Applied Data Science

Name: Chaitanya Shah
Columbia uni: css2211

```
[nltk_data] Downloading package punkt to /Users/css2211/nltk_data...
[nltk_data]   Package punkt is already up-to-date!
```

1. Loading Data

2. EDA

2.1 Understanding the Data

As a start I would first like to first understand the data. Specifically, what are the columns, what is the each type of each columns, what does each column specifiy, what is the size of the total data set.

	title	author	school	sentence_spacy	sentence_str	original_publication_date	corpus_edition_date	sentence_length	sentence_lowered	tokenized_txt	lemmatized_str
0	Plato - Complete Works	Plato	plato	What's new, Socrates, to make you leave your ...	What's new, Socrates, to make you leave your ...	-350	1997	125	what's new, socrates, to make you leave your ...	['what', 'new', 'socrates', 'to', 'make', 'you...	what be new , Socrates , to make -PRON- lea...
1	Plato - Complete Works	Plato	plato	Surely you are not prosecuting anyone before t...	Surely you are not prosecuting anyone before t...	-350	1997	69	surely you are not prosecuting anyone before t...	['surely', 'you', 'are', 'not', 'prosecuting',...	surely -PRON- be not prosecute anyone before ...
2	Plato - Complete Works	Plato	plato	The Athenians do not call this a prosecution b...	The Athenians do not call this a prosecution b...	-350	1997	74	the athenians do not call this a prosecution b...	['the', 'athenians', 'do', 'not', 'call', 'thi...	the Athenians do not call this a prosecution ...
3	Plato - Complete Works	Plato	plato	What is this you say?	What is this you say?	-350	1997	21	what is this you say?	['what', 'is', 'this', 'you', 'say']	what be this -PRON- say ?
4	Plato - Complete Works	Plato	plato	Someone must have indicted you, for you are no...	Someone must have indicted you, for you are no...	-350	1997	101	someone must have indicted you, for you are no...	['someone', 'must', 'have', 'indicted', 'you',...	someone must have indict -PRON- , for -PRON- ...

The columns in the dataset are:

```
Index(['title', 'author', 'school', 'sentence_spacy', 'sentence_str',
       'original_publication_date', 'corpus_edition_date', 'sentence_length',
       'sentence_lowered', 'tokenized_txt', 'lemmatized_str'],
      dtype='object')
```

The distinct type of schools are:

```
{   'analytic',
    'aristotle',
    'capitalism',
    'communism',
    'continental',
    'empiricism',
    'feminism',
    'german_idealism',
    'nietzsche',
```

```
    'phenomenology',
    'plato',
    'rationalism',
    'stoicism'}
```

The distinct type of authors are:

```
{   'Aristotle',
    'Beauvoir',
    'Berkeley',
    'Davis',
    'Deleuze',
    'Derrida',
    'Descartes',
    'Epictetus',
    'Fichte',
    'Foucault',
    'Hegel',
    'Heidegger',
    'Hume',
    'Husserl',
    'Kant',
    'Keynes',
    'Kripke',
    'Leibniz',
    'Lenin',
    'Lewis',
    'Locke',
    'Malebranche',
    'Marcus Aurelius',
    'Marx',
    'Merleau-Ponty',
    'Moore',
    'Nietzsche',
    'Plato',
    'Popper',
    'Quine',
    'Ricardo',
    'Russell',
    'Smith',
    'Spinoza',
    'Wittgenstein',
    'Wollstonecraft'}
```

2.2 Type of Mapping between Authors and School

```
analytic
{'Wittgenstein', 'Quine', 'Lewis', 'Moore', 'Popper', 'Russell', 'Kripke'}

rationalism
{'Spinoza', 'Descartes', 'Malebranche', 'Leibniz'}

communism
{'Lenin', 'Marx'}

plato
{'Plato'}

capitalism
{'Ricardo', 'Keynes', 'Smith'}

german_idealism
{'Kant', 'Hegel', 'Fichte'}
```

```
feminism
{'Davis', 'Wollstonecraft', 'Beauvoir'}

phenomenology
{'Merleau-Ponty', 'Husserl', 'Heidegger'}

aristotle
{'Aristotle'}

stoicism
{'Epictetus', 'Marcus Aurelius'}

nietzsche
{'Nietzsche'}

empiricism
{'Locke', 'Berkeley', 'Hume'}

continental
{'Derrida', 'Foucault', 'Deleuze'}
```

It's clear from the above data that each shool has each various authors so we have One to Many mapping between School and Authors, i.e One school is mapped to many authors

2.3 Word Cloud

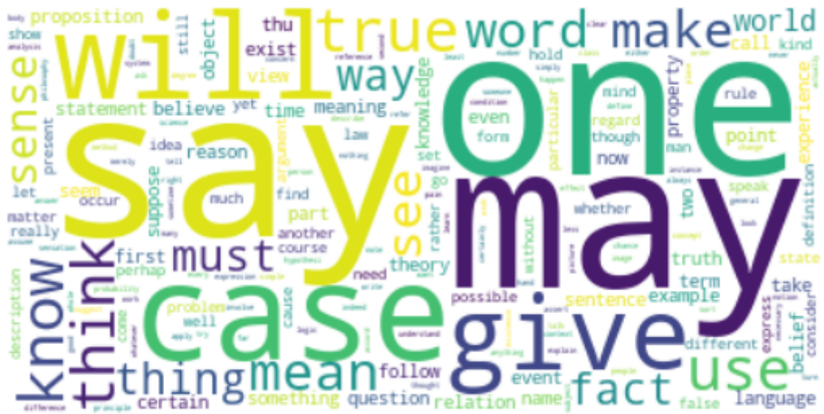
I want to first analyze the word cloud of each school and see if there is some obvious similarity.

