
features.shape
```

Out[10]: (7802, 21963)

In [11]:

```python
from sklearn.feature_selection import chi2
import numpy as np


N = 2
for Product, category_id in sorted(category_to_id.items()):
  features_chi2 = chi2(features, labels == category_id)
  indices = np.argsort(features_chi2[0])
  feature_names = np.array(tfidf.get_feature_names())[indices]
  unigrams = [v for v in feature_names if len(v.split(' ')) == 1]
  bigrams = [v for v in feature_names if len(v.split(' ')) == 2]
  print("# '{}':".format(Product))
  print("  . Most correlated unigrams:\n      . {}".format('\n      . '.joi
  print("  . Most correlated bigrams:\n      . {}".format('\n      . '.join
```

```
# 'Bank account or service':
  . Most correlated unigrams:
      . deposit
      . overdraft
  . Most correlated bigrams:
      . overdraft fees
      . checking account
# 'Checking or savings account':
  . Most correlated unigrams:
      . atm
      . deposit
  . Most correlated bigrams:
      . debit card
      . checking account
# 'Consumer Loan':
  . Most correlated unigrams:
      . vehicle
      . car
  . Most correlated bigrams:
      . told car
      . motor finance
# 'Credit card':
  . Most correlated unigrams:
      . express
      . card
  . Most correlated bigrams:
      . american express
      . credit card
# 'Credit card or prepaid card':
  . Most correlated unigrams:
      . purchases
      . card
  . Most correlated bigrams:
      . american express
      . credit card
# 'Credit reporting':
  . Most correlated unigrams:
      . experian
      . equifax
  . Most correlated bigrams:
      . tax lien
      . possible thank
```

'Credit reporting, credit repair services, or other personal consumer reports':
  . Most correlated unigrams:
      . equifax
      . inquiries
  . Most correlated bigrams:
      . hard inquiries
      . credit report
'Debt collection':
  . Most correlated unigrams:
      . collection
      . debt
  . Most correlated bigrams:
      . collect debt
      . collection agency
'Money transfer, virtual currency, or money service':
  . Most correlated unigrams:
      . wire
      . coinbase
  . Most correlated bigrams:
      . contacted support
      . coinbase xxxx
'Money transfers':
  . Most correlated unigrams:
      . wu
      . moneygram
  . Most correlated bigrams:
      . western union
      . sent money
'Mortgage':
  . Most correlated unigrams:
      . modification
      . mortgage
  . Most correlated bigrams:
      . mortgage company
      . loan modification
'Other financial service':
  . Most correlated unigrams:
      . certegy
      . lexington
  . Most correlated bigrams:
      . lexington law
      . money order
'Payday loan':
  . Most correlated unigrams:
      . rise
      . payday
  . Most correlated bigrams:
      . payday loans
      . payday loan
'Payday loan, title loan, or personal loan':
  . Most correlated unigrams:
      . references
      . revoke
  . Most correlated bigrams:
      . finance charge
      . got paid

```
         # 'Prepaid card':
           . Most correlated unigrams:
                 . prepaid
                 . rushcard
           . Most correlated bigrams:
                 . express serve
                 . prepaid card
         # 'Student loan':
           . Most correlated unigrams:
                 . loans
                 . navient
           . Most correlated bigrams:
                 . student loans
                 . student loan
         # 'Vehicle loan or lease':
           . Most correlated unigrams:
                 . car
                 . vehicle
           . Most correlated bigrams:
                 . credit acceptance
                 . vehicle xx
         # 'Virtual currency':
           . Most correlated unigrams:
                 . coinbase
                 . signup
           . Most correlated bigrams:
                 . changed longer
                 . signup bonus
```

In [12]:
```python
from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.feature_extraction.text import TfidfTransformer
from sklearn.naive_bayes import MultinomialNB

X_train, X_test, y_train, y_test = train_test_split(df['Consumer_complaint_na
count_vect = CountVectorizer()
X_train_counts = count_vect.fit_transform(X_train)
tfidf_transformer = TfidfTransformer()
X_train_tfidf = tfidf_transformer.fit_transform(X_train_counts)

clf = MultinomialNB().fit(X_train_tfidf, y_train)
```

In [13]:
```python
print(clf.predict(count_vect.transform(["This company refuses to provide me v
```

```
['Debt collection']
```

In [14]:
```
y credit report. I initially submitted a police report on XXXX/XXXX/16 and Che
```

```
['Credit reporting, credit repair services, or other personal consumer repo
rts']
```

In [15]:
```
df[df['Consumer_complaint_narrative'] == "This company refuses to provide me
```

Out[15]:

Product	Consumer_complaint_narrative	category_id

In [16]:
```
df[df['Consumer_complaint_narrative'] == "I am disputing the inaccurate infor
```

Out[16]:

Product	Consumer_complaint_narrative	category_id

In [17]:

```python
from sklearn.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestClassifier
from sklearn.naive_bayes import MultinomialNB
from sklearn.svm import LinearSVC

from sklearn.model_selection import cross_val_score


models = [
    RandomForestClassifier(n_estimators=200, max_depth=3, random_state=0),
    LinearSVC(),
    MultinomialNB(),
    LogisticRegression(random_state=0),
]
CV = 5
cv_df = pd.DataFrame(index=range(CV * len(models)))
entries = []
for model in models:
  model_name = model.__class__.__name__
  accuracies = cross_val_score(model, features, labels, scoring='accuracy', 
  for fold_idx, accuracy in enumerate(accuracies):
    entries.append((model_name, fold_idx, accuracy))
cv_df = pd.DataFrame(entries, columns=['model_name', 'fold_idx', 'accuracy'])
```

```
c:\users\finan\appdata\local\programs\python\python37\lib\site-packages\skl
earn\linear_model\logistic.py:433: FutureWarning: Default solver will be ch
anged to 'lbfgs' in 0.22. Specify a solver to silence this warning.
  FutureWarning)
c:\users\finan\appdata\local\programs\python\python37\lib\site-packages\skl
earn\linear_model\logistic.py:460: FutureWarning: Default multi_class will
be changed to 'auto' in 0.22. Specify the multi_class option to silence thi
s warning.
  "this warning.", FutureWarning)
c:\users\finan\appdata\local\programs\python\python37\lib\site-packages\skl
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  FutureWarning)
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  FutureWarning)
c:\users\finan\appdata\local\programs\python\python37\lib\site-packages\skl
```

```
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  "this warning.", FutureWarning)
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  FutureWarning)
c:\users\finan\appdata\local\programs\python\python37\lib\site-packages\skl
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be changed to 'auto' in 0.22. Specify the multi_class option to silence thi
s warning.
  "this warning.", FutureWarning)
```
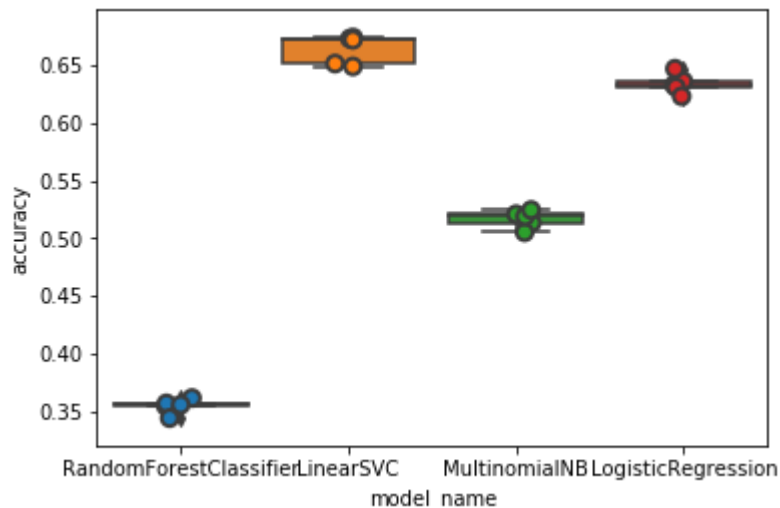
In [18]:
```python
import seaborn as sns

sns.boxplot(x='model_name', y='accuracy', data=cv_df)
sns.stripplot(x='model_name', y='accuracy', data=cv_df,
              size=8, jitter=True, edgecolor="gray", linewidth=2)
plt.show()
```


In [19]:
```python
cv_df.groupby('model_name').accuracy.mean()
```

Out[19]:
```
model_name
LinearSVC              0.663656
LogisticRegression     0.633809
MultinomialNB          0.516543
RandomForestClassifier 0.354655
Name: accuracy, dtype: float64
```

In [20]:
```python
from sklearn.model_selection import train_test_split

model = LinearSVC()

X_train, X_test, y_train, y_test, indices_train, indices_test = train_test_sp
model.fit(X_train, y_train)
y_pred = model.predict(X_test)
```

In [21]: ▶

```python
from sklearn.metrics import confusion_matrix

conf_mat = confusion_matrix(y_test, y_pred)
fig, ax = plt.subplots(figsize=(8,6))
sns.heatmap(conf_mat, annot=True, fmt='d',
            xticklabels=category_id_df.Product.values, yticklabels=category_i
plt.ylabel('Actual')
plt.xlabel('Predicted')
plt.show()
```
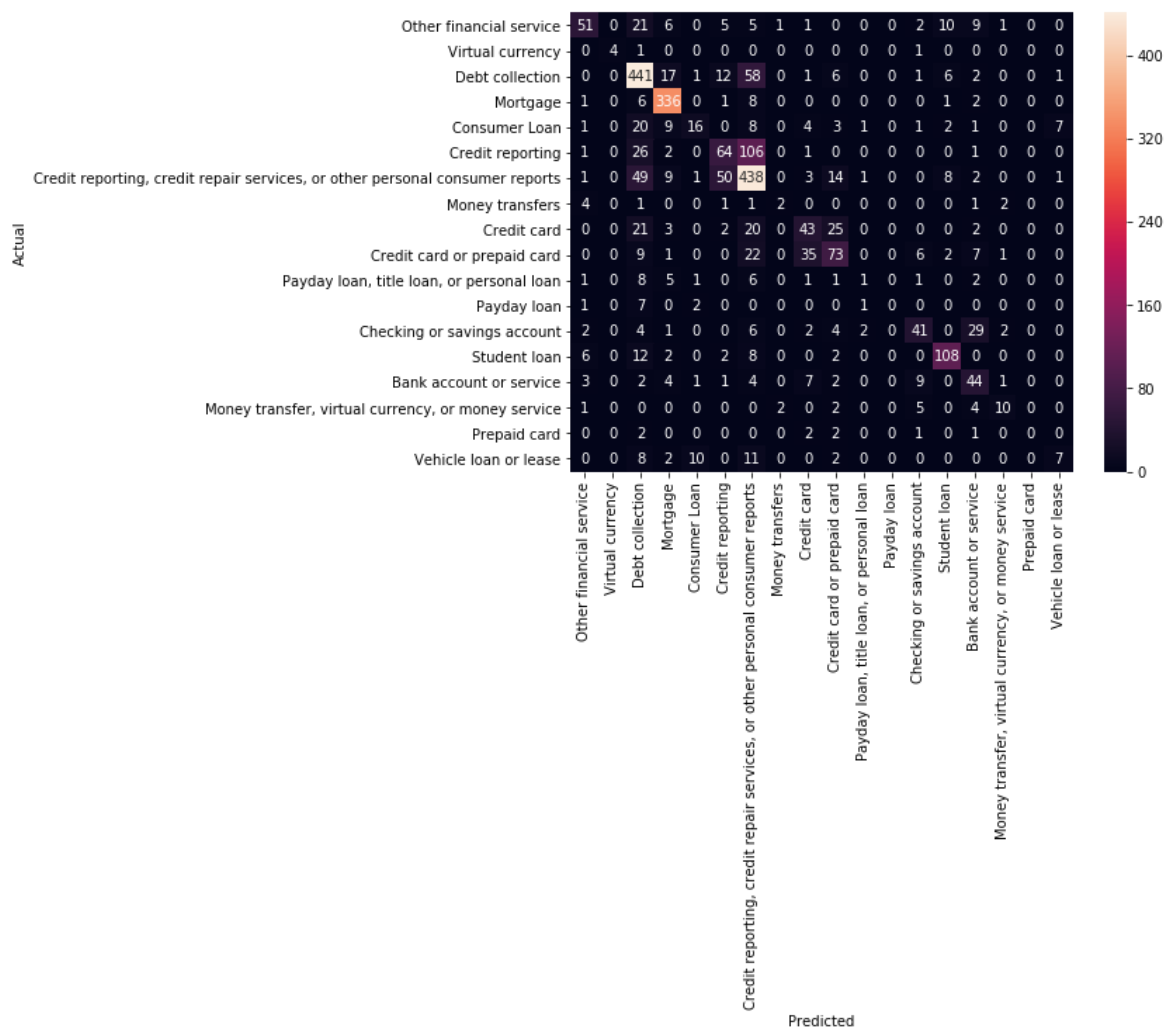
In [22]:

