



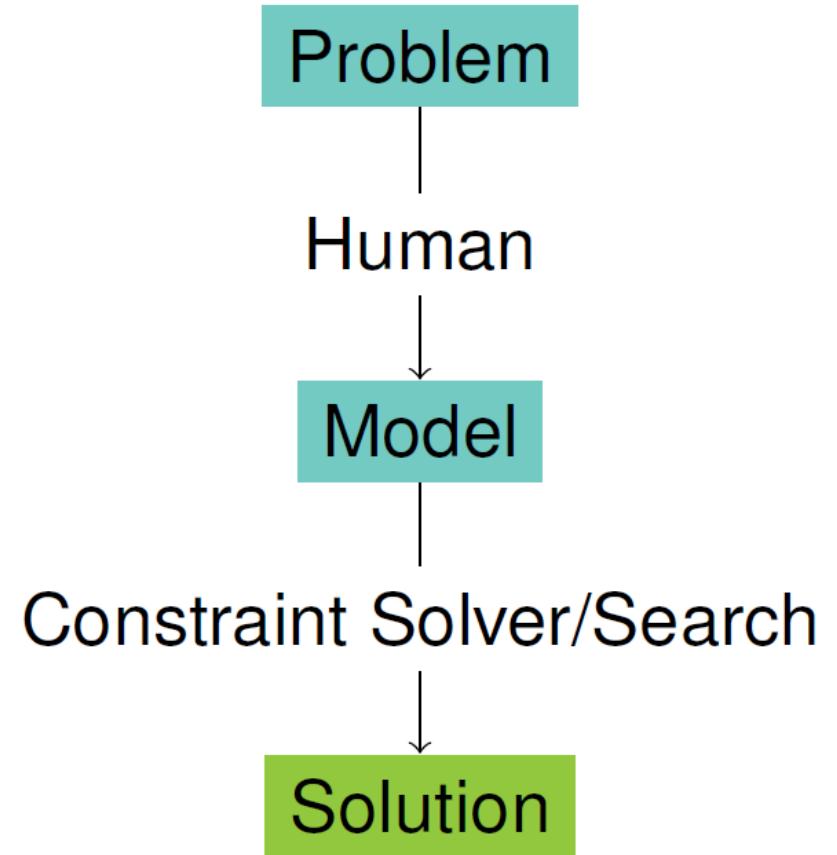
Optimized Decision Making using AI and Constraint Programming

Helmut Simonis, Insight Centre for Data Analytics,
School of Computer Science and Information Technology



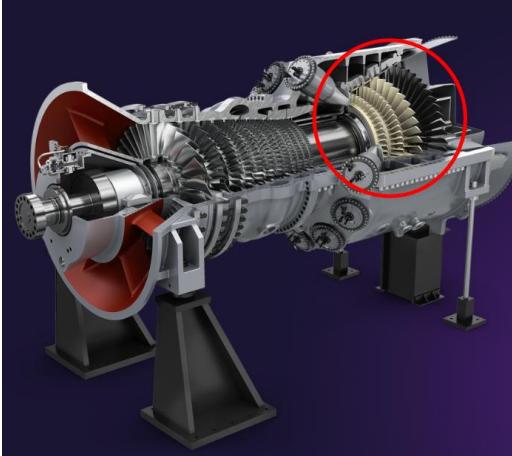
AI is more than ChatGPT

- Enterprises need tools that are
 - Flexible
 - Reliable
 - Explainable
- Constraint Programming provides basis for such tools
 - Research focus at UCC for 25 years
- Flexible interaction with industry
 - Presenting some examples



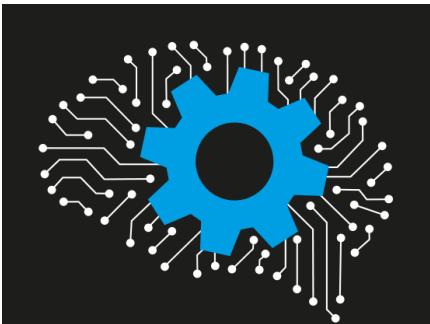
ASSISTANT European Project

- Use AI to improve decision making in manufacturing
- Siemens Energy Use Case
 - Gas Turbine Manufacturing
 - Guaranteeing on-time delivery
 - Using large-scale CP solution



Use Case Scenarios

- Schedule validation of gas turbine blades and vanes manufacturing operations in Berlin plant
- Schedule optimization to manage short-term, mid-term and long-term load fluctuations
- Generate Make-or-Buy proposals for workload balancing within the manufacturing network

