

Text Analysis of the House Intelligence Committee  
Impeachment Hearings  
November 13, 2019 – November 21, 2019  
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## **Introduction**

Since the infamous July 25, 2019 phone call between the United States president Donald Trump and Ukraine's president Volodymyr Zelensky, the country has been divided on the interpretation of the call. The call motivated an impeachment inquiry to determine whether president Trump's actions will result in an impeachable offense. An impeachable offense would be an act classified as a high crime or misdemeanor, or what lawmakers are calling a quid pro quo (this for that). For the context of the analysis I will not be determining whether the president committed a crime but rather what is being said and who is saying it. This is of interest to me because it seems that no matter the issue, politicians are very divided even if there is reason they should not believe along party lines. I am interested to see if this is true in the impeachment process. I will perform a few techniques such as sentiment analysis of various groups to determine attitudes. Additionally, I will be looking at the complexity and uniqueness of lawmakers, lawyers, and witness statements.

## **Executive Summary**

This project attempted to uncover interesting facts and insights about the House Intelligence Committee's impeachment hearings. Analysis was conducted on three groups. The first group compared democrats, republicans, and witnesses, the next group compared House Chairman Adam Schiff and Ranking Member Devin Nunes. The third group compared the diplomats, Marie Yovanovitch, George Kent, William Taylor, and Kurt Volker. The analysis included sentiment analysis which revealed contradictory results between two methods, mainly because the textblob method used a more robust lexicon and way of computing sentiment. This revealed that Nunes was more positive than Schiff, democrats more negative than republicans, and Yovanovitch more variable in sentiment. Additionally, interesting results were uncovered when determining uniqueness and complexity of the groups' vocabularies. The most notable being, Yovanovitch and Kent did not use any unique words amongst the witnesses. The last attempt at analysis was a Naïve Bayes Classifier, and nothing of interest came from that. Either the algorithm was not implemented correctly or there are no unique features amongst the group that aid in predicting class. Hopefully, the algorithm wasn't implemented correctly so that can be fixed and I can find something of interest there.

## **Data**

The data consists of multiple text files, one text file for each day or session of the impeachment hearings. Some days there was only one session, other days there were morning and afternoon sessions. I created a database for the data in order to easily query what I needed for analysis. The database had a column for the speaker's full name, the date of the hearing, the statement, and the role the speaker, whether it was democrat, republican, diplomat, or majority/minority counsel. In total, the database had 4 columns, and 10,025 rows after some entries were removed for having empty statements. In addition, the data is only from the hearings conducted by the House Intelligence Committee.

## **Methods**

For the purpose of the project, three main methods of analysis were used. To gain insights into the impeachment inquiry, I have looked at the sentiment of different groups and people, compiled summary statistics, and developed a Naïve Bayes Classifier. Those that were analyzed together were the democrats, republicans, and witnesses, chairman Schiff and ranking member Nunes, and finally, each of the diplomats, Marie Yovanovitch, William Taylor, Kurt Volker, and George Kent. Within these groups, I

used various methods to analyze the sentiment throughout the hearing, computed word distributions, uniqueness and complexity of vocabulary, and finally attempted a Naïve Bayes' Classifier. With these methods of analysis I hope to uncover the overall feelings and attitudes during the hearings, what words was each group or individual saying and how did it differ from the others they were compared to and if what they were saying was unique or had their vocabulary been repeated. Additionally, the classifier's intent is to find what word features make individuals or groups stand out amongst each other.

In order to get to the point of analysis there were other things I did to get the data ready. First, I created a database to easily query the data. I wrote a few regular expressions to extract the necessary data from the text files. I wrote one to find the name of the person speaking and another to extract the statement of the person. Once I had this data, I was able to insert the values into the database. The data base has four columns: full\_name, date, statement, and role. To get the role of the individual (democrat, republican, majority counsel, minority counsel, or military), I created a text file that had the individual's name and role. I used the text file to update the database by writing a function that would take an update query and the roles list of tuples as inputs.

