

Skills Development for Scheduling in the ENTIRE EDIH

Helmut Simonis

National Manufacturing and Supply Chain Conference

My Background: Insight Centre for Data Analytics



4 Co-Lead Universities 9 partner institutions	Built on 20 years of research in Data Analytics and AI
450+ Academics, Postdocs, PhDs, RAs	3400+ Scientific conference and journal papers
175+ Funded collaborations with industry partners	350+ Research Awards
16 Spin out companies 72 license agreements	135+ H2020 consortia, 500+ collaborations, 40+ countries
1,137+ school visits, 28,000 students	276 PhDs graduated

European Digital Innovation Hubs Network



EDiH – what are they?

A one-stop
shops to
accelerate
digital
transformation
for enterprise
and public
sector.

250 EDiHs in
the EU

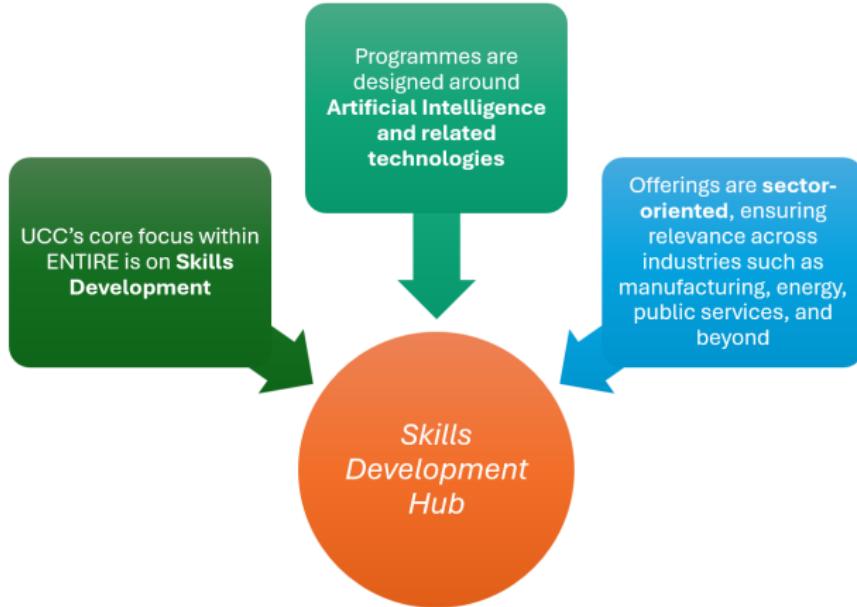
Four EDiHs in
Ireland

- ENTIRE
- QuADAR
- FactoryXChange
- Data2Sustain



<https://entire-edish.ie/>

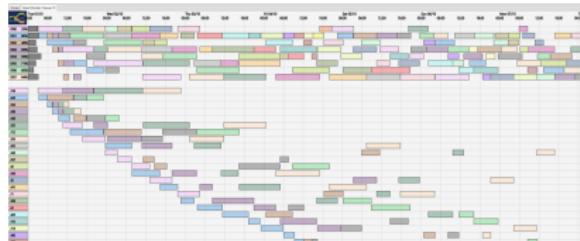
ENTIRE at UCC



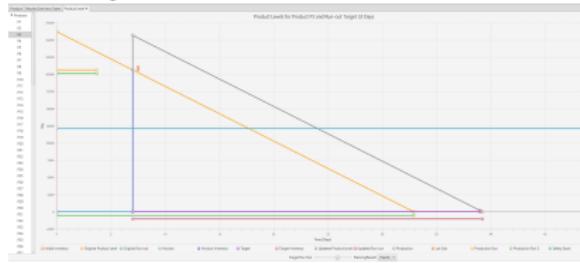
AI Fundamentals: Constraint Based Production Scheduling



- Course already ran twice
- In person event
- Presentation of problem constraints
- A generic scheduling tool
- Visualization techniques
- Industrial case studies
- Future iterations on demand