```python
from IPython.display import display

for predicted in category_id_df.category_id:
  for actual in category_id_df.category_id:
    if predicted != actual and conf_mat[actual, predicted] >= 6:
      print("'{}' predicted as '{}' : {} examples.".format(id_to_category[act
      display(df.loc[indices_test[(y_test == actual) & (y_pred == predicted)]
      print('')
```

'Student loan' predicted as 'Other financial service' : 6 examples.

	Product	Consumer_complaint_narrative
287396	Student loan	This Equitable Acceptance Company contacted me...
697641	Student loan	I contacted FedLoan Services after hearing a c...
67874	Student loan	keep getting denied assess to the account by m...
385989	Student loan	In XX/XX/XXXX I defaulted on my student loan b...
545495	Student loan	I had discover student loans. I refinanced the...
526469	Student loan	I was contacted by Integrity group with the he...

'Other financial service' predicted as 'Debt collection' : 21 examples.

	Product	Consumer_complaint_narrative
628223	Other financial service	I received a letter in the mail from Sofi or S...
736771	Other financial service	I have just started with Clear One Advantage a...
861230	Other financial service	I entered into a contract with Trinity Credit ...
526753	Other financial service	being contacted daily by phone and email from ...
644059	Other financial service	I purchased a WU Money Order for {$75.00} to m...
518293	Other financial service	I was contacted by a representative and was to...
648460	Other financial service	As of XXXX XXXX I had repaid my debt with an e...
787854	Other financial service	Nicholes Financial Inc is reporting a Charged ...
698781	Other financial service	I attempted to exchange euros to dollars at th...
853583	Other financial service	I am submitting a complaint in regards to a ba...
610873	Other financial service	Company claiming to get my student loans reduc...
500310	Other financial service	Received an e-mail from INGO.com online check ...
499347	Other financial service	Had an agreement with CheckCare Systems in XX...
495063	Other financial service	Back in XXXX of XXXX I had credit card debt. I...
621265	Other financial service	I was charged {$170.00} for no reason. Five mo...
630705	Other financial service	On XXXX XXXX I called Apple Law firm to help m...
496811	Other financial service	I find that this company, Riverwalk Debt Solut...
849030	Other financial service	Cornerstone Legal Group , LLC XXXX XXXX XXXX X...

	Product	Consumer_complaint_narrative
758595	Other financial service	I had an account with Bill Me Later and PayPal...
526263	Other financial service	We had a lot of debt with credit cards etc and...
866526	Other financial service	ON the day both social security and SSI XXXX f...

'Mortgage' predicted as 'Debt collection' : 6 examples.

	Product	Consumer_complaint_narrative
758819	Mortgage	The United States Bankruptcy Court in XXXX XXX...
721549	Mortgage	First Tennessee Bank had this account charged ...
580654	Mortgage	XXXX XXXX added fees to my account that were e...
124621	Mortgage	Harmon Law PC has been sent a demand/automatic...
53368	Mortgage	Pacific Union XXXX County Clerk XXXX FL Police...
788302	Mortgage	I have a loan with pennymac transfered from XX...

'Consumer Loan' predicted as 'Debt collection' : 20 examples.

	Product	Consumer_complaint_narrative
820981	Consumer Loan	I have constanlty harras by this deb collector...
692444	Consumer Loan	auto loan from ally financial 6yrs agreement, ...
804652	Consumer Loan	Several months ago, I started receiving calls ...
745775	Consumer Loan	I took out a loan from XXXX Boulevard Cash " ...
784710	Consumer Loan	My name is XXXX XXXX and I have been harrassed...
580479	Consumer Loan	I am another victim of the paypal scandal that...
781167	Consumer Loan	I just recently got a new job and the loan com...
768304	Consumer Loan	Interest rates seemHigher than normal rates ev...
501232	Consumer Loan	Coastal Credit,XXXX, XXXX, CO XXXX, issued a l...
754386	Consumer Loan	I have now defaulted on a loan with World Fina...
794720	Consumer Loan	American Credit Acceptance has repeatedly cont...
802433	Consumer Loan	Nissan Acceptance Corp is listing a debt on my...
533454	Consumer Loan	United Auto Credit left threatening messages o...
870958	Consumer Loan	For the past 2 day I recieved a phone call at ...
761416	Consumer Loan	I bought a vehicle and the Santander Consumer ...
542502	Consumer Loan	on XX/XX/XXXX My now deceased wife and myself ...
623451	Consumer Loan	I leased a kia I did the regular maintenance o...
650035	Consumer Loan	I have been trying to get validation of a debt...
536539	Consumer Loan	Wheels Financial Group , LLC sent me XXXX for ...
706526	Consumer Loan	An account was opened in my name that does not...

'Credit reporting' predicted as 'Debt collection' : 26 examples.

	Product	Consumer_complaint_narrative
820995	Credit reporting	A claim was filed against me in Civil Court. I...
859054	Credit reporting	On XX/XX/XXXX, the XXXX XXXX XXXX company in X...
878206	Credit reporting	I paid my bill in full for {$240.00} to XXXX X...
874501	Credit reporting	XXXX XXXX is listed on my credit report as a c...
686885	Credit reporting	The collection agency the account was on remov...
837154	Credit reporting	Company is reporting an outstanding balance. T...
529871	Credit reporting	Ability recovery services Did not provide adeq...
498686	Credit reporting	I have recently been informed that there is ne...
698280	Credit reporting	When you rent from these apartments, the manag...
684436	Credit reporting	I have requested a method of validation on an ...
766210	Credit reporting	XXXX PHONE NUMBER XXXX XXXX I IN XXXX SENT BAC...
663172	Credit reporting	I try to do a dispute and they wan na alot of ...
503648	Credit reporting	Medical collections that was removed by compan...
773068	Credit reporting	I have never lived at this The Address XXXX XX...
834071	Credit reporting	On XXXX/XXXX/2015, I sent a letter to Experian...
648299	Credit reporting	Regarding XXXX XXXX XXXX Credit Card : I have ...
724035	Credit reporting	I was being billed for yard waste/ refuse serv...
646774	Credit reporting	Recently, I notice a collection from XXXX XXXX...
554552	Credit reporting	I received a collection Notice in the mail fro...
589897	Credit reporting	I have disputed directly with bureau ... trans...
705606	Credit reporting	Am a victim of identity theft which took place...
799094	Credit reporting	There are a couple medical debts listed which ...
799570	Credit reporting	Credit bureau continues to allow XXXX accts to...
882403	Credit reporting	XXXX XXXX sent me XXXX cancellation of debt no...
574037	Credit reporting	Old Debt ... that should be off of my account....
828688	Credit reporting	I just pulled up some info XXXX and noticed a ...

'Credit reporting, credit repair services, or other personal consumer reports' predicted as 'Debt collection' : 49 examples.

	Product	Consumer_complaint_narrative
291117	Credit reporting, credit repair services, or o...	Take thhe frad alert off and the inquirments o...
191082	Credit reporting, credit repair services, or o...	in XX/XX/2007 i took a loan out with XXXX XXXX...

	Product	Consumer_complaint_narrative
277559	Credit reporting, credit repair services, or o...	To Whom it May Concern, This letter is in resp...
417177	Credit reporting, credit repair services, or o...	I have two collection accounts that were for m...
265547	Credit reporting, credit repair services, or o...	XXXX XXXX Account XXXX is wrongfully appearing...
238675	Credit reporting, credit repair services, or o...	XXXX XXXX is a lifelong Iowa resident who has ...
335451	Credit reporting, credit repair services, or o...	I have disputed the following with all three C...
411362	Credit reporting, credit repair services, or o...	Regarding account : XXXX XXXX XXXX account num...
410970	Credit reporting, credit repair services, or o...	To whom it may concern : 1. XXXX XXXX 2. XXXX ...
269290	Credit reporting, credit repair services, or o...	XX/XX/XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX ...
314127	Credit reporting, credit repair services, or o...	PRBC MUST disclose my consumer report to my ma...
147838	Credit reporting, credit repair services, or o...	This is in response to this company 's last re...
386615	Credit reporting, credit repair services, or o...	All four major credit bureaus have illegally h...
68429	Credit reporting, credit repair services, or o...	Grant Mercantile Age Opened XX/XX/2015 - {$350...
466758	Credit reporting, credit repair services, or o...	XXXX and XXXX are showing an outstanding balan...
386033	Credit reporting, credit repair services, or o...	I have attempted to reach out to Citibank a fe...
366447	Credit reporting, credit repair services, or o...	I woman of flesh have mailed certified letters...
165439	Credit reporting, credit repair services, or o...	XXXX : National Consumer Assistance Center XXX...
130575	Credit reporting, credit repair services, or o...	In accordance with the Fair Credit Reporting A...
293643	Credit reporting, credit repair services, or o...	I would like to make a complaint on Portfolio ...
140831	Credit reporting, credit repair services, or o...	1. The Plaintiff, for its Complaint against th...
377991	Credit reporting, credit repair services, or o...	The credit reporting agency refused to accurat...
471079	Credit reporting, credit repair services, or o...	Hi, I recently this month disputed a debt with...
478611	Credit reporting, credit repair services, or o...	My complaint is about the sam club account. Th...
407539	Credit reporting, credit repair services, or o...	Unknown late payment XXXX XXXX XXXX XXXX Accou...

	Product	Consumer_complaint_narrative
459193	Credit reporting, credit repair services, or o...	I have sent you a written request to validate ...
127991	Credit reporting, credit repair services, or o...	Just discovered via XXXX XXXX that you have pu...
313412	Credit reporting, credit repair services, or o...	XXXX/XXXX/XXXX, I have been in a legal case wi...
452147	Credit reporting, credit repair services, or o...	XXXX XXXX at XXXX XXXX, Headquartered out of X...
282167	Credit reporting, credit repair services, or o...	XXXX XXXX XXXX claims I own them {$1000.00} bu...
235114	Credit reporting, credit repair services, or o...	Dear CFPB, There is a Collections account on m...
321298	Credit reporting, credit repair services, or o...	I have send transunion a 609 debt validation l...
333358	Credit reporting, credit repair services, or o...	Never sent me validation that I owe this debt....
373396	Credit reporting, credit repair services, or o...	This was apparently charged to me for a doctor...
180914	Credit reporting, credit repair services, or o...	There is an item on my credit that is quite ol...
160675	Credit reporting, credit repair services, or o...	I paid the account off via the third party col...
211331	Credit reporting, credit repair services, or o...	This Transworld account appeared in my credit ...
272694	Credit reporting, credit repair services, or o...	Send several certified letters with tracking n...
234898	Credit reporting, credit repair services, or o...	XXXX XXXX XXXX Talk to XXXX XXXX about the deb...
375182	Credit reporting, credit repair services, or o...	XXXX XXXX is still showing on my credit report...
253676	Credit reporting, credit repair services, or o...	On XX/XX/XXXX Consumer faxed to the debt colle...
85828	Credit reporting, credit repair services, or o...	Credit Karma has assisted an identity thief in...
65782	Credit reporting, credit repair services, or o...	I HAVE REPEATEDLY CONTACTED ZALES AND TOLD THE...
321774	Credit reporting, credit repair services, or o...	I contact company under FDCPA requesting copy ...
73794	Credit reporting, credit repair services, or o...	I have been trying to delete this 2 past due p...
344751	Credit reporting, credit repair services, or o...	I had a charge card with XXXX XXXX XXXX XXXX c...
46670	Credit reporting, credit repair services, or o...	Send letters didnt respond back
372963	Credit reporting, credit repair services, or o...	I requested to have the XXXX XXXX Bank trade r...

	Product	Consumer_complaint_narrative
29646	Credit reporting, credit repair services, or o...	IC Systems Inc. has continued to reflect a der...

'Credit card' predicted as 'Debt collection' : 21 examples.

	Product	Consumer_complaint_narrative
662058	Credit card	After looking over my credit report I noticed ...
640902	Credit card	I am again reporting an issue with American Ex...
659028	Credit card	There is a charge on my credit report from HSB...
864137	Credit card	I opened a Macy 's credit card once, did not g...