To perform sentiment analysis, I took two approaches. I decided on two different methods because I was not convinced by the results in the first approach, the bag of words approach. Using the tidy text lexicon with about 11,000 negative and positive words felt like there was a lot missing. I used another method from a python package called textblob that has a lexicon with positive, negative and neutral words. In addition to the extra classification, textblob considers three criteria, polarity, subjectivity and intensity. According to the article, *TextBlob Sentiment: Calculating Polarity and Subjectivity*, polarity determines scores for negativity vs. positivity, subjectivity determines subjectivity vs. objectivity, and intensity determines if the word has influence on the proceeding word. The scores are all combined in a manner to determine negative, positive and neutral words, where  $-1 \leq \text{negative} < 0$ ,  $0 < \text{positive} \leq 1$ , and neutral = 0. Textblob is convenient in the fact that it will ignore single letter words if they have not been removed, and it always returns scores for polarity and subjectivity. Once I computed sentiment, I plotted the progression of sentiment, and compared the proportions of each class.

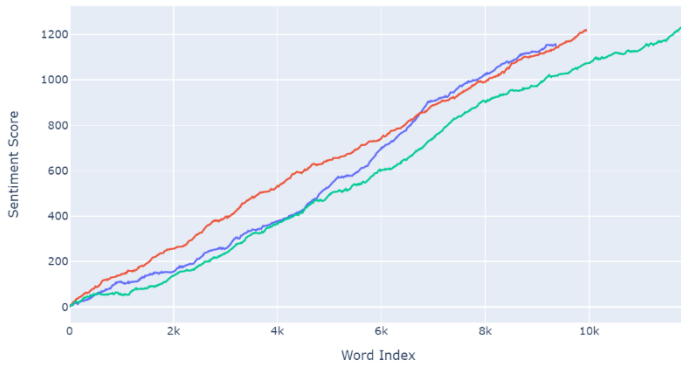
The summary statistics are composed of frequency distributions, uniqueness of vocabulary, and lexical diversity. The frequency distribution was calculated using nltk's handy FreqDist function, lexical diversity was calculated by the length the person's or group's statements divided by the set of the statements. A measure of lexical diversity that equals one indicates that the person/group never repeated themselves, higher values means more repetition. Finally, uniqueness was determined by comparing a word said by a person or group and checking if that word appeared in anybody else's vocabulary. The frequency distributions were used to compute this measure and a list of tuples was returned with the unique word and the frequency in which the person/group used that word.

Finally, there was an attempt made to build a Naïve Bays Classifier. I followed the steps much like we did in class. I created a list of tuples where the first element in the tuple was a list of words (statement a person made in the inquiry), and the second element was a label for the group that the statement belonged. I only compared two groups at a time and used nltk's naïve bayes function.

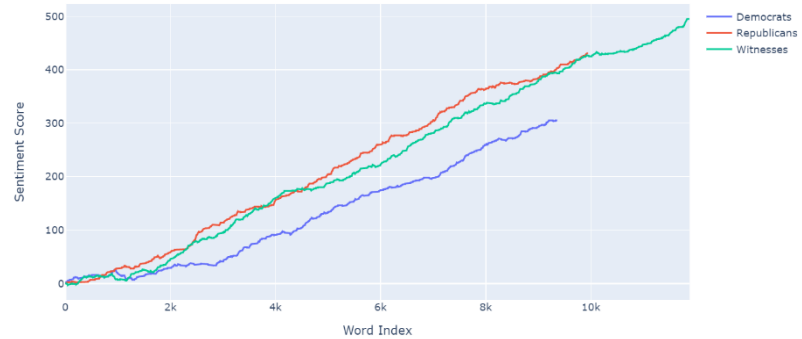
## Results

The results of the sentiment analysis were interesting. I still cannot give a definitive answer on what we should expect from different groups. In the figure below, I compared democrats, republicans, and witnesses. The first plot is from the bag of words approach, the second from textblob.

Sentiment of the Impeachment Hearings by Role (Bag of Words)



Sentiment of the Impeachment Hearings by Role (Textblob)

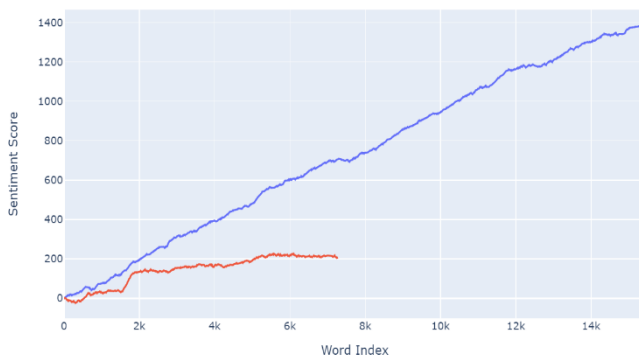


From the bag of words approach, there are much higher sentiment scores for each group. This doesn't seem convincing to me, the textblob analysis appears more feasible. We see that the republicans have higher sentiment than any of the other groups, this may be because they wish to downplay the actions of the president. The democrats could be the most negative because they are talking more about the president's actions and the basis for an impeachment inquiry are because there is reason to believe there was wrongdoing.