I also want to see if the word cloud contains the common words we associate with each school, like for example money with capitalism, women with Feminism and so on

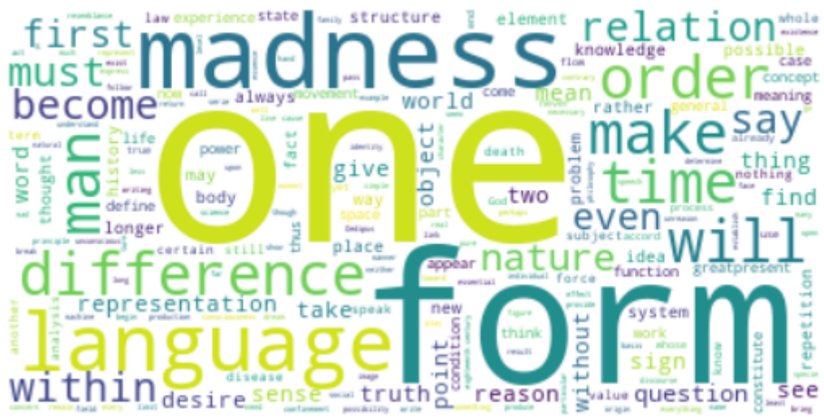
```
nietzsche
```


```
communism
```

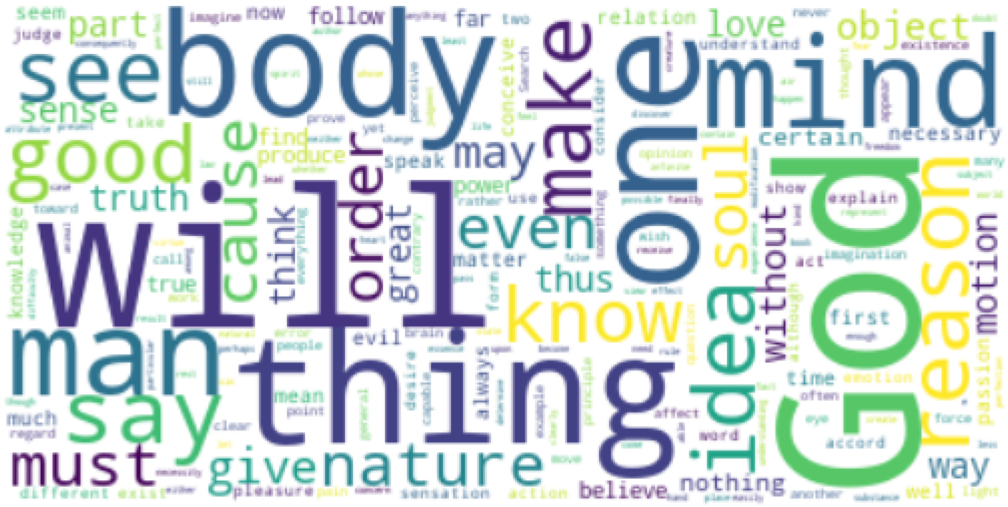
analytic



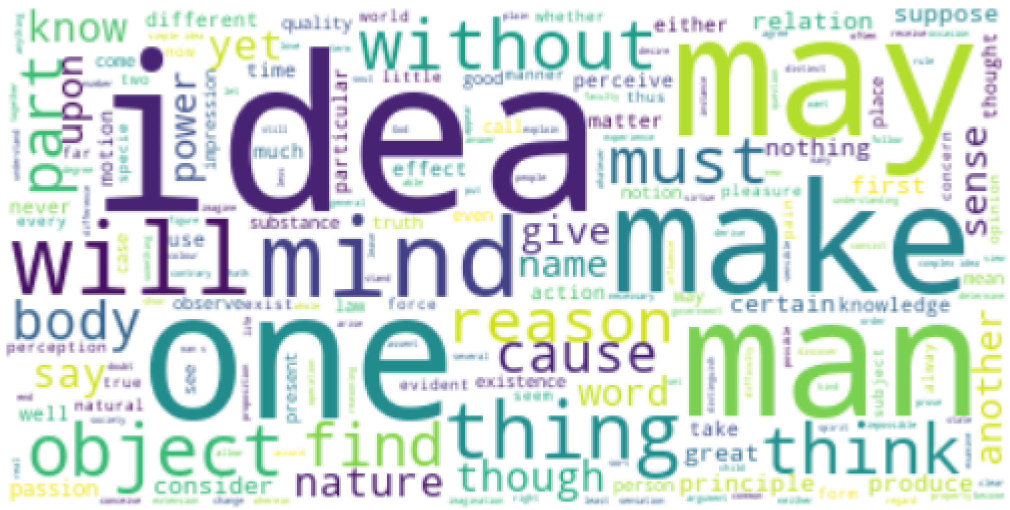
continental



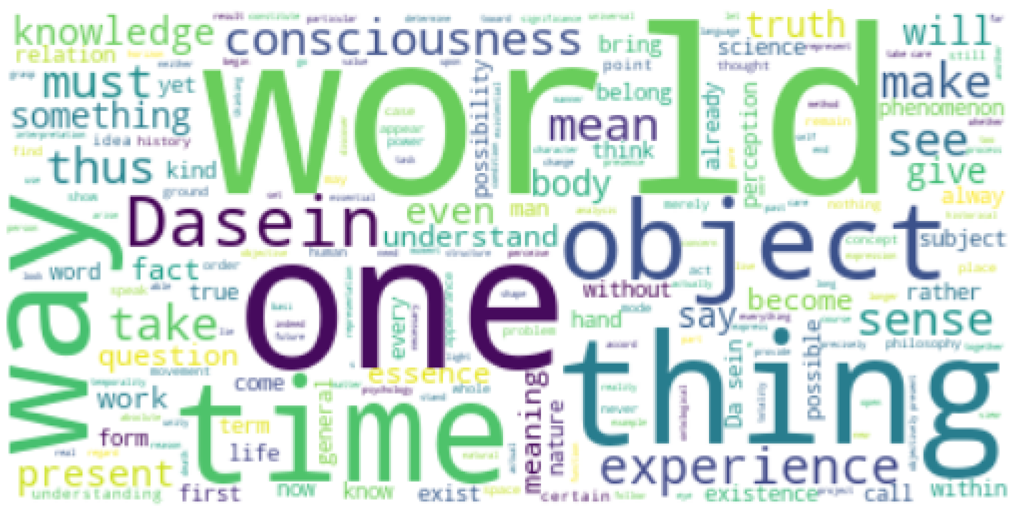
rationalism



empiricism



phenomenology

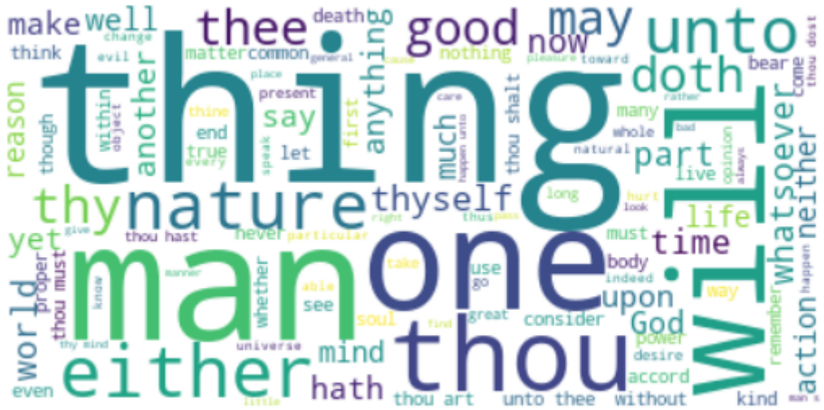


capitalism

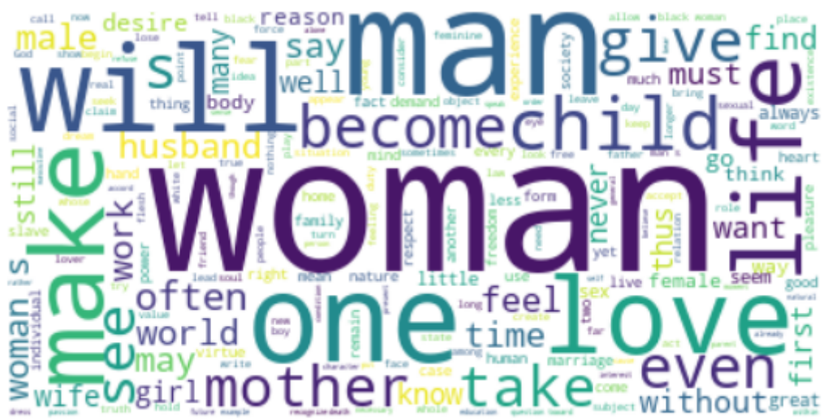
german_idealism

aristotle

stoicism



feminism



plato

From the above word graphs, the top words do coincide with our general idea of each type of school

2.4 Word Cloud change with Time for each author

I want to see if the word cloud changes drastically over the years for the same author. The assumption is that over the years the word cloud might change.

```
Keynes
[1936]
Lewis
[1985]
Moore
```

```
[1910]
Merleau-Ponty
[1945]
Locke
[1689]
Marcus Aurelius
[170]
Foucault
[1961, 1963, 1966]
Wollstonecraft
[1792]
Russell
[1912, 1921]
Aristotle
[-320]
Descartes
[1637, 1641]
Spinoza
[1677]
Heidegger
[1927, 1950]
Leibniz
[1710]
Popper
[1959]
Beauvoir
[1949]
Fichte
[1798]
Davis
[1981]
Plato
[-350]
Hegel
[1807, 1817, 1820]
Marx
[1848, 1883]
Malebranche
[1674]
Deleuze
[1968, 1972]
Kripke
[1972, 1975]
Smith
[1776]
Wittgenstein
[1921, 1950, 1953]
Lenin
[1862]
Berkeley
[1710, 1713]
Hume
[1739, 1779]
Quine
[1950]
Husserl
[1907, 1936]
Kant
[1781, 1788, 1790]
Epictetus
[125]
Derrida
[1967]
Ricardo
```