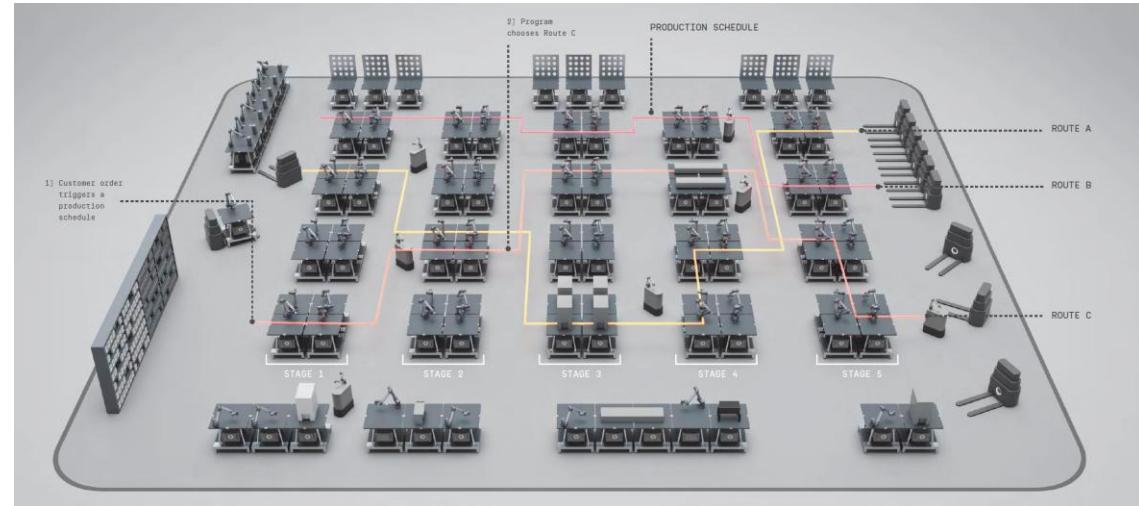


ASSISTANT

“Within less than eight hours the ASSISTANT tools provided us thousands of manufacturing scenarios including different make-or-buy recommendations for making deliberate decisions on the way to proceed for strategic planning.”

Exploring Novel Concepts with Industry

- Project with **Johnson & Johnson** **Confirm**
Smart Manufacturing
- Explore new manufacturing environment
 - Robots, flexible workstations
 - Semi-custom products
- Basic research challenge
 - How to solve this type of scheduling problem
 - Which approach works best
 - Research output



Computers & Operations Research
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Decomposition heuristics for the Hybrid Flexible Flowshop with transportation times

Michele Garraffa ^{b c}   , Helmut Simonis ^{b c}  , Barry O'Sullivan ^{b c}  , Eddie Armstrong ^a 

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<https://doi.org/10.1016/j.cor.2025.107145>

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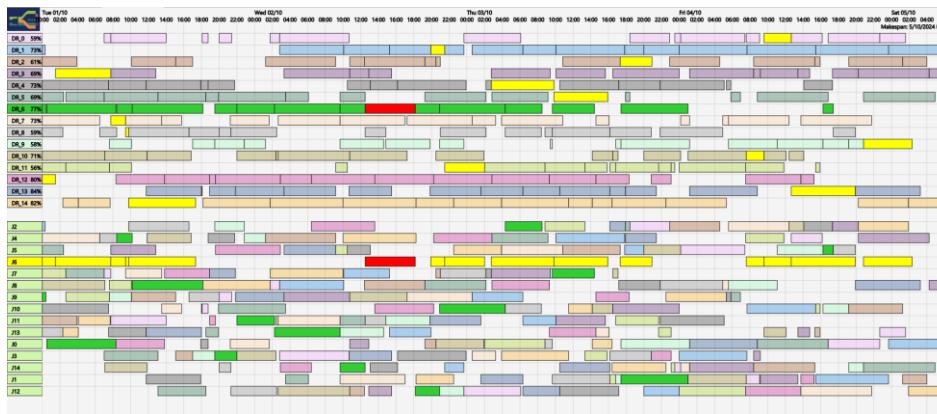
Car Transport with NVD

- Deliver cars from Ports/Factories to dealers
- Complex, non-standard transportation problem
- Process
 - Understand problem
 - Explore solution alternatives
 - Provide experimental solution
 - Handover for productization and daily operation

