Sentiment Analysis of Martin Luther King Jr's speech delivered at Lincoln Memorial, Washington D.C. on August 28, 1963.

Prepared by: Sagun Shakya (https://github.com/sagsshakya)

- GITAM Institute of Science.

1. Web Scraping. ¶

Importing necessary libraries.

In [52]:
```
from bs4 import BeautifulSoup as BS
import requests
```

In [53]:
```
url = 'http://www.analytictech.com/mb021/mlk.htm'
page = requests.get(url)
```

In [54]:
```
soup = BS(page.text, 'html.parser')
```

In [61]:
```
speech = soup.find_all('p')
```

Creating a list of paragraphs of the speech.

In [62]:
```
speech_list = [ii.text for ii in speech]
```

In [63]:
```
for ii in speech_list:
    print(ii)
    print('--------\n')
```

```
I am happy to join with you today in what will go down in
history as the greatest demonstration for freedom in the history
of our nation.
--------

Five score years ago a great American in whose symbolic shadow
we stand today signed the Emancipation Proclamation. This
momentous decree came as a great beckoning light of hope to
millions of Negro slaves who had been seared in the flames of
withering injustice. It came as a joyous daybreak to end the long
night of their captivity.
--------

But one hundred years later the Negro is still not free. One
hundred years later the life of the Negro is still sadly crippled
by the manacles of segregation and the chains of discrimination.
--------

One hundred years later the Negro lives on a lonely island of
poverty in the midst of a vast ocean of material prosperity.
--------

One hundred years later the Negro is still languishing in the
comers of American society and finds himself in exile in his own
```

2. Data cleaning.

In [69]:
```
import re
for ii in range(len(speech_list)):
    speech_list[ii] = re.sub('[^a-zA-Z]', ' ' , speech_list[ii], flags = re.IGNORECASE)
    # We can use '\W' (non - alphanumeric character or non - word character) instead of '[^a-zA-Z]'.

    #Convert into LowerCase.
    speech_list[ii] = speech_list[ii].lower()
```

---

3. WordCloud analysis.

Joining all the words in the list into a string variable.

In [82]:
```
comment_words = ''
for ii in speech_list:
    comment_words += ii
comment_words = comment_words.replace('  ', ' ')
```

Importing necessary libraries.

In [71]:
```
from textblob import TextBlob
from wordcloud import WordCloud, STOPWORDS
```

In [73]:
```
from PIL import Image as II
import numpy as np
```

Creating a mask for wordcloud.

- p.s Doesn't work!

In [103]:
```
# mask = np.array(II.open(requests.get('http://www.clker.com/cliparts/O/i/x/Y/q/P/yellow-house-hi.png', str
```

Creating a set of stopwords.

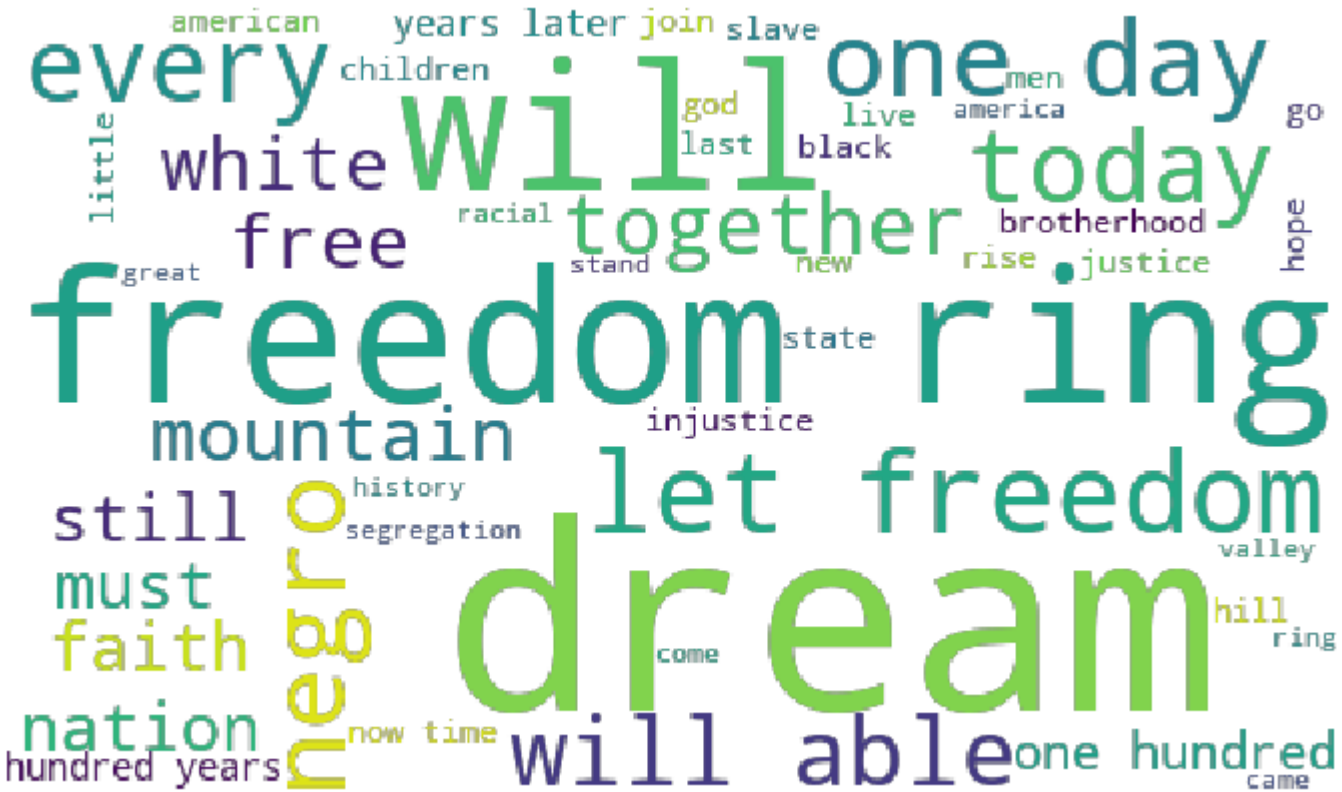
In [94]:
```
stopwords_list = set(STOPWORDS)
```