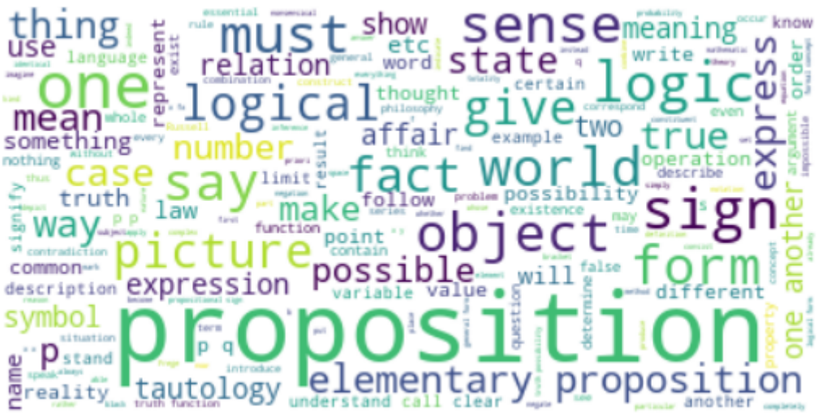
```
[1817]
Nietzsche
[1886, 1887, 1888]
```

Since Wittgenstein has the most spread out years, I can see if the word count changes with time for this author

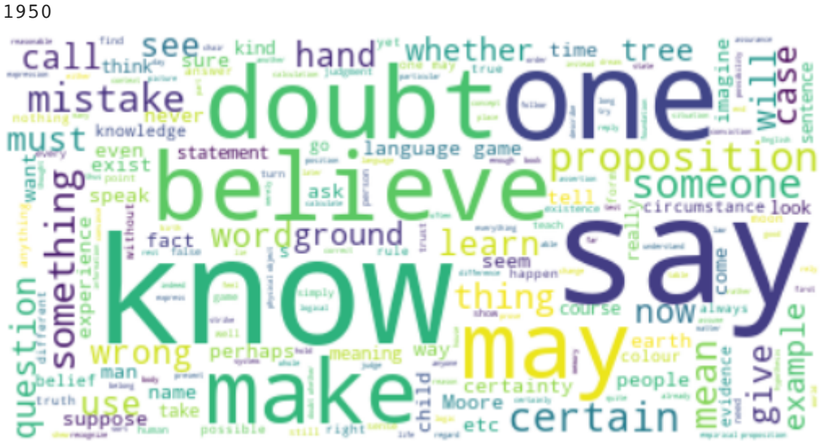
```
Wittgenstein
-------------
1921
['proposition', 'one', 'sign', 'form', 'logical', 'say', 'must', 'sense', 'truth', 'logic', 'world', 'object', 'fact', 'picture', 'give', 'way', 'another', 'elementary', 'mean', 'thing', 'e
xpress']

1950
['know', 'say', 'one', 'doubt', 'may', 'believe', 'make', 'proposition', 'someone', 'certain', 'mistake', 'something', 'mean', 'hand', 'thing', 'game', 'now', 'word', 'learn', 'whether', 'l
anguage']

1953
['say', 'one', 'word', 'mean', 'use', 'see', 'may', 'language', 'now', 'know', 'something', 'make', 'picture', 'think', 'look', 'someone', 'game', 'thing', 'case', 'way', 'give']
```

Overall it is not very clear looking just at this.

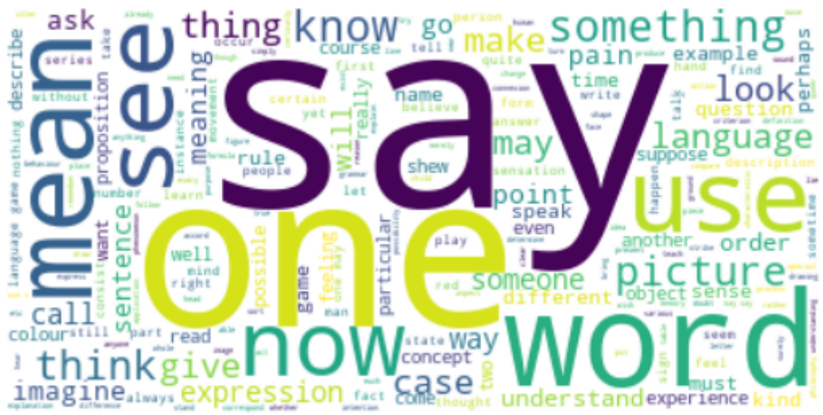
```
Wittgenstein
-------------
1921
```




```
1950
```




```
1953
```



Overall the word count word cloud is more similar in 1950 and 1953 then in 1921, which makes sense and also proves my assumption

3. Emotion Analysis on the data set

3.1 Emotions across School

The most interesting thing that I would like to decipher from the data is to see if there are specific emotions associated with each school of thought.

