Budget Text Analysis

- Datatopian Visionaries

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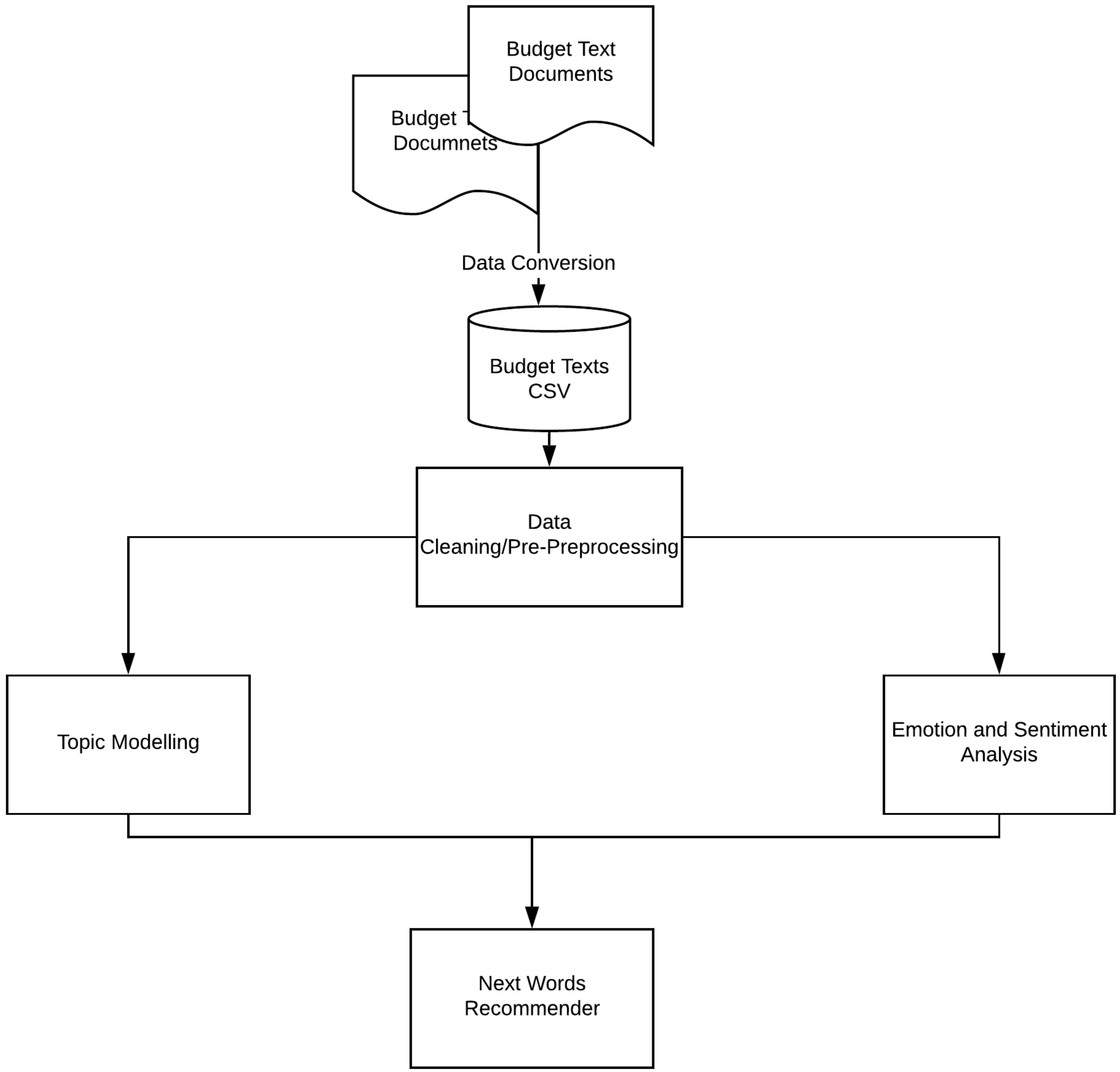
Overview of the Project



Goals

- **Understand the Different sections of budget text data from different counties and create a relation between them.**
- **Compare the general funds section of Guilford county, Durham County and Charlotte City (2008 and 2019) and understand the difference between them.**
- **Visualization of emotions between 2008 and 2019.**
- **Understand the different relevant topics from all the counties 2019 and with computed their coherence score with proper visualization.**
- **Compared the topic modeling results over the years (2008,2012,2016,2020)**

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Team Structure

- All the individuals will work on preparing data i.e. Perform Data cleaning and Data preprocessing.
- Team will be divided into 2 groups to perform different tasks:
  - Team 1: Topic Modelling
    Members:
    1. Naseeb Thapaliya
    2. Miguel Gasper Utrera
  - Team 2: Emotion and Sentiment Analysis
    Members:
    1. Akash Meghani
    2. Unnati Khivasara

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Individual Tasks Done

- Sultan Al Bogami
  1. Collected Budget Documents from all the different Counties websites and other sources(2008 to 2020) and organization of github.
  2. Converted the pdf documents to csv formats. Extract words from the documents using online tool, and classify them for further processing.
- Naseeb Thapaliya
  1. Compared the topic modeling results over the years (2008,2012,2016,2020)
- Miguel Gasper Utrera
  1. Applied Topic modeling on different relevant topics from all the counties and computed their coherence score with proper visualization.
- 2. Applied Davis model and showed top 30 words in each topic and their relevence.
- Unnati Khivasera
  1. Analyzing sentiment intensity using Vader.
  2. Performed visualization of emotions from different sections of documents.
- Akash Meghani
  1. Applied Emotional and Sentiment analysis with NLTK and got meaningful results.
  2. Performed visualization of emotions from different sections of documents.