Creating wordcloud.

In [110]:
```
wc = WordCloud( width = 500, height = 300, max_words = 50,
                stopwords = stopwords_list, background_color = None, mode = 'RGBA',
                contour_width = 0.5, contour_color = 'green').generate(comment_words)
```

Plotting the WordCloud image.

In [107]:
```
import matplotlib.pyplot as plt
plt.figure(figsize = (12, 9), facecolor = None)
plt.imshow(wc)
plt.axis("off")
#plt.tight_layout(pad = 0)

plt.show()
```



Creating an external .png file. (EXPORT)

In [111]:
```
os.chdir(r'C:\Users\acer\Desktop\PythonProgramming')
wc.to_file('mlk.png')
```

```
<wordcloud.wordcloud.WordCloud at 0x21efba30b38>
```

---

4. Sentiment scores.

Removing stopwords.

In [130]:
```
for ii in range(len(speech_list)):
    y = [ii for ii in speech_list[ii].split() if ii not in stopwords_list]
    y = ' '.join(y)
    speech_list[ii] = y
```

In [132]:
```
speech_list[0]
```

```
'happy join today will go history greatest demonstration freedom history nation'
```

Creating a DataFrame.

In [135]:
```
mlk = pd.DataFrame({'paragraph': speech_list})
```

Importing textblob library.

In [133]:
```
from textblob import TextBlob as TB
```

Creating Lamda functions to calculate polarity and subjectivity.

In [149]:
```
pol = lambda x: round(TB(x).sentiment.polarity, 2)
sub = lambda x: round(TB(x).sentiment.subjectivity, 2)
```

In [150]:
```
mlk['polarity'] = mlk['paragraph'].apply(pol)
mlk['subjectivity'] = mlk['paragraph'].apply(sub)
```

In [151]:
```
mlk.head(10)
```

	paragraph	polarity	subjectivity
0	happy join today will go history greatest demo...	0.90	1.00
1	five score years ago great american whose symb...	0.39	0.52
2	one hundred years later negro still free one h...	-0.02	0.45
3	one hundred years later negro lives lonely isl...	-0.03	0.57
4	one hundred years later negro still languishin...	0.00	0.00
5	come hallowed spot remind america fierce urgen...	-0.07	0.25
6	will neither rest tranquility america negro gr...	0.00	0.00
7	must forever conduct struggle high plane digni...	0.17	0.46
8	marvelous new militarism engulfed negro commun...	0.33	0.39
9	even though face difficulties today tomorrow s...	0.00	0.20

---

5. Visualization using graph.

Creating a function to convert rgb values to hexadecimal color codes.

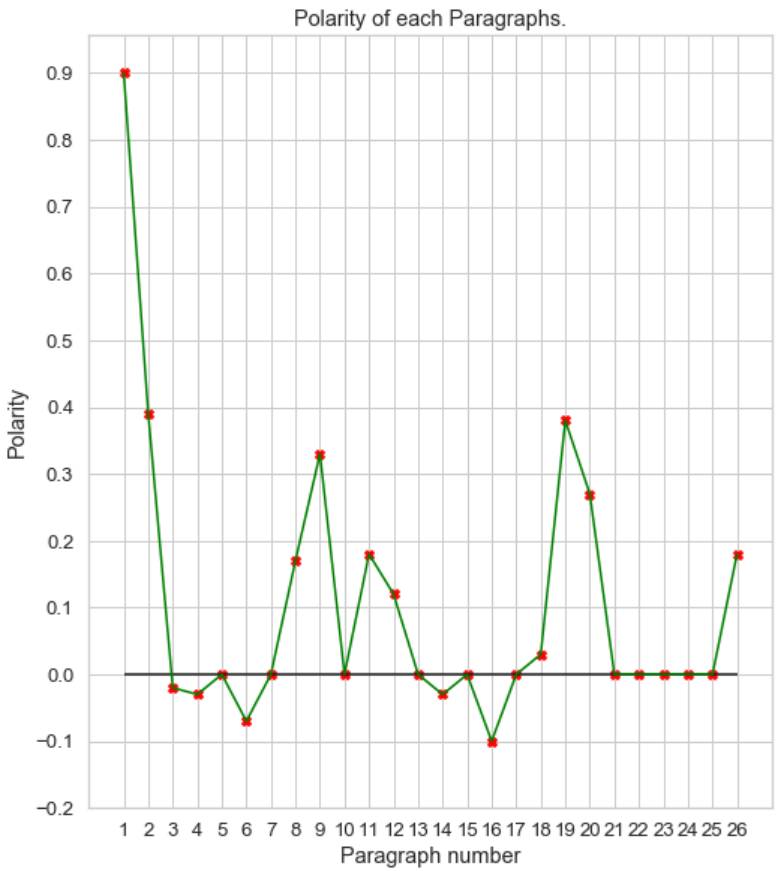
In [166]:
```
def rgb_to_hex(rgb):
    return '%02x%02x%02x' % rgb
rgb_to_hex((100,3,180))
```

