

MSCI 435 Group Project (Groups of three)

The North Star Education and Research Council (NSERC) is a non-profit organization that offers research grants to advance basic research in Science, Maths and Engineering. Each year, NSERC invites applications from all universities across Canada to compete for its multi-million-dollar funding.

To evaluate applications, experts from various domains are recruited. During a week, various meetings are held to discuss and evaluate each application. Each meeting

- discusses only one application.
- is 20 minutes long.
- requires 5 Experts, a meeting Chair, and an Administrator.
- Scheduled in between 8:00 till 7:20 pm ET.

There are 4 meeting rooms, so at most 4 meetings can be held simultaneously. In addition, the schedule should accommodate coffee breaks from 9:20 to 9:40 and from 2:20 to 2:40 as well as lunch from 12:20 to 1:00.

The scheduling of the various Evaluation meetings is the subject of this project. Specifically, Experts and Chairs (referred to as members), serving on multiple meetings have to be offered a schedule that

- Fits their prior commitments.
- Is conflict-free with the applicant.
- Is spread out during the evaluation week (Monday to Friday).
- Accommodates time-zone differences.

A sample schedule is appended to the end of the document.

The project consists of modeling, devising a solution methodology, and implementing an optimization engine to schedule evaluation meetings during the evaluation week. The schedule should be feasible for each member. Sample data is provided below.

A good schedule should seek to:

- Maximize the number of meetings (i.e. number of applications evaluated)
- Space out meetings during the day and across days
- Have a maximum number of meetings per day.
- If the schedule is not feasible, minimize infeasibility (to approach certain members for the possibility of accommodation)
- maximize equity between Experts s and chairs.
- accommodate time after the final games for players and team awards and for the closing ceremony.

Your **task** is to

1. Understand the problem (you can add whatever constraints you feel reasonable) and provide a mathematical formulation. Try to use formulations that will handle large sizes (hint: column generation). Clearly define the decision variables, the objective function, and the constraints.
2. Devise a solution methodology. Use decomposition concepts learned in class and/or heuristic methods to solve the problem.
3. Solve the resulting model. If necessary, refine the approach or make reasonable assumptions to provide meaningful schedules.
4. Validate the approach, e.g. by testing on a different data set, performing sensitivity analysis or exploring different strategies.
5. Carry out testing and comparison. Provide tables/graphs comparing different approaches.
6. Write a final report.

For the implementation, you can use software of your choice, but you are encouraged to use Matlab in order to use some of the codes/scripts developed in class. To be able to solve large MIPS in Matlab, you may have to link it to an external solver, such as Cplex ([IBM ILOG Optimization Academic Initiative: https://www.ibm.com/support/pages/ibm-ilog-optimization-academic-initiative](https://www.ibm.com/support/pages/ibm-ilog-optimization-academic-initiative)) and Gurobi ([Academic Program and Licenses - Gurobi Optimization: https://www.gurobi.com/academia/academic-program-and-licenses](https://www.gurobi.com/academia/academic-program-and-licenses)).

Deliverables and deadlines

Two progress reports, one final report, and a short presentation

- Progress Report 1: Task components **1 to 2**. Due Thursday, Feb. 29@ 11:59 pm ET.
- Progress Report 2: Task components **1 to 4**. Due Thursday, March 21@ 11:59 pm ET.
- Final Report: Task components **1 to 6**. Due Thursday, April 4@ 11:59 pm ET.
- In-class presentation on Tuesday, April 2.

Grading:

The **grading** of the project will depend on

- the sophistication and quality of the proposed approach(es).
- the extent to which you applied material learned in the course.
- the quality of the implementation and testing.
- the quality of the presentation and written reports.

Important Notes:

- References to external material, if any, should be included.
- Be concise and to the point. Detailed output, code listings, etc. should be put in an appendix. Only provide summary results in the body of the report (e.g. in table or figure formats).
- Use 12 pt font with at least 1-inch margins all around.
- Submit your codes with the final report.

You are bound by policy 71. Plagiarism will not be tolerated.

Relevant Data

			Unavailable (in local time)
Chairs Co-Chairs	C1	The University of British Columbia	M/W 10 to 12
	C2	University of Calgary	T/Th 2 to 4
	C3	National Research Council Canada	M/W 1 o 3
	C4	York University	T/F 9 to 11
	C5	University of California – San Diego	Th 8 to 12
	C6	Université de Sherbrooke	W/F 10 to 12
	C7	University of Victoria	T/Th 1 to 3
	C8	Université Laval	Th 8 to 12
	C9	Hydro-Québec	T/F 10 to 12
	C10	Canadian Food Inspection Agency	M/F 11 to 2
Members	M1	University of Toronto	T/Th 2 to 4
	M2	Toronto Metropolitan University	M/W 1 o 3
	M3	University of Michigan	T/F 9 to 11
	M4	École Polytechnique de Montréal	M/Th 11 to 1
	M5	University of Guelph	M/F 2 to 4
	M6	University of Calgary	M/F 3 to 5
	M7	University of Prince Edward Island	M 1 to 3
	M8	University of Manitoba	M/W 10 to 12
	M9	National Research Council	Th 8 to 12
	M10	Royal Military College of Canada	F 11 to 1
	M11	Dalhousie University	M/Th 11 to 1
	M12	University of Windsor	M/F 2 to 4
	M13	Queen's University	M/F 3 to 5
	M14	The University of Western Ontario	W 12 to 5
	M15	École Polytechnique de Montréal	W/F 10 to 12
	M16	Université du Québec en Abitibi-Témiscamingue	T/Th 1 to 3
	M17	Université du Québec à Trois Rivières	M/W 10 to 12
	M18	FPrimeC Solutions Inc.	T/F 10 to 12
	M19	Institut national de la recherche scientifique	Thu 10 to 3
	M20	Université du Québec à Chicoutimi	T/Th 3 to 5
	M21	Université Catholique de Louvain	M/T 1 to 3
	M22	University of Northern British Columbia	Th 8 to 12
	M23	University of Saskatchewan	M/T 10 to 12
	M24	University of Alberta	T/W 3 to 5
	M25	University of Waterloo	T/W 3 to 5
	M26	University of Alberta	M/W 10 to 12
	M27	Brock University	M/F 11 to 2
	M28	University of Cyprus	T/Th 1 to 3
	M29	University of Manitoba	F 12 to 4

Sampel Schedule

	(UTC -5) Eastern Time / Heure de l'est - EST				
	Monday	Tuesday	Wednesday	Thursday	Friday
8:00 - 8:20 AM	Member Unavailable	Member Unavailable	Member Unavailable	Member Unavailable	Member Unavailable
8:20 - 8:40 AM					
8:40 - 9:00 AM					
9:00 - 9:20 AM				Conflict Red & Blue	
9:20 - 9:40 AM	BREAK	BREAK	BREAK	BREAK	BREAK
9:40 - 10:00 AM					
10:00 - 10:20 AM					
10:20 - 10:40 AM					
10:40 - 11:00 AM	BREAK	BREAK	BREAK	BREAK	BREAK
11:00 - 11:20 AM					
11:20 - 11:40 AM					
11:40 - 12:00 PM					
12:00 - 12:20 PM					
12:20 - 12:40 PM	LUNCH	LUNCH	LUNCH	LUNCH	LUNCH
12:40 - 1:00 PM					
1:00 - 1:20 PM	Conflict Purple				
1:20 - 1:40 PM	Conflict Red				
1:40 - 2:00 PM					
2:00 - 2:20 PM					
2:20 - 2:40 PM	BREAK	BREAK	BREAK	BREAK	BREAK
2:40 - 3:00 PM					
3:00 - 3:20 PM					
3:20 - 3:40 PM					
3:40 - 4:00 PM					
4:00 - 4:20 PM	BREAK	BREAK	BREAK	BREAK	BREAK
4:20 - 4:40 PM					
4:40 - 5:00 PM					Conflict Green
5:00 - 5:20 PM					Conflict Red
5:20 - 5:40 PM					
5:40 - 6:00 PM					
6:00 - 6:20 PM					
6:20 - 6:40 PM					
6:40 - 7:00 PM					
7:00 - 7:20 PM					