Emotion And Sentiment Analysis

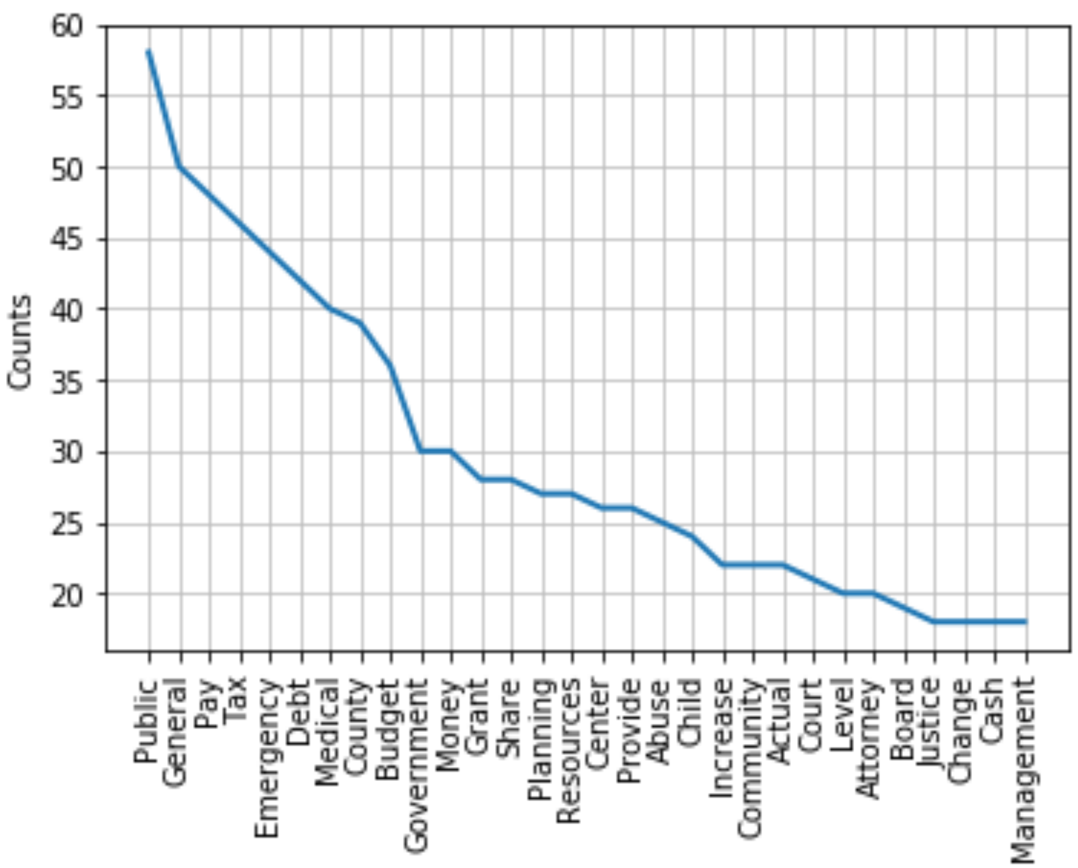
Most Influential Words in Guilford County (2020 and 2008)

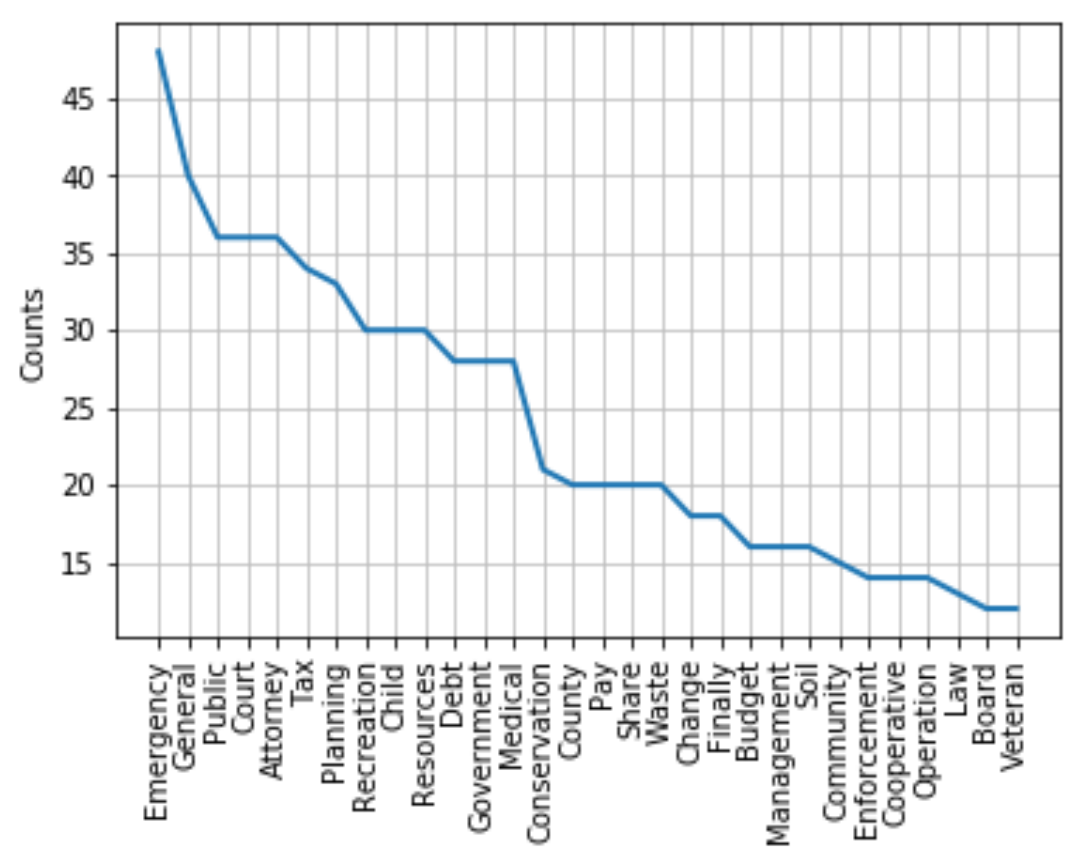
```
[('Public', 58),
 ('General', 50),
 ('Pay', 48),
 ('Tax', 46),
 ('Emergency', 44),
 ('Debt', 42),
 ('Medical', 40),
 ('County', 39),
 ('Budget', 36),
 ('Government', 30)]
```

```
[('Emergency', 48),
 ('General', 40),
 ('Public', 36),
 ('Court', 36),
 ('Attorney', 36),
 ('Tax', 34),
 ('Planning', 33),
 ('Recreation', 30),
 ('Child', 30),
 ('Resources', 30)]
```