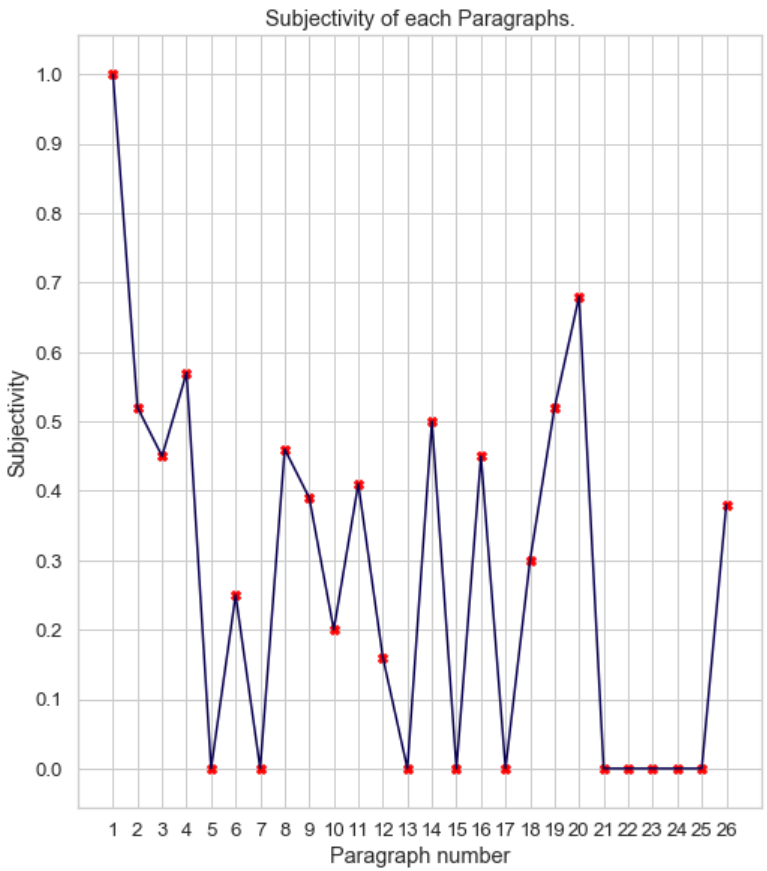
```
'6403b4'
```

Creating a subplots of polarity and subjectivity with respect to paragraphs.

In [219]:

```
from matplotlib import pyplot as plt
import numpy as np

plt.figure(figsize = (18,9.5))
sns.set(style = 'whitegrid', font_scale = 1.2)

plt.subplot(1,2,1)
plt.plot(np.arange(1,mlk.shape[0]+1), mlk.polarity, color = 'green')
plt.scatter(np.arange(1,mlk.shape[0]+1), mlk.polarity, color = 'red', marker = 'X')
plt.hlines(0,1,mlk.shape[0])
plt.title('Polarity of each Paragraphs.')
plt.xlabel('Paragraph number')
plt.ylabel('Polarity')
plt.xticks(np.arange(1,mlk.shape[0]+1))
plt.yticks(np.arange(-0.2, 1.0, 0.1))

plt.subplot(1,2,2)
plt.plot(np.arange(1,mlk.shape[0]+1), mlk.subjectivity, color = '#'+str(rgb_to_hex((10,3,80))))
plt.scatter(np.arange(1,mlk.shape[0]+1), mlk.subjectivity, color = 'red', marker = 'X')
plt.title('Subjectivity of each Paragraphs.')
plt.xlabel('Paragraph number')
plt.ylabel('Subjectivity')
plt.xticks(np.arange(1,mlk.shape[0]+1))
plt.yticks(np.arange(0.0, 1.1, 0.1))

# Saving the figure to a file.
os.chdir(r'C:\Users\acer\Desktop\PythonProgramming')
plt.savefig('paragraph.pdf', dpi = 300, papertype = 'a4', format = 'pdf')

plt.show()
```





