NLP Project Report

Under the Guidance of Dr. Sakthi Balan

Team Name: **LexicallyFlexible**

GitHub Link Repo:

https://github.com/RishabhJ01/nlp-project-2021

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System Requirements:

1. Python 3.x
2. Libraries: NLTK, matplotlib, wordcloud, re, NLTK.corpus, json, ssl, urllib
3. Jupyter Notebook
4. OS: Windows / Linux / Mac OS

Books Used:

Book 1 :
Title: Pride and Prejudice
Author: Jane Austen
Link: https://www.gutenberg.org/files/1342/1342-0.txt

Book 2 :
Title: Gulliver's Travel
Author: Jonathan Swift
Link: https://www.gutenberg.org/files/829/829-0.txt

Project Round-1

Problem statement - 1 :

Import the text, let's call it data1 and data2.

We have imported Book-1 as data1 and Book-2 as data2. We have used **"*json*"** and **"*urllib*"** libraries to scrap the texts from the given links. Further we decoded it to convert the text to string.

Problem statement - 2 :

Perform simple text pre-processing.

1. Changing the text to lowercase.
2. Removing running sections.
3. Removing special characters.
4. Removing Chapter Headlines.
5. Removing digits.
6. Removing implicit next line characters - '\n'.

Problem statement - 3 :

Tokenize the texts.

Tokenization is basically dividing the text into smaller units called tokens. They can be either words, characters, or subwords. It helps in understanding the context and interpreting the meaning behind the sequence of tokens. For example “miserable animals presume*”,* will be tokenized into - [“*miserable*” , “*animals*” , “*presume*”].

1. ‘*data1*’ and ‘*data2*’ are tokenized using the ***nltk.word_tokenize*** function.
2. **‘*token1*’** contains tokens of ‘*data1*’ i.e. Book-1.
3. ‘***token2*’** contains tokens of ‘*data2*’ i.e. Book-2.

Inference:

So now the imported texts **‘*data1*’** and **‘*data2*’** will be tokenized as explained above using ***nltk.word_tokenize*** function. Tokens created are now stored in ‘*token1*’ for ‘*data1*’ and ‘*token2*’ for ‘*data2*’ .

Problem statement - 4 :

Analyze the frequency distribution of tokens separately.

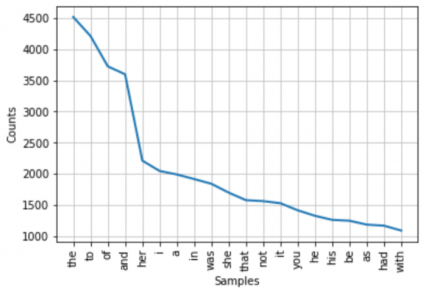
Formed the Frequency Distribution using FreqDist function of NLTK library and then plotted it.

Token1:

In [9]:
```
# Frequency Distribution for token 1
fdist1 = FreqDist(token1)
print(fdist1.most_common(20))
```

```
[('the', 4511), ('to', 4207), ('of', 3722), ('and', 3596), ('her', 2215), ('i', 2050), ('a', 1994), ('in', 1921), ('was', 1845), ('she', 1704), ('that', 1583), ('not', 1568), ('it', 1534), ('you', 1421), ('he', 1333), ('his', 1268), ('be', 1254), ('as', 1192), ('had', 1175), ('with', 1097)]
```

In [12]:
```
fdist1.plot(20)
```

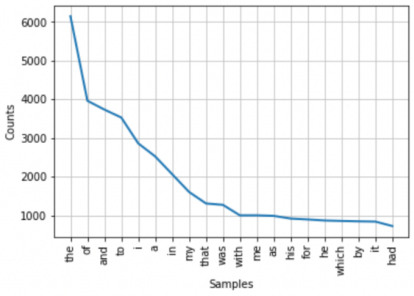


Token2:

