Constraint-Based Scheduling

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Constraint Based Production Scheduling

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Acknowledgments

Key Points

- Two Day Course
- In Person at UCC
- Based on Insight Research
- Using Open-Source Scheduling Tool
- Practical Use-case Studies

The Lecturer

- Mathematics @ TH Darmstadt
- 1986-1990 ECRC GmbH, Munich
- 1990-2000, Technical Director, Cosytec SA, Orsay
- 2000-2005, Imperial College London, Parc Technologies Ltd
- 2013-2014, President, Association for Constraint Programming
- Best Application Paper Awards, CP 2009, CP 2013
- Program Chair, CP 2020, CPAIOR 2014
- Distinguished Service Award, ACP

Top-Level Course Structure

- Background/Motivation
- Scheduling Concepts
- Machine Constraints
- Costs and Objectives
- Advanced Concepts
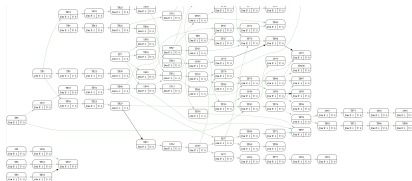- Case Studies
- Literature Review
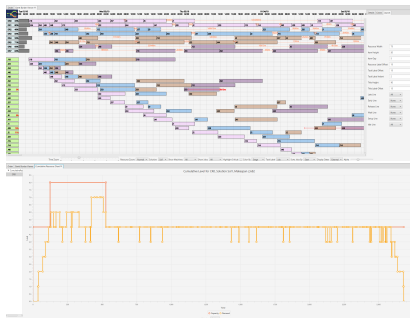
Examples from our scheduling tool

Scheduling Concepts

- Jobs, Tasks and Resources
- Orders, Products, Processes
- Temporal Relations
- Alternative Processes
- Bill of Material
- Problem Classification
- Key Visualisation Concepts

Example of complex temporal relations

Method: Constraint Programming

- Declarative modelling framework
- Combination of powerful solution methods
- Explainable results
- Good solutions found rapidly
- Recognised as preferred tool for solving scheduling problems
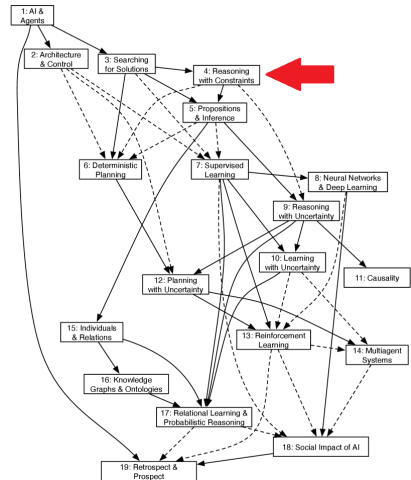
From: David Poole, Alan Mackworth. Artificial Intelligence, Cambridge University Press, 3rd Edition, 2023

Case Studies

- Production Planning
  - Using Scheduling as a module
- Oven Scheduling
  - Unconventional resource constraints
- Blades and Vanes Production Planning
  - Multi-year scheduling for capacity planning
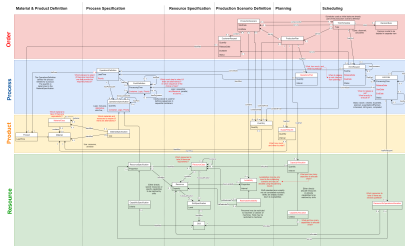
Generic domain model for expressing scheduling

problems