Scheduling Tool: Machine and Job Gantt Chart

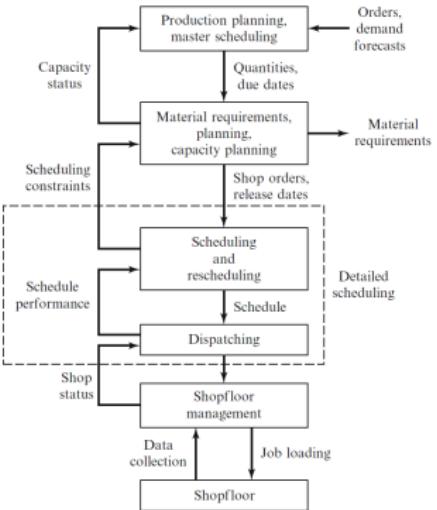


Production Planning Example

Two Day Course - Modules



- Introduction
- Scheduling concepts
- Machine constraints
- Experiments with tool
- Costs and objectives
- Advanced concepts
- Case studies
- Literature survey



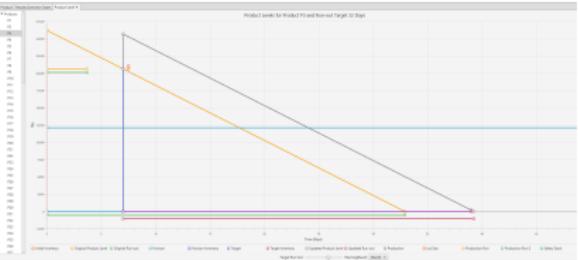
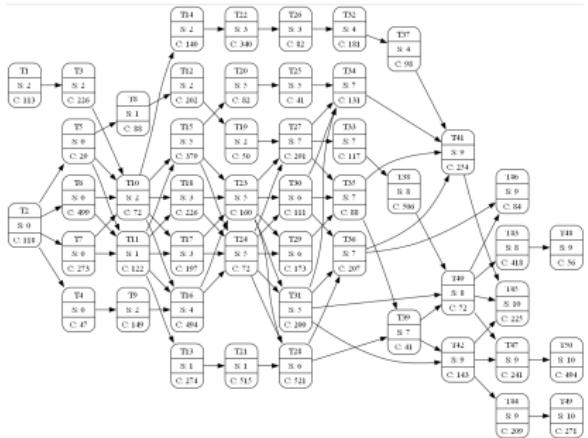
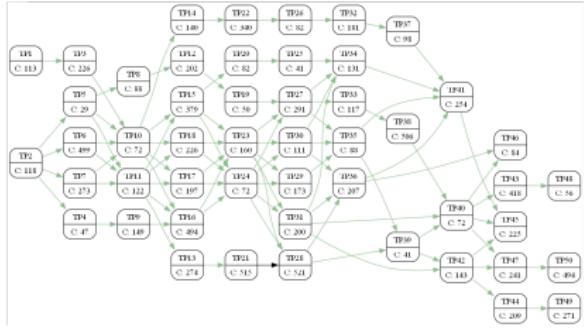
Source: M. Pinedo. Scheduling. Springer, 2016

A Generic Scheduling Tool



- No programming, configured by JSON input data
- Compositional use of different constraint types
- Different commercial or open-source back-end solvers
- Developed in Java
- Interactive JavaFX front-end
- Can be used as back-end scheduling tool/server
- Instance generator included
- Readers for multiple benchmark types included
- Early access open-source available

Scheduling Tool GUI Examples



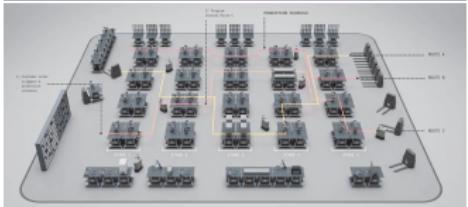
Industrial Case Studies



- Surgical Instruments Production Planning
 - Insight targeted project
- Factory Capacity and Production Planning
 - Siemens Energy - EU ASSISTANT Project
- Flexible Workcell Factory Design
 - J&J - Confirm Centre
- Oven Scheduling
 - Atlas Copco - EU ASSISTANT Project



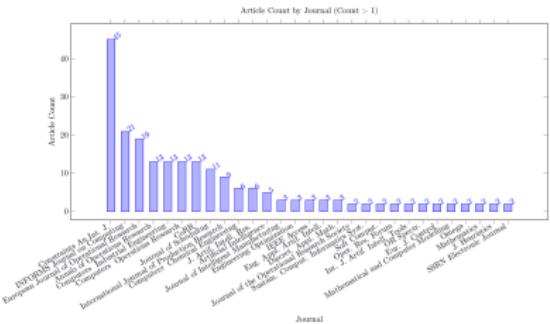
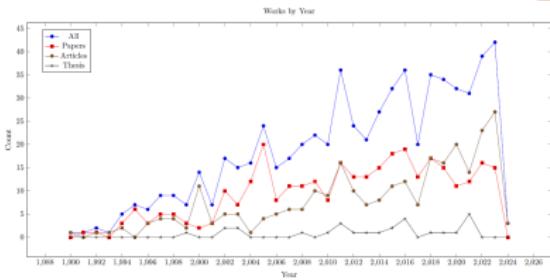
Use Case Scenarios
Schedule visitation of gas turbine blades and vanes manufacturing operations in Berlin plant
Schedule optimization to manage short-term, mid-term and long-term load fluctuations
Generate Move-or-Buy proposals for workload balancing within the manufacturing network