880968	Credit card	I have been contacted by XXXX LLC via letter. ...
854155	Credit card	As a result of of my complaint to your office ...
706398	Credit card	Cancellation of debt was submitted to the IRS ...
772311	Credit card	Bank of America is attempting to collect a deb...
757115	Credit card	XX/XX/XXXX, I received a notice of changes in ...
562621	Credit card	Citibank is charging " residual interest " on...
661628	Credit card	I opened an account in about XXXX with XXXX wi...
584218	Credit card	Called Synchrony Bank for my Sam 's Club MC XX...
750059	Credit card	At approximately XXXX today, my XXXX XXXX XXXX...
716167	Credit card	BarclayUS has a cutoff time for XXXX for the m...
510081	Credit card	I signed a contract lowering my XXXX Citibank ...
722999	Credit card	Original message sent to FCC that they asked f...
783796	Credit card	My husband passed in XXXX. We had some credit ...
782960	Credit card	Best Buy delivered a crushed dishwasher to my ...
880060	Credit card	I received a collection letter from First Nati...
738308	Credit card	Charges were put on my account before the work...
822349	Credit card	I obtained a quote for moving services XX/XX/2...

'Credit card or prepaid card' predicted as 'Debt collection' : 9 examples.

	Product	Consumer_complaint_narrative
327036	Credit card or prepaid card	My credit report shows that I have a charge of...
385251	Credit card or prepaid card	Comentity Bank/XXXX XXXX was removed via succc...
83764	Credit card or prepaid card	I bought this XXXX XXXX loaded it with {$100....
288695	Credit card or prepaid card	I was having financial hardship at the time .....
199109	Credit card or prepaid card	My husband and I originally ordered a gas rang...
296201	Credit card or prepaid card	XX/XX/XXXX CONTINUATION to MY FORMAL COMPLAINT...

	Product	Consumer_complaint_narrative
350997	Credit card or prepaid card	XXXX Accountnumber XXXX ... .failed to no...
345781	Credit card or prepaid card	Applied and was accepted by American Express G...
96679	Credit card or prepaid card	Its a dispute in the amount of XXXX. The compa...

'Payday loan, title loan, or personal loan' predicted as 'Debt collection' : 8 examples.

	Product	Consumer_complaint_narrative
381227	Payday loan, title loan, or personal loan	I contacted this company a year ago and stated...
309850	Payday loan, title loan, or personal loan	I obtained a cash to pay day loan and fell on ...
299152	Payday loan, title loan, or personal loan	Loan was received back in XXXX. Yes I 'm late ...
42215	Payday loan, title loan, or personal loan	XXXX, the rep who continuously calls and leave...
186216	Payday loan, title loan, or personal loan	On XX/XX/XXXX I was approved for an installmen...
184086	Payday loan, title loan, or personal loan	I lost my job now Im back working tried callin...
353336	Payday loan, title loan, or personal loan	I received a call today trying to verify my pe...
245972	Payday loan, title loan, or personal loan	I borrowed {$500.00} and a month later I lost ...

'Payday loan' predicted as 'Debt collection' : 7 examples.

	Product	Consumer_complaint_narrative
696472	Payday loan	I am getting threatening calls from someone wh...
647875	Payday loan	Filed chp XXXX and included all loans, being h...
560223	Payday loan	I borrowed {$1500.00} from XXXX (an online pa...
815553	Payday loan	Calling me at work for {$1000.00} in fees
593578	Payday loan	Retired military do not keep dental coverage s...
741115	Payday loan	Someone from High Point Asset, Inc. called my ...
826226	Payday loan	I have been contacted by a company Executive A...

'Student loan' predicted as 'Debt collection' : 12 examples.

	Product	Consumer_complaint_narrative
675103	Student loan	I only owe on XXXX student loans. Wachovia whi...
537497	Student loan	Complaint against ; Riverwalk Debt Solutions X...
565516	Student loan	ACS/XXXX is reporting my status negatively as ...
325590	Student loan	I requested a copy of my original loan documen...
45147	Student loan	Hello, I have had a debt ({$24000.00}) with ...
598711	Student loan	Sallie Mae is engaging in harassment tactics t...

	Product	Consumer_complaint_narrative
138381	Student loan	I want to file a complaint against GC Services...
124448	Student loan	This company baited and switched. The primary ...
597183	Student loan	I was contacted by someone from Navient using ...
272861	Student loan	Ive sent numerous emails and messages after XX...
37249	Student loan	I submitted an application for an income drive...
374685	Student loan	I recently noticed that the company, Navient, ...

'Vehicle loan or lease' predicted as 'Debt collection' : 8 examples.

	Product	Consumer_complaint_narrative
335154	Vehicle loan or lease	Under the laws of the State of Georgia UCC and...
124920	Vehicle loan or lease	XXXX Account Type Installment Loan Terms 36 Mo...
260443	Vehicle loan or lease	Company put a lien on me and additional cost o...
191182	Vehicle loan or lease	Recently checked my credit report and noticed ...
215554	Vehicle loan or lease	I made both of my biweekly payments for XXXX t...
350046	Vehicle loan or lease	I fell behind on my car payments and gave the ...
207594	Vehicle loan or lease	Good Afternoon : I was sold a vehicle with a r...
163235	Vehicle loan or lease	Before going into the business of collecting d...

'Other financial service' predicted as 'Mortgage' : 6 examples.

	Product	Consumer_complaint_narrative
633485	Other financial service	I received a phone call from XXXX. The compute...
764777	Other financial service	We have been customers of Nationwide Biweekly ...
744149	Other financial service	Nationwide bi-weekly administration has been s...
499728	Other financial service	This is not going to end well for anyone on th...
636458	Other financial service	After purchasing our second home, we were soli...
741923	Other financial service	I had a contractor who fraudulently endorsed a...

'Debt collection' predicted as 'Mortgage' : 17 examples.

	Product	Consumer_complaint_narrative
40441	Debt collection	I lost my job in XXXX and my husband and I fil...
704196	Debt collection	ocwen have continue to sent false information ...
775302	Debt collection	XXXX XXXX purchased discharged mortgage from b...
756399	Debt collection	debts were paid in full with one payment month...
368891	Debt collection	Please find that " XXXX XXXX XXXX " is acting...

	Product	Consumer_complaint_narrative
324776	Debt collection	This complaint is filed so there will be a pub...
265452	Debt collection	In XX/XX/XXXX-XX/XX/XXXX I was in the process ...
568432	Debt collection	DUE XXXX due refusal to disclosed XXXX AS TRUS...
380419	Debt collection	I have tried numerous times to resolve this ma...
622289	Debt collection	As a home- owner we have not received a writte...
883718	Debt collection	Loan was a home I purchased in XXXX XXXX NV. L...
325394	Debt collection	On XX/XX/XXXX I, XXXX XXXX, filed CFPB complai...
619686	Debt collection	My mother and I bought property together and I...
294992	Debt collection	In XX/XX/XXXX there was a devastating fire in ...
592661	Debt collection	You do n't really have a category for what my ...
326566	Debt collection	I am a certified XXXX XXXX XXXX XXXX in the st...
731339	Debt collection	They call up to XXXX per day every day after I...

'Consumer Loan' predicted as 'Mortgage' : 9 examples.

	Product	Consumer_complaint_narrative
572855	Consumer Loan	XXXX a division of Pacific Credit Group in XXX...
719451	Consumer Loan	XXXX/XXXX/XXXX XXXX XXXX XXXX sold me a used X...
520236	Consumer Loan	On XX/XX/XXXX I submitted c complaint XXXX and...
849198	Consumer Loan	My husband and I signed a " Retail Installment...
874536	Consumer Loan	I took out a loan through Duvera Financial to ...
695544	Consumer Loan	Good day. I am writing to make a complaint abo...
872583	Consumer Loan	My Complaint Is With PRESTIGE Financial Locate...
679312	Consumer Loan	I received a loan from consumer portfolio serv...
713837	Consumer Loan	Applied for loan with Circleback Lending - aft...

'Credit reporting, credit repair services, or other personal consumer reports' predicted as 'Mortgage' : 9 examples.

	Product	Consumer_complaint_narrative
416376	Credit reporting, credit repair services, or o...	I just received notice that my existing CFPB C...
58660	Credit reporting, credit repair services, or o...	I have a home mortgage loan with Wells Fargo. ...
224159	Credit reporting, credit repair services, or o...	My mortgage was sold 4 times since original pu...
472072	Credit reporting, credit repair services, or o...	I made a payment to Ditech XXXX / XXXX / XXX...

	Product	Consumer_complaint_narrative
223619	Credit reporting, credit repair services, or o...	WELLSFARGO MORTGAGE SHOWS MANY LATES FOR FOR M...
199500	Credit reporting, credit repair services, or o...	XXXX XXXX XXXX is reporting, as of XX/XX/XXXX,...
420385	Credit reporting, credit repair services, or o...	XXXX XXXX which is with Wells Fargo originally...
342798	Credit reporting, credit repair services, or o...	ONCE AGAIN NATIONSTAR MORTGAGE FAILED TO RE-IN...
290449	Credit reporting, credit repair services, or o...	XXXX XXXX XXXX XXXX XXXX XXXX XXXX, NC XXXX XX...

'Vehicle loan or lease' predicted as 'Consumer Loan' : 10 examples.

	Product	Consumer_complaint_narrative
455512	Vehicle loan or lease	I put XXXX down on a XXXX vehicle 3 weeks ago ...
486302	Vehicle loan or lease	I leased a vehicle from XXXX XXXX hyunda...
382086	Vehicle loan or lease	The final payment was made on XXXX/XXXX/XXXX f...
372581	Vehicle loan or lease	GMAC hired XXXX XXXX to repossess a vehicle th...
454786	Vehicle loan or lease	We bought a car from XXXX XXXX , it was an ...
355681	Vehicle loan or lease	Purchased a vehicle from XXXX XXXX. They over ...
270469	Vehicle loan or lease	Westlake financial has me on a auto loan that ...
289101	Vehicle loan or lease	Credit Acceptance Corp reported my husband and...
246258	Vehicle loan or lease	went truck shopping for a certain truck which ...
311358	Vehicle loan or lease	I was in a car accident on XXXX XXXX. 2017. Th...

'Debt collection' predicted as 'Credit reporting' : 12 examples.

	Product	Consumer_complaint_narrative
314523	Debt collection	I tried multiple times to reach out to get thi...
468827	Debt collection	Received letter out of the blue. Years ago, ad...
566341	Debt collection	The creditor told me they have a snap shot of ...
126514	Debt collection	I found out there was a medical collection (a...
636218	Debt collection	XXXX is by far the worst mobile phone company ...
490733	Debt collection	This debt has been removed from my credit repo...
238815	Debt collection	This account was unauthorized. I am a victim o...
227677	Debt collection	XXXX XXXX XXXX XXXX is currently reporting on ...
355679	Debt collection	TransUnion is committing fraud with this credi...
779631	Debt collection	I got a letter a year ago from Rocky Mountain ...
834526	Debt collection	File incorrect information on credit report an...

	Product	Consumer_complaint_narrative
102113	Debt collection	1) XXXX XXXX XXXX Account - XXXX Amount : {$1...

'Credit reporting, credit repair services, or other personal consumer repor
ts' predicted as 'Credit reporting' : 50 examples.

	Product	Consumer_complaint_narrative
231294	Credit reporting, credit repair services, or o...	Hi I am contacting you because I have tried co...
456227	Credit reporting, credit repair services, or o...	I am requesting the removal of one Bankruptcy ...
451668	Credit reporting, credit repair services, or o...	XXXX XXXX XXXX, reporting on my credit report ...
371844	Credit reporting, credit repair services, or o...	Equifax never confirmed my credit report freez...
485844	Credit reporting, credit repair services, or o...	I am sorry but I have already made a claim wit...
120174	Credit reporting, credit repair services, or o...	I tried to open a checking account at a nation...
283137	Credit reporting, credit repair services, or o...	Equifax Public Records has not provided me pro...
289003	Credit reporting, credit repair services, or o...	Experian only allows people to dispute online ...
273769	Credit reporting, credit repair services, or o...	Im going to attach these documents to support ...
82982	Credit reporting, credit repair services, or o...	I received background check information back f...
395320	Credit reporting, credit repair services, or o...	Equifax was hacked, and investigated the incid...
220165	Credit reporting, credit repair services, or o...	My credit file landed with The Office of Consu...
236118	Credit reporting, credit repair services, or o...	The other credit bureaus like XXXX and XXXX ha...
445676	Credit reporting, credit repair services, or o...	I have already addressed BofA 's incompetence ...
