PDF & Twitter Scraping using Python

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Methods in Empirical Development Economics

Python Project

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Overview

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2. Methodology
   - PDF Scraping + NLP
   - Twitter Scraping + NLP
3. Data visualization
   - PDF Graphs
   - Twitter Graphs
4. Discussion
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The topic

↪ Public awareness due to climate change: The case of COP26 agenda

↪ Urgency of the subjects discussed on the annual COP, and the implications of the decisions that are taken there (Official statements)

↪ Topic is now subject of public debate in different spheres (e.g. Twitter)

PDF Scraping: Web Crawling

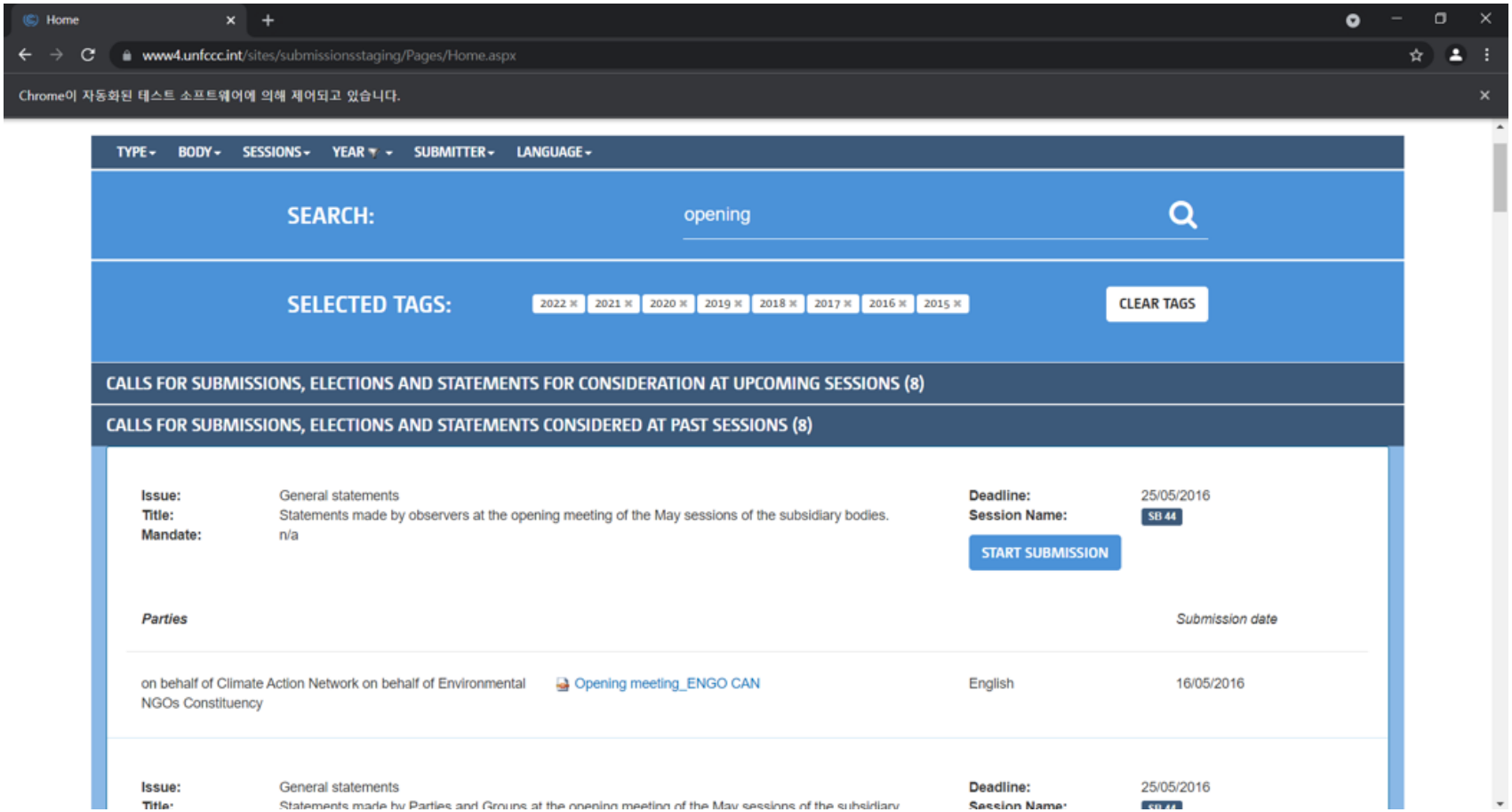
```python
# In[6]:
#pip install selenium
import requests
from bs4 import BeautifulSoup


# In[7]:

from selenium import webdriver
import time



# In[68]:

#Call the web page and maximise
driver = webdriver.Chrome()
web_url = 'https://www4.unfccc.int/sites/submissionsstaging/Pages/Home.aspx'
time.sleep(1)
driver.get(web_url)
driver.maximize_window()
time.sleep(5)
```

