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Corpus of the WWDC

Introduction

Technology has become a part of our lives, and we might not even notice the impact of it. We saw technology improve significantly throughout the years, from brick phones to the thinnest phones. As a society, we take technology for granted. We don't understand how it has improved our lives in terms of communication, travel, and even security. When we talk about technology, we usually associate it with certain companies, specific devices, and certain features. We might associate technology with the company "Apple." In the modern day, we can say that Apple has dominated the technology field for the last 15 years. We all remember seeing people outside the Apple store for days just to get their hands on the television. Their first-ever iPhone, introduced in 2007, was considered a revolutionary piece of technology, a device we had never seen before. After 2007, we can safely say that Apple started revolutionizing technology each year, releasing new software, devices, and technology. We have always associated Apple with its founder, Steve Jobs. Many people back in the early days saw Steve Jobs as the face of the future, and after Steve Jobs passed away, Tim Cook replaced him as the spokesperson for the WWDC. We can't compare Steve Jobs's impact on Apple to Tim Cook's. Steve Jobs was a brilliant marketer and is known for his technological advances. People saw him as the "Father of Technology".

Every year, an important meeting called WWDC is hosted by a select group of students, developers, and influencers. WWDC stands for Worldwide Developers Conference hosted by Apple annually. These meetings are a timestone for technology advancements. They talk about important topics such as operating systems(iOS), new products, app designs, innovation, etc. I decided to compare the WWDC transcripts from various years ranging from 2007 to 2020. You can ask yourself why they changed how they presented the meetings to the audience. Was it to sell more devices? What

made them change the style of speaking of the WWDC? Did they target their meetings to the same audience throughout the years?

Corpus Building

I decided to make the corpus with Python and with the help of some libraries. I imported the packages from the class that followed the same outline, but after some research, I found a class named "Article" from the "newspaper " library. This library cleaned the transcript to avoid having ads or certain links in the transcript, making our corpus more accurate about the WWDC. I obtained the transcripts from the same source, and a total of 10 different transcripts which could give a concrete understanding of the words that they used, the source that I got all the transcripts from was the website Singupost, which has most of the year's transcript so obtaining it won't be hard.

```
from newspaper import Article
from nltk import pos_tag, word_tokenize
from urllib.request import urlopen
from urllib.parse import urlsplit
from pathlib import Path
from bs4 import BeautifulSoup
import nltk
import re

all_tokens = []

def get_transcript(url):
    article = Article(url)
    article.download()
    article.parse()
    text = article.text

    data = urlopen(url).read()
    soup = BeautifulSoup(data, 'html.parser')
    content = soup.find('section', class_='body-content')

    tokens = [word_tokenize(sent) for sent in nltk.sent_tokenize(text)]
    tagged = [pos_tag(sent) for sent in tokens]



    folder = Path('singjupost')
    filename = folder / (f'{year}_{urlsplit(url).path.replace("/", "_")}.txt')
    folder.mkdir(exist_ok=True)

    with open(filename, 'w') as f:
            for sent in tagged:
                for w, t in sent:
                    print(w, t, sep='_', end=' ', file=f)
                print(file=f)

    all_tokens.extend(tokens)

links = [
    'https://singjupost.com/full-transcript-tim-cook-at-apple-wwdc-2020-keynote/?singlepage=1',
    'https://singjupost.com/full-transcript-tim-cook-at-apple-wwdc-2019-keynote/?singlepage=1',
    'https://singjupost.com/tim-cook-at-apple-wwdc-2018-keynote-full-transcript/?singlepage=1',
    'https://singjupost.com/apple-ceo-tim-cook-keynote-at-wwdc-2017-full-transcript/?singlepage=1',
    'https://singjupost.com/apple-ceo-tim-cook-keynote-at-wwdc-2016-full-transcript/?singlepage=1',
    'https://singjupost.com/apple-wwdc-2015-keynote-special-event-june-2015-full-transcript/?singlepage=1',
    'https://singjupost.com/apple-ceo-tim-cook-keynote-wwdc-june-2014-transcript/?singlepage=1',
    'https://singjupost.com/apple-ceo-tim-cook-keynote-wwdc-june-2013-conference-transcript/?singlepage=1',
    'https://singjupost.com/steve-jobs-introduces-iphone-4-facetime-at-wwdc-2010-full-transcript/?singlepage=1',
    'https://singjupost.com/steve-jobs-iphone-2007-presentation-full-transcript/?singlepage=1',
]
```

```
corpus_folder = Path('singjupost')
corpus = nltk.corpus.reader.TaggedCorpusReader(str(corpus_folder), r'[^.].*\.txt', sep='_')
```