363044	Credit reporting, credit repair services, or o...	On XXXX XXXX, 2017 I attempted to get my credi...
58370	Credit reporting, credit repair services, or o...	I'm having extreme trouble having two items re...
394966	Credit reporting, credit repair services, or o...	Equifax, a service i had no option to opt-in o...
393603	Credit reporting, credit repair services, or o...	I submitted a request for a free annual credit...
348166	Credit reporting, credit repair services, or o...	I 've reached out to this company several of t...
375100	Credit reporting, credit repair services, or o...	My state tax lien is being reported on my equi...

	Product	Consumer_complaint_narrative
265145	Credit reporting, credit repair services, or o...	Experian fails to remove the 13 XXXX XXXX XXXX...
382583	Credit reporting, credit repair services, or o...	XXXX XXXX XXXX XXXX my debt to XXXX XXXX. This...
357199	Credit reporting, credit repair services, or o...	Attempting to dispute inaccuracies with TransU...
411289	Credit reporting, credit repair services, or o...	A FRAUD INFORMATION APPEARS ON MY BACKGROUND C...
264240	Credit reporting, credit repair services, or o...	Transunion refuses to remove the address of XX...
136519	Credit reporting, credit repair services, or o...	I was an authorized user on 2 XXXX XXXX credit...
374159	Credit reporting, credit repair services, or o...	XXXX XXXX does not have a valid enforceable co...
389538	Credit reporting, credit repair services, or o...	WHILE I WAS IN CHAPTER XXXX, MORTGAGE PAYMENTS...
346441	Credit reporting, credit repair services, or o...	I have send letters disputing wrong negative i...
38501	Credit reporting, credit repair services, or o...	experian shows XXXX XXXX XXXX as not paid, t...
348490	Credit reporting, credit repair services, or o...	Credit Reporting Agency is reporting an accoun...
286882	Credit reporting, credit repair services, or o...	I have sent XXXX disputes to Equifax in the pa...
290649	Credit reporting, credit repair services, or o...	filed section 609 or verification was not veri...
90433	Credit reporting, credit repair services, or o...	CHEXSYSTEMS Consumer ID : XXXX XXXX XXXX XXXX...
332599	Credit reporting, credit repair services, or o...	I have spent dozens of hours and many months t...
315965	Credit reporting, credit repair services, or o...	There is a tax lien that was paid and canceled...
258391	Credit reporting, credit repair services, or o...	XXXX XXXX XXXX XXXX agree to remove the collec...
409002	Credit reporting, credit repair services, or o...	I went onto the free website, I received easil...
480500	Credit reporting, credit repair services, or o...	On XXXX I went through the various screens a...
214340	Credit reporting, credit repair services, or o...	hello I am a victim of identity theft. enclose...
86747	Credit reporting, credit repair services, or o...	XXXX IS ONCE AGAIN REPORTING XXXX BANKRUPTCY P...
173934	Credit reporting, credit repair services, or o...	XXXX has updated that this XXXX account is pai...
80306	Credit reporting, credit repair services, or o...	I have been trying to get incorrect informatio...

	Product	Consumer_complaint_narrative
480650	Credit reporting, credit repair services, or o...	I have disputed the following with Equifax sev...
211940	Credit reporting, credit repair services, or o...	I have continually made disputes with XXXX, Ex...
354831	Credit reporting, credit repair services, or o...	Hello Ive recently was notified the my opportu...
240658	Credit reporting, credit repair services, or o...	The credit reporting agency refused to show pr...
84852	Credit reporting, credit repair services, or o...	I have some credit checks on my report which w...
47384	Credit reporting, credit repair services, or o...	Equifax failed to open a dispute and subsequen...
302057	Credit reporting, credit repair services, or o...	This account was transferred to XXXX and is cu...

'Debt collection' predicted as 'Credit reporting, credit repair services, o
r other personal consumer reports' : 58 examples.

	Product	Consumer_complaint_narrative
169087	Debt collection	Disputed with the company multiples times, als...
800147	Debt collection	I do not know who opened the account and didnt...
147615	Debt collection	I am writing to dispute an account fraudulentl...
249591	Debt collection	XXXX XXXX XXXX Has reported negative items on ...
536969	Debt collection	My children did not attend this program for th...
411476	Debt collection	Equifax is the only bureau who continues to re...
136495	Debt collection	My identity was stolen and I have a bunch of a...
511991	Debt collection	While doing an extensive search of this compan...
272427	Debt collection	I check my credit report and there is an accou...
654942	Debt collection	I have sent many disputes to the Credit Report...
741704	Debt collection	I am not familiar with this company and do not...
535167	Debt collection	XXXX/XXXX/2017 XXXX XXXX XXXX XXXX XXXX XXXX X...
225326	Debt collection	A collection account by security credit servic...
278097	Debt collection	Portfolio they made an agreement to settle my ...
558977	Debt collection	I was a victim of identity theft and noticed a...
97623	Debt collection	I left for basic training with the XXXX in XX/...
593201	Debt collection	Midland Financial (Case number : XXXX) state...
148688	Debt collection	This is in response to your recent claim regar...
279201	Debt collection	Chase card services : amount of {$10000.00}. A...
196134	Debt collection	On XX/XX/XXXX i paid the 2 debts off. I asked ...

	Product	Consumer_complaint_narrative
263278	Debt collection	I have a lot of unauthorized inquiries on my c...
287881	Debt collection	Account fully terminated in XX/XX/XXXX, howeve...
805341	Debt collection	I 've been getting daily automated phone calls...
494979	Debt collection	Phoenix Financial Services just violated the F...
705534	Debt collection	I already reported this to the CFPB before. Th...
118307	Debt collection	This company has been reporting incorrect date...
629378	Debt collection	I obtained a copy of my credit file around XXX...
279554	Debt collection	Dear Support Representative, I just discovered...
234022	Debt collection	CRA VIOLATION NO KNOWLEDGE INACCURATE ACCOUNTS...
274546	Debt collection	In a complaint submitted to the CFPB, Midwest ...
200533	Debt collection	on XX/XX/2018 XXXX XXXX remove account XXXX f...
188900	Debt collection	I reached out to XXXX XXXX and asked for proof...
254901	Debt collection	As of XX/XX/2018 I have contacted World Financ...
842530	Debt collection	this company has placed a fraudulent account u...
158642	Debt collection	XXXX XXXX XXXX. XXXX calling from XXXX. Have c...
886284	Debt collection	Sent a letter and got no response. Unfortunate...
840703	Debt collection	VIOLATED " FAIR CREDIT BILLING ACT " AND FDCP...
211832	Debt collection	I recently started to check my credit, and not...
579135	Debt collection	MIDLAND FUNDING LLC HAS REPORTED TO MY CREDIT ...
311084	Debt collection	On XX/XX/XXXX, I received my credit report and...
332157	Debt collection	My XXXX reports show a {$4500.00} report on XX...
800900	Debt collection	I received a letter from Oxford Law , LLC, whi...
576542	Debt collection	I have disputed this Syndicated Office Systems...
194170	Debt collection	i hired Tayne law group to settle my debts and...
349854	Debt collection	After months of requests to ICS, they still ha...
482713	Debt collection	I have no recollection of any business transac...
129039	Debt collection	I am requesting verification of the account fr...
228634	Debt collection	CRA VIOLATION NO KNOWLEDGE FRAUDULENT ACCOUNTS...
469094	Debt collection	I keep a close eye on my credit report. As thi...
605914	Debt collection	METRO PUBLIC COMM SVCS has been littering my c...
71565	Debt collection	XXXX XXXX XXXX XXXX XXXX XXXX XXXX XXXX LA XXX...
318909	Debt collection	On XX/XX/XXXX, 2017 XXXX XXXXXXXX XXXX XXXX , ...
509709	Debt collection	I recently received a copy of my credit report...
214692	Debt collection	I have disputed on multiple occasions with the...
466801	Debt collection	Summary of your complaint Complaint number : ...
197489	Debt collection	XX/XX/2017This location sold the items in stor...

| **Product** | **Consumer_complaint_narrative** |

'Mortgage' predicted as 'Credit reporting, credit repair services, or other personal consumer reports' : 8 examples.

	Product	**Consumer_complaint_narrative**
432691	Mortgage	On XX/XX/2017 I received my mortgage statement...
540616	Mortgage	Gentlemen : This Company (PHH XXXX, XXXX NJ X...
555493	Mortgage	I filed a chapter XXXX bankruptcy proceeding X...
410688	Mortgage	Based on the information received XX/XX/XXXX a...
838904	Mortgage	I am very sad at this times, after several mon...
75202	Mortgage	Ditech provided a modified loan payment progra...
208254	Mortgage	This is regarding complaint XXXX. The Lender s...
432189	Mortgage	in XXXX OF XXXX started looking for a building...

'Consumer Loan' predicted as 'Credit reporting, credit repair services, or other personal consumer reports' : 8 examples.

	Product	**Consumer_complaint_narrative**
858522	Consumer Loan	In 2007 my ex-wife and I divorced. I had XXXX ...
672358	Consumer Loan	I made my payment on time for XX/XX/XXXX and X...
533290	Consumer Loan	I was not aware that the company was charging ...
735281	Consumer Loan	Santander Consumer USA violated the Service Me...
583797	Consumer Loan	I have a corporate auto loan with Bank of Amer...
710017	Consumer Loan	There 's is a error on my credit repor A hard ...
603254	Consumer Loan	Account : REGIONAL ACCEPTANCE CORP shows past ...
510571	Consumer Loan	I have been a victim of identity theft and Exe...

'Credit reporting' predicted as 'Credit reporting, credit repair services, or other personal consumer reports' : 106 examples.

	Product	**Consumer_complaint_narrative**
855301	Credit reporting	These accounts below are over/pass the statute...
556067	Credit reporting	I have been disputing hard inquiries on my cre...
528217	Credit reporting	It is the second time that credit report compa...
836142	Credit reporting	I have tried to get my student loan status upd...
749752	Credit reporting	I contacted all XXXX bureaus in XXXX of XXXX b...
858303	Credit reporting	Wrong credit information on credit report debt...
751611	Credit reporting	There are quite a few collections on my accoun...

	Product	Consumer_complaint_narrative
503975	Credit reporting	What I believe is a strategy to enforce the us...
873238	Credit reporting	I have been spending years trying to clear up ...
781388	Credit reporting	I have made over 6 attempts to have the credit...
802435	Credit reporting	Experian refuses to allow me to dispute inform...
495717	Credit reporting	Equifax has an item listed on my credit report...
567873	Credit reporting	I disputed some inaccurate items that are on m...
491899	Credit reporting	Experian is hanging onto old accounts that sho...
615583	Credit reporting	THIS IS NOT MY ACCOUNT. I HAVE DISPUTED WITH C...
736929	Credit reporting	Dispute was not handled thoroughly. Problem wi...
858510	Credit reporting	The judgments that are showing on my credit re...
886064	Credit reporting	account reported as discharged through bankrup...
532327	Credit reporting	To begin, I make this request for myself and b...
518387	Credit reporting	Experian is still listing an account that is p...
792841	Credit reporting	Dear sir/madam, First I would like to thank yo...
605974	Credit reporting	SInce XXXX i notice a few inquiries on my Cred...
764735	Credit reporting	My husband and I went to a couple car lots and...
663682	Credit reporting	Equifax dispute process does not even confirm ...
667812	Credit reporting	after research and tracking down information d...
534677	Credit reporting	Last year while searching for an apartment in ...
825082	Credit reporting	About XXXX months ago my credit score was in t...
797880	Credit reporting	I was contact by XXXX XXXX and they said they ...
760042	Credit reporting	I have been fighting with equifax for quite so...
585631	Credit reporting	I have reached out to experian and asked to sp...
...	...	...
491639	Credit reporting	I have disputed the following accounts with Ex...
777989	Credit reporting	Equifax has not noted to my credit file (XXXX...
569779	Credit reporting	Experian has not validated accurately that the...
543511	Credit reporting	EXPERIAN CURRENTLY HAS THE FOLLOWING ACCOUNTS ...
527851	Credit reporting	I disputed items on my credit on XXXX/XXXX/16 ...
733351	Credit reporting	I am a victim of Id theft and I sent two reque...
817554	Credit reporting	I am a victim of Identity theft. A account was...
505914	Credit reporting	XXXX XXXX XXXX TN, XXXX XXXX Account number # ...
845481	Credit reporting	I disputed with XXXX and Equifaxthat i have ol...