Emotion And Sentiment Analysis

Distribution of most influential Words in Guilford County (2020 and 2008)





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Emotion And Sentiment Analysis

We have assigned numerical value to every emotion present in the document. Here is the list :

"Negative": "0","Positive": "1","Trust" :"2","Sadness":"0","Anticipation":"3","Surprise":"4","Fear":"5","Joy":"6","Anger":"7","Disgust":"8"

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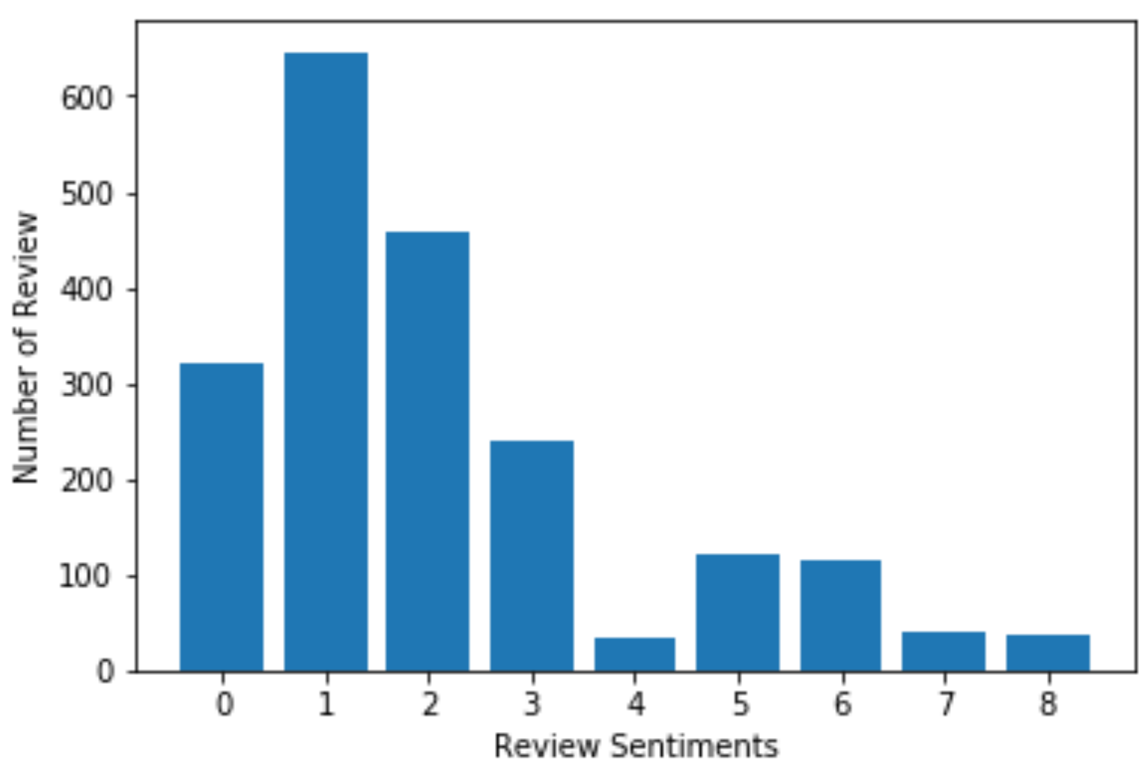
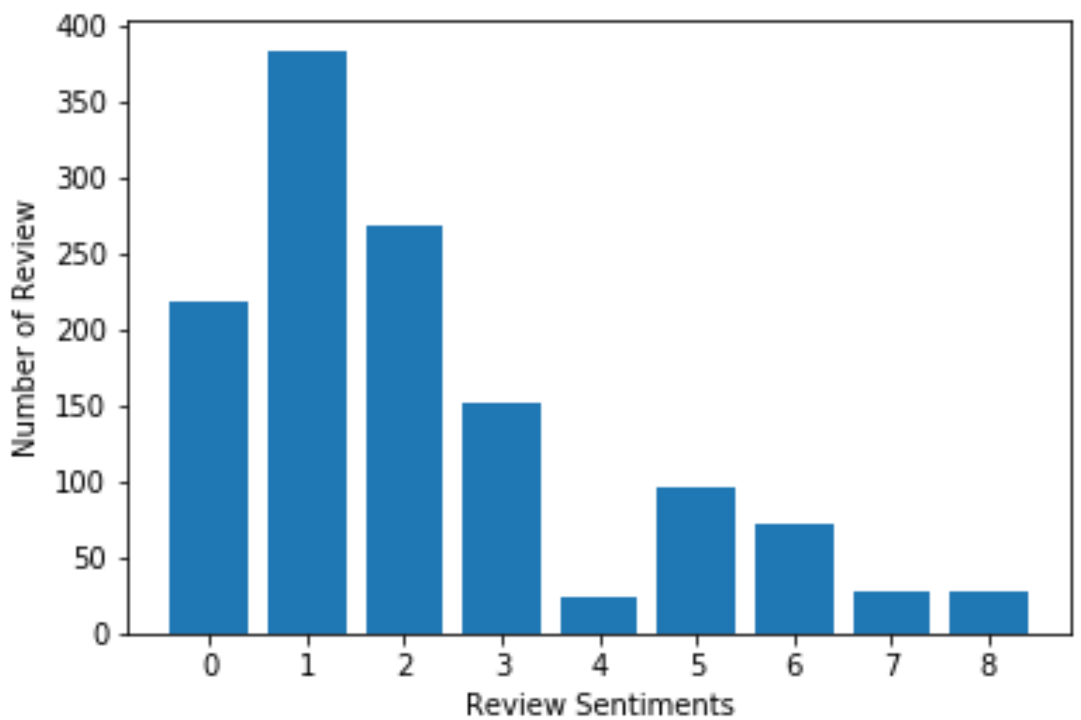
Emotion And Sentiment Analysis

