Jason Scott's favorite 100 - data analysis using NLP

Mini-Project in the ABC of Computational Text Analysis

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Date: 26. May 2021

Preparations [R1]

The following lines of code is used for preparing our environment.

In [1]:
```
#!/usr/bin/env python3
# -*- coding: utf-8 -*-

# load the necessary libraries

import sys
from pathlib import Path
import textacy
import spacy
import re
import itertools
import numpy as np

import scattertext as st
import pandas as pd

from pathlib import Path
from plotnine import *
import textacy.vsm

project_path = Path.cwd().parent

# prepare to load project specific libraries
module_path = str(project_path / "py/")
if module_path not in sys.path:
    sys.path.append(module_path)

# import data_wrangler module
from modules import data_wrangler
from modules import helpers
```

Data Wrangling [R2]

In this section the required data is downloaded and preprocessed (f.E. unzipped). The module data_wrangler will be used for this.

In [2]:
```
data_url = "http://archives.textfiles.com/100.zip"
data_name = "" #use 100 to only analize the top100 files
data_dir = str(project_path / "data/")
tmp_dir = str(project_path / ".tmp/")

dw = data_wrangler.DataWrangler(tmp_dir, data_dir)

dw.process_zip(data_url, data_name)
```

Analisis [R3]

Preliminary Clarifications [R3.1]

In [3]:
```
# preparation for manual analisis [R3.1.1]

# read textfiles
dataset = dw.get_texts(data_dir + "/" + data_name)

# write metadata to csv file
```

```
f = open("top100_generated.csv", "w+")
for item in dataset:
    f.write(item[1]["name"]+","+
            str(item[1]["length"])+","+
            str(item[1]["length_raw"])+","+
            str(item[1]["avgcolumnsize"])+","+
            str(item[1]["charratioA"])+","+
            str(item[1]["charratioB"])+","+
            str(item[1]["year"])+","+
            str(item[1]["eyear"])+","+
            str(item[1]["lyear"])+","+
            str(item[1]["type"])+","+
            "\r\n")
f.close()
```

Create Textcorpora [R3.2]

In [4]:
```
# read textfiles
dataset = dw.get_texts(data_dir + "/" + data_name)

en = textacy.load_spacy_lang("en_core_web_sm")

# create corpus from processed documents
corpus = textacy.Corpus(en, data=dataset)
```

Create Subcorpora [R3.3]

In [5]:
```
# function to filter by metadata: filter invalid filenames
def filter_by_name(doc):
    return doc._.meta.get("name") != "index.html" and doc._.meta.get("name") != ".ztr-directory"

# function to filter by metadata: filter files that contain less than 50% A-z characters
def filter_by_charratio(doc):
    return doc._.meta.get("charratioA") > 0.5

# create new corpus after applying filter function
subcorpustemp = textacy.corpus.Corpus(en, data=corpus.get(filter_by_name))
subcorpus = textacy.corpus.Corpus(en, data=subcorpustemp.get(filter_by_charratio))
```

Wordcount [R3.4]

In [6]:
```
# get lowercased and filtered corpus vocabulary (R3.3.1)
vocab = subcorpus.word_counts(as_strings=True, normalize= 'lower', filter_stops = True, filter_punct

# sort vocabulary by descending frequency
vocab_sorted = sorted(vocab.items(), key=lambda x: x[1], reverse=True)

# write to file, one word and its frequency per line
fname = './analysis/vocab_frq.txt'
with open(fname, 'w') as f:
    for word, frq in vocab_sorted:
        line = f"{word}\t{frq}\n"
        f.write(line)

vocab_sorted[:25]
```

Out[6]:
```
[('computer', 1267),
 ('system', 932),
 ('like', 822),
 ('people', 813),
 ('time', 715),
 ('new', 646),
 ('use', 576),
 ('phone', 555),
 ('program', 554),
 ('number', 537),
 ('t', 501),
 ('real', 497),
 ('software', 492),
 ('service', 489),
 ('know', 468),
 ('bbs', 452),
 ('information', 445),
 ('file', 430),
 ('hackers', 410),
 ('board', 408),
 ('x', 406),
 ('code', 401),
 ('way', 397),
 ('boards', 391),
 ('systems', 390)]
```

