School of Computer Science
University of Guelph

CIS*3490 The Analysis and Design of Algorithms

Winter 2022
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Assignment 4 Guide

Hints and suggestions for individual questions:

- For Q1.1, you can follow the algorithm on page 302 in the textbook. The algorithm is also on slide 33 in "08 Dynamic Programming". Slides 22 – 35 provide more details and examples.
- For Q1.1, your program output can be something like:

```
Enter a key: undergraduate
Compared with of (6.146), go right subtree.
Compared with the (1.976), go right subtree.
Compared with university (0.416), go left subtree.
Compared with to (0.156), go right subtree.
Compared with undergraduate (0.053), found.
```

- For Q1.2, you can sort the words into a sequence in alphabetic order, find the word with the largest probability and place it in the root of tree. Then split the sorted word sequence into two sub-sequences and create two trees from the two sub-sequences as the subtrees of the root mentioned above, by using the same method. Do this recursively.
- For Q1.2, your program output can be something like:

```
Enter a key: wine
Compared with the (0.061), go right subtree.
Compared with to (0.031), go right subtree.
Compared with university (0.018), go right subtree.
Compared with with (0.005), go left subtree.
Compared with which (0.004), go right subtree.
Compared with winter (0.002), go left subtree.
Compared with will (0.001), go right subtree.
Not found.
```

- In Q1.1 and Q1.2, a difference of 0.05 in average number or probability is acceptable.

- For Q2, you can follow the algorithm on page 381 in the textbook. The algorithm is also on slide 39 in "10 Iterative Improvement". Slides 36 – 43 provide more details and examples.

- The following is the content of file *data_A4_Q2_1.txt*. The first 3 is the n. The two matrices are (a) and (b) in Figure 10.11 on page 380. Please see the figure for the meaning of the matrices.

```
3
2  1  3
2  3  1
3  2  1

2  3  1
3  1  2
2  3  1
```

  Program output can be something like

```
1  0  0
0  0  1
0  1  0
```

  with the 1 at row i and column j representing pairing i and j.

- File *data_A4_Q2_2.txt* contains the data of Q4 in Exercises 10.4 in the textbook. Solution to this exercise has been posted on Moodle.

Note:

You can develop your programs using any C system, as long as your programs can be correctly compiled and executed on the Linux system in SoCS.

You are allowed to use standard library functions. Your programs should be submitted as a tar file containing your program files and readme and makefile. The readme file should contain a brief description of how to compile and run each program.

Any compilation error or warning will result in a mark deduction. There will be some marks allocated for documentation.

Each file should have a comment at the beginning containing your name, id, date, and the assignment name. Each function should have a brief comment describing its purpose. Also, any section of code where it is not easily apparent what the code does should have a short comment. Your programs are not required to report running time.