Web Crawling (UNFCCC) for downloading all the opening statements

```python
# In[69]:


#Click and select years
x_path = '//*[@id="searchyear"]/button'
year_button = driver.find_element_by_xpath(x_path).click()
driver.find_element_by_xpath('//*[@id="Open"]').click()
#driver.find_element_by_xpath('//*[@id="2022"]').click()
#driver.find_element_by_xpath('//*[@id="2021"]').click()
driver.find_element_by_xpath('//*[@id="2020"]').click()
driver.find_element_by_xpath('//*[@id="2019"]').click()
driver.find_element_by_xpath('//*[@id="2018"]').click()
driver.find_element_by_xpath('//*[@id="2017"]').click()
driver.find_element_by_xpath('//*[@id="2016"]').click()
driver.find_element_by_xpath('//*[@id="2015"]').click()



# ### Search 'opening'

# In[70]:


search_box = driver.find_element_by_xpath('//*[@id="accordion"]/div[2]/div/div/div[2]/div/div/input')
search_box.click()
search_box.send_keys("opening")
driver.find_element_by_xpath('//*[@id="accordion"]/div[2]/div/div/div[2]/div/div/div/button/i').click()
```

Select all years and search "Opening"

Web Crawling (UNFCCC) for downloading all the opening statements



Download and convert into pdf

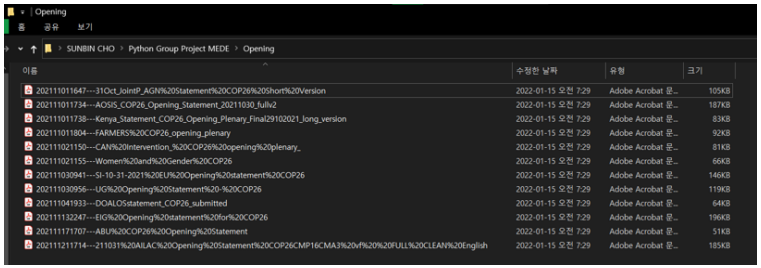
Download all the COP26 opening statement pdf

```
# In[ ]:


pdf_link = []

for a in upcoming_soup.find_all('a', href=True):
    a_string = a['href']
    if a_string.find('.pdf') >= 0:
        if a_string.find('COP26') >= 0:
            pdf_link.append(a_string)

```

Line 136: Read web file and save opening statements into pdf files

```
132 # In[ ]:
133     ## Save opening statements pdf files
134 ## Read web file
135 #pip install urllib3
136 import urllib.request
137
138 for text in sites :
139     report = text.replace(' ','%20')
140     webFile = urllib.request.urlopen(report)
141     pdfFile = open(report.split('/')[-1], 'wb')
142     pdfFile.write(webFile.read())
143     webFile.close()
144     pdfFile.close()
```

From 14 web files, we excluded 2 of spanish version. We'll do the analysis with 12 Opening Statements