In [10]:
```
# frequency Distribution for token 2
fdist2 = FreqDist(token2)
print(fdist2.most_common(20))
```

```
[('the', 6151), ('of', 3965), ('and', 3738), ('to', 3532), ('i', 2864), ('a', 2527), ('in', 2068), ('my', 1608), ('that', 1310), ('was', 1274), ('with', 1003), ('me', 1003), ('as', 989), ('his', 920), ('for', 897), ('he', 870), ('which', 858), ('by', 848), ('it', 841), ('had', 726)]
```

In [13]:
```
fdist2.plot(20)
```



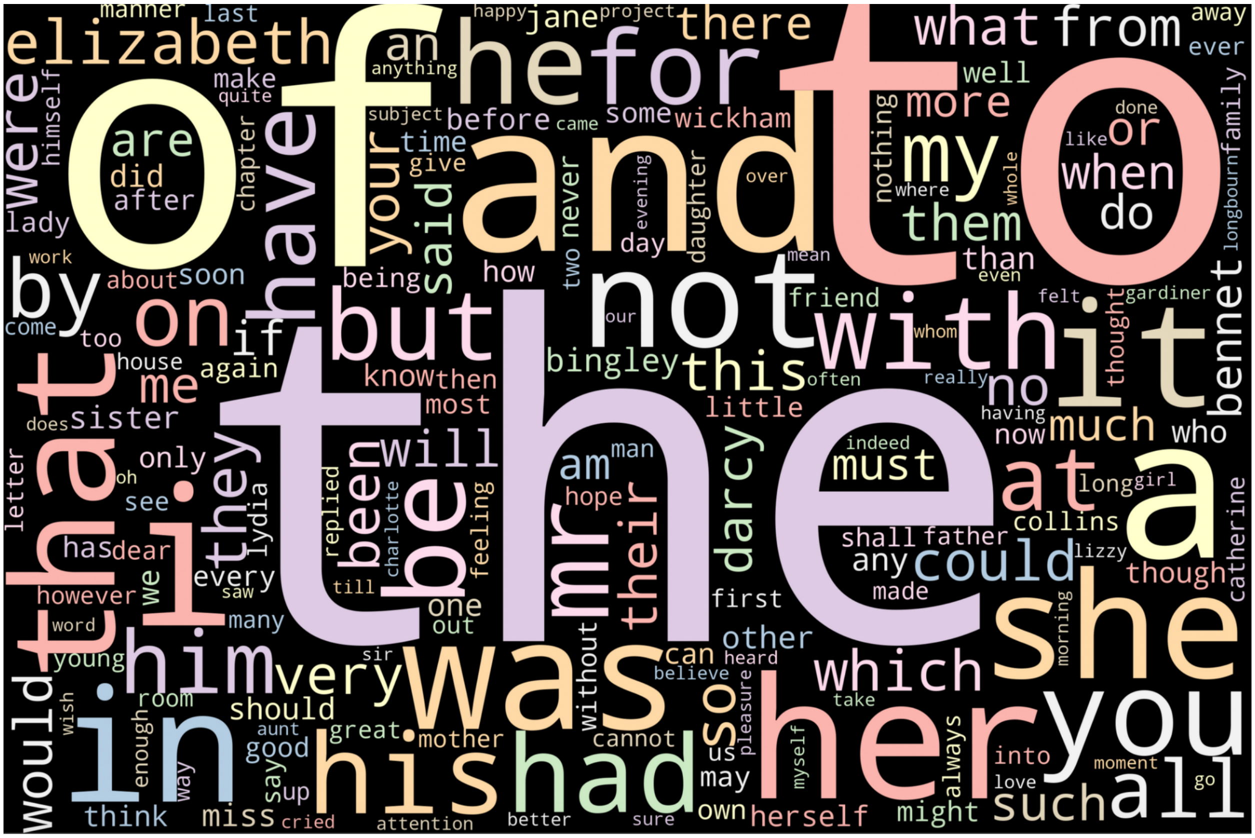
Problem statement - 5 :

Create a wordcloud before and after removing the stop words.

