School of Computer Science
University of Guelph

CIS*3490 The Analysis and Design of Algorithms

Winter 2019
Instructor: Fangju Wang

Assignment 4 (100%)

File *data_7.txt* contains 2045 words (word instances). Develop two programs to read the file, create optimal binary search trees (BSTs) for the words, and search the trees. In a tree, create a node for a word, even the word may appear more than once in the file. For example, *undergraduate* appears nine times in the file, but there should be only one node for it. For each word, calculate its probability from its frequency (repetitions) in the file.

Question 1 (60%)

Develop a program to create an optimal BST by using the technique of dynamic programming (described in section 8.3 in the textbook). You are required to calculate the "main table" and "root table". After creating the tree, the program prompts the user to enter a word (key) and searches the tree for the word. Whenever the program compares user input K with word W at node V, it displays word W and the minimum average number of comparisons of the subtree rooted at V. If the program fails to find the input in the tree, it displays "not found" after comparisons.

Question 2 (40%)

Develop a program to create an optimal BST by using the greedy technique. After creating the tree, the program prompts the user to enter a word (key) and searches the tree for the word. Whenever the program compares user input K with word W at node V, it displays word W and the probability of W. If the program fails to find the input in the tree, it displays "not found" after comparisons.

Due time: 12:00pm (noon), Monday March 25, 2019. Submit your work as a tar file to Moodle.