Distribution of Emotions in General fund summary section (2020 and 2008)





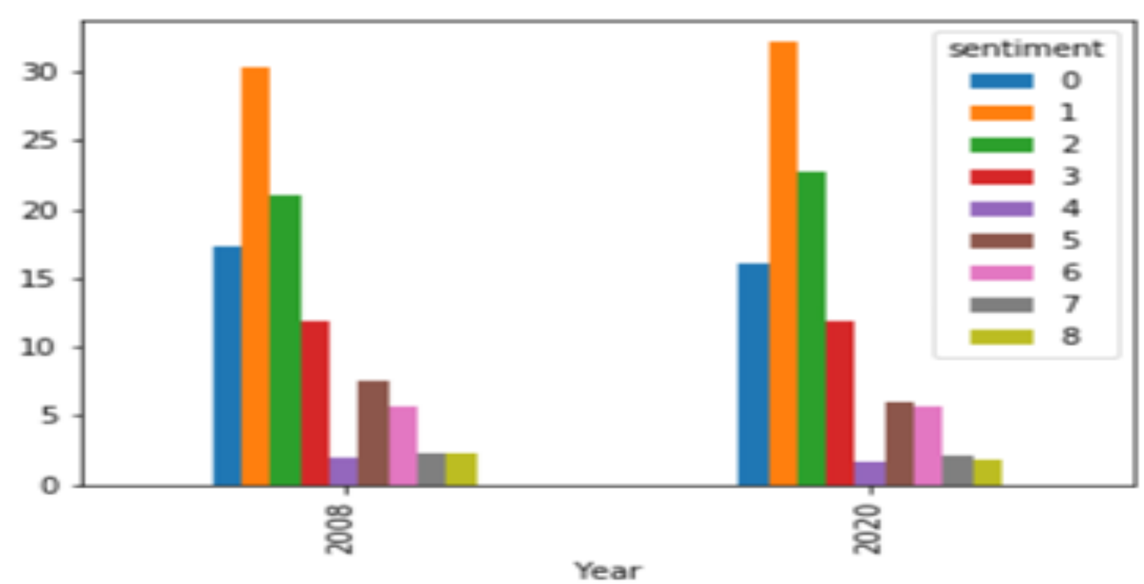
Emotion And Sentiment Analysis

Distribution of Emotions in General fund summary section (2020 and 2008) for Guilford County

```
3278
sentiment          0          1          2          3         4         5
Year
2008       17.219589  30.252765  21.090047  11.927330  1.895735  7.582938
2020       16.003976  32.107356  22.763419  11.928429  1.689861  5.964215

sentiment         6         7         8
Year
2008       5.608215  2.211690  2.211690
2020       5.715706  2.037773  1.789264

<matplotlib.axes._subplots.AxesSubplot at 0x20cf2a6e4a8>
```



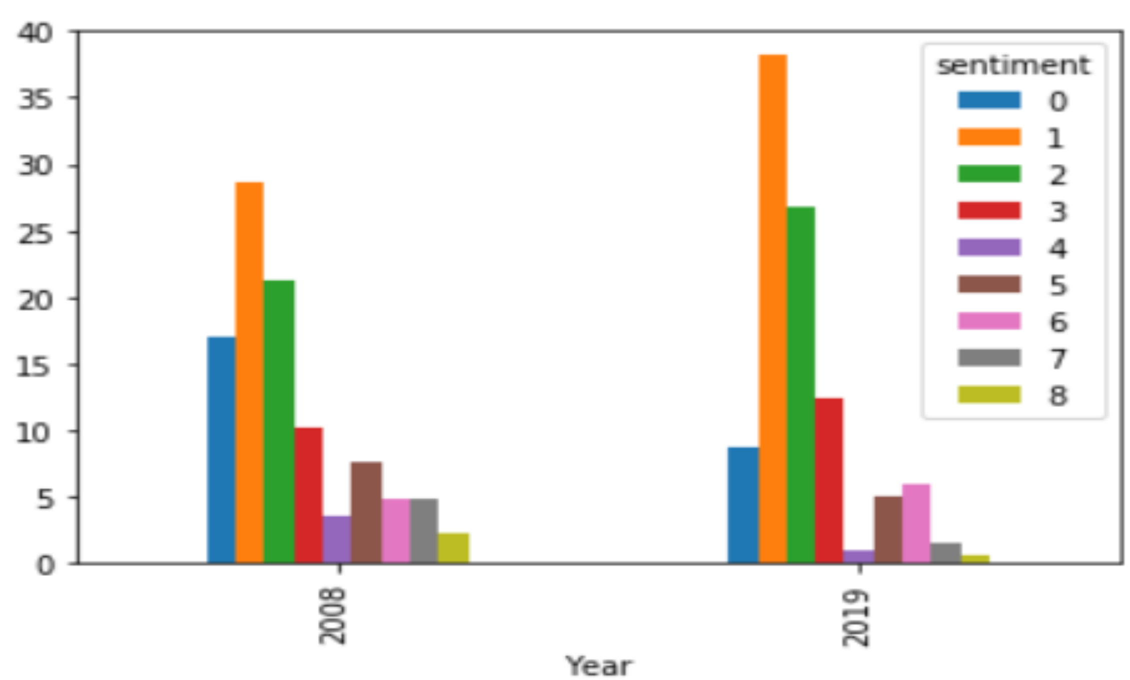
Emotion And Sentiment Analysis

Distribution of Emotions in General fund summary section (2020 and 2008) for Charolette

```
6221
sentiment          0          1          2          3         4         5
Year
2008       16.993464  28.540305  21.241830  10.130719  3.594771  7.625272
2019        8.730907  38.148218  26.758439  12.370356  0.999434  5.091458

sentiment         6         7         8
Year
2008       4.793028  4.793028  2.287582
2019       5.883462  1.470866  0.546860
```