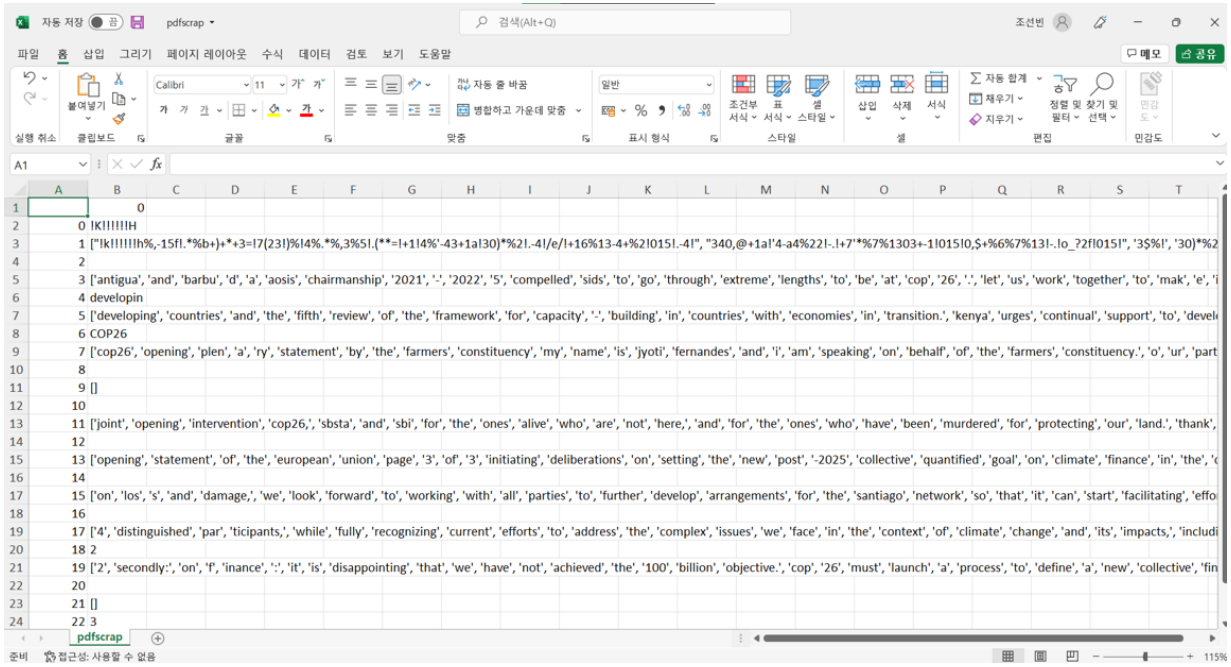


Then we use those ones, to scrap the text inside

```
    ## Scraping PDF

path = r"YOUR DIRECTORY"
dirs = os.listdir(path)
mytext=[]
for item in dirs :
    item_path = os.path.join(path, item)
    with open(item_path, mode='rb') as f:
        reader = PdfFileReader(f)
        for page in reader.pages:
            pass
        text = page.extractText()#.encode('utf-8')
        mytext.append(text)
        print(text)
        text = text.split()
        print(text)
```

Extract/Split text + Word list

Line 144: Extract and Split the text from the Opening statements



Line 175: import CSV file and create word list

Download required packages & Data cleaning (NLP)

Line 187: Download all packages needed

```
187 # In[ ]: From Loukas Download packages for analysis
188     #ANALYSIS
189 import nltk
190 nltk.download('punkt')
191 nltk.download('wordnet')
192 from nltk import sent_tokenize, word_tokenize
193 from nltk.stem.snowball import SnowballStemmer
194 from nltk.stem.wordnet import WordNetLemmatizer
195 from nltk.corpus import stopwords
196 from nltk.tag import pos_tag
197
198 import pandas as pd
199 import numpy as np
200 import re
201 #pip install spacy
202 import spacy
203
204 nlp = spacy.load('en_core_web_lg')
205
206 import spacy
207 from spacy.lang.en.examples import sentences
208
209 nlp = spacy.load("en_core_web_sm")
```

Line 211: Data cleaning

```
211     # Data Cleansing
212 df2=pd.DataFrame(words)
213 df3=df2[0] #To extract the words from the Column 0 (The name of the column that includes words is 0)
214
215 all_sentences = []
216
217 for word in df3:
218         all_sentences.append(word)
219
220 all_sentences
221 #df1 = df.to_string()
222 #df_split = df1.split()
223 #df_split
224
225 lines = list()
226 for line in all_sentences:
227     words = line.split()
228     for w in words:
229         lines.append(w)
230 print(lines)
```