After analyzing the frequency distribution of the tokens, wordclouds are created using these tokens. A wordcloud is a visual representation of text data wherein each word is pictured with its frequency, i.e. higher the frequency, larger the size of the word. **Stopwords** - These are most commonly occurring words because of the grammar rules which hinder the visualization and useful computations.

Before removing stopwords :

Book-1 :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time
like
or
chapter
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did
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sister
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that
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will
much
now
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only
darcy
indeed
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letter
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lydia
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girl
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catherine
replied
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collins
charlotte
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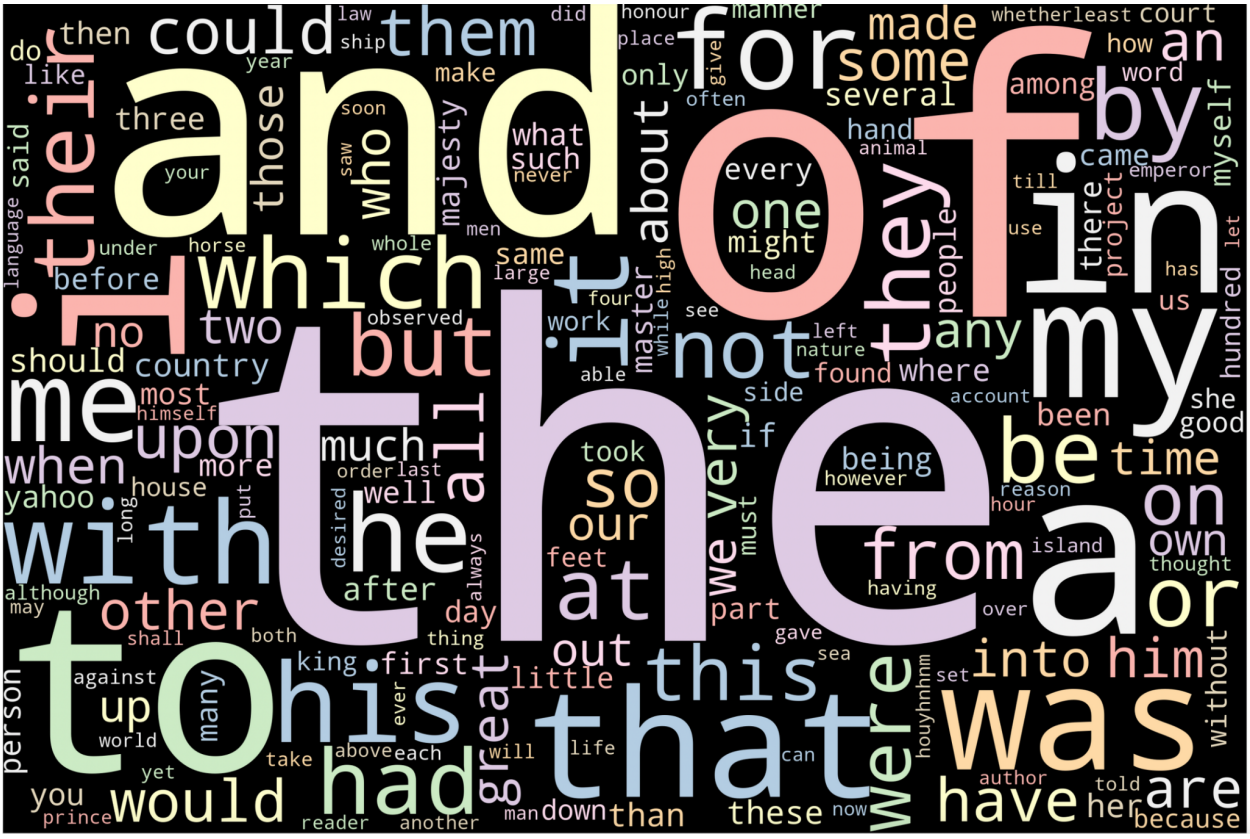
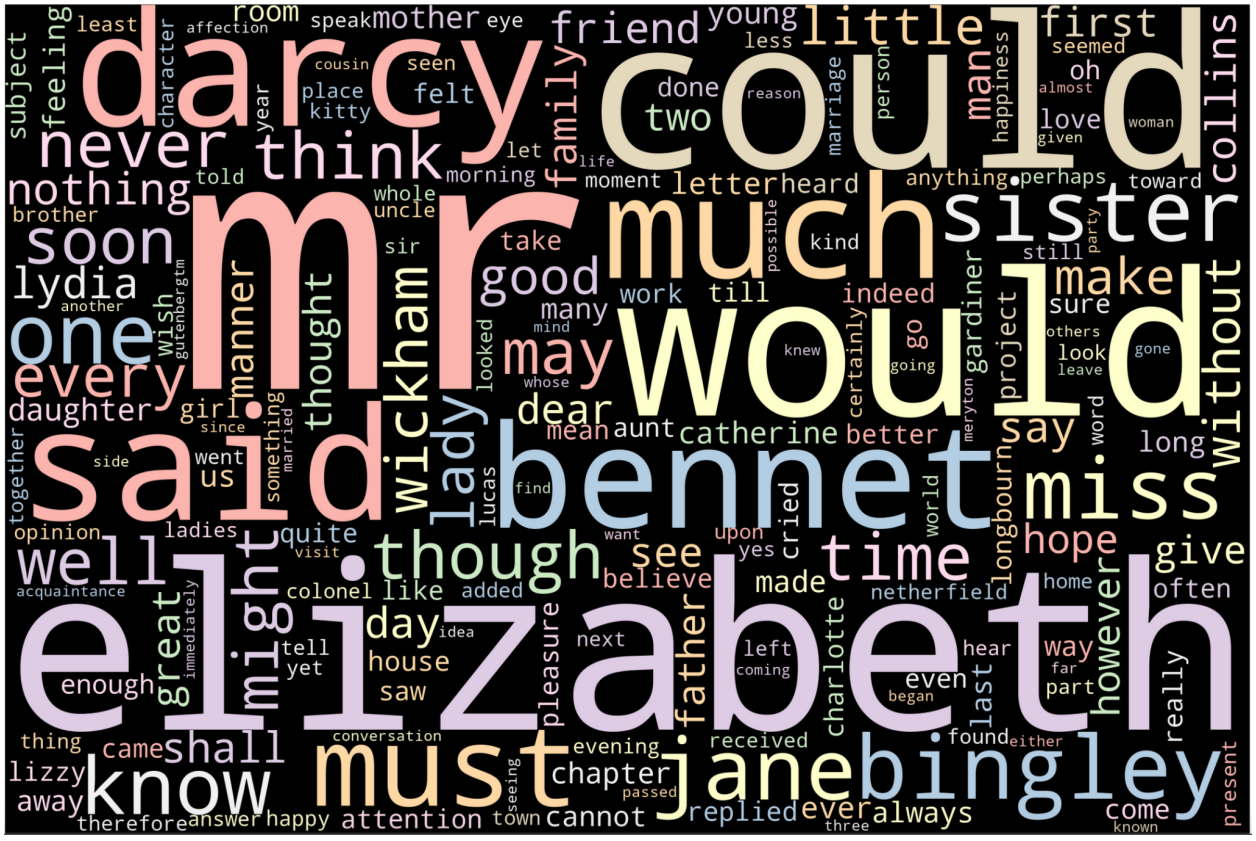
Book-2 :