<matplotlib.axes._subplots.AxesSubplot at 0x20cf2b25780>



Emotion And Sentiment Analysis

Most Influential Words in Charlotte City (2020 and 2008)

```
[('Retirement', 210),
 ('Provide', 138),
 ('Pay', 120),
 ('Public', 118),
 ('Salary', 116),
 ('General', 110),
 ('Planning', 93),
 ('Change', 81),
 ('Risk', 78),
 ('Efficient', 78)]
```

```
[('Emergency', 40),
 ('Medical', 40),
 ('Director', 40),
 ('Public', 38),
 ('Planning', 36),
 ('Continue', 36),
 ('Management', 34),
 ('Provide', 34),
 ('County', 33),
 ('Resources', 33)]
```

Emotion And Sentiment Analysis

- **We have used multiple methods like NLTK, Text blob and Vader to figure out what make sense with our data.**
- **We have applied NLTK on multiple sections of the document but we have only presented interesting things.**

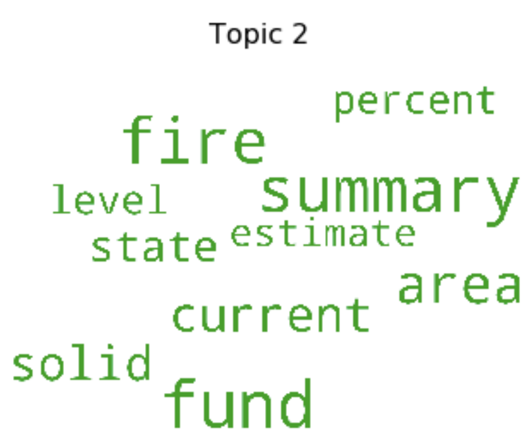
Topic Modeling

```
[(0,
  '0.315*"total" + 0.056*"commissioner" + 0.052*"park" + 0.051*"property" + '
  '0.044*"security" + 0.044*"resource" + 0.035*"policy" + 0.032*"economic" + '
  '0.027*"performance" + 0.026*"amend"'),
 (1,
  '0.196*"program" + 0.153*"provide" + 0.106*"major" + 0.064*"grant" + '
  '0.063*"exist" + 0.053*"operation" + 0.039*"information" + 0.037*"change" + '
  '0.035*"work" + 0.034*"care"'),
 (2,
  '0.115*"fund" + 0.110*"summary" + 0.108*"fire" + 0.078*"area" + '
  '0.062*"current" + 0.060*"solid" + 0.048*"state" + 0.041*"level" + '
  '0.040*"percent" + 0.039*"estimate"'),
 (3,
  '0.187*"fiscal" + 0.086*"debt" + 0.074*"unit" + 0.068*"water" + '
  '0.060*"infrastructure" + 0.050*"issue" + 0.044*"goal" + 0.042*"remain" + '
  '0.042*"government" + 0.041*"base"'),
 (4,
  '0.206*"adopt" + 0.107*"replacement" + 0.090*"support" + 0.083*"increase" + '
  '0.075*"number" + 0.044*"charge" + 0.041*"planning" + 0.038*"additional" + '
  '0.038*"require" + 0.038*"site"'),
 (5,
  '0.219*"capital" + 0.134*"expenditure" + 0.100*"management" + '
  '0.072*"equipment" + 0.050*"balance" + 0.044*"vehicle" + 0.040*"begin" + '
  '0.036*"improve" + 0.030*"identify" + 0.026*"law"'),
 (6,
  '0.242*"include" + 0.164*"community" + 0.095*"school" + 0.075*"impact" + '
  '0.037*"rate" + 0.033*"maintain" + 0.027*"recommend" + 0.027*"associate" + '
  '0.026*"pay" + 0.024*"resident"'),
 (7,
  '0.259*"year" + 0.150*"funding" + 0.117*"public" + 0.080*"development" + '
  '0.077*"actual" + 0.044*"plan" + 0.029*"annual" + 0.024*"life" + '
  '0.021*"address" + 0.019*"help"'),
 (8,
  '0.047*"service" + 0.019*"system" + 0.013*"building" + 0.012*"improvement" + '
  '0.012*"operate" + 0.011*"transfer" + 0.010*"cost" + 0.010*"source" + '
  '0.010*"complete" + 0.009*"future"'),
 (9,
  '0.260*"budget" + 0.207*"project" + 0.180*"facility" + 0.133*"revenue" + '
  '0.052*"tax" + 0.024*"appropriate" + 0.024*"control" + 0.015*"specific" + '
  '0.014*"population" + 0.011*"food"')]
```