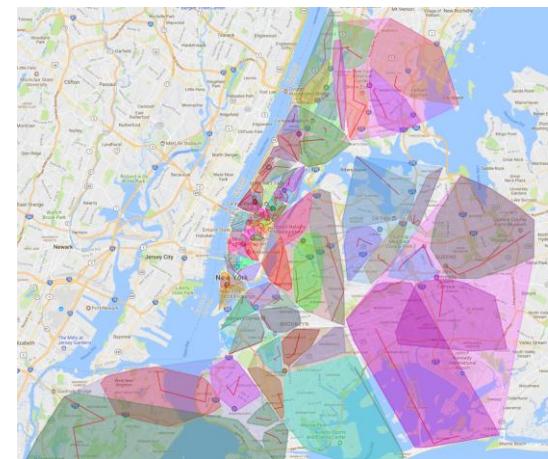


ENTIRE EDIH (European/Enterprise Ireland)

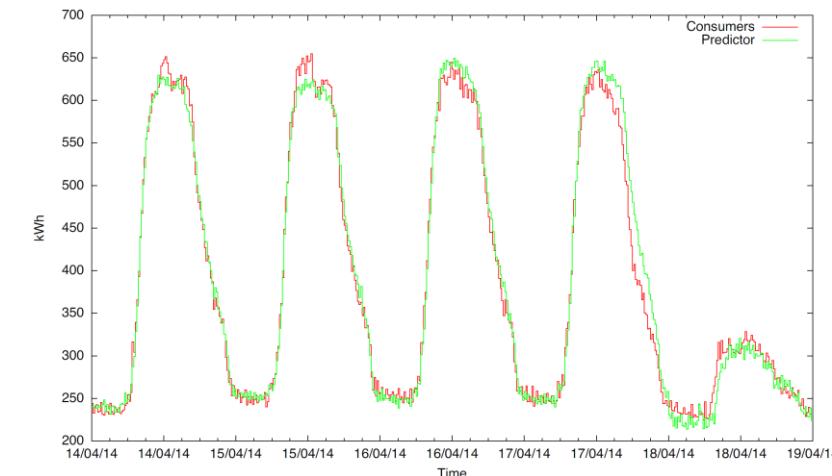
- Digital Innovation Hubs
- Provide training and upskilling for SMEs and PSOs
- AI Fundamentals Courses
 - Using Constraint Programming in different application domains



Scheduling



Rostering and Timetabling



Energy Cost Optimization

Testimonials from Participants



Dave Clarke  1st

CEO, Clarke Analytics - delivering tangible business value to co...
5mo •

What an enjoyable two day refresh on constraint based production scheduling with [Helmut Simonis](#) and [Chrys Ngwa \(PhD\)](#) at [University College Cork](#) last week.

This was an excellent skills development program targetting small to medium enterprises. It was fully funded by [Enterprise Ireland](#), [European Union](#), [European Digital Innovation Hubs Network](#) and Entire.

Scheduling and rostering under resource constraints is always a ripe area for optimisation opportunities in manufacturing, supply chain & logistics, maintenance operations, transport and project managment to name a few.

[Clarke Analytics Ltd.](#) [Skillnet Ireland](#) [Jerry Sweeney](#) [Alireza Soroudi, PhD](#)



Cyril Treacy  2nd

CGO | Responsible AI 🚧 Innovator |Angel Investor | Board ...
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Amazing learnings for myself and [Apoorva Kumar](#) today from [Barry O'Sullivan](#) and team at the inaugural AI Literacy and the AI Act: From AI, to Ethics, to Regulation workshop in [University College Cork](#) today sponsored by [Enterprise Ireland MENA](#) . He and other professor's covered what AI is considered under the EU AI act definition , ML and AI explanation and its limitation's , then real world AI use cases , the complex ethics of AI use in EU and how to evaluate AI use cases by enterprises . We are vey grateful for the opportunity to attend .

#raiops #EUAIACT



Cleidi Hearn • 1st

Founder & CEO @ ML Skills Academy | Creating Value To Data-Driven Bu...
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💡 Exploring AI, Ethics, and EU Regulation 🌟

Super day attending a fantastic course on "AI Literacy and AI Act: from AI, to Ethics, to Regulation" with one of the leading voices in AI, Dr [Barry O'Sullivan](#) Director of [Insight Research Ireland Centre for Data Analytics](#) at [University College Cork](#). It was an eye-opener!