

Project Proposal  
COSC2780/2973 Intelligent Decision Making  
Semester 1, 2023  
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## 1 Introduction

This proposal is for the Semester 1 2023 COSC2780/2973 Intelligent Decision Making project at the Royal Melbourne Institute of Technology (RMIT).

This proposal is partitioned into 3 sections:

- Section 2 provides for a description of the problem to be solved by this project;
- Section 3 details the objectives of the project; while
- Section 4 explicates the methodology to be used in this project.

## 2 Problem description

This project involves the scheduling of LZV (Liefhebbers Zaalvoetbal) Cup matches using intelligent decision making. More specifically, the goal of this work is to develop a system that can schedule LZV (Liefhebbers Zaalvoetbal)

Cup matches as double round robin tournaments, under the following constraints [VGS19]:

- Each team plays a home match against each other team exactly once;
- Home team responsibilities,  $H_i$ , are respected;
- Away team responsibilities,  $A_i$ , are respected;
- At least  $m$  days between two matches with the same team;
- Each team plays at most one game per day; and
- Each team plays at most 2 games in a period of  $R_{max}$  days.

There has been some work on the scheduling of time-constrained and time-relaxed leagues as integer linear programs [Knu10; ÇA20]. While there exists some work in the scheduling of double round robin tournaments [KL09; NGK14; Kyn+17], most of this work seeks to avoid consecutive home or away games for teams as much as possible.

### 3 Project objectives

The objective of this project is to deliver a solution to the aforementioned problem developed (seperately) in 3 different platforms:

1. Answer Set Programming (via Clingo);
2. SWI-Prolog; and
3. OptaPlanner (<https://www.optaplanner.org/>).

The solution will allow the user to specify the season (set of time slots), teams (and divisions), home team responsibilities ( $H_i$ ), away team responsibilities ( $A_i$ ), minimum days between matches with the same team ( $m$ ), and minimum days in which a team can play at most 2 games ( $R_{max}$ ). The solution will provide the user with all feasible tournament schedules that are consistent with the parameters and constraints, where a schedule is a set of assignments of teams to time slots.

A number of experiments will be designed and conducted so as to compare parameters and performance measures against each platform. The data of the experiments will be made available for interaction using the Shiny data visualisation platform (<https://shiny.rstudio.com/>).

A report will also be compiled with accompanying code and experiment data.

## 4 Project methodology

This section of the proposal summarises the project team, schedule, team member availability, and team member responsibilities.

### 4.1 Project team

The project team consists of:

- Dan Rowley (s3442491);
- Denster Joseph Frank (s3894695);
- Jyoti (s3880522); and
- Srujan Basavaraj (s3856311).

### 4.2 Project schedule

The tentative project schedule is as follows:

Task	Start	End
Formulate problem description; design system interfaces; design experiments	April 10, 2023	April 24, 2023
Develop ASP solution	April 17, 2023	May 1, 2023
Develop SWI-Prolog solution	May 1, 2023	May 15, 2023
Develop OptaPlanner solution	May 1, 2023	May 15, 2023
Data visualisation & communication	May 1, 2023	May 15, 2023
Finalise report & code submission	May 15, 2023	May 28, 2023
Finalise video submission	May 29, 2023	June 4, 2023

The project deadlines are as follows:

Report & code submission	May 28, 2023 by 11:59pm
Video submission	June 4, 2023 by 11:59pm

### 4.3 Team member availability

All team members are available from April 10 2023 to June 4 2023.

### 4.4 Team member responsibilities

Team member responsibilities are as follows:

- All team members are responsible for the delivery of the Answer Set Programming solution;
- Denster and Srujan will lead the development of the SWI-Prolog solution;

- Dan and Jyoti will assist in the development of the SWI-Prolog solution;
- Dan and Jyoti will lead the development of the OptaPlanner solution;
- Denster and Srujan will assist in the development of the OptaPlanner solution;
- All team members are responsible for the quality of all solutions and experiments;
- Srujan will lead the design of the system interfaces;
- Denster and Jyoti will lead the design of the experiments;
- Dan will lead the communication and visualisation of the experiment data;
- All team members are responsible for the production of the final report; and
- Each team member is responsible for the development of their own video submission.

## 5 Signatories

The signatories below attest that they agree to this proposal and were active in building it.

Dan Rowley	<b>DAN ROWLEY</b>	April 9, 2023
Denster Joseph Frank	<b>DENSTER FRANK</b>	April 9, 2023
Jyoti .	<b>JYOTI .</b>	April 6, 2023
Srujan Basavaraj	<b>SRUJAN BASAVARAJ</b>	April 9, 2023

## References

- [KL09] Sigrid Knust and Daniel Lücking. “Minimizing costs in round robin tournaments with place constraints”. In: *Computers & Operations Research* 36.11 (2009), pp. 2937–2943.

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- [Kyn+17] Jari Kyngäs et al. “Scheduling the Australian football league”. In: *Journal of the Operational Research Society* 68.8 (2017), pp. 973–982.
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- [ÇA20] Burak Çavdaroglu and Tankut Atan. “Determining matchdays in sports league schedules to minimize rest differences”. In: *Operations Research Letters* 48.3 (2020), pp. 209–216.