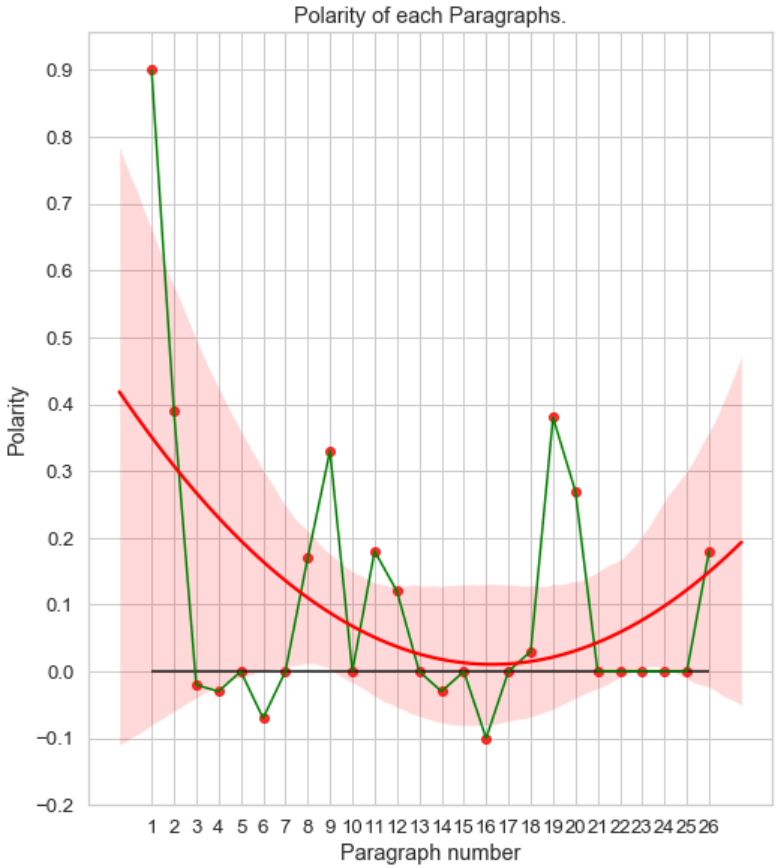
MartinLuther King Jr. is pretty much consistently positive in this speech. However in paragraph 16, we see a small speck of negativity.

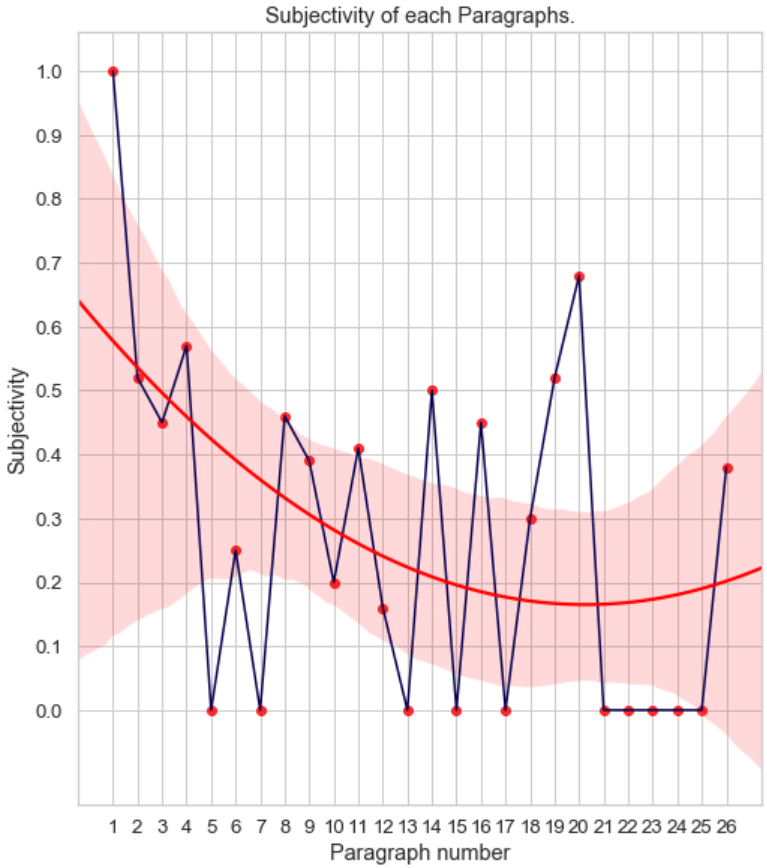
Trend Lines.

i. Regression plots of order 2.

In [220]:

```
import seaborn as sns

plt.figure(figsize = (18,9.5))
sns.set(style = 'whitegrid', font_scale = 1.2)

plt.subplot(1,2,1)
plt.plot(np.arange(1,mlk.shape[0]+1), mlk.polarity, color = 'green')
sns.regplot(x = np.arange(1,mlk.shape[0]+1), y = mlk.polarity, order = 2, color = 'red')
plt.hlines(0,1,mlk.shape[0])
plt.title('Polarity of each Paragraphs.')
plt.xlabel('Paragraph number')
plt.ylabel('Polarity')
plt.xticks(np.arange(1,mlk.shape[0]+1))
plt.yticks(np.arange(-0.2, 1.0, 0.1))

plt.subplot(1,2,2)
plt.plot(np.arange(1,mlk.shape[0]+1), mlk.subjectivity, color = '#'+str(rgb_to_hex((10,3,80))))
sns.regplot(x = np.arange(1,mlk.shape[0]+1), y = mlk.subjectivity, order = 2, color = 'red')
plt.title('Subjectivity of each Paragraphs.')
plt.xlabel('Paragraph number')
plt.ylabel('Subjectivity')
plt.xticks(np.arange(1,mlk.shape[0]+1))
plt.yticks(np.arange(0.0, 1.1, 0.1))

# Saving the figure to a file.
os.chdir(r'C:\Users\acer\Desktop\PythonProgramming')
plt.savefig('regplot_paragraph_ord2.pdf', dpi = 300, papertype = 'a4', format = 'pdf')
plt.show()
```

