# Simplilearn_Project_Keshav

October 1, 2022

[2]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

[4]:
```
df = pd.read_csv("Comcast_telecom_complaints_data.csv")
```

[5]:
```
df.head(3)
```

[5]:
```
  Ticket #                             Customer Complaint      Date  \
0   250635                 Comcast Cable Internet Speeds  22-04-15
1   223441  Payment disappear - service got disconnected  04-08-15
2   242732                               Speed and Service  18-04-15

  Date_month_year         Time        Received Via      City     State  \
0       22-Apr-15   3:53:50 PM  Customer Care Call  Abingdon  Maryland
1       04-Aug-15  10:22:56 AM            Internet   Acworth   Georgia
2       18-Apr-15   9:55:47 AM            Internet   Acworth   Georgia

   Zip code  Status Filing on Behalf of Someone
0     21009  Closed                          No
1     30102  Closed                          No
2     30101  Closed                         Yes
```

[6]:
```
df["date_index"] = df["Date_month_year"] + " " + df["Time"]
```

[7]:
```
df["date_index"] = pd.to_datetime(df["date_index"])
df["Date_month_year"] = pd.to_datetime(df["Date_month_year"])
```

[8]:
```
df.dtypes
```

[8]:
```
Ticket #                             object
Customer Complaint                   object
Date                                 object
Date_month_year              datetime64[ns]
Time                                 object
Received Via                         object
City                                 object
```

```
State                                object
Zip code                              int64
Status                               object
Filing on Behalf of Someone          object
date_index                   datetime64[ns]
dtype: object
```

[9]:
```
df = df.set_index(df["date_index"])
```

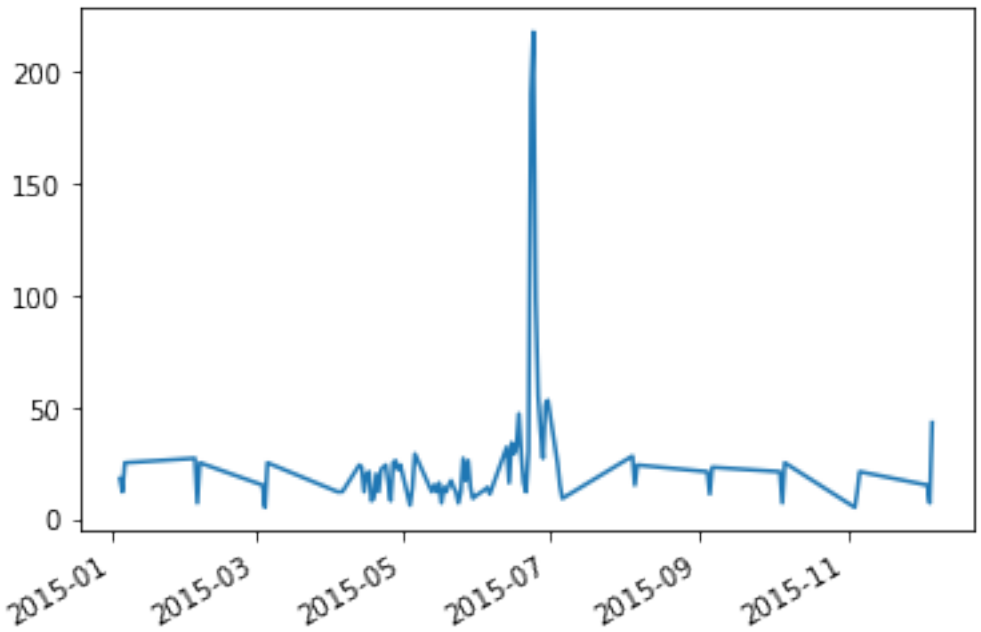
[10]:
```
df.head(3)
```

[10]:
```
                     Ticket #                            Customer Complaint  \
date_index
2015-04-22 15:53:50   250635                 Comcast Cable Internet Speeds
2015-08-04 10:22:56   223441  Payment disappear - service got disconnected
2015-04-18 09:55:47   242732                           Speed and Service

                         Date Date_month_year         Time  \
date_index
2015-04-22 15:53:50  22-04-15      2015-04-22   3:53:50 PM
2015-08-04 10:22:56  04-08-15      2015-08-04  10:22:56 AM
2015-04-18 09:55:47  18-04-15      2015-04-18   9:55:47 AM

                           Received Via      City     State  Zip code  Status  \
date_index
2015-04-22 15:53:50  Customer Care Call  Abingdon  Maryland     21009  Closed
2015-08-04 10:22:56            Internet   Acworth   Georgia     30102  Closed
2015-04-18 09:55:47            Internet   Acworth   Georgia     30101  Closed

                     Filing on Behalf of Someone          date_index
date_index
2015-04-22 15:53:50                           No 2015-04-22 15:53:50
2015-08-04 10:22:56                           No 2015-08-04 10:22:56
2015-04-18 09:55:47                          Yes 2015-04-18 09:55:47
```