684662	Credit reporting	I requested Transunion to correct the multiple...
689948	Credit reporting	This item was disputed previously. \n\nTransun...
628047	Credit reporting	I contacted XXXX XXXX XXXX XXXX and they agree...

	Product	Consumer_complaint_narrative
600530	Credit reporting	Transunion had a glitch in their system that v...
541083	Credit reporting	The investigation is taking several months. Ev...
509157	Credit reporting	Experian has failed to comply with federal and...
518071	Credit reporting	There are so many issues with Experian and the...
664756	Credit reporting	XXXX Unauthorized inquiry this is my second di...
775660	Credit reporting	Experian lowered my overall credit score. When...
619512	Credit reporting	On XXXX XXXX 2016, I checked my credit on XXXX...
762635	Credit reporting	The MIB member insurance bureau is subject to ...
510261	Credit reporting	I, XXXX XXXX believe that the credit bureaus s...
600614	Credit reporting	I am trying to get my credit report fixed and ...
878435	Credit reporting	Upon receiving my credit report, I noticed man...
825505	Credit reporting	My car was stolen and some one stole my inform...
777630	Credit reporting	I sent an id theft affidavit to Equifax to blo...
557021	Credit reporting	This account was opened XX/XX/XXXX. I have n't...
870444	Credit reporting	All XXXX credit reporting bureaus are forcing ...
648556	Credit reporting	I have several duplicate hard inquiries on my ...
603955	Credit reporting	On XXXX XXXX I received a call from someone st...
518089	Credit reporting	I have called disputed the information with al...

106 rows × 2 columns

'Credit card' predicted as 'Credit reporting, credit repair services, or other personal consumer reports' : 20 examples.

	Product	Consumer_complaint_narrative
767011	Credit card	XX/XX/2015Dear Sirs, Most of my credit card co...
558165	Credit card	MY NAME IS XXXX XXXX AND I AM FILING MY SECOND...
587731	Credit card	Fortiva refuses to close the account that was ...
791370	Credit card	I was using my PayPal account to purchase an i...
592263	Credit card	Requested information on this account for over...
840297	Credit card	I am writing in hopes of clearing up a serious...
493947	Credit card	I requested a credit increase on my Lowes Busi...
581619	Credit card	I have sent Capital One several letters but th...
858918	Credit card	I got into some financial difficulty a year ag...
851974	Credit card	Fifth Third bank is reporting this on my credi...
492784	Credit card	I had a credit card with Bank Of America, it w...
516809	Credit card	when my credit card account was closed at XXXX...

	Product	Consumer_complaint_narrative
663964	Credit card	I had a Capital One Credit Card account that w...
824448	Credit card	Have submitted a notarized fraud report and co...
513669	Credit card	Chase is illegally reporting an account of my ...
505141	Credit card	Unauthorized inquiries on my report from Chase...
776411	Credit card	i was first solicited XXXX by phone. i paid a ...
702788	Credit card	Capital One/XXXX is reporting to XXXX that I h...
785588	Credit card	My credit score dropped, and I was denied cred...
633648	Credit card	A former bookkeeper we fired opened credit acc...

'Credit card or prepaid card' predicted as 'Credit reporting, credit repair services, or other personal consumer reports' : 22 examples.

	Product	Consumer_complaint_narrative
148690	Credit card or prepaid card	Dear CFPB, I am XXXX XXXX. My email address is...
182874	Credit card or prepaid card	I have 3 credit cards with XXXX XXXX XXXX XXXX...
145567	Credit card or prepaid card	XXXX has been non-compliant with removing the...
399814	Credit card or prepaid card	I have never had or agreed to an acct ending X...
98189	Credit card or prepaid card	I received a notification that there was an in...
140344	Credit card or prepaid card	I reached out to the CEO of Nordstrom in refer...
86765	Credit card or prepaid card	I was called by XXXX XXXX letting me know on X...
369898	Credit card or prepaid card	I checked my credit on credit karma and it sai...
465460	Credit card or prepaid card	I had applied for a card to help my credit sc...
198321	Credit card or prepaid card	I am writing now in wish to receive your help....
206388	Credit card or prepaid card	I WAS CHARGED FOR SOMETHING I DID NOT AUTHORIZ...
46814	Credit card or prepaid card	I was added as an authorized user on my Husban...
143068	Credit card or prepaid card	XXXX has been non-compliant with removing the ...
188387	Credit card or prepaid card	I bought a golf cart on credit and my first pa...
134098	Credit card or prepaid card	Global Cash Card XX/XX/2018ATM Transaction (D...
277953	Credit card or prepaid card	i opened a store card under my personal name, ...
96120	Credit card or prepaid card	As I was investigating the hard inquires again...
218384	Credit card or prepaid card	I was calling interested XXXX phone payment s...
206244	Credit card or prepaid card	I contacted Kohl 's Store AKA Capital One in r...
420900	Credit card or prepaid card	In between the dates of XXXX XXXX 2017 and XXX...
428518	Credit card or prepaid card	On XXXX XXXX,2016 a hard hit inquiry was place...
245583	Credit card or prepaid card	I am having issues with my credit report, XXXX...

'Payday loan, title loan, or personal loan' predicted as 'Credit reporting, credit repair services, or other personal consumer reports' : 6 examples.

	Product	Consumer_complaint_narrative
456941	Payday loan, title loan, or personal loan	I received a pre-approved letter from Best_Egg...
446930	Payday loan, title loan, or personal loan	I emailed CheckCity on XX/XX/XXXX because the ...
111209	Payday loan, title loan, or personal loan	The account is paid off and closed but it is r...
436630	Payday loan, title loan, or personal loan	I have some conerns in which I was able to obt...
119707	Payday loan, title loan, or personal loan	I have been made aware that this company is no...
267445	Payday loan, title loan, or personal loan	For the past 2 years you have been reporting m...

'Checking or savings account' predicted as 'Credit reporting, credit repair services, or other personal consumer reports' : 6 examples.

	Product	Consumer_complaint_narrative
293621	Checking or savings account	XX/XX/2017 I had {$420.00} taken from my VA XX...
273265	Checking or savings account	On XX/XX/XXXX i paid my XXXX XXXX Bill with my...
363508	Checking or savings account	I was instructed to submit my credit card for ...
367089	Checking or savings account	I signed up for XXXX so sometimes the people e...
429019	Checking or savings account	I have submitted several disputes to Early War...
447266	Checking or savings account	XXXX/XXXX/2017 overdraft and bank would n't se...

'Student loan' predicted as 'Credit reporting, credit repair services, or other personal consumer reports' : 8 examples.

	Product	Consumer_complaint_narrative
595369	Student loan	I settled XXXX CitiBank accounts with XXXX XXX...
160212	Student loan	XX/XX/2018 XXXX XXXX Recurring Payment of {$80...
265762	Student loan	Unable to reach /talk with a real human to loa...
684862	Student loan	ACSXXXX is a student loan that has been paid i...
583775	Student loan	I am filing another complaint on behalf of my ...
158762	Student loan	On XX/XX/2018 I was approved for a XXXX Discha...
110494	Student loan	XX/XX/XXXX a letter was sent requesting amount...
168312	Student loan	I XXXX XXXX received a letter by the Federal T...

'Vehicle loan or lease' predicted as 'Credit reporting, credit repair servi

ces, or other personal consumer reports' : 11 examples.

	Product	Consumer_complaint_narrative
197460	Vehicle loan or lease	XXXX and XX/XX/XXXX and XXXX and XX/XX/XXXX. \...
320425	Vehicle loan or lease	I received a letter from Ally Bank (XXXX XXXX...
161568	Vehicle loan or lease	I received a late report on my credit, I conta...
406959	Vehicle loan or lease	I bought a XXXX XXXX XXXX from XXXX XXXX in XX...
268524	Vehicle loan or lease	XXXX XXXX XXXX, XXXX XXXX XXXX XXXX # XXXX XXX...
463478	Vehicle loan or lease	This account was written off fro m Ally Financ...
364776	Vehicle loan or lease	Hello! My complaint is in regards to a reposse...
64168	Vehicle loan or lease	I received a loan from Santander for {$12000.0...
194258	Vehicle loan or lease	I have been having a major problem with wells ...
52285	Vehicle loan or lease	I finance a vehicle from Santander consumer US...
402876	Vehicle loan or lease	I am a co-signer to an account with my sister ...

'Credit card or prepaid card' predicted as 'Credit card' : 35 examples.

	Product	Consumer_complaint_narrative
123610	Credit card or prepaid card	Made payment of {$500.00} to Citibank and its ...
422256	Credit card or prepaid card	To Whom It May Concern - I opened a US Bank cr...
261213	Credit card or prepaid card	I have a XXXX XXXX XXXX credit account that wa...
472456	Credit card or prepaid card	On XXXX of XXXX , when I visited XXXX X...
447520	Credit card or prepaid card	My credit account was closed today because acc...
478560	Credit card or prepaid card	Here is the timeline of the events. I have a p...
63286	Credit card or prepaid card	Capital One has a computer glitch which they a...
144749	Credit card or prepaid card	Because of fraud charges, I had to be issued a...
407583	Credit card or prepaid card	Capitol One closed both of my credits cards du...
387109	Credit card or prepaid card	Comenity bank charged me a late fee of {$27.00...
208458	Credit card or prepaid card	Bank of America has made it very difficult to ...
164000	Credit card or prepaid card	I have filed with the comptroller of the curre...
305198	Credit card or prepaid card	REF Complaints # XXXX Dear Citi Card and Feder...
290007	Credit card or prepaid card	I applied for autopay as soon as was possible ...
379709	Credit card or prepaid card	I used bestbuy credit card to buy some item, i...
60309	Credit card or prepaid card	My Wells Fargo Credit Card is being declined f...
414349	Credit card or prepaid card	Back in XXXX of 2016 I got an offer to transfe...
141119	Credit card or prepaid card	On XX/XX/2018, US Bank accepted my credit card...
61897	Credit card or prepaid card	Had an online car rental reservation from XX/X...
316746	Credit card or prepaid card	It was announced that Citibank would no longer...

	Product	Consumer_complaint_narrative
176465	Credit card or prepaid card	I issued a statement to the CFPB regarding Dis...
461682	Credit card or prepaid card	After attempting to close a Chase Amazon credi...
408806	Credit card or prepaid card	Chase Sapphire closed my credit card account w...
236407	Credit card or prepaid card	I purchase an item from a merchant for XXXX do...
352639	Credit card or prepaid card	In late 2016 I received an email from XXXX XXX...
215230	Credit card or prepaid card	My XX/XX/XXXX statement was paid in full as ev...
171154	Credit card or prepaid card	On XX/XX/XXXX I initiated a balance transfer o...
54347	Credit card or prepaid card	An auto payment of XXXX was processed by the A...
437346	Credit card or prepaid card	When i was XXXX XXXX XXXX i applied for ...
474724	Credit card or prepaid card	We have a l ocal Toys 'R ' us credit card. We ...
373232	Credit card or prepaid card	I have a Synchrony Credit card with XXXX XXXX ...
247622	Credit card or prepaid card	I applied and was approved for a Wells Fargo m...
67511	Credit card or prepaid card	I received a promotional offer for the America...
216038	Credit card or prepaid card	I reported my card missing to the bank by phon...
58583	Credit card or prepaid card	American Express RAISED MY INTEREST RATE BY 5 ...

'Bank account or service' predicted as 'Credit card' : 7 examples.

	Product	Consumer_complaint_narrative
754902	Bank account or service	My wife and I have XXXX IRAs with Morgan Stanl...
630995	Bank account or service	I set up recurring automatic payments for a cr...
805373	Bank account or service	The practice of people that use credit charge ...
660538	Bank account or service	I signed up for a Citigold account with Citiba...
656401	Bank account or service	I purchased XXXX flat irons from a mall kiosk ...
680946	Bank account or service	I received an offer from Citibank to open a ne...
515604	Bank account or service	This is a complaint about a promotional bonus ...

'Debt collection' predicted as 'Credit card or prepaid card' : 6 examples.

	Product	Consumer_complaint_narrative
477637	Debt collection	on XXXX XXXX , 2014 I purchased furniture...
848686	Debt collection	Capital One Bank has posted negative remarks o...
41708	Debt collection	In XX/XX/XXXX, I signed up for a {$20.00} per ...
166879	Debt collection	Please see letter of communication sent to the...
57933	Debt collection	I have previously requested Chase not call me ...