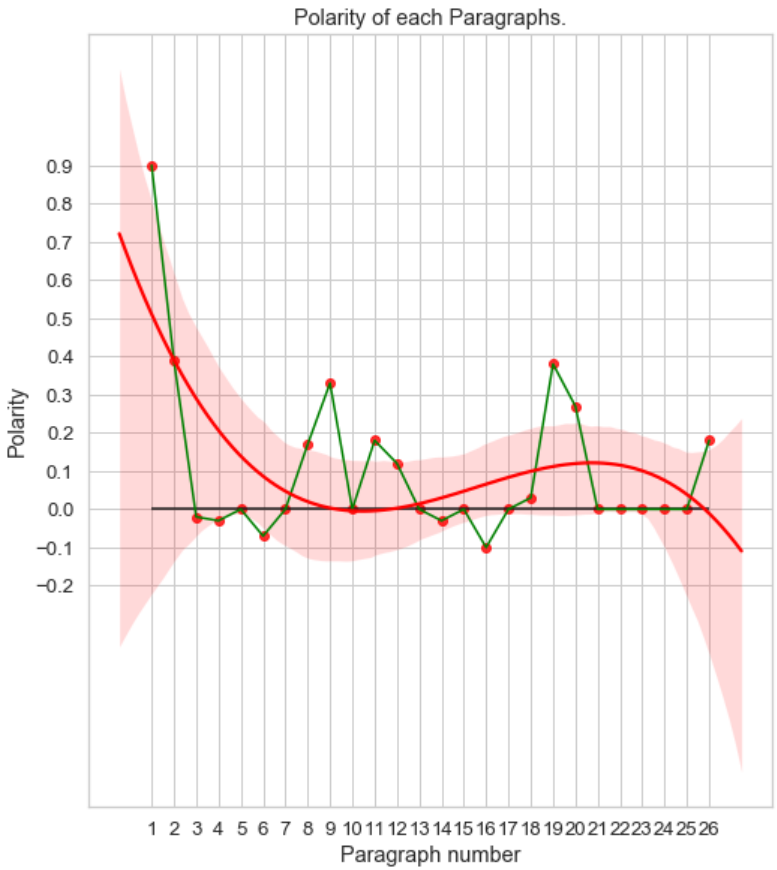


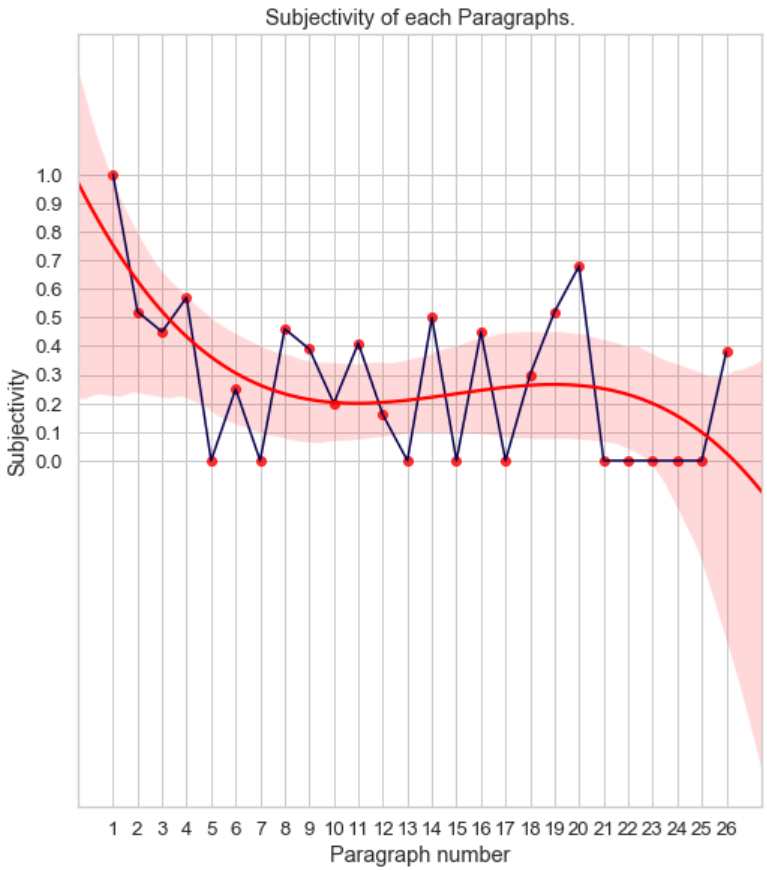


ii. Regression plots of order 3.