The idea is to compare and see if the emotions we decipher from the data match with what we usually associate with the school of thought. For this analysis I am going to compare schools that I am familiar with which are :

```
['analytic', 'feminism', 'rationalism', 'capitalism', 'communism', 'stoicism']
```

The emotions that I plan to extract from the data are:

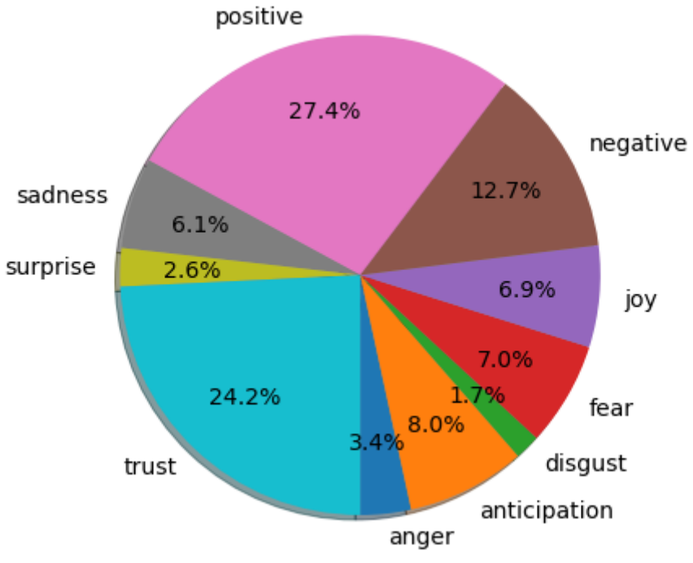
```
['anger', 'anticipation', 'disgust', 'fear', 'joy', 'negative', 'positive', 'sadness', 'surprise', 'trust']
```

```
nietzsche: 13548
communism: 17958
analytic: 55425
continental: 33779
rationalism: 22949
empiricism: 19931
phenomenology: 28573
capitalism: 18194
german_idealism: 42136
aristotle: 48779
stoicism: 2535
feminism: 18635
plato: 38366
```

Since the count of texts of each school is different, to avoid any bias, we will randomly select a fixed number of paragraphs from each school. It would be computationally expensive to run the analysis on the whole dataset and hence we will creatre a sample of 100 paragraphs and resmple 25 times and then calculate the stats. I will consider the school of thoughts which I am familiar with and clearly understand what they represent which are analytic, feminism, rationalism,capitalism, communism and stoicism.

Analytic School

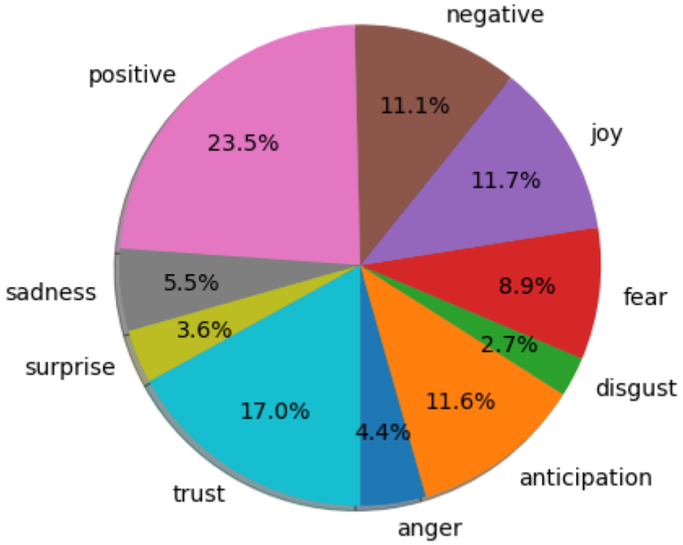
The ussual emotion that I would associate with the school would be Trust and Positive. And I would not associate the suprise emotion with this school.



Based on the above data, it can be seen that my assumption(understanding) about Analytic school is correct. But it is interesting to see that negative has the 3rd highest proportion something I would not associate with Analytical school