To gather all the words from the word list

```
Console 1/A
"'stakeholder',", "'collaboration',", "'and',", "'a',", "'source',", "'of',",
"'innovation',", "'and',", "'new',", "'ideas',", "'for',", "'climate',", "'action.',",
"'14.',", "'a',", "'great',", "'opportunity',", "',',", "'not',", "'just',", "'to',",
"'richly',", "'excha',", "'nge',", "'of',", "'views',", "',',", "'but',", "'to',", "'m',",
"'ak',", "'e',", "'bold',", "'decisions',", "'that',", "'will',", "'spur',",
"'accelerated',", "'climate',", "'action',", "'and',", "'enable',", "'us',", "'achieve',",
"'the',", "'goals',", "'of',", "'the',", "'paris',", "'agreement.',", "'thank',", "'you',",
"'all',", "'.']", 'COP26', 'opening', 'plen', 'a', 'ry', 'Statement', 'by', 'the', 'Farmers',
'Constituency', 'My', 'name', 'is', 'Jyoti', 'Fernandes', 'and', 'I', 'am', 'speaking', 'on',
'behalf', 'of', 'the', 'farmers', 'constituency.', 'O', 'ur', 'partic', 'i', 'pation', 'in',
'this', 'process', 'is', 'instrumental', 'in', 'raising', 'global', 'climate', 'ambition',
'for', 'our', 'sector', ',', 'untapping', 'the', 'great', 'potential', 'that', 'a',
'griculture', 'and', 'its', 'people', 'ha', 've', 'in', 'the', 'fight', 'against', 'climate',
'change.', 'W', 'e', 'want', 'to', 'see', 'the', 'Paris', 'Agreement', 'implemented', 'in',
'full', 'so', 'that', 'the', 'necessary', 'enabling', 'framework', 'and', 'architectures',
'move', 'us', 'forward', 'towards', 'a', 'better', 'fu', 'ture', 'for', 'the', 'hundreds',
'of', 'millions', 'of', 'farmers', 'across', 'the', 'world', 'who', 'are', 'on', 'the',
'front', 'line', 'of', 'this', 'global', 'climate', 'emergency', 'and', 'for', 'us', 'all',
'because', 'we', 'depend', 'on', 'the', 'food', 'they', 'produce.', 'We', 'want', 'to',
'see', 'inclusive', 'and', 'ambitious', 'NDCs', 'that', 'deliver', 'on', ';', 'th', 'at',
'lead', 'to', 'investment', 'in', 'research', ',', 'innovation', 'and', 'tec', 'hnology',
'transfer,', 'in', 'extension', 'services', 'and', 'capacity', 'building', ',', 'and', 'to',
'ambitious', 'financial', 'frameworks', 'to', 'support', 'a', 'just', 'transition', 'and',
'a', 'dynamic', 'agricultural', 'sector.', 'O', 'nly', '15%', 'of', 'climate', 'finance',
'has', 'been', 'allocated', 'to', 'agriculture', '.', 'This', 'imbalance', 'must', 'be',
'addressed.', 'This', 'means', 'that', 'decisions', 'must', 'be', 'made.', 'Farmers',
'understand', 'the', 'difficulty', 'in', 'making', 'decisions', 'in', 'the', 'face', 'of',
'complexity', '.', 'They', 'do', 'this', 'every', 'day', '.', 'They', 'have', 'to',
'because', 'they', 'know', 'that', 'the', 'weather', 'and', 'the', 'planet', 'wait', 'for',
'no', 'person.', 'We', 'are', 'the', 'key', 'to', 'unlocking', 'inclusive,', 'equitable,',
'sustainable', 'and', 'resilient', 'food', 'systems', 'and', 'economies', 'with', 'f',
'armers', 'of', 'all', 'shapes', 'and', 'sizes', 'at', 'their', 'heart', 'and', 'which',
'leave', 'no', 'farmer', 'behind', '.', 'F', 'armers', 'organi', 's', 'ations', 'and',
'agricultural', 'cooperatives', 'provide', 'a', 'strong', 'foundation', 'on', 'which', 'to',
```

N.B. We installed spacy sm and lg model before (source: `https://anaconda.org/conda-forge/spacy-model-en_core_web_sm`)

From line 288: Data Visualization (NLP)