In [221]:

```
import seaborn as sns

plt.figure(figsize = (18,9.5))
sns.set(style = 'whitegrid', font_scale = 1.2)

plt.subplot(1,2,1)
plt.plot(np.arange(1,mlk.shape[0]+1), mlk.polarity, color = 'green')
sns.regplot(x = np.arange(1,mlk.shape[0]+1), y = mlk.polarity, order = 3, color = 'red')
plt.hlines(0,1,mlk.shape[0])
plt.title('Polarity of each Paragraphs.')
plt.xlabel('Paragraph number')
plt.ylabel('Polarity')
plt.xticks(np.arange(1,mlk.shape[0]+1))
plt.yticks(np.arange(-0.2, 1.0, 0.1))

plt.subplot(1,2,2)
plt.plot(np.arange(1,mlk.shape[0]+1), mlk.subjectivity, color = '#'+str(rgb_to_hex((10,3,80))))
sns.regplot(x = np.arange(1,mlk.shape[0]+1), y = mlk.subjectivity, order = 3, color = 'red')
plt.title('Subjectivity of each Paragraphs.')
plt.xlabel('Paragraph number')
plt.ylabel('Subjectivity')
plt.xticks(np.arange(1,mlk.shape[0]+1))
plt.yticks(np.arange(0.0, 1.1, 0.1))

# Saving the figure to a file.
os.chdir(r'C:\Users\acer\Desktop\PythonProgramming')
plt.savefig('regplot_paragraph_ord3.pdf', dpi = 300, papertype = 'a4', format = 'pdf')
plt.show()
```


Polarity of each Paragraphs.
Polarity
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
−0.2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Paragraph number


Subjectivity of each Paragraphs.
Subjectivity
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
Paragraph number

In [185]:
```
script = [ii.text for ii in speech]
script[15]
```

```
'I have a dream that one day down in Alabama, with its vicious\r\nracists, with its Governor having his lips dripping with the\r\nwords of interposition and nullification, one day right there in\r\nAlabama little black boys and black girls will be able to join\r\nhands with little white boys and white girls as sisters and\r\nbrothers. '
```

---

6. Sentiment Score: word - by - word.

In [187]:
```
comment_words
```

```
'i am happy to join with you today in what will go down in history as the greatest demonstration for freedom in the history of our nation
five score years ago a great american in whose symbolic shadow we stand today signed the emancipation proclamation this momentous decree c
ame as a great beckoning light of hope to millions of negro slaves who had been seared in the flames of withering injustice it came as a j
oyous daybreak to end the long night of their captivity but one hundred years later the negro is still not free one hundred years later th
e life of the negro is still sadly crippled by the manacles of segregation and the chains of discrimination one hundred years later the ne
gro lives on a lonely island of poverty in the midst of a vast ocean of material prosperity one hundred years later the negro is still lan
guishing in the comers of american society and finds himself in exile in his own land we all have come to this hallowed spot to remind ame
rica of the fierce urgency of now now is the time to rise from the dark and desolate valley of segregation to the sunlit path of racial ju
stice now is the time to change racial injustice to the solid rock of brotherhood now is the time to make justice ring out for all of god
s children there will be neither rest nor tranquility in america until the negro is granted citizenship rights we must forever conduct our
struggle on the high plane of dignity and discipline we must not allow our creative protest to degenerate into physical violence again and
again we must rise to the majestic heights of meeting physical force with soul force and the marvelous new militarism which has engulfed t
he negro community must not lead us to a distrust of all white people for many of our white brothers have evidenced by their presence here
today that they have come to realize that their destiny is part of our destiny so even though we face the difficulties of today and tomorr
ow i still have a dream it is a dream deeply rooted in the american dream i have a dream that one day this nation will rise up and live ou
t the true meaning of its creed  we hold these truths to be self evident that all men are created equal  i have a dream that one day on th
e red hills of georgia the sons of former slaves and the sons of former slave owners will be able to sit together at the table of brotherh
ood i have a dream that one day even the state of mississippi a state sweltering with the heat of injustice sweltering with the heat of op
pression will be transformed into an oasis of freedom and justice i have a dream that little children will one day live in a nation where
they will not be judged by the color of their skin but by the content of their character i have a dream today i have a dream that one day
down in alabama with its vicious racists with its governor having his lips dripping with the words of interposition and nullification one
day right there in alabama little black boys and black girls will be able to join hands with little white boys and white girls as sisters
and brothers i have a dream today i have a dream that one day every valley shall be exalted  every hill and mountain shall be made low the
rough places plains and the crooked places will be made straight and before the lord will be revealed and all flesh shall see it together
this is our hope this is the faith that i go back to the mount with with this faith we will be able to hew out of the mountain of despair
a stone of hope with this faith we will be able to transform the genuine discords of our nation into a beautiful symphony of brotherhood w
ith this faith we will be able to work together pray together to struggle together to go to jail together to stand up for freedom forever
mowing that we will be free one day and i say to you today my friends let freedom ring from the prodigious hilltops of new hampshire let f
reedom ring from the mighty mountains of new york let freedom ring from the mighty alleghenies of pennsylvania let freedom ring from the s
now capped rockies of colorado let freedom ring from the curvaceous slopes of california but not only there let freedom ring from the ston
e mountain of georgia let freedom ring from lookout mountain in tennessee let freedom ring from every hill and molehill in mississippi  fr
om every mountainside let freedom ring and when this happens when we allow freedom to ring when we let it ring from every village and haml
et from every state and every city we will be able to speed up that day when all of god s children black men and white men jews and gentil
es  protestants and catholics will be able to join hands and sing in the words of the old negro spiritual  free at last free at last thank
god almighty we re free at last  '
```

Creating tokens.