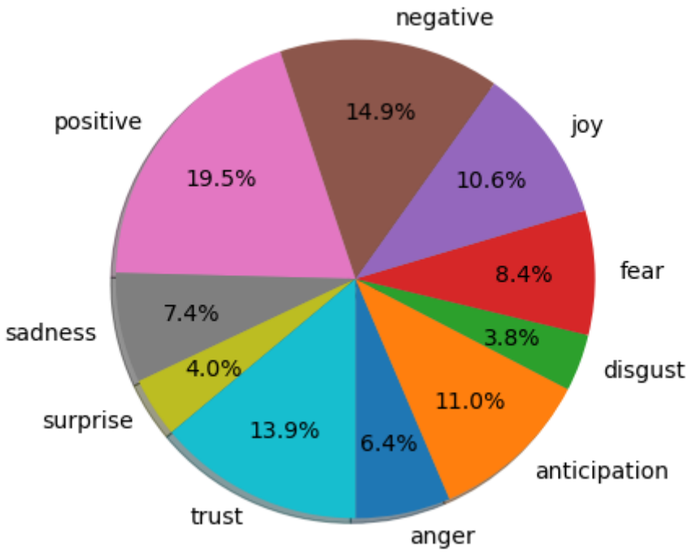
Rationalism School

The ussual emotion that I would associate with the school would be Positive



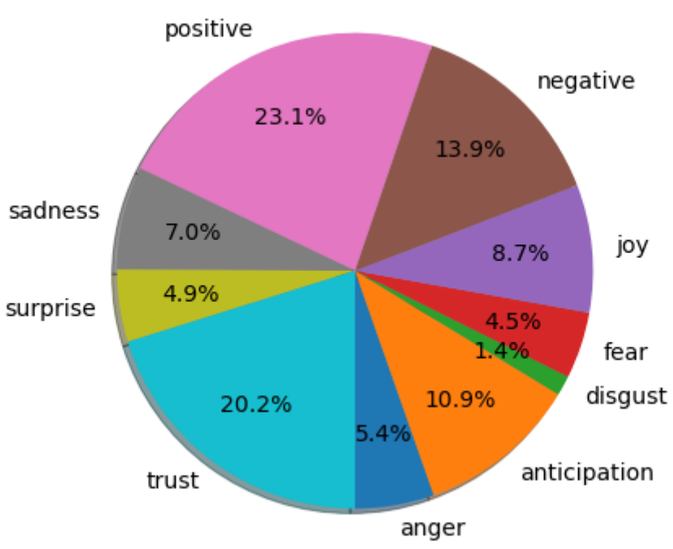
It is interesting to see that positive emotion is a major proportion followed by trust(my assumption) and joy. Joy is not something I would associate with Rationalism school

Feminism School



It is interesting to see that positive emotion is a major proportion followed by negative and trust. I feel the negative emotion is one of the major proportion because the texts might be filled about incidents of women being not treated equally

Capitalism School

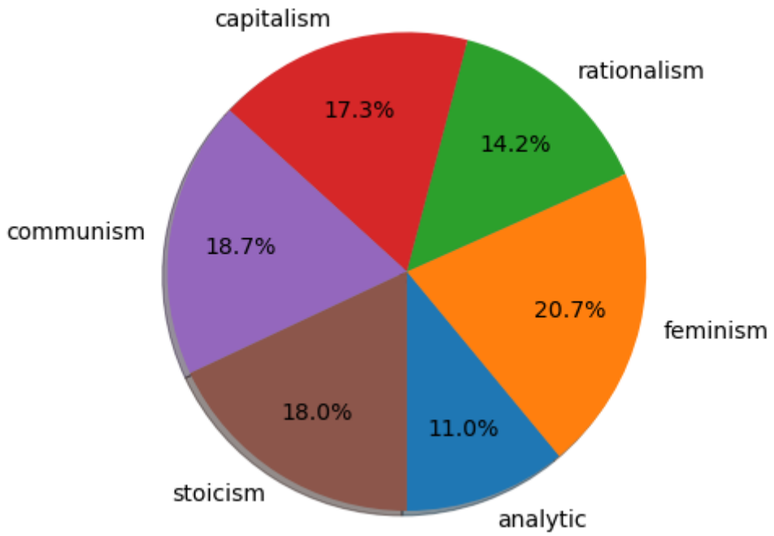


It is interesting to see that positive and trust are the major proportion with no one in the vicinity.

It would be more clear if we compare schools across emotion rather than the other way around.

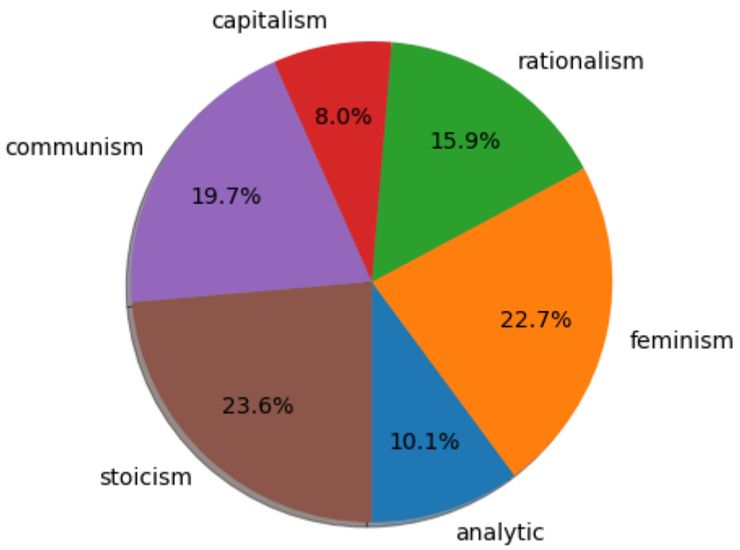
3.2 Schools across Emotion

Anger



I feel the higher propotion of anger being in Communism and Feminism can be reasoned with the idea that the texts in this schools might be focussed on the feelings of oppressed people.

