



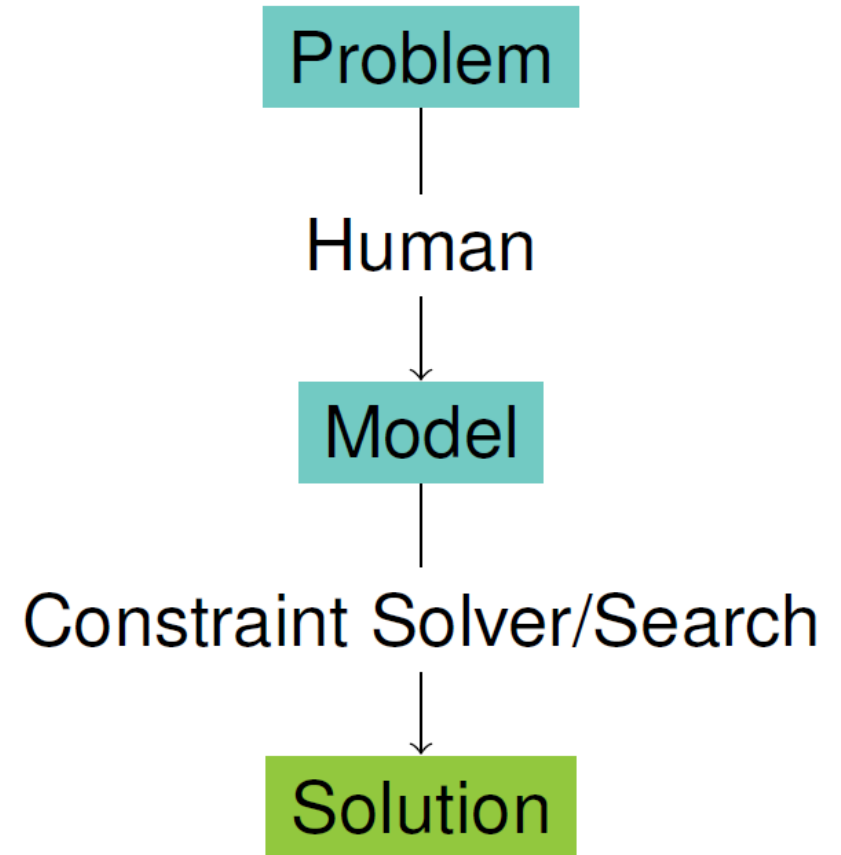
Optimized Decision Making using AI and Constraint Programming