Survey of Existing Literature



- Constraint Programming and Scheduling
- Joint work with C. Ozturk, MTU
- Covers 1227 papers, articles, theses
- What is important?
- Who covers this concept?
- What is it used for?
- <https://hsimonis.github.io/pthg24/>



Outline

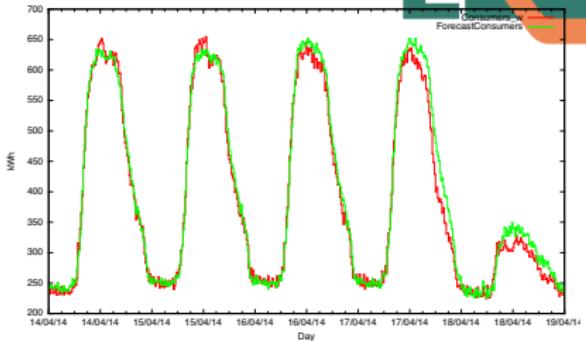


Other Courses

Energy Cost Optimization



- First iteration ran beginning of May
- In person event
- How to exploit time variable energy prices
- Using energy storage
- Predicting production, demand and prices
- Case studies
- Next iteration planned for Fall 25



Predicting UCC Campus Electricity Demand
Hourly Irish Wholesale Electricity Price



Time Variable Electricity Price

AI Literacy and the AI Act



- From AI, to Ethics, to Regulation
- One day course run by B. O'Sullivan
- First iteration ran in November 24
- Hybrid event format
- Next iteration June 26th



- Evaluation of AI systems
- Ethics for AI
- An overview of the AI Act
- Assessment List for Trustworthy AI

AQuA - All Questions Answered



- One hour sessions on specific topics
- In planning
- One session per month
- In person, online or hybrid
- Reacting to demand of SME/PSO



Rostering and Personnel Assignment



- Problem types
 - Rostering
 - Timetabling
 - Capacity planning
- Solution methods
- Case studies
- Planned for Fall 25

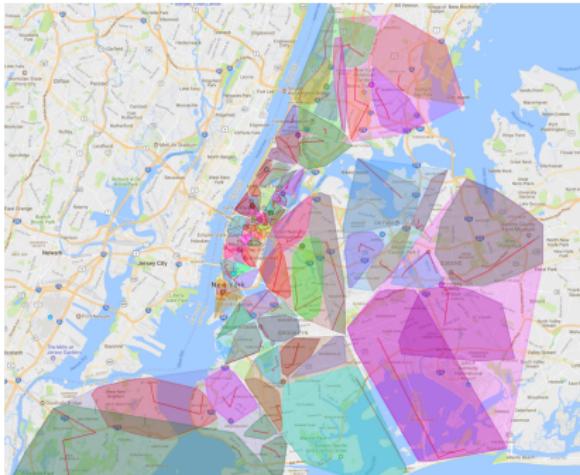


Outpatient Capacity Planning Dashboard

Transportation and Distribution



- Problem types
 - Tour limited
 - Capacity limited
 - On-line problems
- Predicting travel times
- Industrial case studies
 - Scheduling maintenance visits
 - Car transport in Ireland
- Planned for Winter 25/26



Elevator Maintenance Planning in NYC

Testimonials from SME Participants



Dave Clarke 1st
CEO, Clarke Analytics - delivering tangible business value to co...
Simo • 0

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 targeting 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 Aireza Soroudi, PhD



Cyril Tracy 2nd
CDQ | Response AI Innovator | Angel Investor | Board ...
Simeon • 0

Amazing learning 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 very grateful for the opportunity to attend .



#raips #EUAIACT

Cleidi Hearn 1st
Founder & CEO @ ML Skills Academy | Creating Value To Data-Driven Bu...
Willow Westside
Simo • 0

Big 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!

More on ENTIRE at Exhibition



- Partner in ENTIRE EDIH
- Stand B02