Export to CSV [R3.5]

In [7]:
```
# merge metadata and actual content for each document in the corpus
# ugly, verbose syntax to merge two dictionaries
data = [{**doc._.meta, **{'text': doc.text}} for doc in subcorpus]

# export corpus as csv
f_csv = './analysis/subcorpus.csv'
textacy.io.csv.write_csv(data, f_csv, fieldnames=data[0].keys())
```

Load CSV file [R3.6]

In [8]:
```
# read dataset from csv file
f_csv = './analysis/subcorpus.csv'
df = pd.read_csv(f_csv)

df_sub = df[(df['text'].str.len() > 10)]

# make new column containing all relevant metadata (showing in plot later on)
df_sub['descripton'] = df_sub[['name', 'year', 'charratioA', 'avgcolumnsize']].astype(str).agg(', '.

# sneak peek of dataset
df_sub.head()
```

Out[8]:

	name	length_raw	length	avgcolumnsize	charratioA	charratioB	year	eyear	lyear	type	
0	declarationbarlow1996.txt	5089	5089	252.70	4.08	114.66	1996	1996	1996	declaration	A Declar (Independ Cybers
1	peat.hum	532	521	56.67	2.13	8.33	nd.	nd.	nd.	textfile	When we to dra out (pea
2	killsant.hum	3497	3410	57.29	1.60	5.27	1994	1994	1994	textfile	
3	pezrambl.oct	20975	20660	68.49	1.83	9.33	1987-1987	1987	1987	textfile	——— — ——— —— –
4	warning.hum	2537	2492	71.97	1.23	4.46	nd.	nd.	nd.	textfile	

Scattertext Plot [R3.7]

In [9]:
```
# import with a short name
import scattertext as st
import pandas as pd

# import all specific/all objects from a module
from pathlib import Path
from plotnine import *
import textacy.vsm

censor_tags = set(['CARD']) # tags to ignore in corpus, e.g. numbers

# stop words to ignore in corpus
en_stopwords = spacy.lang.en.stop_words.STOP_WORDS # default stop words
custom_stopwords = set(['[', ']', '%'])
en_stopwords = en_stopwords.union(custom_stopwords) # extend with custom stop words

# create corpus from dataframe
# lowercased terms, no stopwords, no numbers
# use lemmas for English only, German quality is too bad
corpus_speeches = st.CorpusFromPandas(df_sub, # dataset
                             category_col='type', # index differences by ...
                             text_col='text',
                             nlp=en, # German model
                             feats_from_spacy_doc=st.FeatsFromSpacyDoc(tag_types_to_censor=censor_ta
                             ).build().get_stoplisted_unigram_corpus(en_stopwords)

# produce visualization (interactive html)
```

```
html = st.produce_scattertext_explorer(corpus_speeches,
            category='declaration', # set attribute to divide corpus into two parts
            category_name='declaration',
            not_category_name='textfiles',
            metadata=df_sub['descripton'],
            width_in_pixels=1000,
            minimum_term_frequency=5, # drop terms occurring less than 5 times
            save_svg_button=True,
)

# write visualization to html file
fname = "../public/viz_declaration_textfiles.html"
open(fname, 'wb').write(html.encode('utf-8'))
```

```
Out[9]: 4750122
```

Docs per Year [R3.8]