[11]:
```
df["Date_month_year"].value_counts()[:3]
```

[11]:
```
2015-06-24    218
2015-06-23    190
2015-06-25     98
Name: Date_month_year, dtype: int64
```

[12]:
```
df["Date_month_year"].value_counts().plot();
```



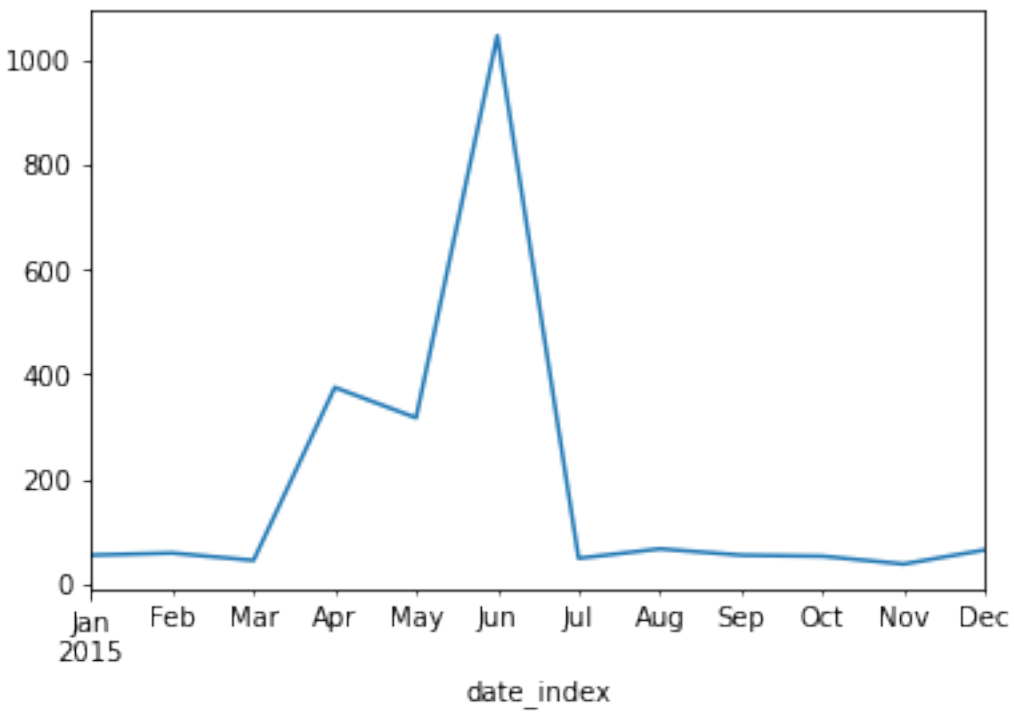

[13]:
```
f = df.groupby(pd.Grouper(freq="M")).size()
```

[14]:
```
f.head()
```

[14]:
```
date_index
2015-01-31     55
2015-02-28     59
2015-03-31     45
2015-04-30    375
2015-05-31    317
Freq: M, dtype: int64
```

[15]:
```
df.groupby(pd.Grouper(freq="M")).size().plot()
```

[15]:
```
<AxesSubplot:xlabel='date_index'>
```




[16]:
```
df.Status.unique()
```

[16]:
```
array(['Closed', 'Open', 'Solved', 'Pending'], dtype=object)
```

[17]:
```
df["newStatus"] = ["Open" if Status=="Open" or Status=="Pending" else "Closed"␣
↪for Status in df["Status"]]
```