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



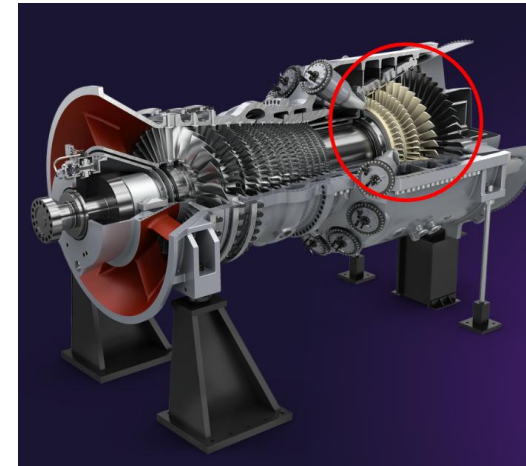
AI is more than ChatGPT

- 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



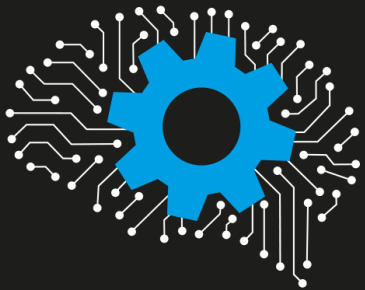
ASSISTANT European Project

- 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

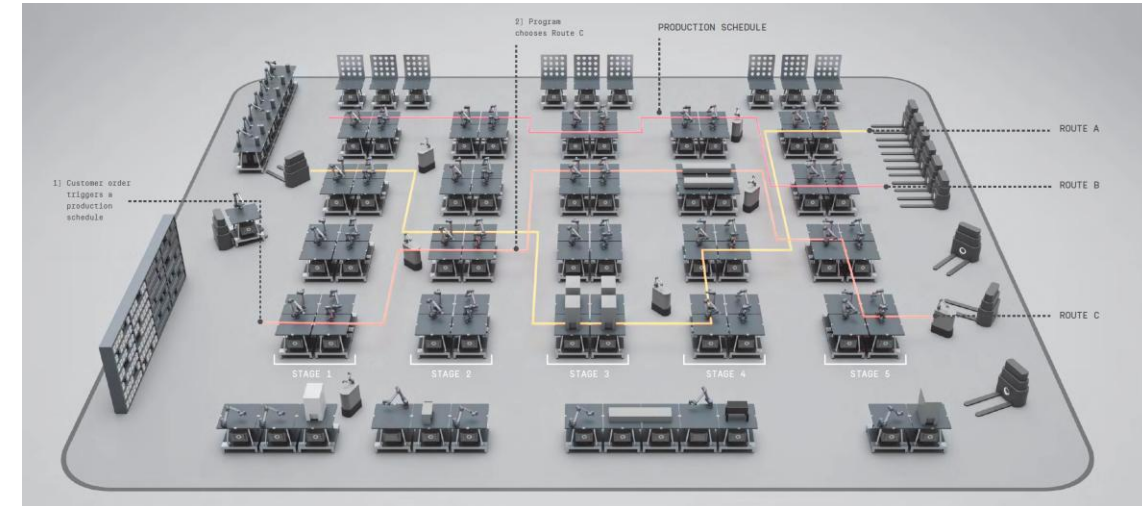


ASSISTANT

“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 
- 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




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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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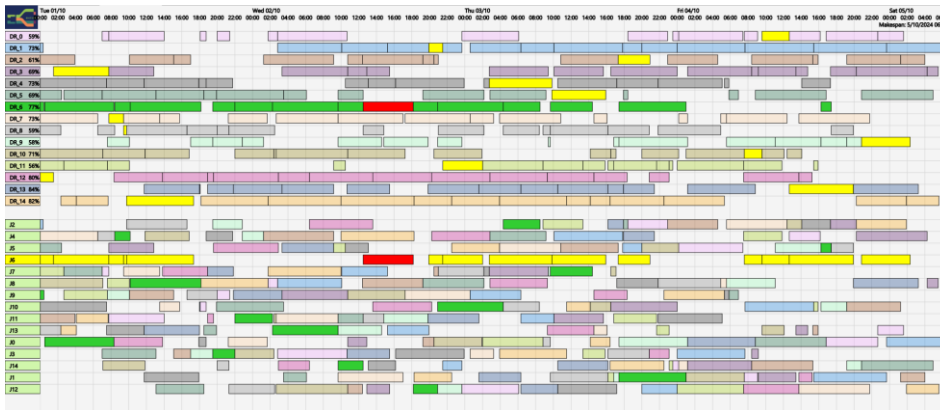
Car Transport with NVD

- 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

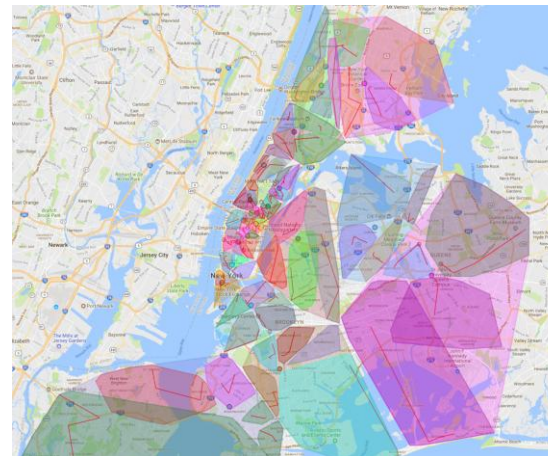


ENTIRE EDIH (European/Enterprise Ireland)

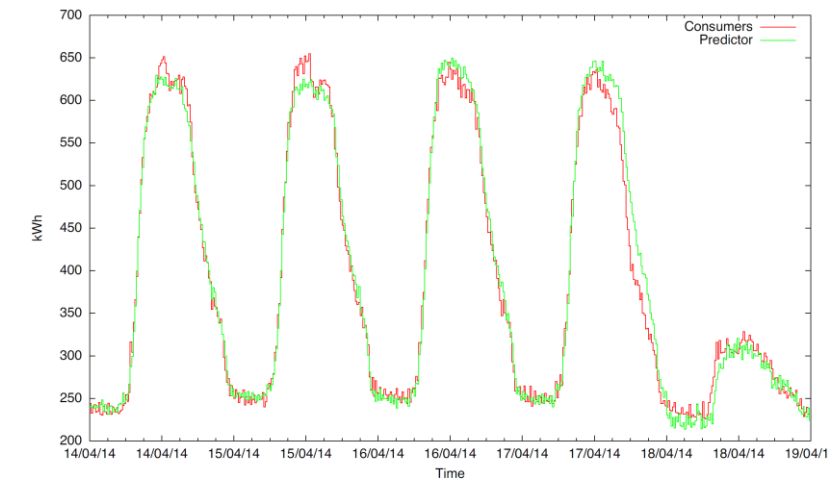
- Digital Innovation Hubs
- Provide training and upskilling for SMEs and PSO
- AI Fundamentals Courses
 - Using Constraint Programming in different application domains



Scheduling



Rostering and Timetabling




Energy Cost Optimization

Testimonials from Participants



Dave Clarke  • 1st

CEO, Clarke Analytics - delivering tangible business value to co...
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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 management 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!