1. Counting words

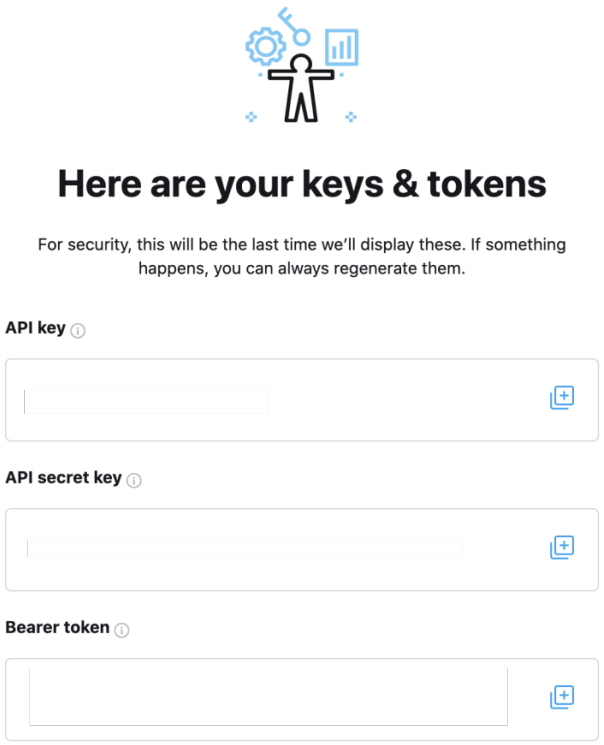
```
288  # In[ ]: VISUALIAZTION
289
290  #count words again with nltk
291
292  df = df2[0].value_counts()
293
294  #df
295  #df['freq'] = df.groupby(0)[0].transform('count')
296  #df['freq'] = df.groupby(0)[0].transform('count')
297  #df.sort_values(by = ('freq'), ascending=False)
298  #This will give frequencies of our words
299
300  from nltk.probability import FreqDist
301
302  freqdoctor = FreqDist()
303
304  for words in df:
305      freqdoctor[words] += 1
306
307  freqdoctor
```

2. Creating plot with top overall words

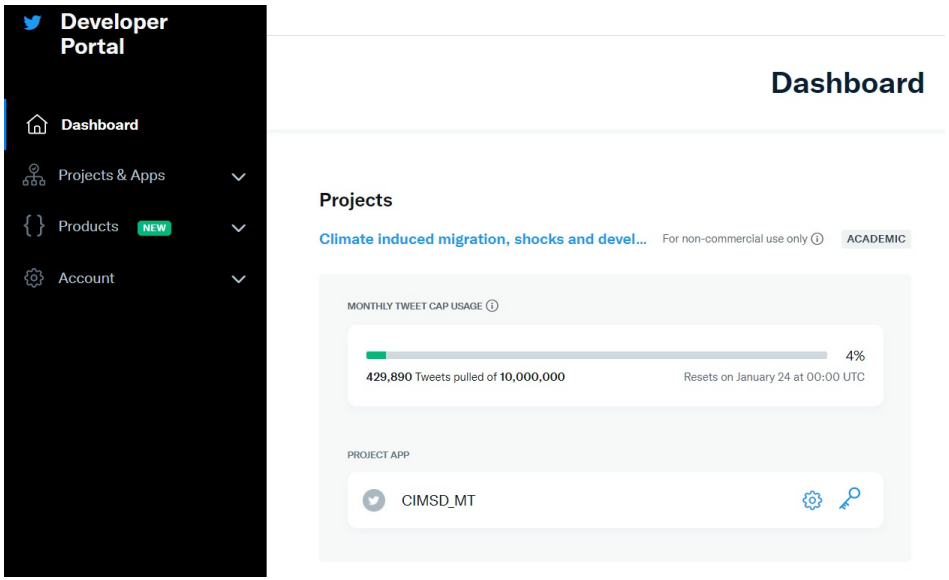
```
309  ##plot
310
311  import matplotlib.pyplot as plt; plt.rcdefaults()
312  import numpy as np
313  import matplotlib.pyplot as plt
314  import seaborn as sns
315
316  #This is a simple plot that shows the top 20 words being used
317  #df.plot(20)
318
319  df = df[:20,]
320  plt.figure(figsize=(10,5))
321  sns.barplot(df.values, df.index, alpha=0.8)
322  plt.title('Top Words Overall')
323  plt.ylabel('Word from Opening Statements', fontsize=12)
324  plt.xlabel('Count of Words', fontsize=12)
325  plt.show()
```

Twitter Scraping: Pre-requisites

To extract tweets you need to apply at *https://developer.twitter.com/en/products/twitter-api/academic-research* and present your project



Which will give you a bearer token, that will allow you to program Python queries to obtain information from Twitter



Packages and Environment variables

Required Packages:

```
# -- coding: utf-8 --
import pandas as pd
import requests
import time
```

Line 24: Put the previously obtained bearer token The 'headers' object uses the token and returns headers we will use for scraping.

```
23  #BEARER TOKEN
24  bearer_token = "-"
25  #CREATE URL
26  search_url = "https://api.twitter.com/2/tweets/search/all"
27  #CREATE HEADERS
28  headers = {"Authorization": "Bearer {}".format(bearer_token)}
29
```