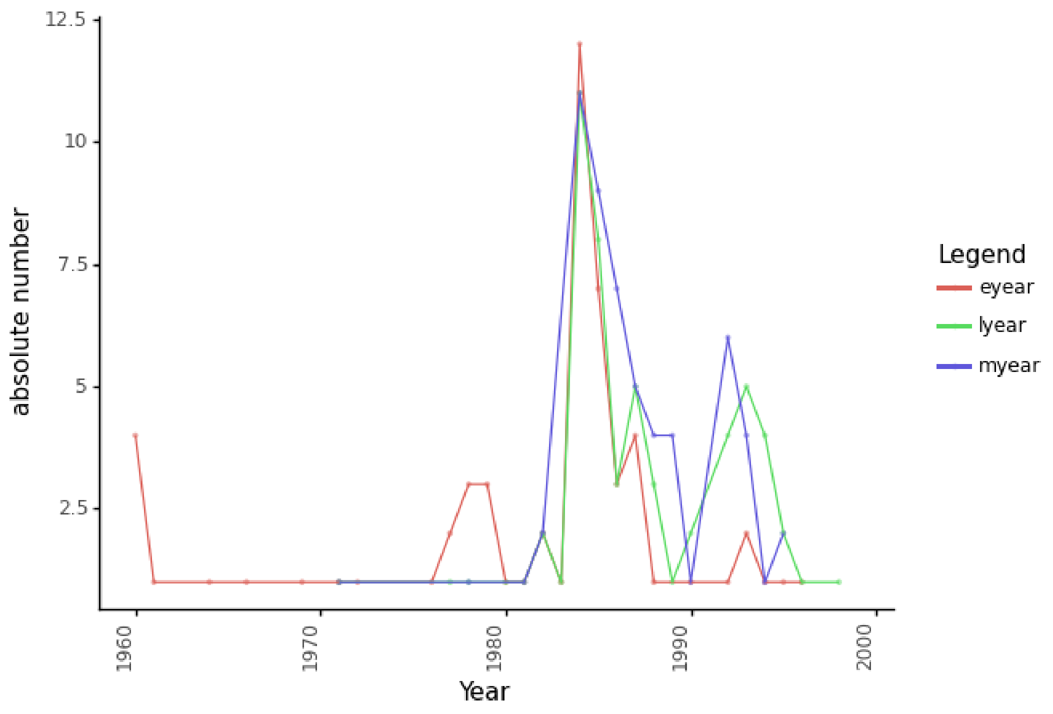
```
In [10]: dtmp = df_sub.groupby('eyear').agg({'text': "count" }).reset_index().rename(columns={'text':'count'}
dtmp = dtmp.rename(columns={"eyear": "year"})
dtmp.insert(2,"type","eyear")
docs_per_year = dtmp

dtmp = df_sub.groupby('lyear').agg({'text': "count" }).reset_index().rename(columns={'text':'count'}
dtmp = dtmp.rename(columns={"lyear": "year"})
dtmp.insert(2,"type","lyear")
docs_per_year = docs_per_year.append(dtmp, ignore_index=True)

dtmp = pd.read_csv('top100_years.txt', delimiter = ",").groupby('myear').agg({'text': "count" }).res
dtmp = dtmp.rename(columns={"myear": "year"})
dtmp.insert(2,"type","myear")
docs_per_year = docs_per_year.append(dtmp, ignore_index=True)

docs_per_year = docs_per_year[docs_per_year["year"] != "nd."]
docs_per_year['year'] = pd.to_numeric(docs_per_year['year'])

(ggplot(docs_per_year, aes('year', 'count', color='type', group='type'))
 + geom_point(alpha=0.5, stroke = 0)
 + geom_line()
 + theme_classic()
 + labs(x = "Year",
        y = "absolute number",
        color = "Legend")
 + theme(axis_text_x = element_text(angle = 90, hjust = 1))
 + scale_x_continuous(limits = (1960,1999))
)
```



```
Out[10]: <ggplot: (8737743464162)>
```