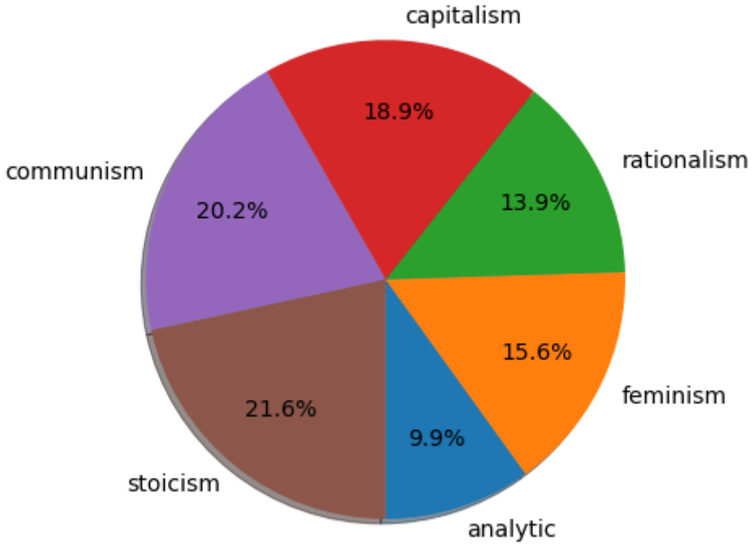
Disgust



I feel the higher propotion of disgust being in Feminism can be attributed to the fact that texts might be focused on feeling disgusted of not being treated equally.

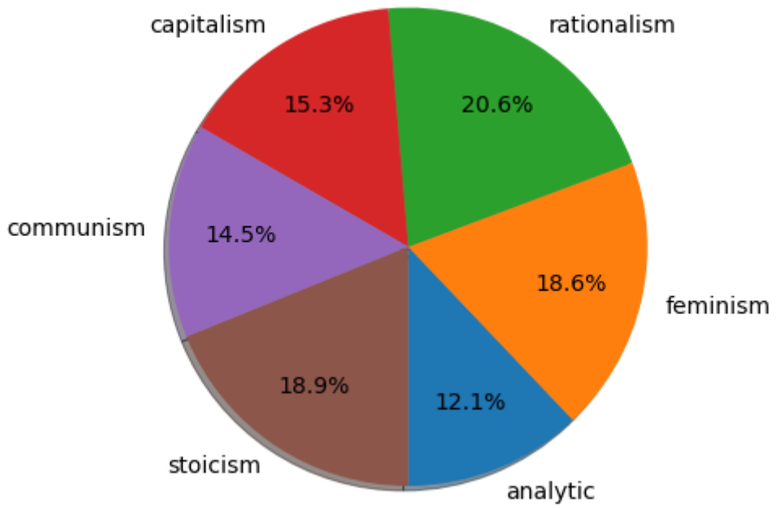
It is interesting to see that stoicism is also a major proportion and I cannot think of a reason to justify that.

Surprise



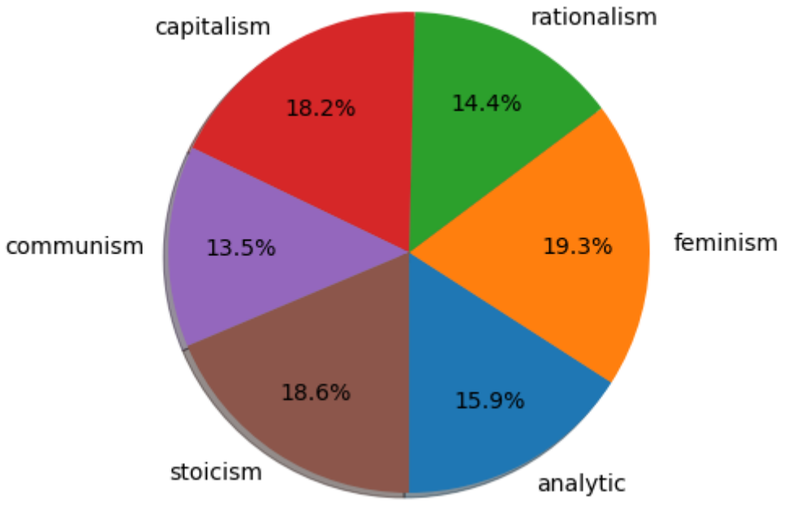
The highest proportion of suprise in Communism can be reasoned to the fact that the texts might be focussed on how the communism is established and how it works

Joy



It is interesting to see that rationalism has the most proportion of joy and analytic has the least proportion and I cannot think of a reason to justify that.