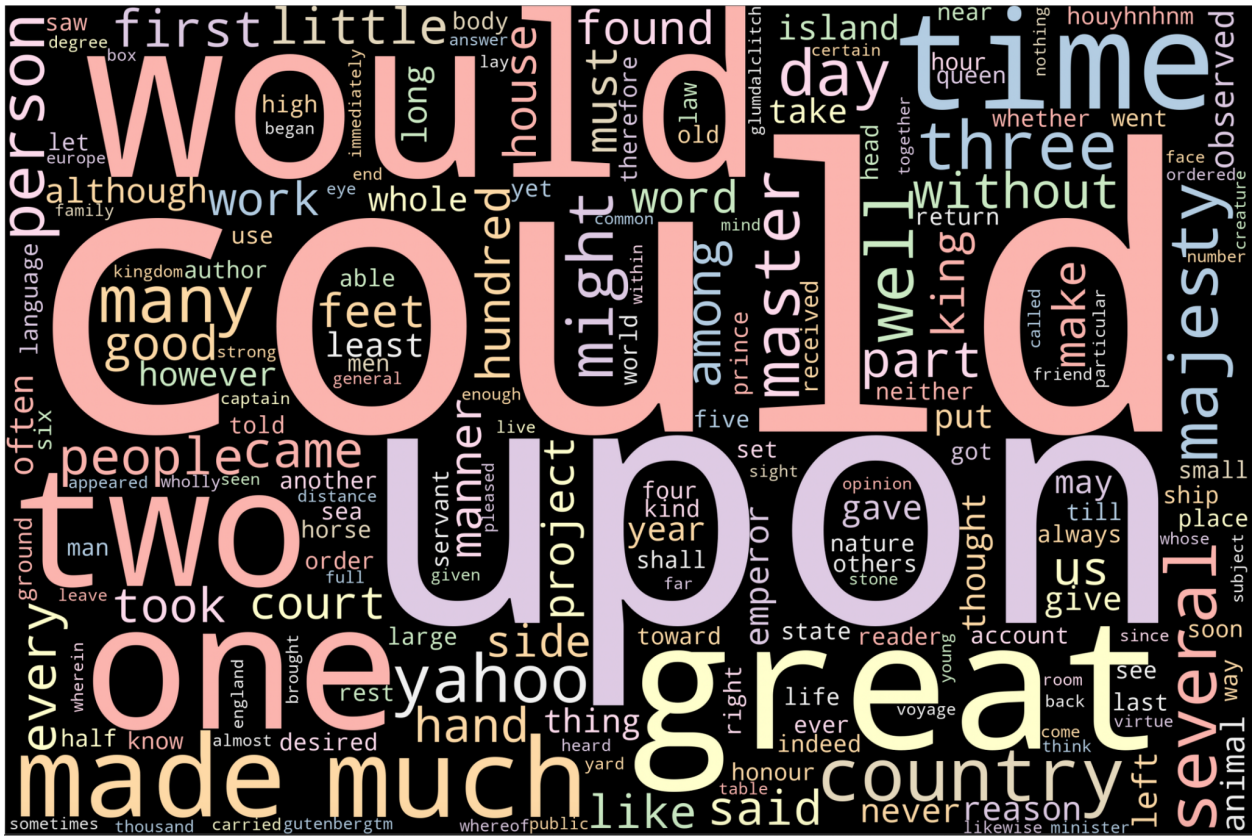
After removing stopwords :

NLTK library provides a list of the stopwords of the english language. So with the help of this list, we omitted out the stopwords from our tokens.

Book-1 :



Book-2 :



Inference :

As it can be clearly seen in above pictures of wordcloud before removing the stop words,the larger words are*‘and’*,*‘of’*,*‘the’*, *‘to’*, etc. These are the stopwords which occur very frequently (size of a word in a word cloud is determined according to its frequency) and these words are not essential for our analysis. So after removing the stopwords, we can ensure that other words which are in context with our books show up in the word cloud.

Problem statement - 6 :

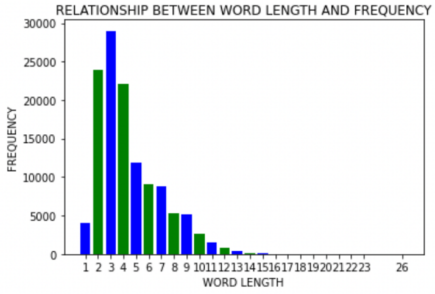
Evaluate the relationship between the word length and frequency after removing stopwords.

