# Scheduling Examples for Constraint Acquisition

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Constraint Acquisition [1] is one of the most interesting combinations of the Constraint Programming and Machine Learning areas. It aims at deriving Constraint Models for a combinatorial problem by program, rather than relying on a human to write the model. Different approaches have been studied, where the main techniques are

- learning from example solutions and non-solutions
- asking questions about the model to a human
- understanding a textual description of a problem to derive an executable model

A first benchmark set for Constraint Acquisition was presented in the PTHG21 Challenge [3], which presented sets of solutions and non-solutions for a number of small scale combinational problems.

In this contribution we will present a new set of benchmark problems for Constraint Acquisition from the area of scheduling. These benchmarks will address some of the concerns stated in [2]. They contain more *complex structures* to describe the instance data, both for input data and solution format, derived from the typical data formats used in scheduling problems. Instances may contain *hidden variables*, which are part of the intended model, but which are not explicitly present in the solution output. All problems specified are *generic*, i.e. they do not describe a single instance, but a family of problems, each defined by a set of input data. The model generated by Constraint Acquisition needs to be *transferable*, i.e. able to be applied to a new, unseen dataset, producing a solution for this new problem. For some problems, *efficiency* of the generated model is important, just finding a consistent model for the problem is not enough, the program should be able to solve more complex instances within a reasonable time period.

The problems included consist of teaching problems used in courses on Constraint Programming, existing benchmark problems, plus some industrial scheduling problems from the literature.

# References


[1] Christian Bessiere, Frédéric Koriche, Nadjib Lazaar, and Barry O'Sullivan. Constraint acquisition. *Artif. Intell.*, 244:315–342, 2017. doi:10.1016/j.artint.2015.08.001.

[2] Helmut Simonis. Requirements for practical constraint acquisition. In Eugene Freuder and Barry O'Sullivan, editors, *AAAI 2023 Bridge on Constraint Programming and Machine Learning*, 2023. URL: http://osullivan.ucc.ie/CPML2023/submissions/03.pdf.

[3] Helmut Simonis and Eugene Freuder. PTHG21 challenge, August 2021. The results of the Challenge were presented at the PTHG21 workshop of CP 2021. videos of the presentations are in the youtube playlist at https://www.youtube.com/playlist?list=PL97NT99ttj2AAQh9_KxxEGVBA_X79pVhD (videos 8-11). doi:10.5281/zenodo.5155465.