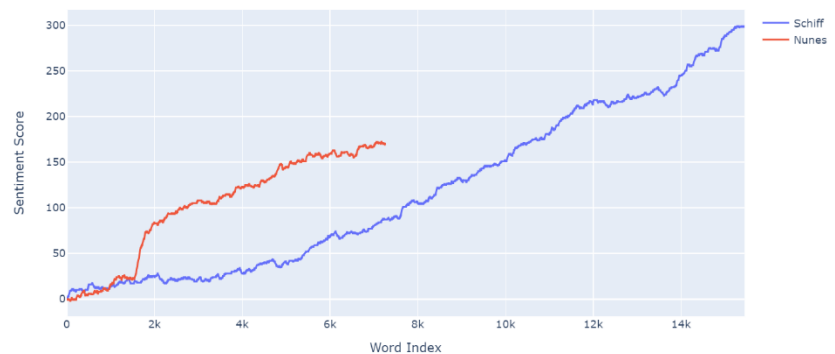
As well as being able to see the change in sentiment during the progression of the hearings, we can see how much each group talked. It is reasonable to understand the witnesses said more words since they need to elaborate their answers. There is not much difference between the amount of words the democrat and republicans used.

The next comparison of sentiment was between Chairman Adam Schiff (Democrat) and Ranking Member Devin Nunes (Republican). Below we can see that the analysis between the two methods was quite drastic.

Sentiment Between Schiff and Nunes During the Impeachment Hearings (Bag of Words)



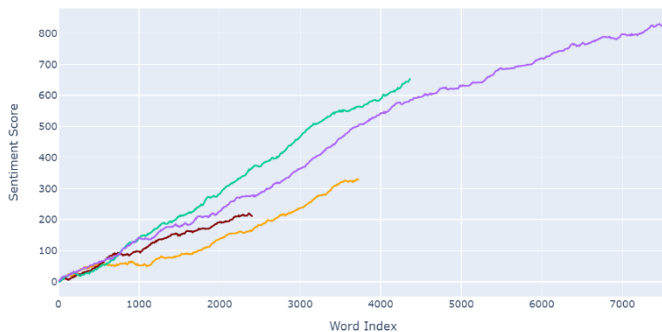
Sentiment Between Schiff and Nunes During the Impeachment Hearings (Textblob)



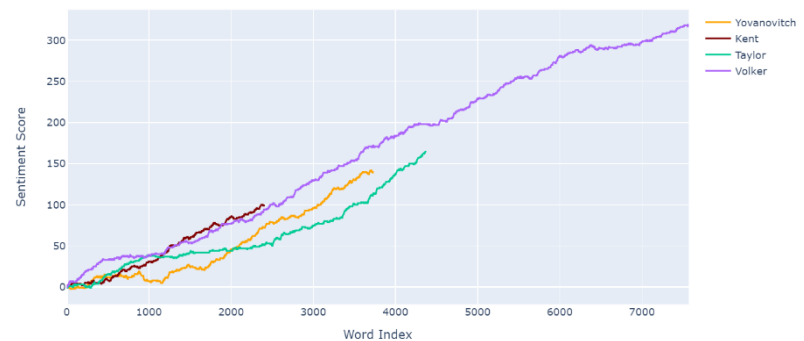
I don't have great insights into the drastic change in sentiment between the two methods. All I can think of is that the tidy text lexicon we used for bag of words didn't contain most of the words that the lexicon in textblob uses. We also see here that Schiff speaks way more than Nunes. Note the reason I picked these individuals was because they are both hold a position of leadership on the committee.

The next comparison is between the individual witnesses. In the graphs below, Yovanovitch, Kent, Taylor, and Volker are depicted.