[18]:
```
df.head(3)
```

[18]:

| date_index | Ticket # | Customer Complaint | Date | Date_month_year | Time | Received Via | City | State | Zip code | Status |
|---|---|---|---|---|---|---|---|---|---|---|
| 2015-04-22 15:53:50 | 250635 | Comcast Cable Internet Speeds | 22-04-15 | 2015-04-22 | 3:53:50 PM | Customer Care Call | Abingdon | Maryland | 21009 | Closed |
| 2015-08-04 10:22:56 | 223441 | Payment disappear - service got disconnected | 04-08-15 | 2015-08-04 | 10:22:56 AM | | | | | |
| 2015-04-18 09:55:47 | 242732 | Speed and Service | 18-04-15 | 2015-04-18 | 9:55:47 AM | | | | | |

```
2015-08-04 10:22:56            Internet   Acworth   Georgia     30102  Closed
2015-04-18 09:55:47            Internet   Acworth   Georgia     30101  Closed

                     Filing on Behalf of Someone          date_index newStatus
date_index
2015-04-22 15:53:50                           No 2015-04-22 15:53:50    Closed
2015-08-04 10:22:56                           No 2015-08-04 10:22:56    Closed
2015-04-18 09:55:47                          Yes 2015-04-18 09:55:47    Closed
```

[19]:
```
df.groupby(["State"]).size().sort_values(ascending=False).to_frame().
↪reset_index().rename({0: "Count"}, axis=1)[:5]
```

[19]:
```
         State  Count
0      Georgia    288
1      Florida    240
2   California    220
3     Illinois    164
4    Tennessee    143
```

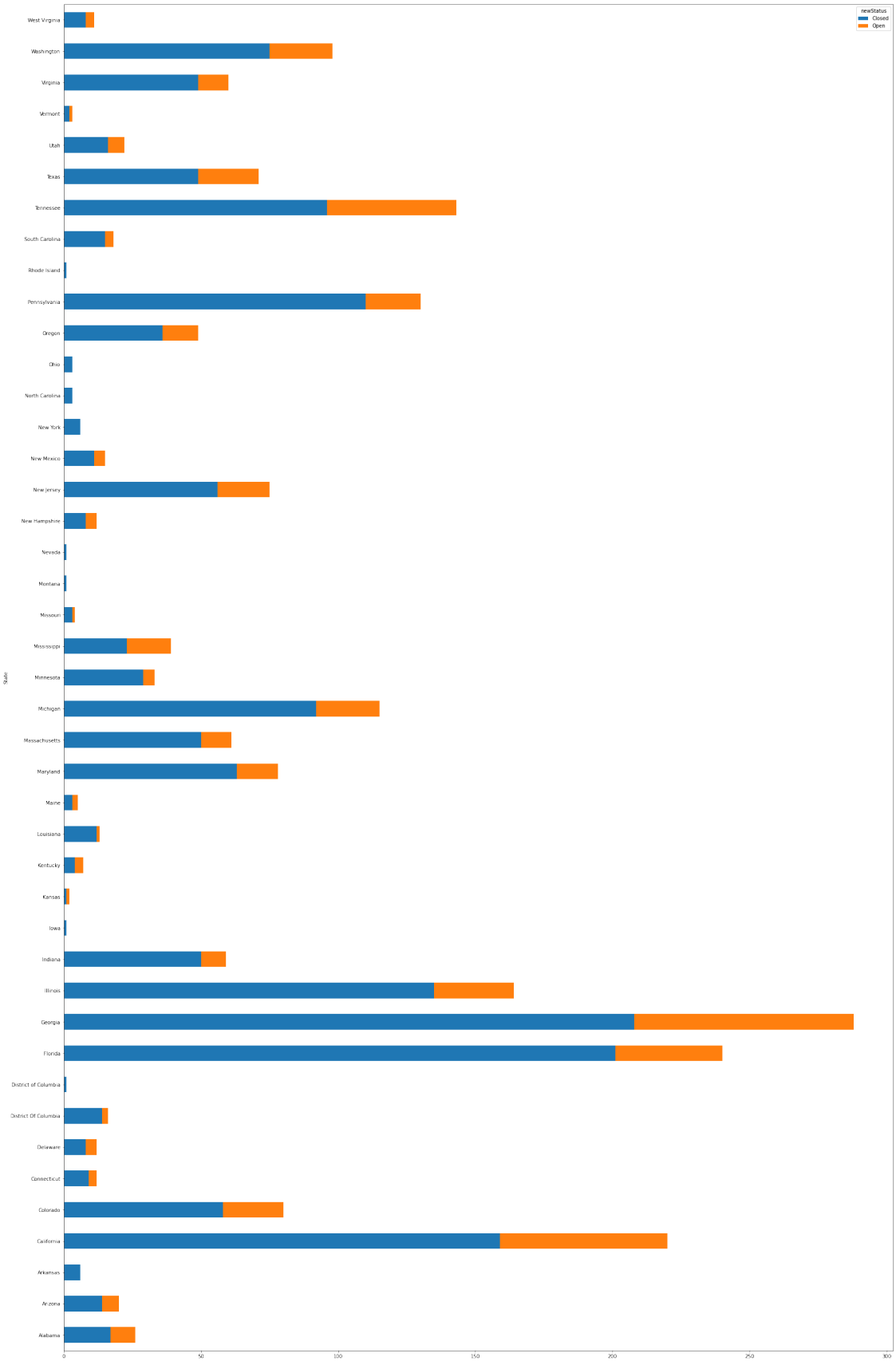
[20]:
```
Status_complaints = df.groupby(["State","newStatus"]).size().unstack().fillna(0)
Status_complaints
```