Transcripts are extracted and processed from a list of Apple event URLs using Python, following the lecture's outline. The get_transcript function downloads and parses articles using the newspaper library, uses BeautifulSoup to extract text content, tokenizes words and sentences using NLTK, tags parts of

speech, and saves the results to text files. The path from the URL and the year are used to structure filenames. Applying the function to each event URL as an iterative going through the list, the script gathers all the tokens into a global list called all_tokens. This code, created especially for Apple event transcripts, makes collecting and analyzing text data systematically from various sources easier.

```
corpus_folder = Path('singjupost')
corpus = nltk.corpus.reader.TaggedCorpusReader(str(corpus_folder), r'[^.].*\.txt', sep='_')
```

To handle tagged text data, the code generates a TaggedCorpusReader, a tool from the NLTK package. It designates a directory ('singjupost') for storing tagged text files. The reader is configured to distinguish files that finish in ".txt" and uses underscores to divide tokens which with ending “txt” let us know that is stored as file dataset corpus. This allows the tagged text data to be easily accessed and analyzed within the specified directory in preparation for additional NLTK processing. After I compiled all my code and generated a corpus of WWDC Apple transcripts, I wanted to see how many words were in the corpus, so I did the integrated function of Python (.words(). It turns out that there are 195338 words in my corpus that could be considered a significant amount.

```
len(corpus.words())
```

```
195338
```

MSTR type/token ratio

After this, I was interested in the MSTR for each transcribed year of the WWDC, so I computed each year's mean standardized type/token ratio (MSTR). I used a partition size of 1,000 tokens and normalized the text by removing both punctuation and making it lowercase. We normalized it by using this function below:

```
def normalize(text):
    return [tok.lower() for tok in text if tok.isalpha()]
```

I created a normalize (text) function, which outputs a new list with each token transformed to lowercase if it comprises only alphabetic characters (letters). The MSTR is a score based on the Standardised type/token ratio (MSTR). You divide the text into segments we get to decide on; we did 1000 segments for

this project. TTR is the type/token ratio that can help us analyze the transcripts, and then we calculate the TTR from each segment and divide it into the mean value of TTRs. The formula is provided down below:

$$\text{type/token ratio} = \frac{\text{no. of types in text or corpus}}{\text{no. of tokens in text or corpus}}$$

We calculated the MSTR by using functions that it was provided in the lectures, which were:

```
import nltk
from nltk.tokenize import WhitespaceTokenizer, RegexpTokenizer
import re
from toolz import partition

%precision 3
def normalize(text):
    return [tok.lower() for tok in text if tok.isalpha()]

def ttr(text):
    text = normalize(text)
    return len(set(text)) / len(text)

def msttr(text, k=2000):
    text = normalize(text)
    ttrs = [ttr(chunk) for chunk in partition(k, text)]
    return sum(ttrs) / len(ttrs)
msttr(corpus.words(), k=1000)
```

```
0.347
```