Sentiment Between Witnesses during the Impeachment Hearings (Bag of Words)



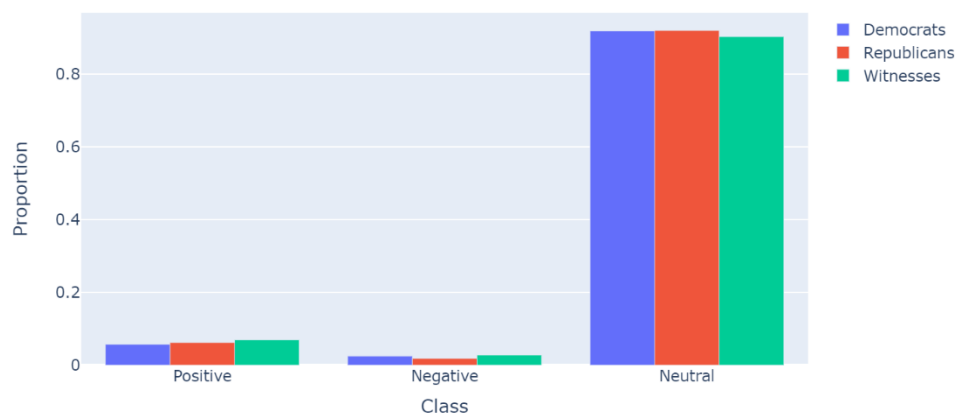
Sentiment Between Witnesses During the Impeachment Hearings (Textblob)



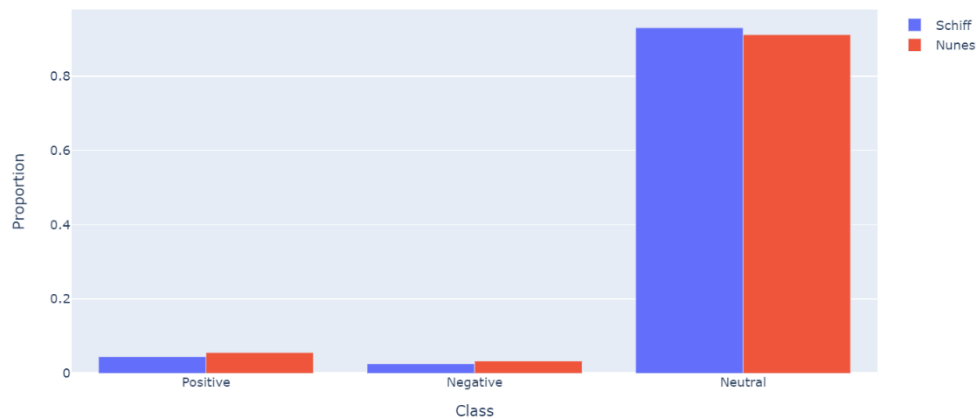
Again, we see that the bag of words scores are much higher. Everyone appears to have moderate variability except for Yovanovitch. We can see quite a dip a few times in her testimony. I would be interested to see when this happens. I am wondering if it is when she was made aware that the president was attacking her on Twitter in real-time.

Further exploration of the sentiment can be seen in the proportions of positive, negative and neutral words as computed from the textblob analysis. Below are the distributions for each of the groups described above.

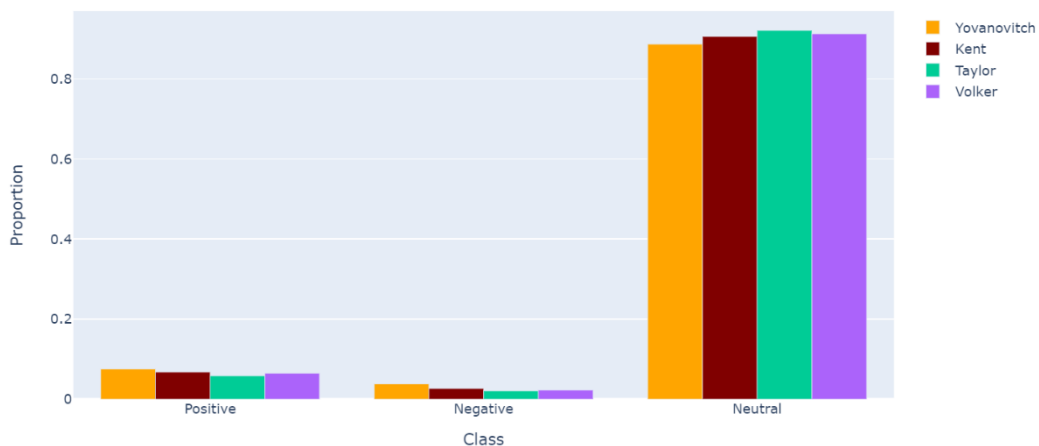
Proportion of Word Sentiment Types Amongst Roles During the Impeachment Inquiry