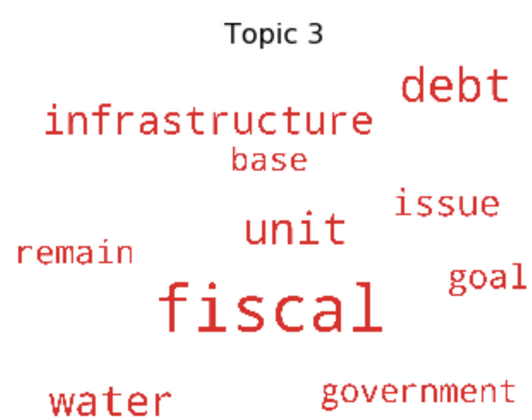
Topic Modeling

Label: Property Maintenance and Security

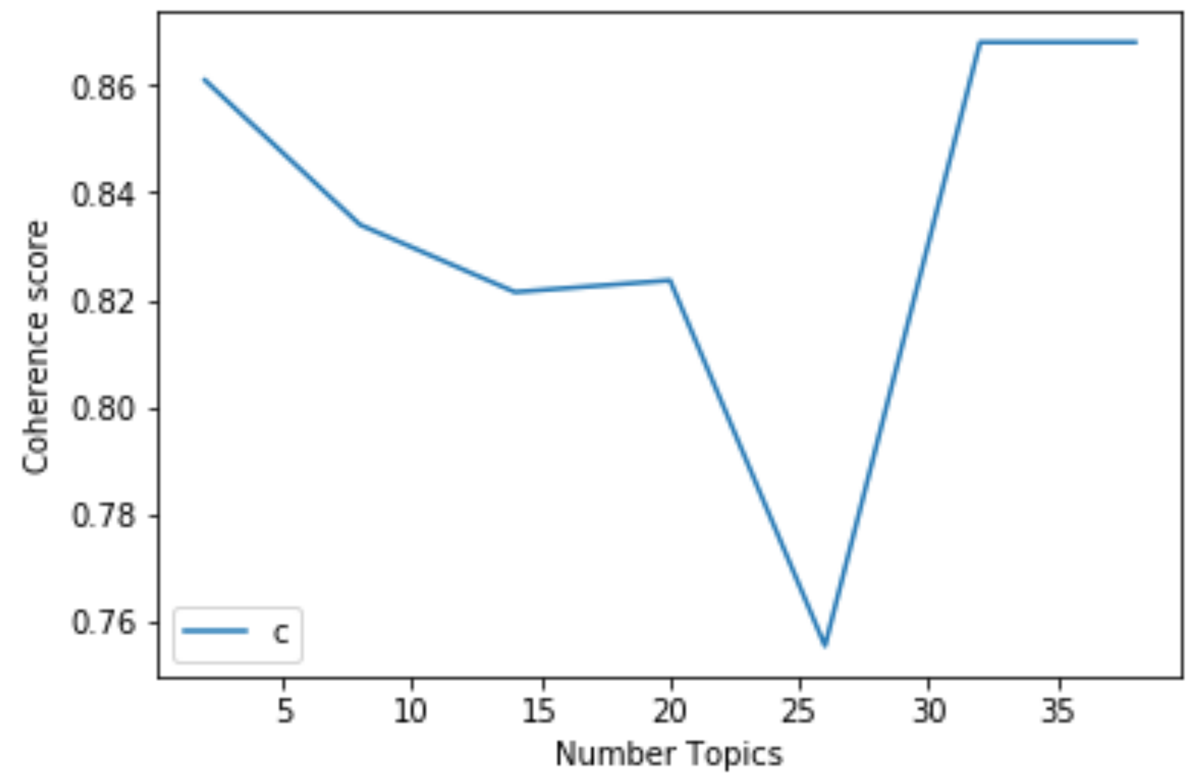
Label: Grant for Work or Program



Label: State Fire Fund

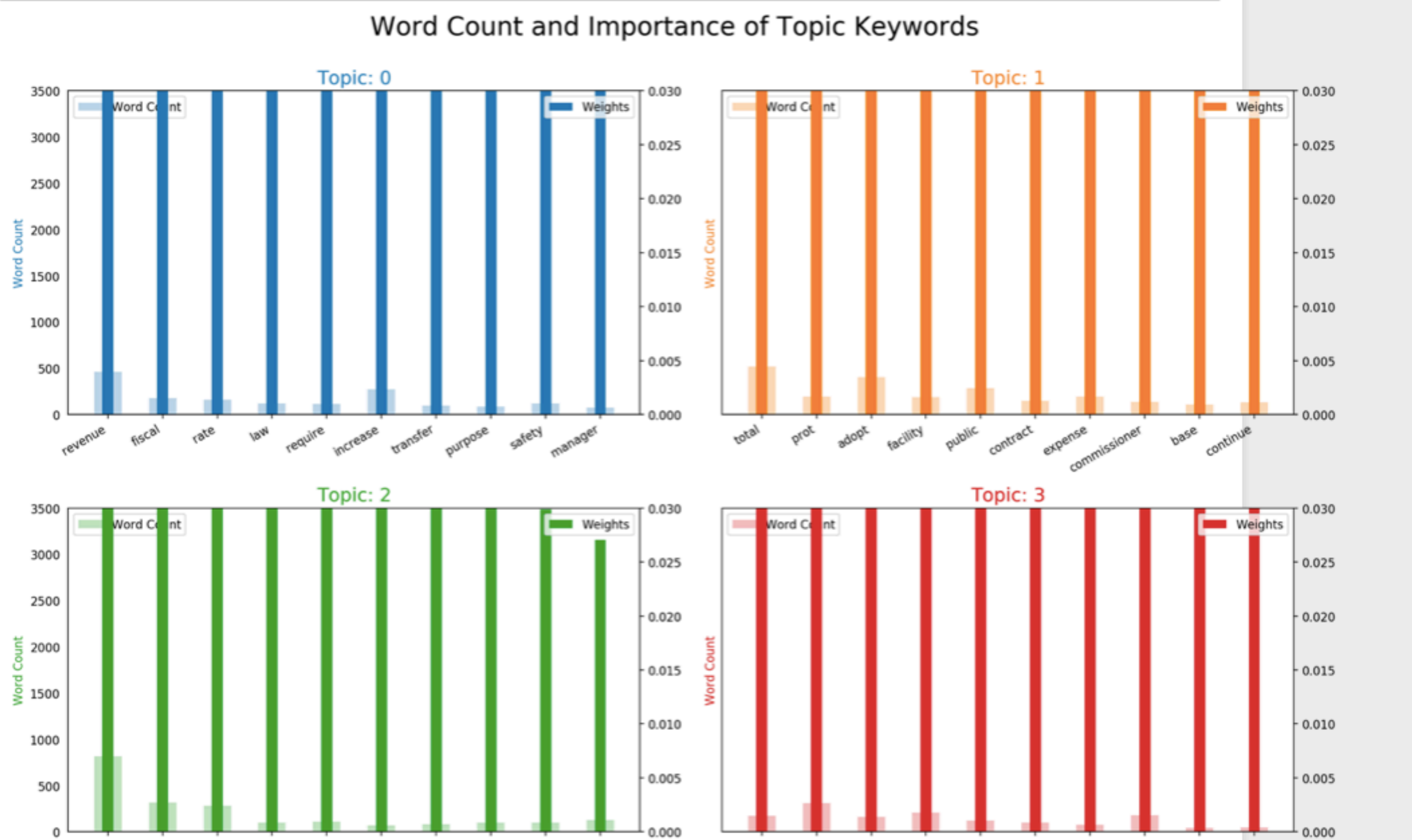


Label: Government Fiscal Year



Coherence Score: 0.8256146597574272

Topic Modeling



Topic Modeling Comparison

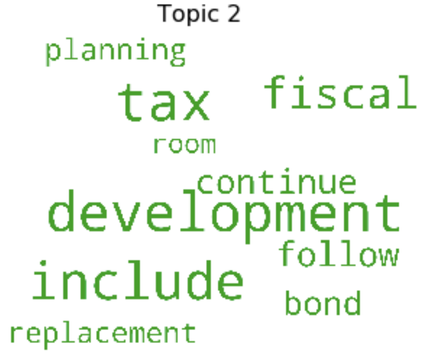
Topic 0

Label: Capital Funding for Education

Topic 1

Label: Fire Fund Program

Topic 2



Label: Fiscal Year Planning

Topic 3

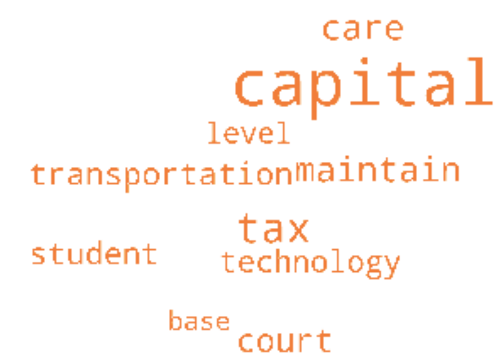
Label: Community Construction

2020

Topic 0

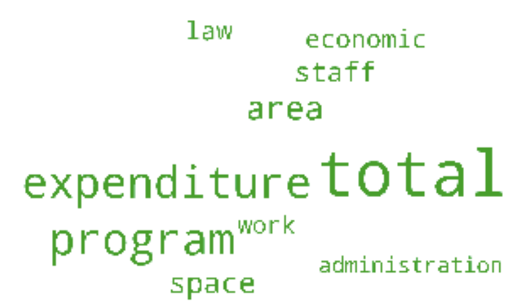
Label: Increase risk in project, department