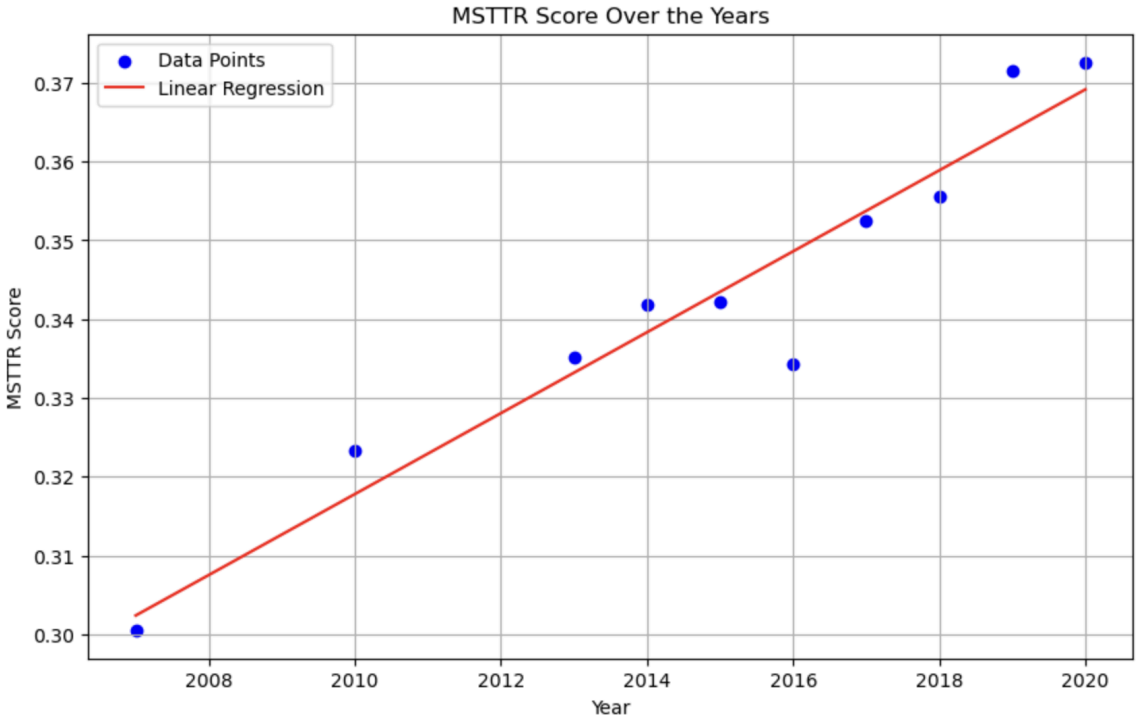
We defined three functions: MSTR, which determines the MSTR by dividing the text into segments of a given size 2000 and averaging the TTRs of these segments; and TTR, which determines the Type-Token Ratio for a normalized text. A corpus's MStr is calculated using mstr(corpus.words(), k=1000), where k=1000 determines the chunk size. We obtained an MSTR of 0.347, which could be explained that on average there's a 34.7% diversity of words per 1000 words in our corpus which could be considered pretty normal. Now, if we want to compare it to each other year to see if there is any pattern of the MSTR every year, it could give a theory that the language that they use changes throughout the years, making us wonder the question why it changes every year and is its marketing strategy or society change. We calculated the MSTR for every year by writing this function below:

```
In [23]: for file_id in corpus.fileids():

             year_match = re.search(r'(\d{4})[^0-9]', file_id)

             if year_match:
                 year = year_match.group(1)
                 words_in_category = corpus.words(file_id)
                 score = msttr(words_in_category, k=1000)
                 print(f'Year {year} WWDC MSTR: {score:.3f}')
```

I created a for loop with an if statement integrated that loops over files in a corpus in each file by using a regular expression to extract the year from the file's ID and print out the result for each year in the context of the WWDC (Apple Worldwide Developers Conference). Now, to see the pattern, we must graph them, and we can apply a linear regression to see if the MSTR is going up or down, which could help us conclude our theory. Our results indicate that the MSSR has significantly increased throughout the years, as shown in our graph.



The first year of our corpus was 2007 WWDC, the score was 0.301, and the most recent transcript of the WWDC was 2020 WWDC was 0.373. Throughout the years, the diversity in the language of transcripts has changed every year. This was an increment of around .72 which could be significant, we can say that the diversity of words in the transcripts throughout the years increases. This could imply that Apple that

people of all ages are becoming more technologically literate, but highlights that younger people are typically more adept with technology.

Flesch-Kincaid Readability Level(FK)

After that, we used the Flesch-Kincaid Readability Level (FK), which is the calculation to measure the difficulty of every transcript. The formula to calculate the FK, we used the following equation:

$$FK = 0.39 \times \frac{\#\text{ of words}}{\#\text{ of sents}} + 11.8 \times \frac{\#\text{ of sylls}}{\#\text{ of words}} - 15.59$$

We defined the function that was given; this function was used to count the syllabus; the following function was:

```
def syllables(word):
  if word in cmudict:
    return len([p for p in cmudict[word][0] if p[-1].isdigit()])
  else:
    return len(re.findall(r'[aeiou]+', word))
```

