Assignment - 2 (Artificial Intelligence)

B21AI007

Assumptions :

1) The courses with less than 20 student's does not need any TA so they are ignored in the start.
2) The TA who has applied for a course has done some similar or the same course with grade as mentioned in the data.
3) Each of the TA's who has applied for is willing to work as TA for the entire semester.
4) The TA's are not prioritized on the basis of grades if they have grades as A or A- in that course or any similar course.
5) Seniority level of programs are as following :
   seniority={ 'UG 1':1, 'UG 2':2, 'UG 3':3, 'UG 4':4, 'M.Tech 1':5,'M.Tech-M.Tech 1' : 5 , 'M.Tech-PhD 1':6, 'PhD 1':7, 'M.Tech 2':8, 'M.Tech-PhD 2':9, 'PhD 2':10, 'M.Tech-PhD 3':11, 'PhD 3':12, 'M.Tech-PhD 4':13,'PhD 4':14, 'M.Tech-PhD 5':15, 'PhD 5':16 } ⇒ seniority level is used for checking if any student who has applied is eligible for being TA of the course he/she has applied for.
6) Complete Assignment ⇒ All courses can be assigned require number of TA's
7) Incomplete Assignment ⇒ Assuming that no assignments will be performed if any course does not get the required number of TA's.

Question:

1) Data -> from the shared file
   https://drive.google.com/open?id=1BXLO9RVxw1p3aLo6PzdjLOzznMLHa5yz

2) First checking in the data if any TA's with a lower program has applied to the course in which he/she is not eligible to be TA (like UG3 can't apply for TA for a course offered for UG4) and then ignoring such data. Then also checking that any TA applied who has grade <A- in any course then he/she is also not eligible for that course to be a TA , ignoring that also .

   Used **backtracking search** to solve the given CSP problem.

First priority is given according to the programs of the TA (PhD/MTech-PhD second year onwards > MTech second year > PhD/MTech-PhD/MTech first year > UG4 > UG3) and the second priority is given to the preferences of ta's as per the data by taking 3 inputs in a list for a single ta in the below format for each course :

[*PROGRAM* , *PREFERENCE* , *ROLL NO OF TA*]

After creating a list of each course in the above format and they are sorted in a reverse manner to get the TA wil most priority at the top like (priority of program of PhD is 5 , Mtech is 4 etc and similarly for preference , which after sorting ensures that the top most priority TA's will be at the top) , we find the subset of size equal to the number of TA's required for that course which is all possible combinations of TA's that can be assigned to that particular course. After getting this list for each course in a dictionary we apply a backtracking search over all the courses to assign each course a group of TA's required and then move to next after checking if all the constraints are satisfied . The constraints used are following :

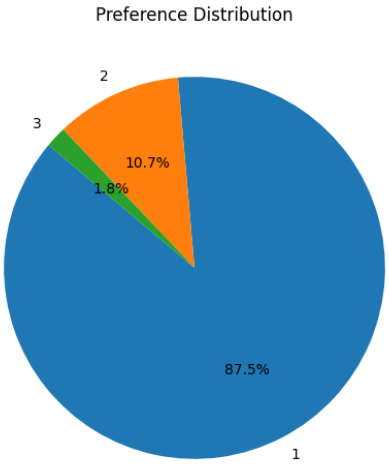
i) each TA will be assigned at most one course
ii) no. of ug ta's should be less than 60% of the total number of ta's
iii) at least one PhD TA per 100 students

Variables ⇒ Courses
Domains ⇒ The combination of TA's data

Calculation:

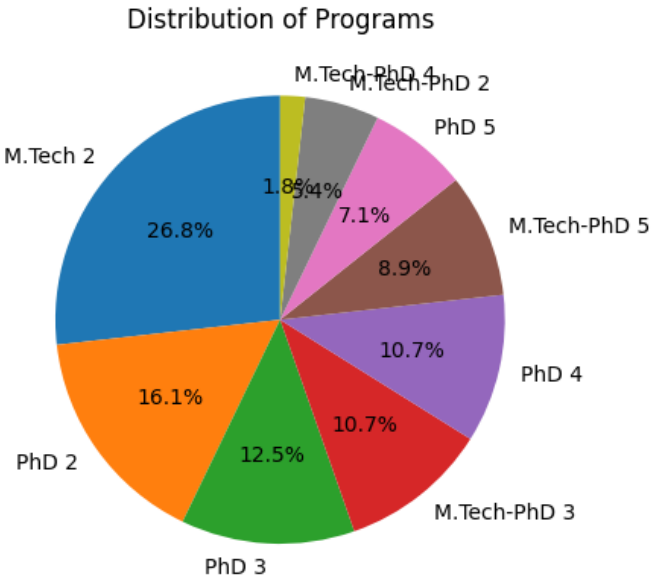
Number of Credits for Course ⇒ (L + T + P/2) (L-T-P ⇒ Credit Structure)
Calculation of number of TA's ⇒ (num of student * credits) / (number of ta per credit per student) taken as input

3)



This plot shows the distribution of the preferences by TA's and the course allotted. Here we can see that most of the courses allotted are given to preference 1 TA and also from the output it is clear that most of the TA's are from Phd , PhD- Mtech (Higher Education) which shows that they are given more priority.

Here's one more plot showing the distribution of programs over allocated TA's and from here we can see that as per the priorities most of the courses are allocated to high priority program pursuing TA's



Execution Time of backtracking search is 0.20627617835998535

All the courses are assigned with required number of TA's based on the formula already mentioned before.

Incomplete Assignment :

For incomplete assignments I have considered that the data will have less than 63 TAs as in complete assignments we need 63 TA's to assign different courses. So I have sliced the data upto 30 indexes and for incomplete assignment , no any assignment is done so output is an empty list

4) After running the codes the output files will be added to the same directory and are also attached with this report.