

CS5205: Advanced Artificial Intelligence Lab

Assignment - 1

10/01/2025

Consider the following situation. The instructor of a course has given a set of assignments (A) in a class along with a set of books (B) and notes (N). The assignments have some dependencies. You cannot proceed to an assignment unless you solve its prerequisites. A student can solve at most one assignment in a given day. Sometimes, the instructor allows the assignments can be solved in a group of g students to finish those early. The students can share solutions with each other. To reduce the burden, the students can distribute the load within the group. The assignments have different levels of difficulty. A student needs tasty food from a local food joint to solve an assignment. The food item needed to solve an assignment depends on its difficulty level!! The food joint offers a special discount if the same set of food items are ordered daily. The price for food items is exorbitantly high if the same set of food items are not ordered, therefore, only a single menu has to be ordered on each day. The price for each food item is known. A student can take exactly one food item in a given day and a food item is not shared between the students. A student consumes a food item only when he/she solves an assignment. The goal here is to come up with all valid reasonable schedules and determine the fixed menu ordered from the food joint for each of the schedule. Let us take a look at a concrete example. Please see Fig. 1.

- A_1, \dots, A_{11} be the the set of assignments
- $B_1, B_2, B_3, N_1, N_2, N_3$ are books and notes
- The set of food items needed to solve assignments are TC – Tandoori chicken, PM – Paneer butter masala, DF – Dal fry, and GJ – Gulab jamun.
- O_1, O_2, O_3 are the final outcome of the assignments which need to be submitted.
- The dependency among the assignments have been shown in the figure. For example, to solve A_5 one has to solve A_1 and A_2 .

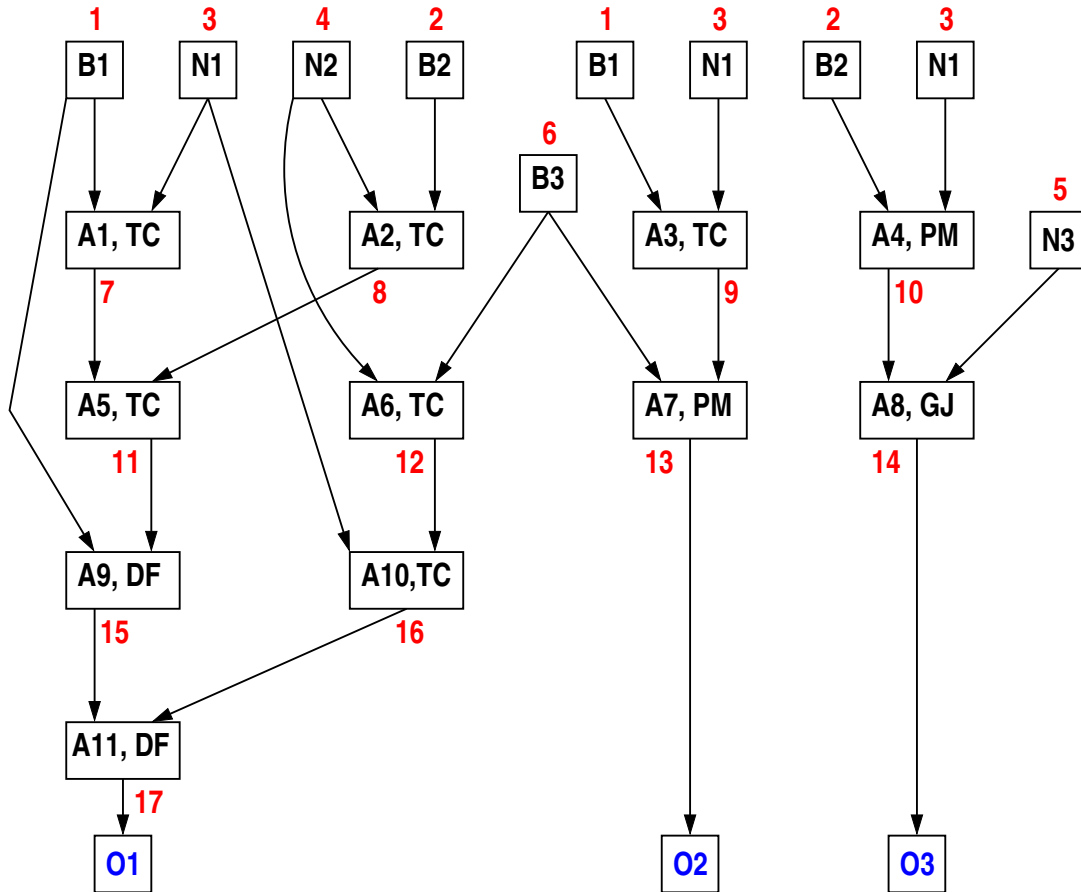


Figure 1: A sample scenario

For example, if all assignments are to be solved by a group of 3 people and the daily fixed menu is as follows (2-TC, 1-PM, 1-DF, 1-GJ) (2 portions of TC, 1 portion of PM, etc.) then a reasonable schedule can be as follows

Day-1: A1, A2, A4
 Day-2: A5, A6, A8
 Day-3: A9, A10, A3
 Day-4: A11, A7

Submission

You need to submit the following. Submission procedure will be informed later.

- A C or C++ or python code
- At least 3 different test cases in the given format. A test case should have at least 10 assignments. Assume no more than two input edges for a node.
- A README.txt file describing how to run your program and any other details.

Sample input:

```
% Comments

% Cost <food-item> <value>
C TC 1
C DF 1
C PM 1
C GJ 1

% Group size
G 2

% Inputs - books / notes. It ends with -1
I 1 2 3 4 5 6 -1

% Outputs - final outcome. It ends with -1
O 13 14 17 -1

% Assignment dependency list
% A <id> <input1> <input2> <outcome> <Food-name>
A 1 1 3 7 TC
A 2 4 2 8 TC
A 3 1 3 9 TC
A 4 2 3 10 PM
A 5 7 8 11 TC
A 6 4 6 12 TC
A 7 6 9 13 PM
A 8 10 5 14 GJ
A 9 1 11 15 DF
A 10 3 12 16 TC
A 11 15 16 17 DF
```