Scraping

By using the requests package, execute queries on the desired keywords, and set specific days to concentrate on days of the COP meeting, among other settings

```
query_params = {'query': 'lang:en (cop26)',
            'start_time': {},
            "end_time": yesterday.isoformat("T") + "Z",
            'max_results': 500,
            'expansions': 'author_id,in_reply_to_user_id,geo.place_id',
            'tweet.fields': 'id,text,author_id,in_reply_to_user_id,geo,conversation_id,created_at
            'user.fields': 'id,name,username,created_at,description,public_metrics,verified',
            'place.fields': 'full_name,id,country,country_code,geo,name,place_type'}
```

Store the results for the analysis

```
        #Creating a list of responses from the scrapping
        response = requests.request("GET", search_url, headers=headers, params=query_params)
        #Technical threshold to avoid potential errors in the process
        if response.status_code == 429:
            time.sleep(60)
            response = requests.request("GET", search_url, headers=headers, params=query_params)
        #Falsification like text (Automatically python sends back an error if response code!=200)
        if response.status_code != 200:
            raise Exception(response.status_code, response.text)
        #The "clean" responses are saved in a different list (in JSON format)
        r = response.json()
        #Saving the scrapped data as text
        for e in r["data"]:
            #print(e["text"])
            mytext.append(e["text"])
    #Dataframing the text, with the help of Panda, in order to be saved in an editing format whether in csv or in xlsx
    df = pd.DataFrame(r["data"]) #correct one
    #Exporting data in an Excel and/or csv
    df.to_excel("twitterscraping.xlsx")
    df.to_csv("twitterscraping.csv")
```

NLP-Step 1: Importing packages and loading spacy model

Required packages:

```
#ANALYSIS
import nltk
nltk.download('punkt')
nltk.download('wordnet')
from nltk.stem.snowball import SnowballStemmer
import pandas as pd
import re
import spacy
nlp = spacy.load('en_core_web_lg')
```

Split the tweets into lines...

Inde	Type	Size	Value
0	str	127	The latest Architects News from piqu! https://t.co/W1ZTwuloQ0 Thanks t ...
1	str	195	Caroline May and Charles Winch contributed an article published in Law ...
2	str	223	If @ScotGovFM was THAT CONCERNED as she claims. The Louisa Jordan woul ...
3	str	278	Tracking today: US @CommerceGov holds civil nuclear trade advisory com ...
4	str	143	The latest Journal of #Sustainability #CSR & #Marketing! https://t ...
5	str	101	Syria: How an ecological disaster can unfold in mere decades.

NLP-Step 2: Stemming + Removing Stop words

Remove RT (Retweet acronyms)

```python
lines = [re.sub(r'[^A-Za-z0-9]+', '', x) for x in lines]

lines

lines2 = []

for word in lines:
    if word != '':
        lines2.append(word)

#Removing RT (Retweet condition within tweet)
for word in lines:
    if word == 'RT':
        lines2.remove(word)

```

Stem words to their root

```python
#This is stemming the words to their root
from nltk.stem.snowball import SnowballStemmer

# The Snowball Stemmer requires that you pass a language parameter
s_stemmer = SnowballStemmer(language='english')

stem = []
for word in lines2:
    stem.append(s_stemmer.stem(word))

stem

#Part 3
#Removing all Stop Words
import spacy
nlp = spacy.load('en_core_web_lg')
stem2 = []

for word in stem:
    if word not in nlp.Defaults.stop_words:
        stem2.append(word)

```

Remove all Stop words

```python
import spacy
nlp = spacy.load('en_core_web_lg')
stem2 = []

for word in stem:
    if word not in nlp.Defaults.stop_words:
        stem2.append(word)

stem2
```