[20]:
```
newStatus             Closed  Open
State
Alabama                 17.0   9.0
Arizona                 14.0   6.0
Arkansas                 6.0   0.0
California             159.0  61.0
Colorado                58.0  22.0
Connecticut              9.0   3.0
Delaware                 8.0   4.0
District Of Columbia    14.0   2.0
District of Columbia     1.0   0.0
Florida                201.0  39.0
Georgia                208.0  80.0
Illinois               135.0  29.0
Indiana                 50.0   9.0
Iowa                     1.0   0.0
Kansas                   1.0   1.0
Kentucky                 4.0   3.0
Louisiana               12.0   1.0
Maine                    3.0   2.0
Maryland                63.0  15.0
Massachusetts           50.0  11.0
Michigan                92.0  23.0
Minnesota               29.0   4.0
Mississippi             23.0  16.0
```

```
Missouri                3.0   1.0
Montana                 1.0   0.0
Nevada                  1.0   0.0
New Hampshire           8.0   4.0
New Jersey             56.0  19.0
New Mexico             11.0   4.0
New York                6.0   0.0
North Carolina          3.0   0.0
Ohio                    3.0   0.0
Oregon                 36.0  13.0
Pennsylvania          110.0  20.0
Rhode Island            1.0   0.0
South Carolina         15.0   3.0
Tennessee              96.0  47.0
Texas                  49.0  22.0
Utah                   16.0   6.0
Vermont                 2.0   1.0
Virginia               49.0  11.0
Washington             75.0  23.0
West Virginia           8.0   3.0
```

[21]:
```
Status_complaints.plot(kind="barh", figsize=(30,50), stacked=True)
```

[21]:
```
<AxesSubplot:ylabel='State'>
```


newStatus
Closed
Open
State
West Virginia
Washington
Virginia
Vermont
Utah
Texas
Tennessee
South Carolina
Rhode Island
Pennsylvania
Oregon
Ohio
North Carolina
New York
New Mexico
New Jersey
New Hampshire
Nevada
Montana
Missouri
Mississippi
Minnesota
Michigan
Massachusetts
Maryland
Maine
Louisiana
Kentucky
Kansas
Iowa
Indiana
Illinois
Georgia
Florida
District of Columbia
District Of Columbia
Delaware
Connecticut
Colorado
California
Arkansas
Arizona
Alabama
0
50
100
150
200
250
300

[22]:
```
df.groupby(["State"]).size().sort_values(ascending=False).to_frame().
↪reset_index().rename({0: "Count"}, axis=1).max()
```