The function syllables, defined in this code, determine how many syllables are in a given word. Using a regular expression, it counts the number of vowels in the word's lowercase form. Credit is defined as (credit = nltk.corpus. credit.dict()), ensuring the word is in the music. To calculate the Flesch-Kincaid Readability, we used the function that we obtained from the lecture:

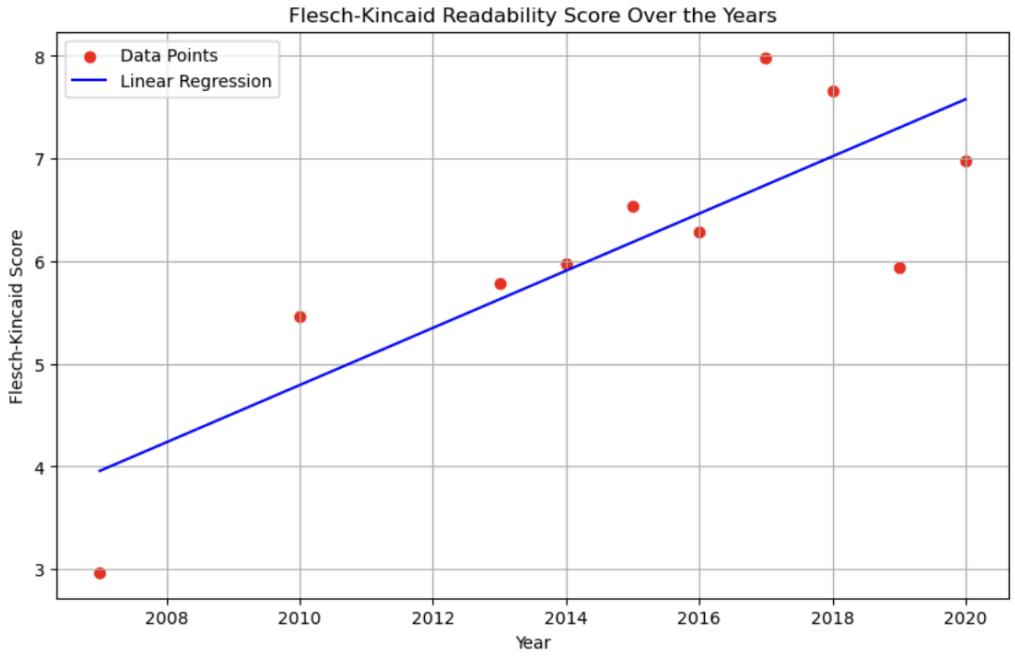
```
def fk(text):
    words = len(word_tokenize(text))
    sylls = sum([syllables(w) for w in word_tokenize(text)])
    sents = len(sent_tokenize(text))
    return 0.39 * (words/sents) + 11.8 * (sylls/words) - 15.59

for file_id in project.fileids():

    year_match = re.search(r'(\d{4})[^0-9]', file_id)

    if year_match:
        year = year_match.group(1)
        full_text = project.raw(file_id)
        score = fk(full_text)
        print(f'Year {year} WWDC FK: {score:.3f}')
```

We created a function named “fk” to compute the formula above between words, syllabus, and sents(the text tokenized). Then, by computing the formula, I used an if for loop with an if statement similar to the MTSR situation to obtain the FK. After computing the Flesch-Kincaid Readability for every year of WWDC, we can conclude that the score seems to have risen quite significantly throughout the years and that throughout the years, the reading level has decreased significantly. I decided to graph them to see a correlation. We would compare our (x-variable) year to our FK score, which is our (y-variable). The graph came out like this:



I would assume this because technology is most targeted at our young society since they are the ones who keep up with these significant technological advancements and are interested in buying devices just to obtain a new feature. Today's society has babies who can use an iPad better than senior citizens. The WWDC Is young people who can take advantage of technological advancements; maybe the first iPhone was targeted at thenstream adults.

