Execise1

February 23, 2024

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```
import pandas as pd
import numpy as np
import re
import matplotlib.pyplot as plt
from collections import Counter
from cleantext import clean
import nltk
pd.set_option('display.width', 120)
#The prints of the data has been commented out such that the resulting pdf␣
 ↪would not be huge
#Simply uncomment them in their respective cells to see the effects of cleaning␣
 ↪and execute
#All the cells
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#Part 1
#a)
cpr_example_data = '''140598-1773
1405981773
1209445676'''

#Compiling the regex to get the matching pattern
pattern = re.compile(r"(0[1-9]|[12][0-9]|3[01])(0[1-9]|1[1,2])([0-9][0-9])-?
 ↪([0-9][0-9][0-9][0-9])")

# Iterating through the data
for cpr in cpr_example_data.split():
    #Checking if there is a match with our pattern object
    match = pattern.match(cpr)
    #Printing the CPR-number if there is a match, as well as the 4 groups␣
 ↪(dd),(mm),(yy),(llll)
    if match:
        print(cpr)
        print(match.groups())

#b)
def relevant_century(llll, yy):
    '''Given the last 4 digits of a CPR and the 2-digits signifying the year
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    return the relevant centure as of the table given in the assignment text. The function
    assumes correct input is given'''
    if llll in range(4000) and yy in range(100):
        return 1900
    if llll in range(4000, 5000) and yy in range(37):
        return 2000
    if llll in range(4000, 5000) and yy in range(37, 99):
        return 1900
    if llll in range(5000, 9000) and yy in range(58):
        return 2000
    if llll in range(5000, 9000) and yy in range(58, 100):
        return 1800
    if llll in range(9000, 10000) and yy in range(37):
        return 2000
    if llll in range(9000, 10000) and yy in range(37, 100):
        return 1900

#Example usage of relevant_century the function:
print('Example usage of relevant_century: ', relevant_century(1773, 98))
```

```
140598-1773
('14', '05', '98', '1773')
1405981773
('14', '05', '98', '1773')
1209445676
('12', '09', '44', '5676')
Example usage of relevant_century:  1900
```

[ ]:
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#1.
#Reading the CSV-file into a data-frame
news_data = pd.read_csv("news_sample.csv")
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#2.
#The data has completely empty columns which i remove. Also when i inspected the data i found
#the contents column to contain the most data and it is super unstructured (mainly due to
#crazy spacing between paragraphs and such). I fix this following the steps provided for (3.)

#Dropping completely empty columns
news_data = news_data.dropna(axis=1, how='all')

#Extracting the data of interest namely the content column:
content_column = news_data['content']
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# print(content_column)
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#3.
'''I assume we're supposed to clean the data in the 'content' column since
it is the data that would be the most interesting to clean. Thus the input to␣
 ↪the method
 should be each element in the content_column.'''

def clean_text(raw_text):
    '''Function for cleaning the raw_text input data'''

    # making all the words in the text lowercase
    raw_text = raw_text.lower()

    #Replacing multiple whitespaces, tabs or newlines with single whitespace
    raw_text = re.sub(r'\s+', ' ', raw_text)

    #Replaces numbers of for example the format: $3,500 with <NUM>
    raw_text = re.sub(r'\$?\d+,?\d+', '<NUM>', raw_text)

    #Replaces dates of for example the format (which is present in the data):
    # January 24, 2018 with <DATE>
    raw_text = re.sub(r'\b(\w+\s)(\d{2})(th)?,?(\s\d{4})\b', '<DATE>', raw_text)

    #replacing emails of for example the format (which is present in the data):
    # info@treadwells-london.com with <EMAIL>
    # and my own emil.oerum@hotmail.com
    raw_text = re.sub(r'\b\w+\W?\w*@\w+\W?\w+\.\w{2,3}\b', '<EMAIL>', raw_text)

    #replacing URL's of for example the format (which is present in the data):
    # https://www.treadwells-london.com/ with <URL>
    # as well as many others with only http (no s) or no prefix at all.
    raw_text = re.sub(r'(https?://)?(www\.)?\w+-?\.?\w+\.\w{2,3}/?', '<URL>',␣
 ↪raw_text)

    return raw_text


#Applying the our clean_text() function to each element
#in the 'content' column in our dataframe:
content_column_cleaned = content_column.apply(clean_text)

# print(content_column_cleaned)
```

