

Promotor(s): Prof Luc De Raedt

Begeleider(s): Mohit Kumar Kumar and Stefano Teso

Context of the research and Goals: Many real world problems require constraints, in my thesis, we take a deeper look into the world of sport scheduling, this is a real complex and laboursome task. If you take for example a look at the major league baseball in the USA, we talk about 2 leagues with 3 divisions and 162 games per team in regular season only. The scheduling of this takes a lot of work. The main goal of my thesis is to do research to check if it is possible to lower the amount of work using tensor manipulations.

Studied/used literature:

- Paramonov, Sergey and Kolb, Samuel and Guns, Tias and De Raedt, Luc. (2017). TaCLE: Learning Constraints in Tabular Data. 2
- Beldiceanu N., Simonis H. (2012) A Model Seeker: Extracting Global Constraint Models from Positive Examples. In: Milano M. (eds) Principles and Practice of Constraint Programming. Lecture Notes in Computer Science, vol 7514. Springer, Berlin, Heidelberg
- Anson S., Lester S. Sports Scheduling: Algorithms and Applications
- Kumar M., Teso S. De Causmaecker P., De Raedt L. (2018) Automating Personnel Rostering by Learning Constraints Using Tensors
- M. Carlsson, M. Johansson and J. Larson, A Stronger Integrated Constraint Programming Approach to Scheduling Sports Leagues with Divisional and Roundrobin Tournaments, 2014.
- T. Bartsch, A. Drexler and S. Krger, Scheduling the professional soccer leagues of Austria and Germany, Computers and Operations Research, vol. 33, pp. 19071937, 2006.

Deliverables (inclusief tijdsrapportering):

- Literature study: research in sport scheduling: what are the most common patterns, how are they made, what are the mathematical functions behind these? Also comprehension of the CountOR approach (+15 hours)
- Written example: tensor representation of a double round robin tournament, made generic for n teams (odd and even) + broadening to xRR, this made some constraints very clear (+- 15 hours)??
- First constraint solver: coding of a constraintsolver that uses the discovered constraints from the written example, this uses the Java Library Choco (which is a wrapper around MiniZinc) (+30 hours)

Most important results:

- Clear view on my workapproach
- Scheduler that generates tensors based on the most common 2RR constraints

Biggest difficulties:

Representing complex constraints over multidimension tensors in Gurobi/MiniZinc, this problem is (temporarily) solved by using a Java library that uses MiniZinc as a wrapper. But there is a very good possibility a .mzn file with the constraints will be written soon anyway

Scheduled work:

Before christmas: Literature study and starting to learn the constraints from my own constraint solver

After christmas: Learning/adjusting the first version of the algorithm to support edge cases that are common within the sports scheduling world. The goal in the end is to generate schedules for the regular season of the belgium football competition.

If I continue to work like I am doing now, I expect to earn 14/20 in the end.

I plan to finish my thesis in June