[22]:
```
State    West Virginia
Count              288
dtype: object
```

[23]:
```
df.groupby(["State","newStatus"]).size().unstack().fillna(0).max()
```

[23]:
```
newStatus
Closed    208.0
Open       80.0
dtype: float64
```

[24]:
```
!pip install wordcloud
```

```
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: wordcloud in /usr/local/lib/python3.7/site-
packages (1.6.0)
Requirement already satisfied: pillow in /usr/local/lib/python3.7/site-packages
(from wordcloud) (7.1.1)
Requirement already satisfied: numpy>=1.6.1 in /usr/local/lib/python3.7/site-
packages (from wordcloud) (1.21.5)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.7/site-
packages (from wordcloud) (3.5.1)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.7/site-
packages (from matplotlib->wordcloud) (21.0)
Requirement already satisfied: pyparsing>=2.2.1 in
/usr/local/lib/python3.7/site-packages (from matplotlib->wordcloud) (2.4.6)
Requirement already satisfied: python-dateutil>=2.7 in
/usr/local/lib/python3.7/site-packages (from matplotlib->wordcloud) (2.8.1)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.7/site-
packages (from matplotlib->wordcloud) (0.10.0)
Requirement already satisfied: kiwisolver>=1.0.1 in
/usr/local/lib/python3.7/site-packages (from matplotlib->wordcloud) (1.2.0)
Requirement already satisfied: fonttools>=4.22.0 in
/usr/local/lib/python3.7/site-packages (from matplotlib->wordcloud) (4.28.5)
Requirement already satisfied: six in /usr/local/lib/python3.7/site-packages
(from cycler>=0.10->matplotlib->wordcloud) (1.14.0)
```

```
WARNING: You are using pip version 22.0.3; however, version 22.0.4 is
available.
You should consider upgrading via the '/usr/local/bin/python3 -m pip install
--upgrade pip' command.
```

[25]:
```
from nltk.corpus import stopwords
from nltk.stem.wordnet import WordNetLemmatizer
import string

stop = set(stopwords.words('english'))
exclude = set(string.punctuation)
lemma = WordNetLemmatizer()
```

[26]:
```
def clean(doc):
    stop_free = " ".join([i for i in doc.lower().split() if i not in stop])
    punc_free = "".join([ch for ch in stop_free if ch not in exclude])
    normalised = " ".join(lemma.lemmatize(word) for word in punc_free.split())
    return normalised
```

[27]:
```
doc_complete = df["Customer Complaint"].tolist()
doc_clean = [clean(doc).split() for doc in doc_complete]
```

[28]:
```
import gensim
from gensim import corpora
```

[29]:
```
dictionary = corpora.Dictionary(doc_clean)
print(dictionary)
```

```
Dictionary(1412 unique tokens: ['cable', 'comcast', 'internet', 'speed',
'disappear']…)
```

[30]:
```
doc_term_matrix = [dictionary.doc2bow(doc) for doc in doc_clean]
doc_term_matrix
```

[30]:
```
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 (8, 1),
 (72, 1),
 (203, 1),
```

```
 (279, 1),
 (281, 2),
 (369, 1),
 (584, 1),
 (660, 1),
 (747, 1),
 (871, 1),
 (872, 1)],
[(8, 1),
 (38, 1),
 (72, 1),
 (82, 1),
 (271, 1),
 (572, 1),
 (873, 1),
 (874, 1),
 (875, 1),
 (876, 1)],
[(1, 1), (38, 1), (159, 1), (877, 1)],
[(10, 1), (20, 1), (35, 1), (289, 1)],
[(12, 1), (193, 1), (294, 1), (393, 1), (878, 1), (879, 1)],
[(1, 1), (880, 1)],
[(1, 1), (8, 1), (71, 1), (72, 1), (283, 1), (411, 1), (559, 1), (881, 1)],
[(1, 1), (8, 1), (71, 1), (72, 1), (283, 1), (411, 1), (559, 1), (881, 1)],
[(1, 1), (8, 1), (72, 1), (197, 1), (875, 1)],
[(38, 1), (112, 1)],
[(0, 1), (1, 1)],
[(258, 1), (443, 1), (539, 1), (588, 1), (882, 1)],
[(883, 1), (884, 1)],
[(1, 1), (8, 1)],
[(1, 1), (102, 1)],
…]
```

[31]:
```
from gensim.models import LdaModel
```

[32]:
```
Num_Topic = 9
ldamodel = LdaModel(doc_term_matrix, num_topics= Num_Topic, id2word=␣
 ↪dictionary, passes= 30)
```