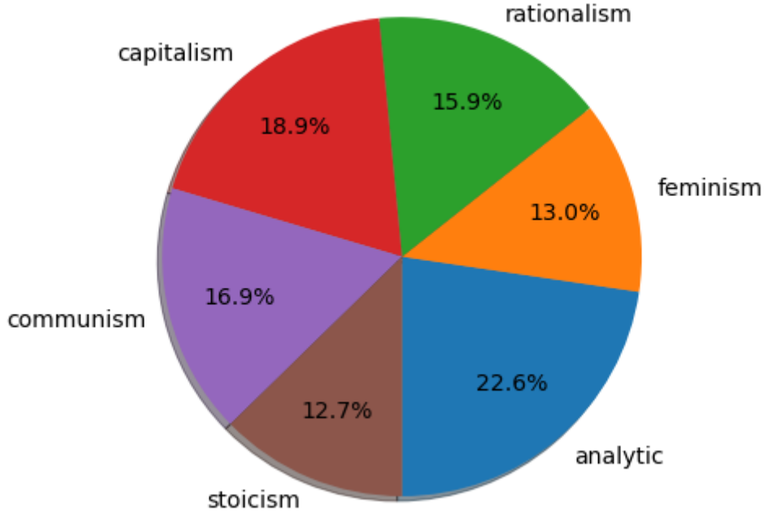
Sadness



I feel the higher propotion of sadness being in Feminism can be attributed to the fact that texts might be focused on feeling sad and disheartned by not being treated equally.

It is interesting to see that stoicism is also a major proportion and I cannot think of a reason to justify that.

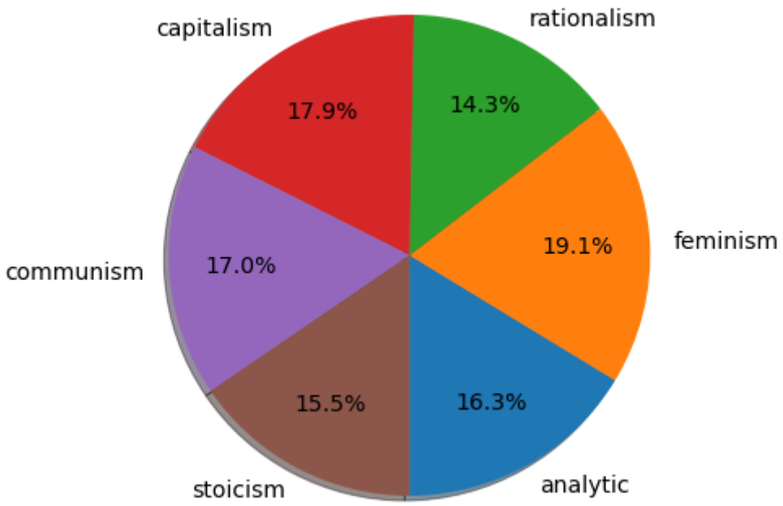
Trust



The highest proportion of trust being in analytic school can be reasoned with the idea that analytic school is based on the value of making decisions based on facts and the texts might have more words describing trust

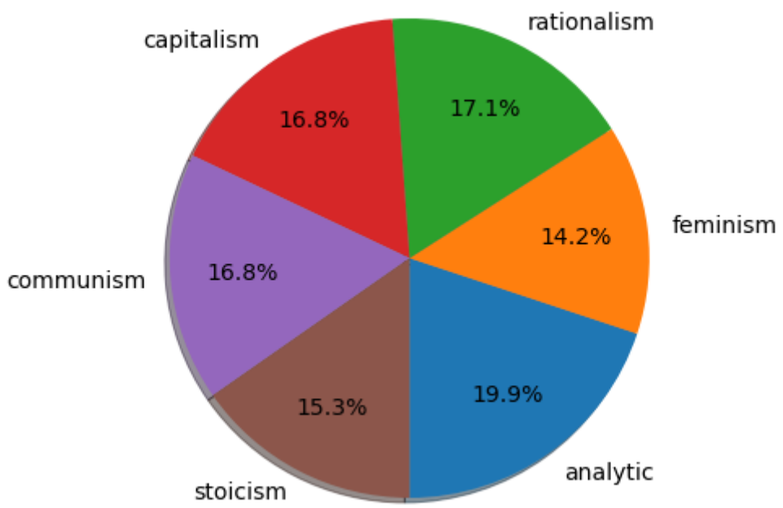
The higher proportion of trust in capitalism is also interesting

Negative



All the shools are more or less evenly poised

Positive



All the schools are more or less evenly poised

4. Conclusion

It is difficult to conclude anything with certaninity but we can comment about the type of texts in each school based on the emotion derived for each school

Feminism: The texts are more focussed on the defintion, feelings and history of Feminism
Stocism: The texts are more focuseed on the benefits of stocism and how to achieve it
Communism: The texts are more focussed on the feelings of the people living under a Communist regime and how communist regime is established

I cannot comment about other schools based on the analysis done till now.

It is intersting to see the higher and lower proportion of different emotions in few schools. It would be interesting to dig further in the library and see what exactly is the reason behind it

5. Potential Issues

5.1 Multiple authors for each school

One of the potential problem with the analysis is that I am assuming that each author in every school of thought has the same way of writing and same opinion. It could be that Ricardo author in Capitalism might be explaining the history where as Smith in the same school might be talking about the drawbacks of capitalism

5.2 Small Random Sampling

To have a lower time compeleixty I ran a small sampling to find emotions across schools. It could be missing out important texts when randomly sampled

5.3 LeXmo Library

I have only used 1 library for emtoion analysis and I haven't seen the source code of the library and hence if something is wrong in my understanding of the library and thereby in my implementation, the results might be different as well