Correlations for docs per year

In [11]:
```
# sorry for ugly...
dummy = pd.DataFrame([{"year":1960, "count": 0},
                      {"year":1961, "count": 0},
                      {"year":1962, "count": 0},
                      {"year":1963, "count": 0},
                      {"year":1964, "count": 0},
                      {"year":1965, "count": 0},
                      {"year":1966, "count": 0},
                      {"year":1967, "count": 0},
                      {"year":1968, "count": 0},
                      {"year":1969, "count": 0},
                      {"year":1970, "count": 0},
                      {"year":1971, "count": 0},
                      {"year":1972, "count": 0},
                      {"year":1973, "count": 0},
                      {"year":1974, "count": 0},
                      {"year":1975, "count": 0},
                      {"year":1976, "count": 0},
                      {"year":1977, "count": 0},
                      {"year":1978, "count": 0},
                      {"year":1979, "count": 0},
                      {"year":1980, "count": 0},
                      {"year":1981, "count": 0},
                      {"year":1982, "count": 0},
                      {"year":1983, "count": 0},
                      {"year":1984, "count": 0},
                      {"year":1985, "count": 0},
                      {"year":1986, "count": 0},
                      {"year":1987, "count": 0},
                      {"year":1988, "count": 0},
                      {"year":1989, "count": 0},
                      {"year":1990, "count": 0},
                      {"year":1991, "count": 0},
                      {"year":1992, "count": 0},
                      {"year":1993, "count": 0},
                      {"year":1994, "count": 0},
                      {"year":1995, "count": 0},
                      {"year":1996, "count": 0},
                      {"year":1997, "count": 0},
                      {"year":1998, "count": 0},
                      {"year":1999, "count": 0}])

m = dummy.append(docs_per_year[docs_per_year['type'] == "myear"][["year","count"]]).groupby('year').
e = dummy.append(docs_per_year[docs_per_year['type'] == "eyear"][["year","count"]]).groupby('year').
l = dummy.append(docs_per_year[docs_per_year['type'] == "lyear"][["year","count"]]).groupby('year').
```

In [12]:
```
print("r_{myear mit eyear} = ",np.corrcoef(m["count"], e["count"])[0, 1])
print("r_{myear mit lyear} = ",np.corrcoef(m["count"], l["count"])[0, 1])
```

```
r_{myear mit eyear} =  0.7666121890473637
r_{myear mit lyear} =  0.91481657982525
```

Entities [R3.9]

In [13]:
```
entities = []

for doc in subcorpus.docs:
    for ent in textacy.extract.entities(doc):
        try:
            entities += [{"text": ent.text, "label": ent.label_, "explain":spacy.explain(ent.label_)
        except:
            print("Problem with:", doc._.meta["name"])

# export corpus as csv
f_csv = './analysis/entities.csv'
textacy.io.csv.write_csv(entities, f_csv, fieldnames=entities[0].keys())
```

```
Problem with: top10.news
Problem with: hack11a.txt
Problem with: hack11a.txt
Problem with: hack11a.txt
Problem with: hack11a.txt
Problem with: hack11a.txt
Problem with: famous.bug
Problem with: purity.txt
Problem with: utopia.hum
Problem with: dec.wars
Problem with: dec.wars
Problem with: krckwczt.app
```

In [14]:
```
#df_sub.groupby('eyear').agg({'text': "count" }).reset_index().rename(columns={'text':'count'})
```

```
df_entities = pd.DataFrame(entities,columns=['text','label','explain'])
df_entities_count = df_entities.groupby('text').agg({'label': "count"}).rename(columns={'label':'cou


# write to file, one word and its frequency per line
fname = './analysis/entities_frq.csv'
with open(fname, 'w') as f:
    for i, d in df_entities_count.iterrows():
        line = d["text"]+","+str(d["count"])+"\n"
        f.write(line)

df_entities_count[:25]
```

Out[14]:

	text	count
0	one	426
1	first	359
2	two	302
3	1	285
4	2	260
5	3	223
6	10	172
7	24	170
8	IBM	170
9	4	165
10	5	149
11	Secret Service	132
12	American	124
13	second	113
14	three	105
15	Bell	104
16	20	100
17	One	89
18	6	86
19	8	84
20	Kapor	83
21	today	82
22	12	81
23	Neidorf	76
24	America	74