[33]:
```
topics = ldamodel.show_topics()
for topic in topics:
    print(topic)
    print()
```

```
(0, '0.081*"practice" + 0.060*"billing" + 0.056*"unfair" + 0.042*"price" +
0.031*"monopolistic" + 0.031*"bill" + 0.031*"service" + 0.028*"connection" +
0.026*"high" + 0.019*"paying"')
```

```
(1, '0.318*"internet" + 0.116*"comcast" + 0.082*"service" + 0.065*"speed" +
0.033*"slow" + 0.020*"cable" + 0.017*"problem" + 0.016*"fee" + 0.010*"month" +
0.010*"phone"')

(2, '0.140*"comcast" + 0.091*"charge" + 0.056*"bill" + 0.027*"credit" +
0.023*"payment" + 0.022*"account" + 0.020*"email" + 0.017*"unauthorized" +
0.017*"option" + 0.016*"tucson"')

(3, '0.184*"comcast" + 0.151*"billing" + 0.071*"issue" + 0.066*"service" +
0.021*"customer" + 0.016*"without" + 0.014*"terrible" + 0.013*"charging" +
0.012*"price" + 0.009*"equipment"')

(4, '0.187*"data" + 0.168*"cap" + 0.140*"comcast" + 0.026*"charge" +
0.019*"fraudulent" + 0.018*"overage" + 0.015*"incorrect" + 0.012*"back" +
0.009*"overcharge" + 0.009*"lied"')

(5, '0.115*"speed" + 0.082*"throttling" + 0.032*"promised" + 0.027*"cramming" +
0.020*"low" + 0.020*"time" + 0.019*"outage" + 0.014*"scam" +
0.014*"disconnection" + 0.014*"promotion"')

(6, '0.233*"comcast" + 0.107*"service" + 0.067*"complaint" + 0.032*"customer" +
0.023*"contract" + 0.015*"help" + 0.013*"2" + 0.013*"business" + 0.012*"show" +
0.011*"bill"')

(7, '0.131*"service" + 0.048*"poor" + 0.026*"get" + 0.025*"charged" +
0.021*"comcast" + 0.021*"home" + 0.019*"billed" + 0.018*"year" + 0.018*"modem" +
0.016*"fee"')

(8, '0.095*"comcast" + 0.069*"xfinity" + 0.049*"pricing" + 0.047*"usage" +
0.029*"comcastxfinity" + 0.029*"deceptive" + 0.025*"data" + 0.022*"switch" +
0.021*"access" + 0.020*"false"')
```

[34]:
```
word_dict = {}
for i in range(Num_Topic):
    words = ldamodel.show_topic(i, topn =20)
    word_dict["Topic # " + "{}".format(i)] = [i[0] for i in words]
```

[35]:
```
pd.DataFrame(word_dict)
```

[35]:

| | Topic # 0 | Topic # 1 | Topic # 2 | Topic # 3 | Topic # 4 | \ |
|---|---|---|---|---|---|---|
| 0 | practice | internet | comcast | comcast | data | |
| 1 | billing | comcast | charge | billing | cap | |
| 2 | unfair | service | bill | issue | comcast | |
| 3 | price | speed | credit | service | charge | |
| 4 | monopolistic | slow | payment | customer | fraudulent | |

| | | | | | |
|---|---|---|---|---|---|
| 5 | bill | cable | account | without | overage |
| 6 | service | problem | email | terrible | incorrect |
| 7 | connection | fee | unauthorized | charging | back |
| 8 | high | month | option | price | overcharge |
| 9 | paying | phone | tucson | equipment | lied |
| 10 | unreliable | intermittent | change | rate | awful |
| 11 | increased | installation | without | provide | fee |
| 12 | monopoly | xfinitycomcast | request | availability | bill |
| 13 | cable | day | improper | shitty | bandwidth |
| 14 | monthly | signal | bandwidth | plan | cost |
| 15 | hbo | without | connectivity | connection | resolution |
| 16 | go | connectivity | consent | ps4 | wont |
| 17 | notice | broadband | excessive | information | charged |
| 18 | comcasts | throttle | inconsistent | hbogo | install |
| 19 | week | extremely | transfer | still | higher |

| | Topic # 5 | Topic # 6 | Topic # 7 | Topic # 8 |
|---|---|---|---|---|
| 0 | speed | comcast | service | comcast |
| 1 | throttling | service | poor | xfinity |
| 2 | promised | complaint | get | pricing |
| 3 | cramming | customer | charged | usage |
| 4 | low | contract | comcast | comcastxfinity |
| 5 | time | help | home | deceptive |
| 6 | outage | 2 | billed | data |
| 7 | scam | business | year | switch |
| 8 | disconnection | show | modem | access |
| 9 | promotion | bill | fee | false |
| 10 | term | appointment | call | limit |
| 11 | misrepresentation | bad | 3 | advertising |
| 12 | every | failure | monthly | unfair |
| 13 | area | horrible | quality | bait |
| 14 | consistently | please | 10 | several |
| 15 | power | 12 | mbps | lack |
| 16 | supervisor | mb | system | throttled |
| 17 | changing | sale | security | one |
| 18 | anyone | people | pay | practice |
| 19 | 105 | paying | returned | issue |

[ ]: