Information Retrieval

Assignment 1 - Text Processing Functions

Due date: 4/19 at 11:59pm

This assignment is to be done individually. You cannot use code written by your classmates. Use code found over the Internet at your own peril - it may not do exactly what the assignment requests. If you do end up using code you find on the Internet, you must disclose the origin of the code. **Concealing the origin of a piece of code is plagiarism**. Use the discussion section on Canvas ("Questions about assignment #1" https://canvas.eee.uci.edu/courses/5075/discussion_topics/59851) for general questions whose answers can benefit you and everyone.

General Specifications

1. You can use any programming language. The next homework will use crawlers written in Python, so you may want to use this homework to brush up your knowledge of Python.
2. Make sure to break down your program into classes/methods/functions corresponding to the parts in this specification. They will be tested separately.
3. The function signatures in this specification are informal; their purpose is to explain the inputs and outputs of the methods.
4. At points, the assignment may be underspecified. In those cases, make your own assumptions and be prepared to defend them.

Part A: Word Frequencies (40 points)

Write a program that takes a text file as a command line argument and outputs the word frequency in decreasing order.

Briefly, implement the following functionality:
1. Read an input file passed as a command line argument
2. Tokenize the text of the file. A token is a sequence of alphanumeric characters, independent of capitalization (so *Apple*, *apple* are the same token)
3. Counts the number of occurrences of each word in the tokens generated
4. Print out the word frequency counts onto the screen. The print out should be ordered by decreasing frequency. (so, highest frequency words first). Resolve ties alphabetically.

Here is an example of an input file and corresponding output after computing the word frequency:

Input:

```
Here's a fun-fact! White tigers live mostly in "India".
Wild lions live mostly in "Africa".
```

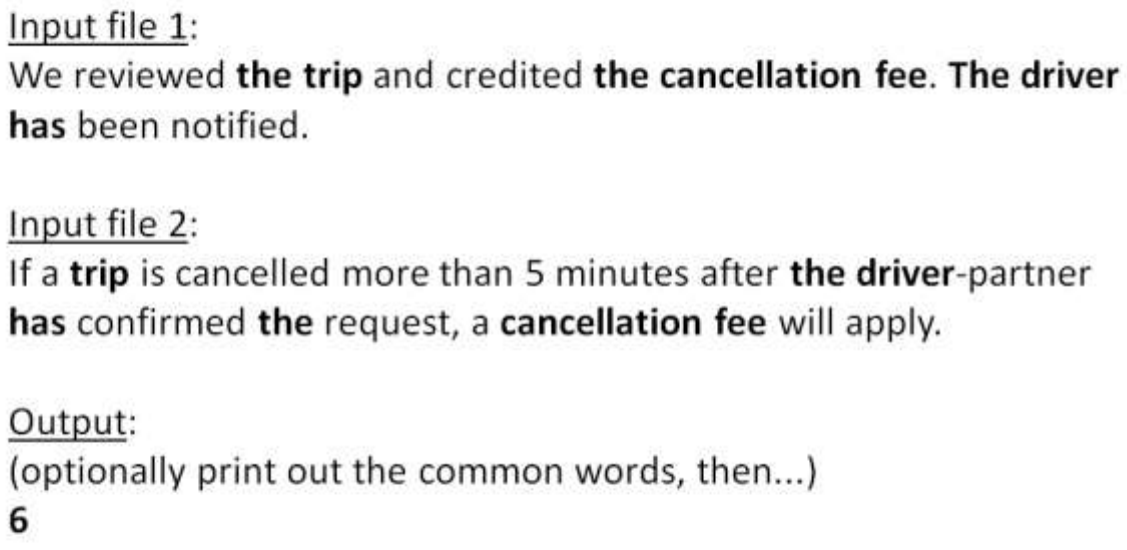
Output:

```
in – 2
live – 2
mostly – 2
a – 1
africa – 1
fact – 1
fun – 1
here – 1
india – 1
lions – 1
s – 1
tigers – 1
white – 1
wild – 1
```

The TA will provide a test text file during the f2f presentation. For this part, it is expected that your program will read this text file, tokenize it, count the tokens, and print out the word (token) frequencies in descending order.

Part B: Intersection of two files (60 points)

Write a program that takes two text files as arguments and outputs the number of tokens they have in common. Here is an example of input/output:



Input file 1:
We reviewed **the trip** and credited **the cancellation fee**. **The driver has** been notified.

Input file 2:
If a **trip** is cancelled more than 5 minutes after **the driver**-partner **has** confirmed **the** request, a **cancellation fee** will apply.

Output:
(optionally print out the common words, then...)
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You can reuse code you wrote for part A.

The TA will provide text files during the f2f presentation. Note that some of the text files may be VERY LARGE.

Once you have implemented your program, please perform an analysis of its runtime complexity: does it run in linear time relative to the size of the input? Polynomial time? Exponential time?

For this part, programs that perform better will be given more credit than those that perform poorly.

Submitting Your Assignment

Your submission should be a single zip file containing two programs, one for part A, the other for part B. Submit it to Canvas.

Grading Process

You will meet with the grader for about 10 minutes during the week starting on 4/20. During that meeting, be ready for the following:

1. Show your program running on your own computer, on an input file provided by the grader on a USB stick
2. Answer questions about your program (as submitted) and its behavior during the meeting

You should **not** continue to work on your program once you submit it to Canvas, as the TA will be looking at your submitted code.

Evaluation Criteria

Your assignment will be graded on the following four criteria.

1. Correctness (40%)
    a) How well does the behavior of the program match the specification?
    b) How does your program handle bad input?
2. Understanding (30%)
    a) Do you demonstrate understanding of the code?
3. Efficiency (30%)
    a) How quickly does the program work on large inputs?