TA Allocation as a CSP

Problem Description

In the TA allocation task, the objective is to allocate the required number of TAs to all the given courses under certain constraints. This is equivalent to considering each course as a variable with one or more assignments possible. Given a set of all the available TAs, there is a subset of TAs corresponding to each course who are eligible for that particular course. The total number of TAs required may be either equal to or less than the number of available TAs.

(A) Some of the information that one may assume to be known/given:

(1) A list of courses along with their levels {100, 200, 300, 400, 600, 700}, credit structure, number of students registered, offered for (e.g., the course CSL3090 is offered for UG3 and UG4 students).

(2) A list of TAs along with their programs and batches (UG3-AI/CSE, UG4-AI/CSE, MTech-AI/CSE first and second year, MTech-PhD AI/CSE first to fifth year, PhD first to fifth year).

(3) The preference of allocation should be as follows:
PhD/MTech-PhD second year onwards > MTech second year > PhD/MTech-PhD/MTech first year > UG4 > UG3

(B) Some of the necessary constraints:

(1) A TA assigned to a course is expected to have done that (or a similar) course with a "decent" grade, and should be willing to work as a TA in that course.

(2) Each course must be assigned the required number of TAs. We may expect to have 1 TA per ~90 students per credit (e.g., 2 TAs in a 3-0-0 course with ~60 students), and no TA if there are <20 students irrespective of the credit structure. This should be taken as an input by your code; i.e., "1 TA per credit per approximately how many students = ".

(3) One student may be eligible to become a TA in more than one course (i.e., one value may be present in the domain of more than one variable), however he/she may be assigned to exactly one course, if at all.

(4) There should be at least one PhD/MTech-PhD TA per 100 students.

(5) A course cannot have more than 60% UG TAs.

(6) A student may be assigned as a TA only to those courses that are being offered to his/her (academically) junior batches. E.g., a UG3 TA can be assigned to only UG1/UG2 courses, an MTech first year TA can be assigned to only UG courses, etc.

One may include additional constraints if needed.

Tasks

(1) (Non-graded and Optional) Create at least two sample data assuming 20-60 courses and minimum number of PhD/MTech-PhD TAs. In this, each TA should have 3-5 preferences. One data should have a complete assignment and the other should have an incomplete assignment. See this file for the format of given data. You are encouraged

to share the data that you create with your classmates through this form in the form of a spreadsheet (only one submission allowed). The shared data can be accessed from here. One may choose not to create any data on his/her own and evaluate using only the ones shared by others.

(2) Implement an algorithm to solve the above CSP, by adapting any of the algorithms discussed in class.

(3) Analyze your algorithms and their outputs in general in terms of correctness, execution time, number of valid (complete) assignments, etc.

(4) The code should also output a file containing the details of the unassigned TAs.

Deliverables

(1) A folder containing your codes, one spreadsheet file per dataset used by you, and a detailed readme file. You may use any programming language, publicly available codes and/or standard libraries/functions.

(2) A report (PDF) describing the experimental details, results, observations, analyses, challenges faced, learnings, etc.

(3) Create a single zipped file name <RollNo_Assig2.zip> containing the above and upload.

General instructions

(1) During execution, if your code does not accept a file as in the given format or throws any type of error, you will be given a zero.

(2) Do not paste your codes in the report.

(2) Cite all the resources in the report.

(3) If anything is missing or not clear from the above description, you may make appropriate assumptions and clearly mention them in the report.

(4) A submission which does follow any of the guidelines will be awarded a penalty.

(5) Plagiarism will result in a zero in this assignment, and an additional penalty in the total score in the course.

Penalty for late submission

There will be a penalty of 20% per day. A submission which is >=4 days late will not be evaluated. The time recorded in google-classroom will be considered.