554306	Debt collection	This credit card was issued thru MBNA and was ...

'Credit reporting, credit repair services, or other personal consumer reports' predicted as 'Credit card or prepaid card' : 14 examples.

	Product	Consumer_complaint_narrative
357687	Credit reporting, credit repair services, or o...	I have now spoken with three/four (but the se...
110333	Credit reporting, credit repair services, or o...	I had a credit card with XXXX XXXX. As my fath...
37243	Credit reporting, credit repair services, or o...	Some one using my personal information to open...
245299	Credit reporting, credit repair services, or o...	I have emailed Capital One twice (XX/XX/XXXX ...
244025	Credit reporting, credit repair services, or o...	I opened an account with XXXX XXXX XXXX in XXX...
259379	Credit reporting, credit repair services, or o...	Third theft of credit card/debit card by someo...
166103	Credit reporting, credit repair services, or o...	This is a charge on my personal credit report ...
321264	Credit reporting, credit repair services, or o...	My XXXX XXXX and XXXX XXXX XXXX XXXX credit ca...
306191	Credit reporting, credit repair services, or o...	XXXX Applied for a Pre Paid card with bank. \n...
217606	Credit reporting, credit repair services, or o...	Two unpaid XXXX cards are listed as mine, whil...
356477	Credit reporting, credit repair services, or o...	I have disputed the balance of this account fo...
130649	Credit reporting, credit repair services, or o...	Dear Sir, XX/XX/XXXX causing troubles to me by...
429183	Credit reporting, credit repair services, or o...	XX/XX/XXXX To Whom It May Concern : XX/XX/XXXX...
147586	Credit reporting, credit repair services, or o...	Two weeks ago, I was notified by the XXXX XXXX...

'Credit card' predicted as 'Credit card or prepaid card' : 25 examples.

	Product	Consumer_complaint_narrative
552991	Credit card	Chase lowered my credit lines to within a coup...
664912	Credit card	My bank reversed a payment for {$110.00} on a ...
872784	Credit card	I was told by Capital One in an email I was re...
783810	Credit card	I got pick pocket out of the United States and...
533852	Credit card	I have a credit card with Capital One. it has ...
684684	Credit card	Hi! My name is XXXX XXXX. I got a British Airw...
865578	Credit card	My JCPenney card has a deferred interest balan...
542078	Credit card	I purchased and cancelled orders for a couple ...

	Product	Consumer_complaint_narrative
771662	Credit card	I was sent a citicard pre-aproved invitation f...
622367	Credit card	Discover Card offers an interest rate from 11....
749030	Credit card	On XXXX XXXX, 2015, my wife and I traveled to ...
605476	Credit card	I have been defrauded by Capital One bank and ...
652023	Credit card	i have contact kay jewelery in reguard to my c...
506998	Credit card	Request your assistance to get my Kohl 's char...
542607	Credit card	I applied for credit line increase and I was d...
536527	Credit card	I signed up for a wells fargo credit card with...
696608	Credit card	I applied for a transfer balance credit line t...
533695	Credit card	I carry a 0 % balance transfer ({$3800.00}) ...
647681	Credit card	i am a XXXX XXXX XXXX retiree who became invol...
660935	Credit card	i am well aware of all the red tape in this wo...
651129	Credit card	Over the past 7 months I have been monitoring ...
621203	Credit card	Fall of XXXX, I applied and received XXXX Capi...
670582	Credit card	At some point towards XX/XX/2016, Bank of Amer...
720783	Credit card	Chase wo n't close my account after I requeste...
533268	Credit card	I applied the XXXX Platinum Card on XX/XX/2016...

'Credit card or prepaid card' predicted as 'Checking or savings account' :
6 examples.

	Product	Consumer_complaint_narrative
141358	Credit card or prepaid card	On XX/XX/XXXX American Express Bluebird was do...
472979	Credit card or prepaid card	On XXXX XXXX , XXXX I filed an unauthor...
161032	Credit card or prepaid card	I did not authorize this purchase on XX/XX/201...
62030	Credit card or prepaid card	This is in regard to a debit card called acces...
304490	Credit card or prepaid card	When making 'payments ' on the charge account ...
85482	Credit card or prepaid card	I been disputing Naviet account XXXX, and also...

'Bank account or service' predicted as 'Checking or savings account' : 9 ex
amples.

	Product	Consumer_complaint_narrative
541970	Bank account or service	On XX/XX/XXXX, a friend and I (XXXX XXXX-year...
518095	Bank account or service	Chase Bank XXXX : XXXX I closed the account wh...
567144	Bank account or service	I deposited a check in XX/XX/2016 for {$300.00...

	Product	Consumer_complaint_narrative
877379	Bank account or service	After XXXX years of banking with Bank of Ameri...
644203	Bank account or service	I have submitted several request to Barclays b...
520819	Bank account or service	I believe that I have unfairly been charged 2 ...
834388	Bank account or service	I BEEN WITH WELLS FARGO BANK FOR XXXX YEARS I ...
643587	Bank account or service	XX/XX/XXXX I discovered unauthorized charges o...
643479	Bank account or service	I opened up an account with US Bank for their ...

'Other financial service' predicted as 'Student loan' : 10 examples.

	Product	Consumer_complaint_narrative
842446	Other financial service	I was contacted by National Budget Planners an...
670881	Other financial service	I am a recent graduate of a XXXX looking for g...
543981	Other financial service	I entered into an Agreement with Student Loan ...
527921	Other financial service	I was told, i could have my loans cut by 50 %....
520775	Other financial service	On XXXX XXXX , I received an e-mail at my w...
544325	Other financial service	About a month ago (XX/XX/XXXX) I was contact...
776745	Other financial service	After speaking with the handler of my student ...
490759	Other financial service	I was charged XXXX by The Student Loan Help ...
661379	Other financial service	I contacted Nationwide Doc Prep to get help wi...
553804	Other financial service	I saw an ad on Facebook that a friend posted s...

'Debt collection' predicted as 'Student loan' : 6 examples.

	Product	Consumer_complaint_narrative
614639	Debt collection	My daughter was XXXX and her medical bill was ...
751609	Debt collection	As a cosigner for my children the Credit repor...
521704	Debt collection	I had a XXXX student loan with citizens bank, ...
531349	Debt collection	Several years ago I put into a web online shop...
144316	Debt collection	My complaint is directed at the American Educa...
759492	Debt collection	Student Assist Corp keep calling. I do not hav...

'Credit reporting, credit repair services, or other personal consumer reports' predicted as 'Student loan' : 8 examples.

	Product	Consumer_complaint_narrative

	Product	Consumer_complaint_narrative
82502	Credit reporting, credit repair services, or o...	I recently received a copy of my credit report...
280848	Credit reporting, credit repair services, or o...	I have always had an excellent relationship wi...
55445	Credit reporting, credit repair services, or o...	I located a company via the U.S. Department of...
458372	Credit reporting, credit repair services, or o...	This relates to on going complaints/investigat...
106538	Credit reporting, credit repair services, or o...	I originally took out student loans with Salli...
155446	Credit reporting, credit repair services, or o...	At present I have 16 student loan accounts rep...
368506	Credit reporting, credit repair services, or o...	Spoke with XXXX customer service XXXX XXXX, XX...
348118	Credit reporting, credit repair services, or o...	My student loan was serviced by XXXX. I have 2...

'Other financial service' predicted as 'Bank account or service' : 9 exampl
es.

	Product	Consumer_complaint_narrative
529279	Other financial service	A third party debt relief service -Student Loa...
754932	Other financial service	I mailed a payment to the XXXX XXXX which pres...
856108	Other financial service	I visited XXXX # XXXX on XXXX/XXXX/15 I wrote ...
876606	Other financial service	SirI was forced to accept a chashiers check in...
729662	Other financial service	I made a transaction on XXXX XXXX, 2016 on the...
728755	Other financial service	My issue is with Morgan Stanley and an Inherit...
670474	Other financial service	I have banked with Bank of Oklahoma for almost...
586569	Other financial service	In looking to exchange foreign currency, I fou...
856082	Other financial service	I visited XXXX # XXXX on XXXX/XXXX/15 I wrote ...

'Credit card or prepaid card' predicted as 'Bank account or service' : 7 ex
amples.

	Product	Consumer_complaint_narrative
409984	Credit card or prepaid card	Wells Fargo firstly fraudulently charged me ex...
79824	Credit card or prepaid card	Social security benefits of XXXX and PNC is st...
72013	Credit card or prepaid card	Account was not open by me
483953	Credit card or prepaid card	I purchased US Bank pr epaid Mastercards # X...
165770	Credit card or prepaid card	BB & T linked my sister 's and my credit card,...
42833	Credit card or prepaid card	I cancelled my Bank of America XXXX XXXX Busi...

	Product	Consumer_complaint_narrative
366786	Credit card or prepaid card	Facts : 1. Kohls alleges that I owe {$250.00} ...

'Checking or savings account' predicted as 'Bank account or service' : 29 e xamples.

	Product	Consumer_complaint_narrative
336924	Checking or savings account	In XXXX 2017 We received 7 letters stating Cit...
475803	Checking or savings account	I never do this but my disappointment in USAA ...
442353	Checking or savings account	XXXX / XXXX / 2017 , Discover Bank created a c...
357300	Checking or savings account	On XXXX I went over to the XXXX XXXX XXXX XXXX...
191118	Checking or savings account	On XX/XX/XXXX or there about I noticed many of...
462516	Checking or savings account	Sometime during XX/XX/XXXX, I received 3 munic...
452880	Checking or savings account	I use XXXX to file my taxes. I mistakenly le...
388034	Checking or savings account	money was taken XXXX to XXXX in the amount of ...
486468	Checking or savings account	I opened several accounts wit h Wells Fargo af...
427837	Checking or savings account	I would like a proper, truthful response to my...
372625	Checking or savings account	Dear XXXX, I am filing a complaint against Cha...
409706	Checking or savings account	Today I called Santander Bank to close my chec...
327394	Checking or savings account	I want CapitalOne to enable me to share my fin...
182774	Checking or savings account	I opened a checking account with Bank of Ameri...
296547	Checking or savings account	My Wells Fargo account was inactive as I had s...
121441	Checking or savings account	My card was charged {$38.00} by XXXX XXXX, XXX...
451735	Checking or savings account	Existing account Fraud. On XXXX/XXXX/17 someon...
73995	Checking or savings account	I filed for a dispute clam in XX/XX/XXXX for a...
456603	Checking or savings account	I would like to know why XXXX XXXX is stil...
115139	Checking or savings account	I am a Wells Fargo customer. On XX/XX/XXXX, I ...
85005	Checking or savings account	I have had a safe deposit box at a local Chase...
337840	Checking or savings account	I have a checking/savings account with Citiban...
140293	Checking or savings account	i had three checking accounts with navy federa...
382000	Checking or savings account	I have three direct deposit that go into my ch...
214099	Checking or savings account	I applied for Valley National Bank XXXX XXXX A...
156373	Checking or savings account	US BANK CHARGED THEIR MONTHLY MAINTENANCE FEE ...
156570	Checking or savings account	On XX/XX/XXXX there was an unauthorized charge...
222117	Checking or savings account	Never was told about regional atm fees and wan...
229687	Checking or savings account	On XX/XX/XXXX, a mobile deposit was made by me...

'Consumer Loan' predicted as 'Vehicle loan or lease' : 7 examples.

	Product	Consumer_complaint_narrative
602611	Consumer Loan	I went to a car dealer to get a car and they g...
574083	Consumer Loan	I applied for a vehicle purchase loan with a c...
733067	Consumer Loan	In XXXX I got an auto loan from J.P. Morgan Ch...
730735	Consumer Loan	The book value of my vehicle is XXXX dollars a...
839428	Consumer Loan	I have a loan through Prestige Financial Servi...
830392	Consumer Loan	On XXXX XXXX, 2014, I purchased a standard use...
582444	Consumer Loan	Due to a divorce, I was late with my car payme...

In [23]: ▶| `model.fit(features, labels)`

Out[23]: LinearSVC(C=1.0, class_weight=None, dual=True, fit_intercept=True,
          intercept_scaling=1, loss='squared_hinge', max_iter=1000,
          multi_class='ovr', penalty='l2', random_state=None, tol=0.0001,
          verbose=0)

In [24]:

```python
from sklearn.feature_selection import chi2

N = 2
for Product, category_id in sorted(category_to_id.items()):
  indices = np.argsort(model.coef_[category_id])
  feature_names = np.array(tfidf.get_feature_names())[indices]
  unigrams = [v for v in reversed(feature_names) if len(v.split(' ')) == 1][:
  bigrams = [v for v in reversed(feature_names) if len(v.split(' ')) == 2][:N
  print("# '{}':".format(Product))
  print("  . Top unigrams:\n       . {}".format('\n       . '.join(unigrams)
  print("  . Top bigrams:\n       . {}".format('\n       . '.join(bigrams)))
```

```
# 'Bank account or service':
  . Top unigrams:
       . bank
       . citigold
  . Top bigrams:
       . account overdrawn
       . money withdrawn
# 'Checking or savings account':
  . Top unigrams:
       . bank
       . access
  . Top bigrams:
       . checking account
       . debit card
# 'Consumer Loan':
  . Top unigrams:
       . finance
       . loan
  . Top bigrams:
       . loan company
       . aware credit
# 'Credit card':
  . Top unigrams:
       . card
       . discover
  . Top bigrams:
       . credit card
       . bank credit
# 'Credit card or prepaid card':
  . Top unigrams:
       . card
       . capital
  . Top bigrams:
       . card sent
       . visa card
# 'Credit reporting':
  . Top unigrams:
       . equifax
       . experian
  . Top bigrams:
       . information xxxx
       . reporting accurate
# 'Credit reporting, credit repair services, or other personal consumer rep
orts':
```

. Top unigrams:
    . inquiries
    . freeze
. Top bigrams:
    . xxxx xxxx
    . xxxx experian
'Debt collection':
. Top unigrams:
    . debt
    . collection
. Top bigrams:
    . reporting credit
    . credit management
'Money transfer, virtual currency, or money service':
. Top unigrams:
    . coinbase
    . support
. Top bigrams:
    . contacted support
    . coinbase xxxx
'Money transfers':
. Top unigrams:
    . moneygram
    . money
. Top bigrams:
    . sent money
    . send money
'Mortgage':
. Top unigrams:
    . mortgage
    . ditech
. Top bigrams:
    . short sale
    . mortgage payment
'Other financial service':
. Top unigrams:
    . check
    . lexington
. Top bigrams:
    . money order
    . lexington law
'Payday loan':
. Top unigrams:
    . payday
    . loan
. Top bigrams:
    . 00 fees
    . payday loan
'Payday loan, title loan, or personal loan':
. Top unigrams:
    . loan
    . references
. Top bigrams:
    . got paid
    . finance charge
'Prepaid card':
. Top unigrams:

- rushcard
- prepaid
  - Top bigrams:
    - need money
    - closed accounts
'Student loan':
  - Top unigrams:
    - navient
    - private
  - Top bigrams:
    - private loan
    - xxxx loans
'Vehicle loan or lease':
  - Top unigrams:
    - vehicle
    - car
  - Top bigrams:
    - credit acceptance
    - vehicle xx
'Virtual currency':
  - Top unigrams:
    - coinbase
    - circle
  - Top bigrams:
    - money going
    - signup bonus

In [25]:

```python
texts = ["I requested a home loan modification through Bank of America. Bank
         "It has been difficult for me to find my past due balance. I missed
         "I can't get the money out of the country.",
         "I have no money to pay my tuition",
         "Coinbase closed my account for no reason and furthermore refused to
text_features = tfidf.transform(texts)
predictions = model.predict(text_features)
for text, predicted in zip(texts, predictions):
  print('"{}"'.format(text))
  print("  - Predicted as: '{}'".format(id_to_category[predicted]))
  print("")
```

```
"I requested a home loan modification through Bank of America. Bank of Amer
ica never got back to me."
  - Predicted as: 'Mortgage'

"It has been difficult for me to find my past due balance. I missed a regul
ar monthly payment"
  - Predicted as: 'Mortgage'

"I can't get the money out of the country."
  - Predicted as: 'Other financial service'

"I have no money to pay my tuition"
  - Predicted as: 'Student loan'

"Coinbase closed my account for no reason and furthermore refused to give m
e a reason despite dozens of request"
  - Predicted as: 'Money transfer, virtual currency, or money service'
```

In [26]:

```python
from sklearn import metrics
print(metrics.classification_report(y_test, y_pred,
                                    target_names=df['Product'].unique()))
```

	precision	recall	f1-score	support
Other financial service	0.70	0.46	0.55	112
Virtual currency	1.00	0.67	0.80	6
Debt collection	0.69	0.81	0.74	546
Mortgage	0.85	0.95	0.89	355
Consumer Loan	0.50	0.22	0.30	73
Credit reporting	0.46	0.32	0.38	201
Credit reporting, credit repair services, or other personal consumer reports	0.62	0.76	0.69	577
Money transfers	0.40	0.17	0.24	12
Credit card	0.43	0.37	0.40	116
Credit card or prepaid card	0.54	0.47	0.50	156
Payday loan, title loan, or personal loan	0.17	0.04	0.06	27
Payday loan	0.00	0.00	0.00	11
Checking or savings account	0.60	0.44	0.51	93
Student loan	0.79	0.77	0.78	140
Bank account or service	0.41	0.56	0.48	78
Money transfer, virtual currency, or money service	0.59	0.42	0.49	24
Prepaid card	0.00	0.00	0.00	8
Vehicle loan or lease	0.44	0.17	0.25	40
micro avg	0.65	0.65	0.65	2575
macro avg	0.51	0.42	0.45	2575
weighted avg	0.63	0.65	0.63	2575

```
c:\users\finan\appdata\local\programs\python\python37\lib\site-packages\skl
earn\metrics\classification.py:1143: UndefinedMetricWarning: Precision and
F-score are ill-defined and being set to 0.0 in labels with no predicted sa
mples.
  'precision', 'predicted', average, warn_for)
```

In [ ]:

In [ ]:

In [1]:
```python
from sklearn import model_selection, preprocessing, linear_model, naive_bayes
from sklearn.feature_extraction.text import TfidfVectorizer, CountVectorizer
from sklearn import decomposition, ensemble

import pandas, xgboost, numpy, textblob, string
from keras.preprocessing import text, sequence
from keras import layers, models, optimizers
```

Using TensorFlow backend.

In [2]:
```python
# load the dataset
data = open('corpus.txt').read()
labels, texts = [], []
for i, line in enumerate(data.split("\n")):
    content = line.split()
    labels.append(content[0])
    texts.append(" ".join(content[1:]))

# create a dataframe using texts and lables
trainDF = pandas.DataFrame()
trainDF['text'] = texts
trainDF['label'] = labels
```

In [3]:
```python
# split the dataset into training and validation datasets
train_x, valid_x, train_y, valid_y = model_selection.train_test_split(trainDF

# label encode the target variable
encoder = preprocessing.LabelEncoder()
train_y = encoder.fit_transform(train_y)
valid_y = encoder.fit_transform(valid_y)
```

In [4]:
```python
# create a count vectorizer object
count_vect = CountVectorizer(analyzer='word', token_pattern=r'\w{1,}')
count_vect.fit(trainDF['text'])

# transform the training and validation data using count vectorizer object
xtrain_count =  count_vect.transform(train_x)
xvalid_count =  count_vect.transform(valid_x)
```

In [5]:
```python
# word level tf-idf
tfidf_vect = TfidfVectorizer(analyzer='word', token_pattern=r'\w{1,}', max_fe
tfidf_vect.fit(trainDF['text'])
xtrain_tfidf =  tfidf_vect.transform(train_x)
xvalid_tfidf =  tfidf_vect.transform(valid_x)

# ngram level tf-idf
tfidf_vect_ngram = TfidfVectorizer(analyzer='word', token_pattern=r'\w{1,}',
tfidf_vect_ngram.fit(trainDF['text'])
xtrain_tfidf_ngram =  tfidf_vect_ngram.transform(train_x)
xvalid_tfidf_ngram =  tfidf_vect_ngram.transform(valid_x)

# characters level tf-idf
tfidf_vect_ngram_chars = TfidfVectorizer(analyzer='char', token_pattern=r'\w{
tfidf_vect_ngram_chars.fit(trainDF['text'])
xtrain_tfidf_ngram_chars =  tfidf_vect_ngram_chars.transform(train_x)
xvalid_tfidf_ngram_chars =  tfidf_vect_ngram_chars.transform(valid_x)
```

In [ ]:
```python
# load the pre-trained word-embedding vectors

embeddings_index = {}
for i, line in enumerate(open('wiki-news-300d-1M.vec')):
    values = line.split()
    embeddings_index[values[0]] = numpy.asarray(values[1:], dtype='float32')

# create a tokenizer
token = text.Tokenizer()
token.fit_on_texts(trainDF['text'])
word_index = token.word_index

# convert text to sequence of tokens and pad them to ensure equal length vect
train_seq_x = sequence.pad_sequences(token.texts_to_sequences(train_x), maxle
valid_seq_x = sequence.pad_sequences(token.texts_to_sequences(valid_x), maxle

# create token-embedding mapping
embedding_matrix = numpy.zeros((len(word_index) + 1, 300))
for word, i in word_index.items():
    embedding_vector = embeddings_index.get(word)
    if embedding_vector is not None:
        embedding_matrix[i] = embedding_vector
```

In [8]:
```python
trainDF['char_count'] = trainDF['text'].apply(len)
trainDF['word_count'] = trainDF['text'].apply(lambda x: len(x.split()))
trainDF['word_density'] = trainDF['char_count'] / (trainDF['word_count']+1)
trainDF['punctuation_count'] = trainDF['text'].apply(lambda x: len("".join(_
trainDF['title_word_count'] = trainDF['text'].apply(lambda x: len([wrd for wr
trainDF['upper_case_word_count'] = trainDF['text'].apply(lambda x: len([wrd f
```

In [9]:

```python
import nltk
nltk.download('averaged_perceptron_tagger')

pos_family = {
    'noun' : ['NN','NNS','NNP','NNPS'],
    'pron' : ['PRP','PRP$','WP','WP$'],
    'verb' : ['VB','VBD','VBG','VBN','VBP','VBZ'],
    'adj' :  ['JJ','JJR','JJS'],
    'adv' : ['RB','RBR','RBS','WRB']
}

# function to check and get the part of speech tag count of a words in a give
def check_pos_tag(x, flag):
    cnt = 0
    try:
        wiki = textblob.TextBlob(x)
        for tup in wiki.tags:
            ppo = list(tup)[1]
            if ppo in pos_family[flag]:
                cnt += 1
    except:
        pass
    return cnt

trainDF['noun_count'] = trainDF['text'].apply(lambda x: check_pos_tag(x, 'nou
trainDF['verb_count'] = trainDF['text'].apply(lambda x: check_pos_tag(x, 'ver
trainDF['adj_count'] = trainDF['text'].apply(lambda x: check_pos_tag(x, 'adj'
trainDF['adv_count'] = trainDF['text'].apply(lambda x: check_pos_tag(x, 'adv'
trainDF['pron_count'] = trainDF['text'].apply(lambda x: check_pos_tag(x, 'pro
```

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

In [10]:

```python
# train a LDA Model
lda_model = decomposition.LatentDirichletAllocation(n_components=20, learning
X_topics = lda_model.fit_transform(xtrain_count)
topic_word = lda_model.components_
vocab = count_vect.get_feature_names()

# view the topic models
n_top_words = 10
topic_summaries = []
for i, topic_dist in enumerate(topic_word):
    topic_words = numpy.array(vocab)[numpy.argsort(topic_dist)][:-(n_top_word
    topic_summaries.append(' '.join(topic_words))
```

In [11]: ▶|
```python
def train_model(classifier, feature_vector_train, label, feature_vector_valic
    # fit the training dataset on the classifier
    classifier.fit(feature_vector_train, label)

    # predict the labels on validation dataset
    predictions = classifier.predict(feature_vector_valid)

    if is_neural_net:
        predictions = predictions.argmax(axis=-1)

    return metrics.accuracy_score(predictions, valid_y)
```

In [12]: ▶|
```python
# Naive Bayes on Count Vectors
accuracy = train_model(naive_bayes.MultinomialNB(), xtrain_count, train_y, xv
print ("NB, Count Vectors: ", accuracy)

# Naive Bayes on Word Level TF IDF Vectors
accuracy = train_model(naive_bayes.MultinomialNB(), xtrain_tfidf, train_y, xv
print ("NB, WordLevel TF-IDF: ", accuracy)

# Naive Bayes on Ngram Level TF IDF Vectors
accuracy = train_model(naive_bayes.MultinomialNB(), xtrain_tfidf_ngram, train
print ("NB, N-Gram Vectors: ", accuracy)

# Naive Bayes on Character Level TF IDF Vectors
accuracy = train_model(naive_bayes.MultinomialNB(), xtrain_tfidf_ngram_chars,
print ("NB, CharLevel Vectors: ", accuracy)
```

```
NB, Count Vectors:  0.846
NB, WordLevel TF-IDF:  0.8468
NB, N-Gram Vectors:  0.8364
NB, CharLevel Vectors:  0.8156
```

In [13]:

```python
# Linear Classifier on Count Vectors
accuracy = train_model(linear_model.LogisticRegression(), xtrain_count, trair
print ("LR, Count Vectors: ", accuracy)

# Linear Classifier on Word Level TF IDF Vectors
accuracy = train_model(linear_model.LogisticRegression(), xtrain_tfidf, trair
print ("LR, WordLevel TF-IDF: ", accuracy)

# Linear Classifier on Ngram Level TF IDF Vectors
accuracy = train_model(linear_model.LogisticRegression(), xtrain_tfidf_ngram,
print ("LR, N-Gram Vectors: ", accuracy)

# Linear Classifier on Character Level TF IDF Vectors
accuracy = train_model(linear_model.LogisticRegression(), xtrain_tfidf_ngram_
print ("LR, CharLevel Vectors: ", accuracy)
```

c:\users\finan\appdata\local\programs\python\python37\lib\site-packages\skl
earn\linear_model\logistic.py:433: FutureWarning: Default solver will be ch
anged to 'lbfgs' in 0.22. Specify a solver to silence this warning.
  FutureWarning)

LR, Count Vectors: 0.8708
LR, WordLevel TF-IDF: 0.8792
LR, N-Gram Vectors: 0.832
LR, CharLevel Vectors: 0.8524

In [14]:

```python
# SVM on Ngram Level TF IDF Vectors
accuracy = train_model(svm.SVC(), xtrain_tfidf_ngram, train_y, xvalid_tfidf_r
print ("SVM, N-Gram Vectors: ", accuracy)
```

c:\users\finan\appdata\local\programs\python\python37\lib\site-packages\skl
earn\svm\base.py:196: FutureWarning: The default value of gamma will change
from 'auto' to 'scale' in version 0.22 to account better for unscaled featu
res. Set gamma explicitly to 'auto' or 'scale' to avoid this warning.
  "avoid this warning.", FutureWarning)

SVM, N-Gram Vectors: 0.526

In [15]: ▶|
```python
# RF on Count Vectors
accuracy = train_model(ensemble.RandomForestClassifier(), xtrain_count, train
print ("RF, Count Vectors: ", accuracy)

# RF on Word Level TF IDF Vectors
accuracy = train_model(ensemble.RandomForestClassifier(), xtrain_tfidf, train
print ("RF, WordLevel TF-IDF: ", accuracy)
```

c:\users\finan\appdata\local\programs\python\python37\lib\site-packages\skl
earn\ensemble\forest.py:246: FutureWarning: The default value of n_estimato
rs will change from 10 in version 0.20 to 100 in 0.22.
  "10 in version 0.20 to 100 in 0.22.", FutureWarning)

RF, Count Vectors: 0.7556

c:\users\finan\appdata\local\programs\python\python37\lib\site-packages\skl
earn\ensemble\forest.py:246: FutureWarning: The default value of n_estimato
rs will change from 10 in version 0.20 to 100 in 0.22.
  "10 in version 0.20 to 100 in 0.22.", FutureWarning)

RF, WordLevel TF-IDF: 0.77

In [ ]: ▶|