CSC311: The Design and Analysis of Algorithms

Computer Science Department   Second Semester 1444

King Saud University   Project

Due:

- Week 8: Thu. 4:00 p.m.

Ms. Abeer is arranging for a professional training program. The hierarchical structure of the university forms a tree rooted at the university's chief executive officer. The employees are ranked by the HR office based on their evaluation, which is a real number. In order to make the best utilization of the program, the chief executive officer does not want both an employee and his or her immediate head to attend. Ms. Abeer is given the tree that describes the structure of the university, using the tree data structure. Each node of the tree holds, in addition to the pointers, the name and evaluation-based ranking of an employee.

Assume a complete binary tree. Describe two algorithms to make up a program registration offer list that maximizes the sum of the evaluation-based ratings of the employees such that an employee does not attend with his/her immediate head, using Brute Force and Dynamic Programming. Analyze the running time of your algorithms.

Deliverables

- The source code (the project folder). Make sure your code is well organized and documented. You may use any language you like, Java, Python, C++ ... etc

- A report that includes the following sections:

  - Cover page
  - Brute Force:
    1. A description of the algorithm (pseudo-code with explanation)
    2. Time and space complexity
    3. Sample run on the provided cases (see Input Sample)
    4. Source code (in Courier New with font size:8) with comments
  - Dynamic Programming:
    1. A description of the algorithm (pseudo-code with explanation)
    2. Time and space complexity
    3. Sample run on the provided cases (see Input Sample)
    4. Source code (in Courier New with font size:8) with comments
  - Describe challenges faced and how you tackled them
  - Student peer evaluation form (see Team Work Evaluation table below).

Evaluation Rubric

Evaluation rubric is divided into two parts: First part evaluates Team Work and second part addresses the functional requirements. The code in grade assignment is shown to the right.

Code	
Fully satisfied	1
Partially satisfied	0.5
Not satisfied	0

Part 1: Team Work				
Criteria	Student1	Student2	Student3	Student4
Work division: Contributed equally to the work				
Peer evaluation: Level of commitments (Interactivity with other team members), and professional behavior towards team & TA				
Project Discussion: Accurate answers, understanding of the presented work, good listeners to questions				
Time management: Attending on time, being ready to start the demo, good time management in discussion and demo.				
Total/2				

Part 2: Functional Requirements		
	Criteria	Evaluation
General	Overall quality of the code implementation (organization, clearness, design,...)	
	Complete report with well organized sections	
	Total/3	
Brute Force	Algorithm description (pseudo-code with explanation)	
	Time and space complexity	
	Implementation correctness + sample run	
	Total/5	
DP	Algorithm description (pseudo-code with explanation)	
	Time and space complexity	
	Implementation correctness + sample run	
	Total/5	

Important notes:

- Group size should be 3-4 students.

- No late submissions accepted.

- The group leader is asked to upload everything on LMS as a compressed file (zip) containing (source code and report).

- Discussions will be conducted at the end of the semester.

- You need to prepare a simple presentation for the discussion, include:
  * The pseudo-code that you will explain.
  * challenges faced and how you tackled them.

Good luck and have fun!

Sample run

Input will be in the form of a text file your program should read. The input has the following format:
ID_of_parent : Name : ID : Evaluation_Score

Example.txt:
0:Ahmed:1:10.2
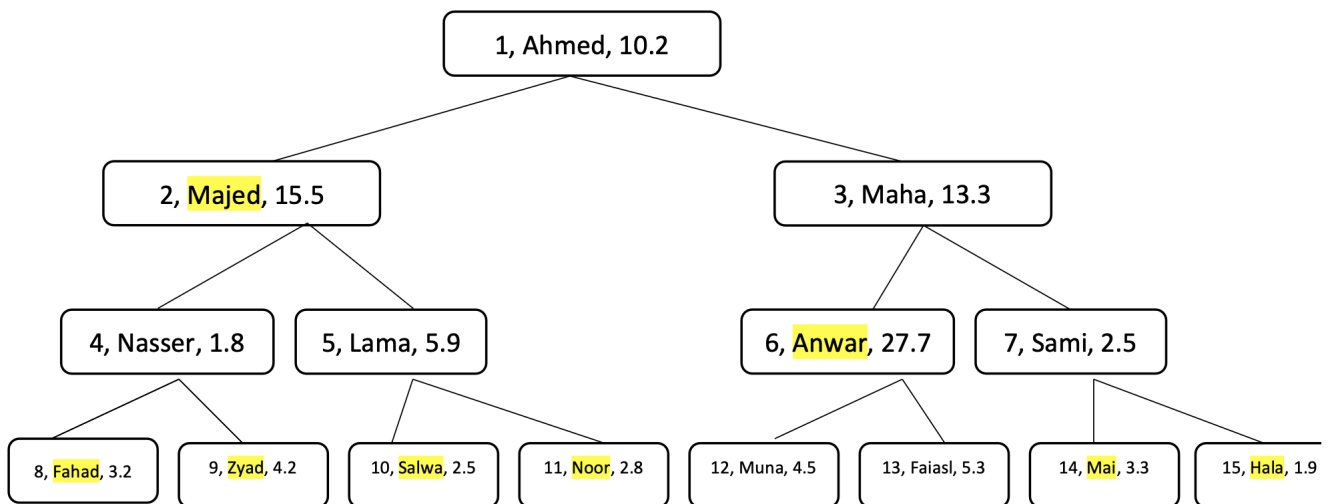1:Majed:2:15.5
1:Maha:3:13.3
2:Nasser:4:1.8
2:Lama:5:5.9
3:Anwar:6:27.7
3:Sami:7:2.5
4:Fahad:8:3.2
5:Zyad:9:4.2
7:Salwa:10:2.5

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Output Sample:
ID Name
2 Majed
6 Anwar
8 Fahad
9 Zyad
10 Salwa
11 Noor
14 Mai
15 Hala