NLP-Step 3: Count words and Visualization

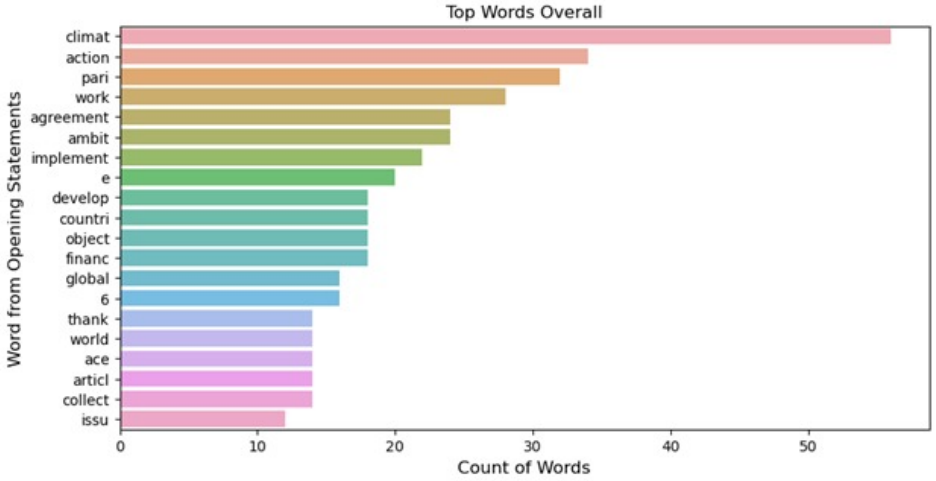
Count word frequency

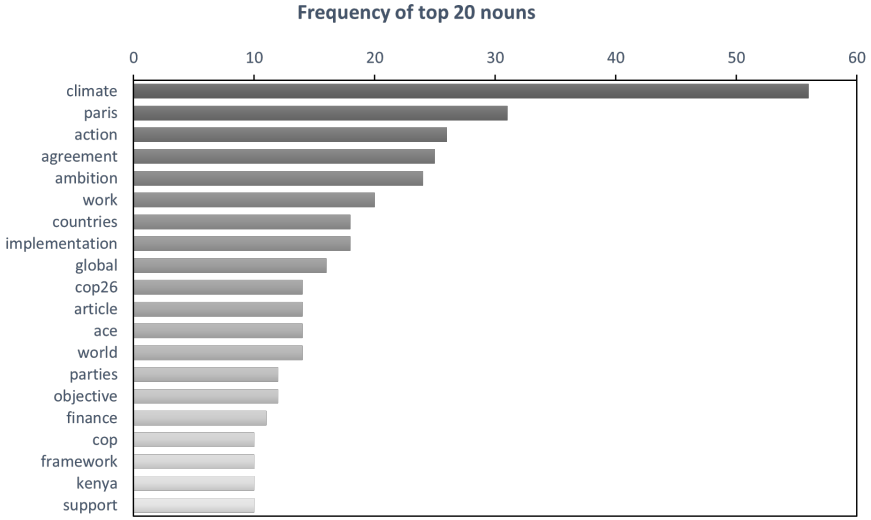
```
from nltk.probability import FreqDist

freqdoctor = FreqDist()

for words in df:
    freqdoctor[words] += 1

freqdoctor
```

Create and label graphs

```
df7 = df7['Word'].value_counts()
df = df7[:20,]
plt.figure(figsize=(10,5))
sns.barplot(df.values, df.index, alpha=0.8)
plt.title('Top Organizations Mentioned')
plt.ylabel('Word from Tweet', fontsize=12)
plt.xlabel('Count of Words', fontsize=12)
plt.show()
```