Collocations

Collocations are expressions of multiple words that happen next to each other, which can help us understand certain topics better or suggest a specific meaning. The thing that I wanted to find was trigrams and bigrams. Bigrasm is two words, and trigrams are 3 words. First, we will discuss the bigrams attempting to obtain the top ten trigrams according to their Pointwise Mutual Information (PMI) rankings. Pointwise Mutual Information, or PMI for short, is a statistical metric that quantifies the degree of relationship between two words in a corpus. These are helpful because the “the” and “is” simple two-letter words are ignored. The results are:

```
In [13]: finder3.nbest(trigram_measures.pmi, 10)
Out[13]: [('Tweet', 'Pinterest', 'Email'),
          ('shares', 'Share', 'Tweet'),
          ('Do', 'Not', 'Disturb'),
          ('Share', 'Tweet', 'Pinterest'),
          ('New', 'York', 'Times'),
          ('Chief', 'Creative', 'Officer'),
          ('third', 'party', 'apps'),
          ('iOS', 'software', 'program'),
          ('Industrial', 'Light', 'and'),
          ('Light', 'and', 'Magic')]
```

We can obtain crucial information to analyze the best trigrams in our transcripts. We will explain the most important ones that people must understand. First, we have “Do,” “Not,” and “Disturb,” which is a feature from our iPhone that stops our phone from making a sound while we receive a notification, a feature that is useful when we are supposed to have our phone in silent, or we are busy. We can also talk about “third ", “party,” and “apps,” which many people don’t know what they mean, but we can

explain that third apps are an app that comes from a seller who isn't the company that made the device. These are important for developers developing apps or being part of the Android community. Now, let's talk about "iOS," "software," and "program," which is one of the most significant parts of technology that people are most excited about, how their phone software is going to change. This might mean new features to your current phone, even a faster phone, or fixes for glitches. Now if we want to see the common words are without the PMI, which could be simple words, the results are:

```
In [11]: finder.nbest(bigram_measures.likelihood_ratio, 10)
Out[11]: [('going', 'to'),
          ('you', 'can'),
          ('I', 'can'),
          ('want', 'to'),
          ('of', 'course'),
          ('look', 'at'),
          ('as', 'well'),
          ('App', 'Store'),
          ('d', 'like'),
          ('on', 'the')]
```

The code searches a corpus for and retrieves the top ten bigram pairs from a corpus. This is important because even though Steve Jobs and Tim Cook are brilliant salespeople, they mostly use words such as "you" and "can" to ensure the audience feels included in the new technological advances, which make more sales. They also mostly use "look at," ensuring they always have the audience's attention and know what they are buying. A surprising bigram was "App" "Store," a store where you can download apps for your phone. Every iPhone has experience with the Apple store, so they decided to say that a lot every year.

```
In [12]: trigram_measures = nltk.collocations.TrigramAssocMeasures()
         finder3 = TrigramCollocationFinder.from_words(tokens)
         finder3.apply_word_filter(notalpha)
         finder3.apply_freq_filter(10)
         finder3.nbest(trigram_measures.likelihood_ratio, 10)
Out[12]: [('m', 'going', 'to'),
          ('re', 'going', 'to'),
          ('going', 'to', 'be'),
          ('going', 'to', 'make'),
          ('going', 'to', 'show'),
          ('going', 'to', 'do'),
          ('am', 'going', 'to'),
          ('going', 'to', 'get'),
          ('going', 'to', 'go'),
          ('going', 'to', 'bring')]
```

This code, utilizing NLTK, distinguishes and positions the best 10 huge trigrams in a text. It selects trigrams that appear at least ten times and applies filters to exclude non-alphabetic words. The positioning depends on the probability proportion measure, underlying factual importance in word affiliations. Most of the words have "going," I can assume that Steve Jobs and Tim Cook use these words just to show the audience that they are "going" to do something that might surprise them. Show something new; that is what the words now suggest.

Conclusion

After doing the corpus and considering the MSTR, KF, and collocations, their language changed at every WWDC meeting. We can answer the introduction's questions: "What made them change the style of speaking of the WWDC?" We can say that this shows a greater frequency of these particular terms, which may imply a change or emphasis on the subject of information covered in the WWDC. I showed graphs that prove this. Also, the collocation might show us that they use terms that people involved in the Apple community might know. We can safely assume that the MSTR and KF will go up in the future because we will be more aware of the terms they talk about. The era of technology is barely starting, and soon, everyone will understand it more. We can finally conclude that technology draws in a younger, more technologically aware audience. Younger people are frequently more eager to discover and accept new features and devices. They also tend to adjust to technological changes more rapidly. Younger generations are more adapted to rapid technological changes, making them the perfect audience.

Works Cited

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