Firstly we created an empty list and stored the number of words for each length and then plotted it using Frequency Distribution and matplotlib.

Before Removing Stopwords:-

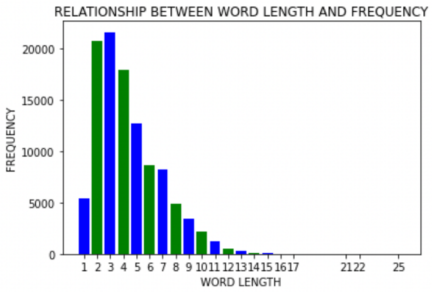
Book-1:

```
In [14]: plot_relationship(fdist1)
```



Book-2:

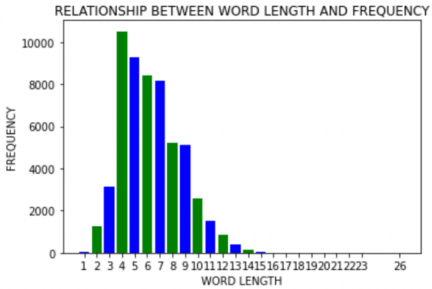
In [15]:
```
plot_relationship(fdist2)
```



After Removing Stopwords:-

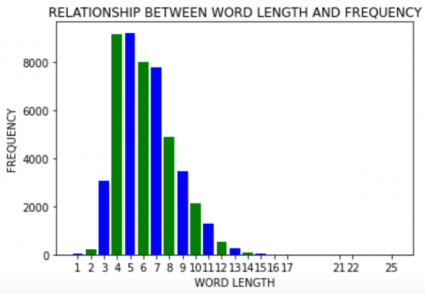
Book-1:

In [21]:
```
# For Data 1
plot_relationship(FreqDist(rem1))
```



Book-2:

In [22]:
```
# For Data 2
plot_relationship(FreqDist(rem2))
```



Inference :

Frequency of words of smaller length decreased significantly after removing the stopwords as generally these stopwords are of smaller length, e.g. - *'to', 'the',* etc.

Problem statement - 7 :

Do PoS Tagging using any of the four tagset studied in the class and get the distribution of various tags.

PoS stands for parts of speech. PoS tagging means to tag each word with its part of speech like noun, verb, adverb, adjective, etc. Though there are some third party libraries which can be used to do PoS tagging in just one line of code, there is a very fancy algorithm which is doing all the work behind this. Basically it uses *HMM (hidden markov model)* to tag each word. The crux of the algorithm is to find the most probable tagset for the given set of words among all the possible tagsets. It uses the *Viterbi* algorithm which is based on the dynamic programming paradigm to efficiently find the most probable tagset. There are many available tagsets which can be used for this purpose. For this project, we have used the *Treebank* tagset.*Tree bank* tagset includes *36* PoS tags like Coordinating Conjunction (CC), Determiner (DT) etc.

Note :- Below plots are for the 20 most occuring tags.

Book-1 :-

PoS tagging analysis

In [30]:
```
FreqDist(tags1)
```

Out[30]:
```
FreqDist({'NN': 17754, 'JJ': 10157, 'RB': 5250, 'VBD': 4328, 'NNS': 4103, 'VB': 2420, 'VBP': 2234, 'VBG': 2176, 'VBN': 2147, 'MD': 1932,
...})
```

Book-2 :-

PoS tagging analysis

In [31]:
```
FreqDist(tags2)
```

Out[31]:
```
FreqDist({'NN': 14486, 'JJ': 9178, 'NNS': 6175, 'VBD': 4104, 'RB': 3455, 'VBN': 1922, 'VBP': 1899, 'VBG': 1724, 'VB': 1596, 'IN': 1390,
...})
```