UNIVERSITY OF LETHBRIDGE

Computational Optimization Term Project Report

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Problem 1

1. Problem Statement: Sarah is an Operation Management Student of Takshashila University (TU). In her last semester she will need to take some courses.Some courses are compulsory as some courses have choices. For choosing the courses Sarah need to fulfil some conditions.They are stated as bellow:

1. She has to take 5 courses in total.

2. She has to take Business Strategy (MGT 490) and International Finance (FIN 358).

3. She has interest in service-learning course and found Intergenerational Computing (CIS 102T) and Web Design for Non-profit Organizations (CIS 102W) interesting. She will take one of the two courses between these.

4. Between four potential finance elective courses (Data Analysis in Finance (FIN 325), Risk Management(FIN 352), Options, Futures, and Swaps (FIN 356) and Fixed Instruments and Markets (FIN 359)) she will take two courses.

Sarah rated each section of the available courses based on content of the course, reputation of the instructor and timing of the course. Now it's my job to find an appropriate schedule for Sarah which will meet all the above mentioned conditions and also will give highest total rating. I will solve the problem using two strategies. First one is Greedy Heuristic

and the second one is LP model. Using Greedy Heuristic I will find a solution which may not be optimal but good enough, using LP model I will find optimal solution and finally I will find maximum rating of three days a week schedule by extending the LP

2. Input Data: The input data for the problem are rearranged as follows:

Meeting Time(s)	MGT 490	FIN 358	CIS 102T	CIS 102W	FIN 325	FIN 352	FIN 356	FIN 359
M 6-8:45 p.m.	4.3	0	0	0	0	3.6	0	3
T 6-8:45 p.m.	3.8	0	0	3.7	0	0	3.2	0
W 6-8:45 p.m.	3.5	3.5	0	0	0	0	0	3.5
F 6-8:45 p.m.	3.5	0	0	0	0	0	0	0
M 1:25-2:20 p.m. W 1:25-3:15 p.m.	4.6	0	0	0	3.7	0	0	0
T 1:25-3:15 p.m. Th 1:25-2:20 p.m.	2.7	3.3	0	0	0	0	3.4	0
W 2:30-5:15 p.m.	0	0	4.4	3.5	0	0	0	0
Th 2:30-5:15 p.m.	0	0	3.1	0	0	0	0	0
Th 6-8:45 p.m.	0	0	0	0	3	0	0	0
M 1:25-3:15 p.m. W 1:25-2:20 p.m.	0	0	0	0	0	3.9	0	0

Table 1: Course Data

Table 1 shows the rating of the sections of corresponding subjects and their Meeting times. Ratings of sections of a subject are in the same column under the subject code and the corresponding rows indicates the meeting times of the sections. For example MGT 490 has 6 sections and the first section has rating of 4.3 and its meeting time is M 6-8:45 p.m.

3. Solution Strategies:

a. Heuristic: Solving the scheduling problem using Greedy Heuristic is simple and straight forward. The concept of greedy heuristic is I have to choose local maximum rating at each iteration.Finally I will get total rating. The things I need to keep in my mind are:

1. The program should meet the conditions stated in Problem Statement.

2. There are some Meeting Times that conflicts with each other. So if I choose a maximum rating in any iteration and it's meeting time(s) conflicts with any other meeting time(s) then I will not consider the ratings under that/those meeting time(s) in the next iterations.

I put the course codes, meeting times and the ratings in a text file and from octave function I read the data and stored course codes, meeting times and ratings in three matrices. From the matrix in which I stored ratings I calculated maximum rating of each column in every iteration. Maximum rating of a column indicates the maximum rating of that subject. After

getting the maximum rating I made all indices of that row to zero because the corresponding time slot is taken, so other ratings in the same that are in the same row will not contribute in finding maximum ratings in following iterations. If the time slot conflicts with any other time slot(s) the ratings of the corresponding rows also made zero for same reason. Finally I got the maximum ratings of each subjects and choose the ratings of five subjects that met Sarah conditions and showed the output in readable format. The maximum rating using greedy heuristic is 18.8. The output from octave console is given bellow:

```
>> heuristic
The taken subjects with corresponding meeting times and ratings are as follows:
MGT-490 ,Time: M 1:25-2:20_W 1:25-3:15 ,Rating: 4.6
FIN-358 ,Time: W 6-8:45 ,Rating: 3.5
CIS-102W ,Time: T 6-8:45 ,Rating: 3.7
FIN-352 ,Time: M 6-8:45 ,Rating: 3.6
FIN-356 ,Time: T 1:25-3:15_Th 1:25-2:20 ,Rating: 3.4
Total Rating:18.8
```

Figure 1: Output of Greedy Heuristic

The Octave code for greedy heuristic is in appendix part