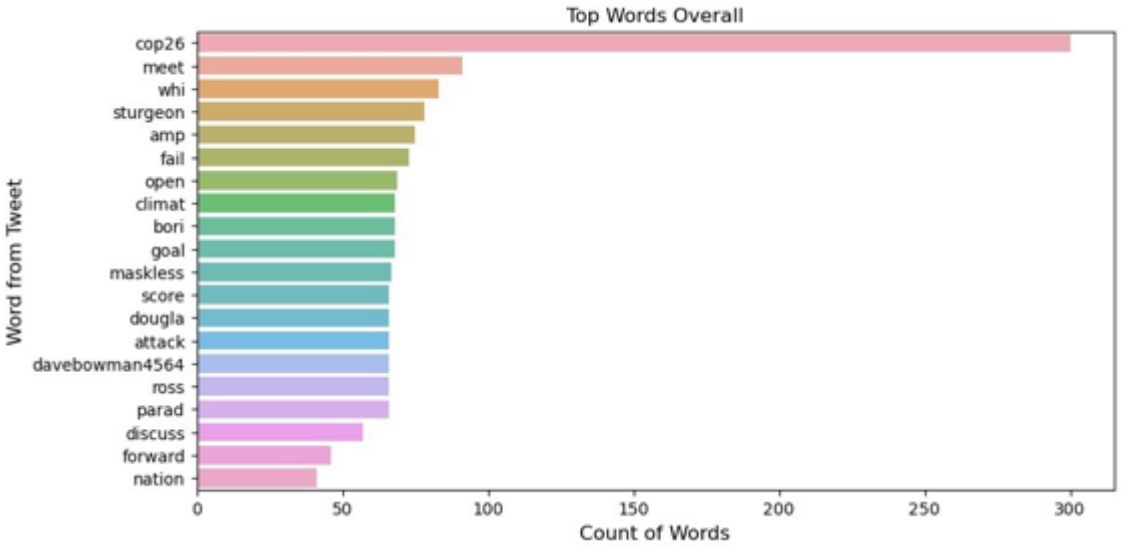
PDF Graphs

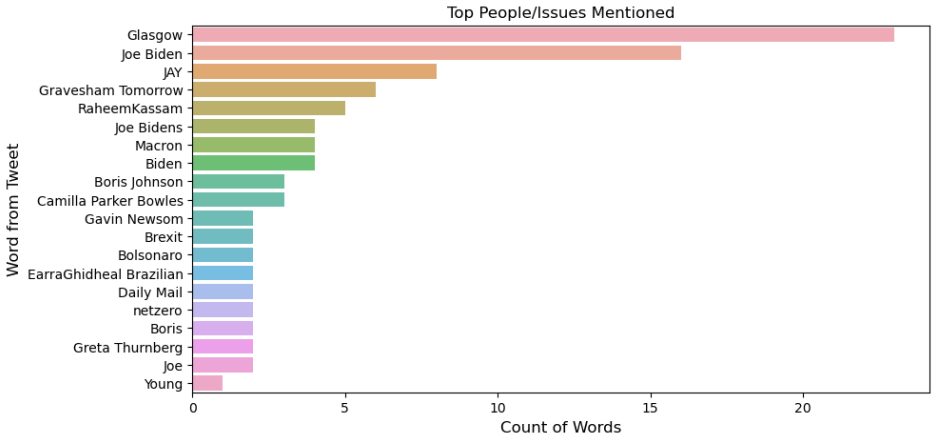


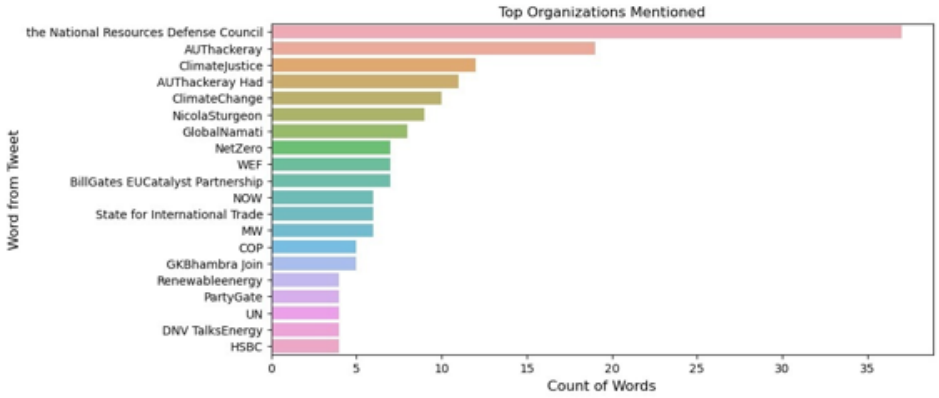


Note: Excel post-editing

Twitter Graphs







Analysis

PDF Scraping

- Climate (56) is the most used noun with a lead of 25 words, which is in line with one's expectantions for speeches at the COP26
- Top words like action (26), agreement (25), implemenation (18) and article (14) characterize, at least formally, a strongly solution-oriented approach
- Negative words like devastating (4), damage (4), emergency (2), disaster (2) or instability (2) are used very rarely indicating a reluctance of producing unpleasant emotions
- The relatively frequent use of the country name Kenya (10) seems to be idiosyncratic, as the next country name in the ranking is India (2) with a much lower frequency

Twitter Scraping

- At first glance, we observe a diverse composition of apparently unrelated and incomplete Twitter keywords
- Presumably, this is a result of the high variety of differing motives behind each and every individual tweet
- While top words like "fail" and "attack" can typically characterize a complaining Twitter user, they also create the impression of a rather high degree of pessimism most likely deriving from low expectations for the outcome of cop26
- The relatively frequent use of the word "maskless" in relation to cop26, suggests that twitter users might observe and even criticize a loose enforcement of mask rules among cop26 participants

Word-Cloud: A duality ? (using wordart.com)

PDF

Twitter

Merci!

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