Topic 1



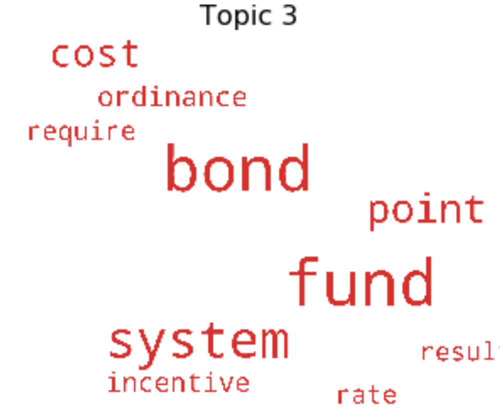
Label: Student Tax

Topic 2



Label: Economic Expenditure

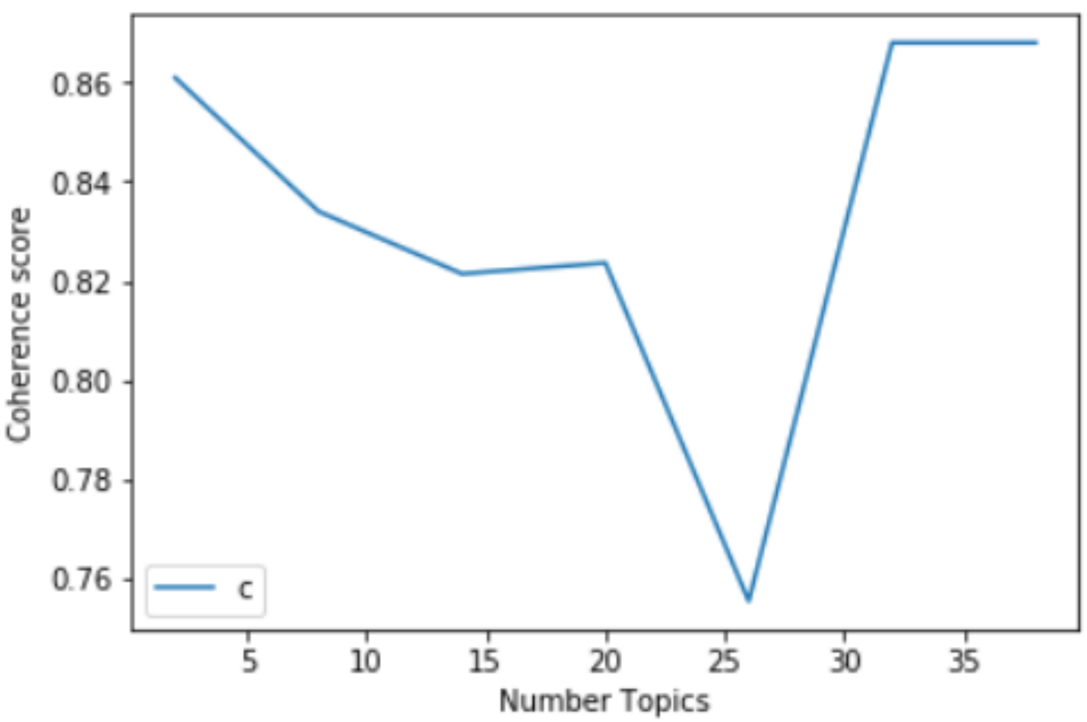
Topic 3



Label: Financial Indicators

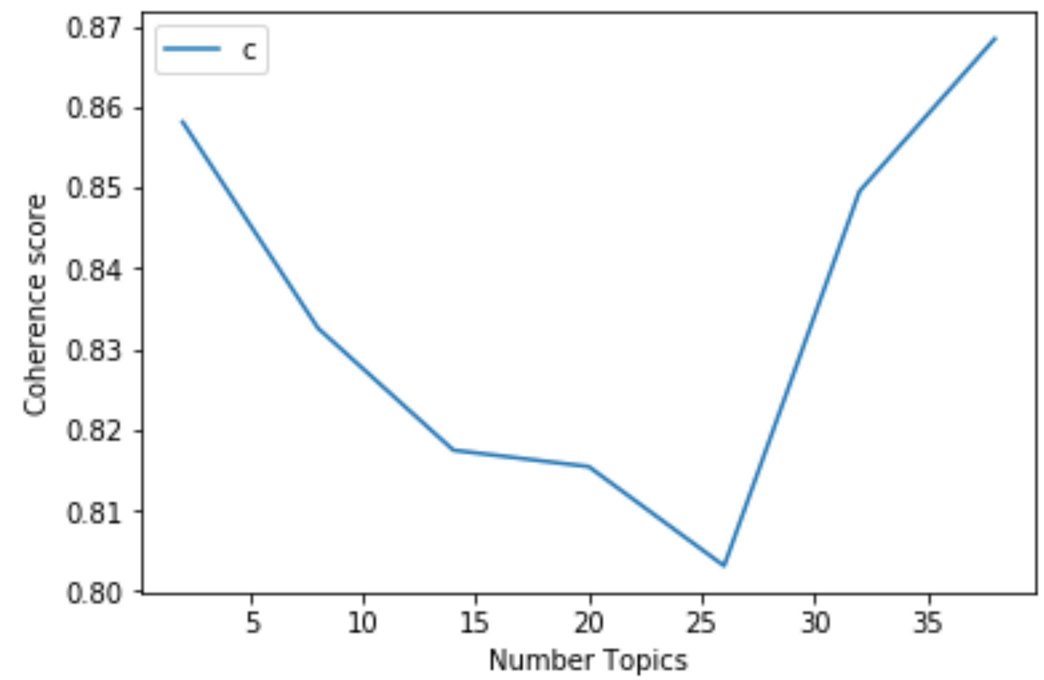
2008

Topic Modeling Comparison



Coherence Score: 0.8256146597574272

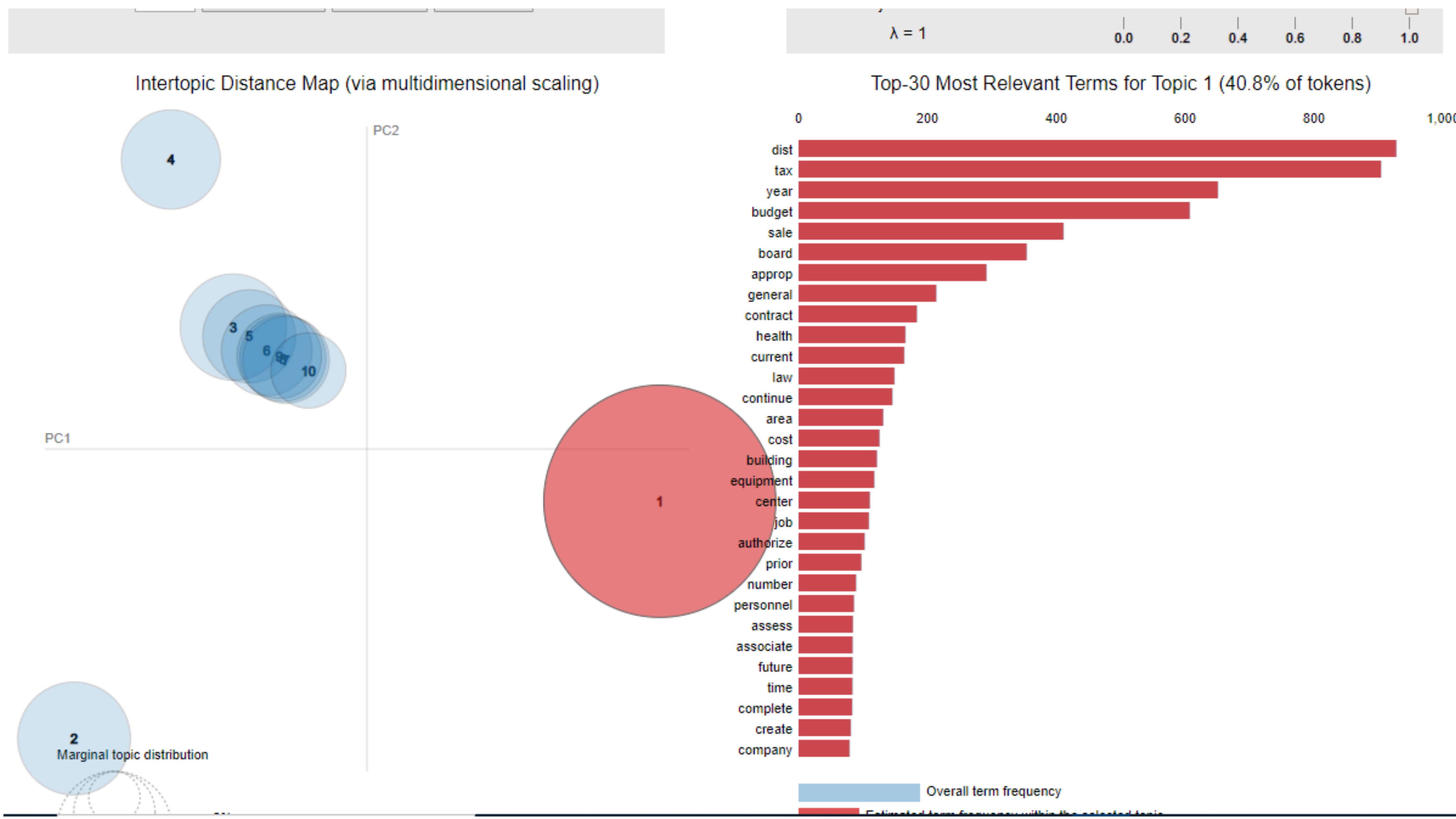
2019



Coherence Score: 0.8247949042506306

2008

Topic Modeling Comparison



Next Word Recommender

- Whenever a user tries to enter a word/s suggest the next word based on combination of words used as input in previous searches.
- Use results from Topic modeling to predict the recommended word/topic which are important.