MSCI 435-Introduction to Optimization
Team Projects (in pairs)

The project consists of modeling, devising a solution methodology, and implementing an optimization engine for **sports tournament scheduling**.

In the wake of the covid-19 pandemic, sports associations around the world had to modify their tournament structures to overcome measures imposed because of the pandemic. The concepts of "bubble" tournaments as in basketball and "closed-tournaments" as in soccer have been used successfully. Both are versions of spectator-free tournaments, where teams are hosted within a city or a facility over the period of the tournament. One contributing factor in the success of this structure is **scheduling.**

Your **task** is to

1. Describe a situation/framework/tournament specific to a particular sport.
2. Provide a problem definition outlining the sports picked, the structure of the tournament, the time frame, the facilities/venue used, the assumptions made, etc.
3. Provide a mathematical formulation. Try to use formulations that will handle large sizes (hint: set covering type). Clearly define the decision variables, the objective function, and the constraints.
4. Devise a solution methodology. Use decomposition concepts learned in class and/or heuristic methods to solve the problem.
5. Generate data, hypothetically, but realistically.
6. Solve the resulting model. If necessary, refine the approach to provide meaningful schedules.
7. Validate the approach, by performing sensitivity analysis and/or explore different strategies.
8. Carry out testing and comparison, providing tables/graphs comparing different approaches.
9. Write a final report.

Most importantly, ensure that your schedule takes the following into account.

- The structure of the tournament, round-robin, knock-out, etc
- Rest period before games
- Fairness between participating teams
- Facilities used for games and for practices
- Minimize interaction between teams (overlap)
- TV broadcast times for maximum viewing

and your case study has

- At least 8 teams
- At least 3 arenas/playing fields for games and practices
- Each team should be allowed a practice session once per day.
- Each team should play at least three games
- Games schedules should be well-spaced. E.g. Arenas for certain sports cannot accommodate more than two games/practices per day.
- The tournament should not last more than 2 weeks. The shorter, the better.
- Any other specifics of the sport.

Deliverables:

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

- Progress Report 1: Task components 1 to 3. Due Friday, Feb. 26@ 11:59 pm ET using Dropbox.
- Progress Report 2: Task components 1 to 6. Due Friday, March 17@ 11:59 pm ET using Dropbox.
- Progress Report 3: Task components 1 to 9. Due Monday, April 12@ 11:59 pm ET using Dropbox.
- Presentation on Wednesday April 7th and Monday April 12th.

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.**