In [194]:
```
comment_words = comment_words.split()
```

```
['i',
 'am',
 'happy',
 'to',
 'join',
 'with',
 'you',
 'today',
 'in',
 'what',
 'will',
 'go',
 'down',
 'in',
 'history',
 'as',
 'the',
 'greatest',
 'demonstration',
 'for',
 'freedom',
 'in',
 'the',
 'history',
```

Creating a dataframe of tokens.

In [196]:
```
mlk_mod = pd.DataFrame({'words': comment_words})
```

In [198]:
```
mlk_mod['polarity'] = mlk_mod['words'].apply(pol)
mlk_mod['subjectivity'] = mlk_mod['words'].apply(sub)
```

In [200]:
```
mlk_mod.head(10)
```

	words	polarity	subjectivity
0	i	0.0	0.0
1	am	0.0	0.0
2	happy	0.8	1.0
3	to	0.0	0.0
4	join	0.0	0.0
5	with	0.0	0.0
6	you	0.0	0.0
7	today	0.0	0.0
8	in	0.0	0.0
9	what	0.0	0.0

Visualization of polarity of each word using graph.

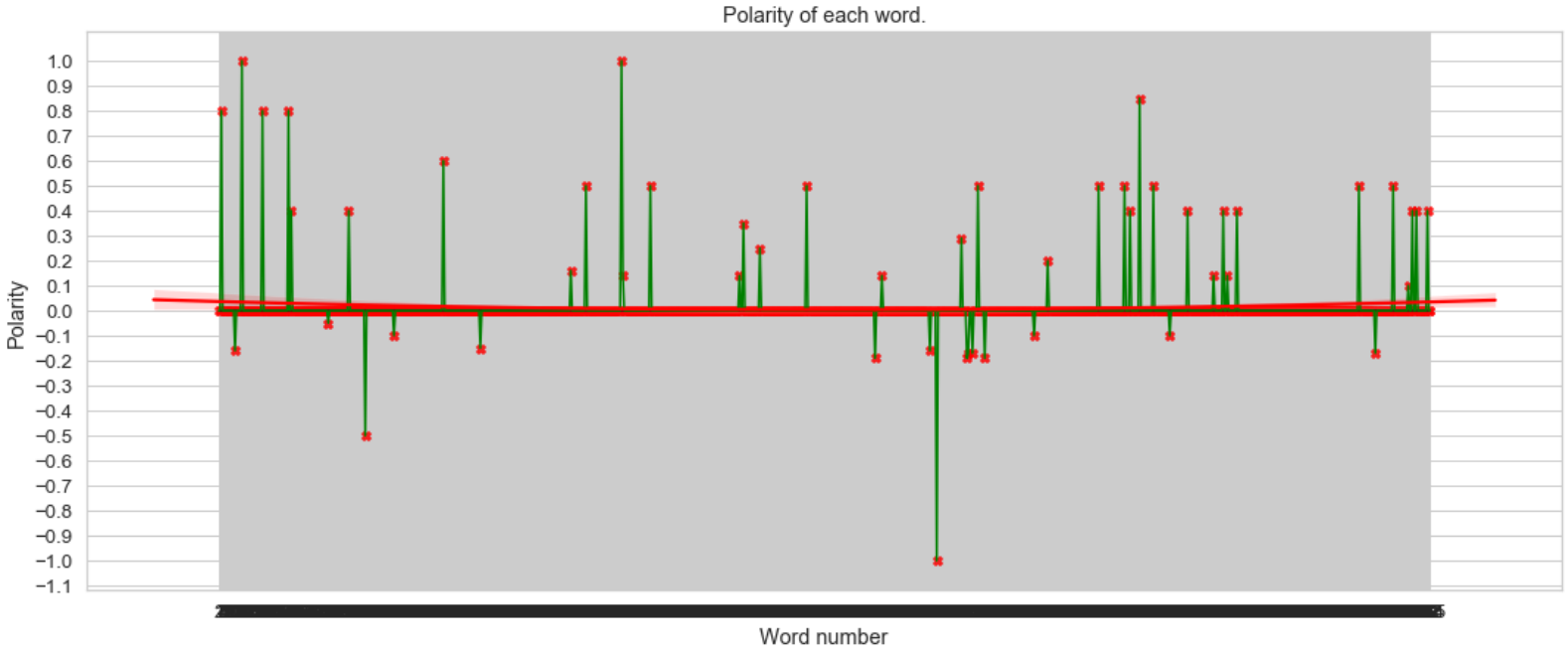
In [201]:
```
def rgb_to_hex(rgb):
    return '%02x%02x%02x' % rgb
rgb_to_hex((100,3,180))
```

```
'6403b4'
```

i. Regression plot of order 2.

