Programming Assignment 2 (Due Wednesday October 30, 2024)

Analysis of Algorithms

You need to construct optimal search trees for your work, and you plan to use the dynamic programming algorithm discussed in the Algorithm class to implement it. You know from your boss that the way you will be using the binary search trees will not result in any search of characters that are NOT in the tree – that is, there will be no "dummies".

Input:
Your program will take input from a file (filename to be entered by the user). The file is formatted as follows:

- Each line represents one <character, probability> pair.
- The format of each line is a character of interest in the first position, a blank space, followed by a real number representing the probability of occurrance of the character.
- The lines are in no particular order (neither sorted by probability nor by character).
- You should process all lines in the file.
- The probabilities in the file sum to 1.0, give or take a rounding error.

Output:
Your program should output the following:

- a copy (echo) of the input,
- the final "cost" matrix (upper triangular portion),
- the final "root" matrix (upper triangular portion),
- an inorder and postorder traversal of the final tree.

What to Submit:

Please submit a write-up, and the source code to Blackboard before the due date of the assignment. In the write-up, please provide a concise description of your method and rationale for design and implementation decisions. Please also provide answers to the requirement instructions above, if any.

Your write-up may consist of three types of content: *Analysis*, *Results*, and *Source Code.*

Analysis: This section may include relevant algorithmatic reasoning and related decisions necessary for your implementation or answering particular questions.

Results: Your write-up should include the output from running your program on each of the testing files. The testing files will be given in Blackboard. Discuss if your results did or did not conincide with your expectations. Bonus points will be given to optional graphics and plots that are approciate for visualize your results.

Source Code: The source code should be readable and commented appropriately. Internal comments should describe algorithms and variables, relating them to those described in your Analysis section. Briefly describe the inputs and outputs of your code. Your program should be ready to run on a machine for verification purposes if needed for addressing concerns from the instructor or the TA.

Note: The programming assignments and associated write-ups must be done individually. However, discussing with your classmates or the instructor is encouraged.