Proportion of Word Sentiment Types Amongst Schiff and Nunes During the Impeachment Inquiry



Proportion of Word Sentiment Types Amongst Witnesses During the Impeachment Inquiry



It is apparent that most words are neutral even when we are comparing them with context clues and a more robust lexicon. Unfortunately, it doesn't appear that any one person or group is drastically different from those it is compared to.

I won't really go much into the results of the naïve Bayes classifier partially because I am not sure if I implemented the algorithm correctly but if I did, the results were not impressive. Every group I tried to build the classifier for yielded one-to-one ratios for all of the most informative features. For the accuracy, if we consider the proportion of each class' statements, the classifier's accuracy rate was the same as the class with the largest proportion. For example, democrat statements made up about 37% of the data and republican statements made up 63% of the data. The accuracy for that classifier was 64.8%.

Looking at individual's and groups' vocabularies illuminated interesting results. When compared amongst each other, the democrat's vocabulary included 94 unique words that were greater than a length of 10 characters. Some of the most frequently used unique words included "questioning" used four times, "extraordinarily" used three times, and appropriated used three times. Republicans used 90 unique words with "representatives" used six times, "recollections" used five times, and

“communicating” used four times. Witnesses used 121 unique words using “undersecretary” six times, “institution” five times, and “distinction” five times. Between Schiff and Nunes, Schiff used 170 unique words while Nunes used 101 unique. Of those lengthy unique words, the most frequently used words for Schiff were “immediately” used 22 times, “gentlewoman” used 21 times, and “opportunity” used 20 times. The most frequently used unique words for Nunes were “republicans” used 19 times, “indications” used seven times, and “criticizing”, used five times. Overall, Schiff used more lengthy unique words and used them more frequently, however as we saw above, Schiff spoke more often than Nunes. The unique words used by witnesses highlight some of the most interesting results. Both Yovanovitch and Kent did not use any unique words of length more than 10 when compared with Taylor and Volker. Seeing this I decided to remove the logic that checked for length, and even then, no words they used of any length were unique amongst the witnesses. I find this extremely interesting considering each witness has a different account of what happened. Between Taylor and Volker, Taylor used 56 unique words and Volker used 102 unique words. Of those unique words Taylor’s most frequently used were “conditioned” used six times, “longstanding” used three times, and “explanation” used three times. Volker’s most frequently used words were “accusations” used five times, “distinction” used five times, and “represented” used four times. I was surprised by the results of the unique words. It was very interesting that Yovanovitch and Kent do not use any unique words and it is even surprising at how many unique words each person/group use considering they are all talking about the same subject.

Overall, the analysis of the impeachment hearings uncovered interesting results, but there is more than should be analyzed.

### **Future Directions**

There are a lot of other aspects I want to explore with this dataset. I feel like I have barely scratched the surface. There are many different combinations of comparisons between people and groups that could bring about interesting results. I decided to leave out Alexander Vindman when comparing witnesses, since his role was slightly different as a member of the military and not a diplomat. I would like to take a better look into the Naïve Bayes Classifier, considering I was able to find sets of words that were unique to each group I think there must be something of interest within the classifier. I would also like to see how many times people are interrupting each other and who is the main offender. Since the impeachment inquiry is ongoing, I would like to see how the results change and if there is anything else of interest that comes out of the analysis. As of December 3<sup>rd</sup>, 2019, the intelligence committee formally ended their investigation and handed over the process to the judiciary committee. I think there could be a lot to explore when comparing the hearings from the intelligence committee and the judiciary committee.

### Works Cited

Factba.se. "FactSquared Live(lsh) Transcript - Impeachment Hearings." Factba.se, [factba.se/impeachment-20191113](https://factba.se/impeachment-20191113).

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