In [222]:

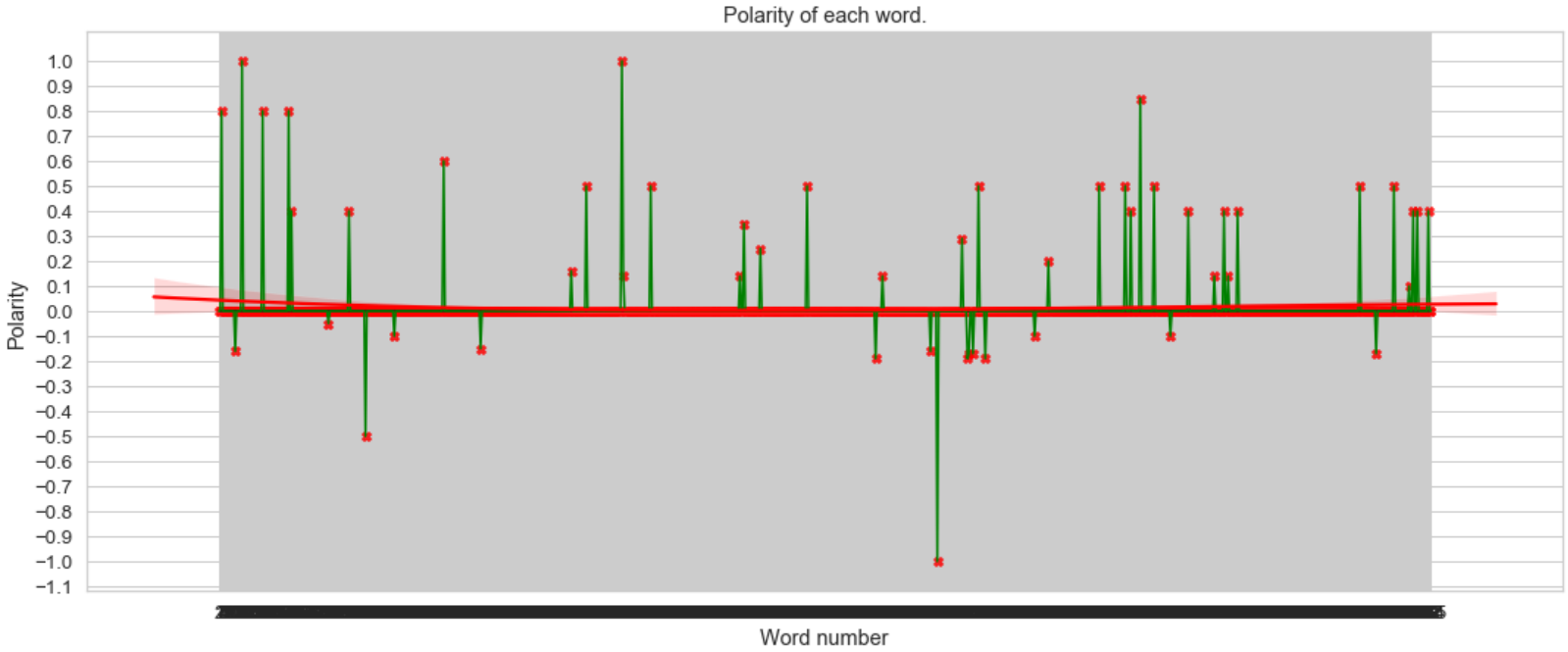
```
plt.figure(figsize = (18,7))
sns.set(style = 'whitegrid', font_scale = 1.2)

plt.plot(np.arange(1,mlk_mod.shape[0]+1), mlk_mod.polarity, color = 'green')
sns.regplot(x = np.arange(1,mlk_mod.shape[0]+1), y = mlk_mod.polarity,
            color = 'red', marker = 'X', order = 2)
plt.hlines(0,1,mlk_mod.shape[0])
plt.title('Polarity of each word.')
plt.xlabel('Word number')
plt.ylabel('Polarity')
plt.xticks(np.arange(1,mlk_mod.shape[0]+1))
plt.yticks(np.arange(-1.1, 1.1, 0.1))

# Saving the figure to a file.
os.chdir(r'C:\Users\acer\Desktop\PythonProgramming')
plt.savefig('regplot_wordbyword_ord2.pdf', dpi = 300, papertype = 'a4', format = 'pdf')
plt.show()
```



ii. Regression plot of order 3.

In [223]:

```
plt.figure(figsize = (18,7))
sns.set(style = 'whitegrid', font_scale = 1.2)

plt.plot(np.arange(1,mlk_mod.shape[0]+1), mlk_mod.polarity, color = 'green')
sns.regplot(x = np.arange(1,mlk_mod.shape[0]+1), y = mlk_mod.polarity,
            color = 'red', marker = 'X', order = 3)
plt.hlines(0,1,mlk_mod.shape[0])
plt.title('Polarity of each word.')
plt.xlabel('Word number')
plt.ylabel('Polarity')
plt.xticks(np.arange(1,mlk_mod.shape[0]+1))
plt.yticks(np.arange(-1.1, 1.1, 0.1))

# Saving the figure to a file.
os.chdir(r'C:\Users\acer\Desktop\PythonProgramming')
plt.savefig('regplot_wordbyword_ord3.pdf', dpi = 300, papertype = 'a4', format = 'pdf')
plt.show()
```


Polarity of each word.
Polarity
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
−0.4
−0.5
−0.6
−0.7
−0.8
−0.9
−1.0
−1.1
Word number

The End.