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#4
#Using the clean-text module to clean the data:
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#Reading in the data to a dataframe once again to not interfere with the␣
 ↪manually
#cleaned data
news_data2 = pd.read_csv('news_sample.csv')
content_column2 = news_data2['content']

#Calling the clean function from the clean-text module with the appropriate␣
 ↪arguments
# to achieve similar functionality as the manually created clean-text function.
# this however does not support substitution of dates in the data
content_column2_cleaned = content_column2.apply(lambda x : clean(x,
    lower=True,
    no_line_breaks=True,
    no_urls=True,
    no_emails=True,
    no_numbers=True,
    no_currency_symbols=True,
    no_punct=True,
    replace_with_punct="",
    replace_with_url="_URL_",
    replace_with_email="_EMAIL_",
    replace_with_number="_NUM_",
    replace_with_currency_symbol="_CUR_",
    lang="en"  ))

# print(content_column2_cleaned)
```

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#Part 3
#1.
'''Calculating the number of unique words in the data after preprocessing and␣
 ↪comparing it to
# the number of unique words before preprocessing (i.e. in the raw data):

#We can use the Counter module to do this - to make this easier we need to␣
 ↪tokenize the
#content_column using the nltk library:'''

#Calculating the number of unique words in the data after preprocessing:

#Tokenization
content_column2_cleaned_and_tokenized = content_column2_cleaned.apply(lambda x:␣
 ↪nltk.word_tokenize(x))

#Creating series of dictionaries containing words and their frequencies
word_frequency_preprocessed = content_column2_cleaned_and_tokenized.
 ↪apply(lambda x: Counter(x))
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#Merging dictionaries into one
combined_counter_preprocessed = word_frequency_preprocessed.sum()

#Calculating the length aka the unique words after preprocessing:
unique_words_after_preprocessing = len(combined_counter_preprocessed)

print('Unique words after preprocessing: ', unique_words_after_preprocessing)

#Calculating the number of unique words in the data before preprocessing:

#Tokenization
content_column2_tokenized = content_column2.apply(lambda x : nltk.
 ↪word_tokenize(x))

#Creating series of dictionaries containing words and their frequencies
word_frequency_not_preprocessed = content_column2_tokenized.apply(lambda x:␣
 ↪Counter(x))

#Merging dictionaries into one
combined_counter_not_preprocessed = word_frequency_not_preprocessed.sum()

#Calculating the length aka the unique words before preprocessing:
unique_words_before_preprocessing = len(combined_counter_not_preprocessed)

print('Unique words before preprocessing: ', unique_words_before_preprocessing)

#2
'''Calculating how frequently each of these words is used in the dataset and
plotting the top 50 most frequent words in a bar plot (Both preprocessed and␣
 ↪not preprocessed) '''

#Sorting the counter object after the most common ones
sorted_word_frequency_preprocessed = combined_counter_preprocessed.most_common()

#Extracting the top 50 most common words
top_50_words_preprocessed = sorted_word_frequency_preprocessed[:50]

#unzipping the tuples in top_50_words_preprocessed containing the words and␣
 ↪their corresponding
#frequency into seperate values to be able to plot them
words_preprocessed, frequencies_preprocessed = zip(*top_50_words_preprocessed)

#Plotting
plt.subplot(2, 1, 1)
plt.bar(words_preprocessed, frequencies_preprocessed, color='green')
plt.xlabel('Words')
plt.ylabel('Frequency')
```

```
plt.title('Top 50 Most Frequent Words - Preprocessed')
plt.xticks(rotation=90)

#Sorting the counter object after the most common ones
sorted_word_frequency_not_preprocessed = combined_counter_not_preprocessed.
 ↪most_common()

#Extracting the top 50 most common words
top_50_words_not_preprocessed = sorted_word_frequency_not_preprocessed[:50]

#unzipping the tuples in top_50_words_preprocessed containing the words and␣
 ↪their corresponding
#frequency into seperate values to be able to plot them
words_not_preprocessed, frequencies_not_preprocessed =␣
 ↪zip(*top_50_words_not_preprocessed)

#Plotting
plt.subplot(2, 1, 2)
plt.bar(words_not_preprocessed, frequencies_not_preprocessed, color='red')
plt.xlabel('Words')
plt.ylabel('Frequency')
plt.title('Top 50 Most Frequent Words - Not Preprocessed')
plt.xticks(rotation=90)

plt.tight_layout()

plt.show()
```

```
Unique words after preprocessing:  16810
Unique words before preprocessing:  20947
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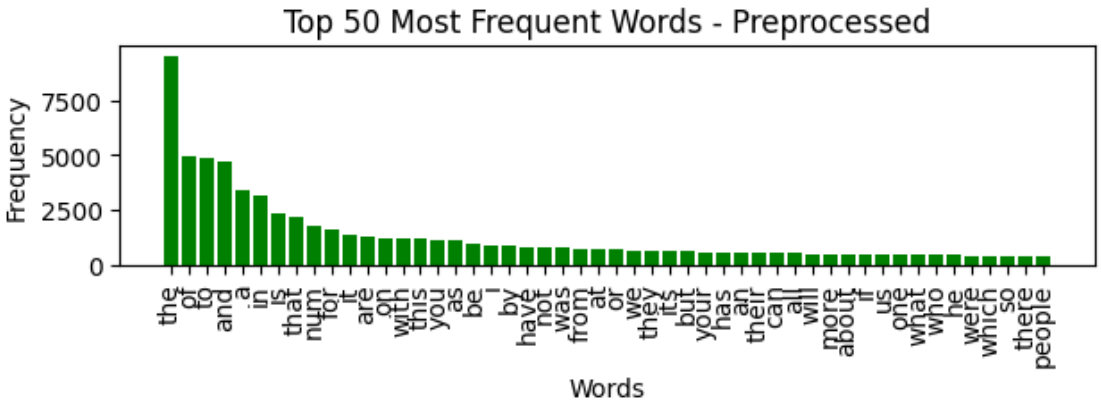
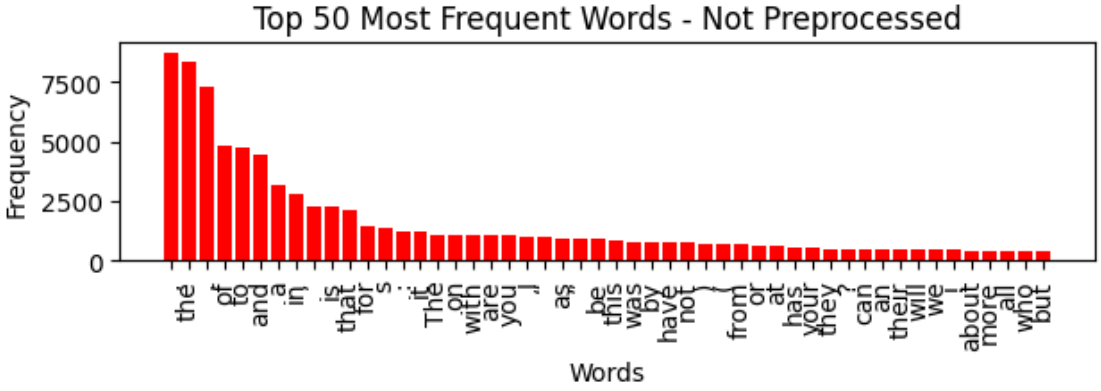

Top 50 Most Frequent Words - Preprocessed
Frequency
7500
5000
2500
0
the of to and a in is that num for it are on with this you as be I by have not was from at or we they it's but your has an their can all will more about if us one what who he were which so there people
Words


Top 50 Most Frequent Words - Not Preprocessed
Frequency
7500
5000
2500
0
the of to and a in is that for s . it The on with are you J , as " be this was by have not) (from or at has your they ? can an their will we I about more all who but
Words