

The background features a complex data visualization with a grid of white dots and green lines. Several numerical values are scattered across the grid, including 40.6755, 67.6263, 91.9679, 96.4505, 97.4776, 77.7001, 51, 69.0513, 57.7679, 92.7364, 2.8979, 90.9878, 31.3881, 78.3673, 73.2919, 9.6914, 46.88, 58, 63, 99.5519, and 4.5419. The OPTIT logo is positioned in the upper right, with the tagline 'optimal solutions' below it.

OPTIT
optimal solutions

Supporting the Industry towards Digital Excellence

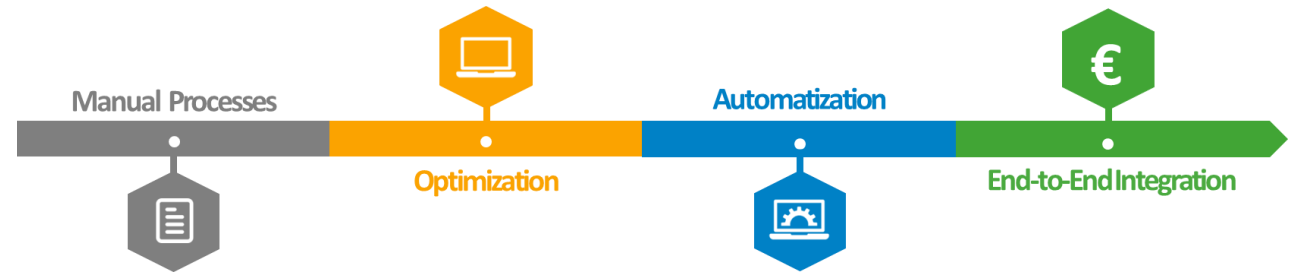
**Stefano Morgione
Caterina Tamburini**

Bologna, 05/12/2024

- 
- **Digital Innovation for the Industry**
 - What is Decision Science?
 - Industrial applications
 - Conclusions

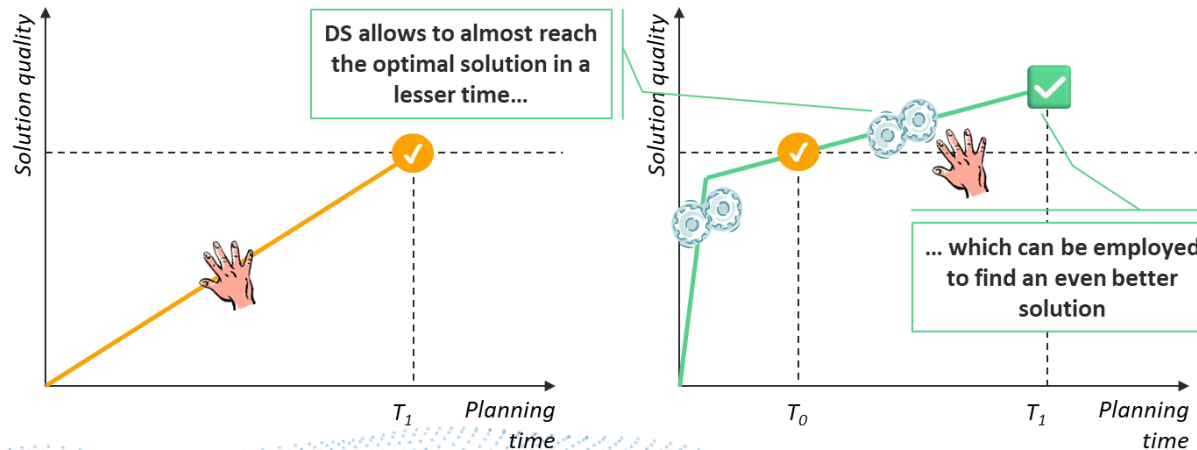
Designing and implementing a **Digital Innovation Roadmap** faces a lot of challenges:

- ... how to properly model the process?
- ... how to integrate “Smart” Approaches with internal processes and legacy experience?
- ... to what extent automatization/integration is feasible and/or impactful?



From manual process ...

... to a DS-driven process



Applying **Decision Science methodologies** allows to:



Proven economic benefits



Increased planning speed and accuracy



Improved service quality



Standardized Knowledge

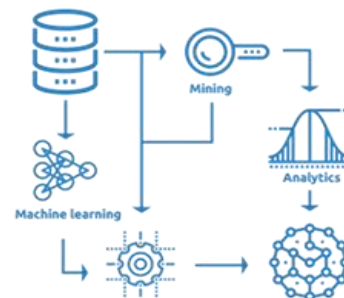
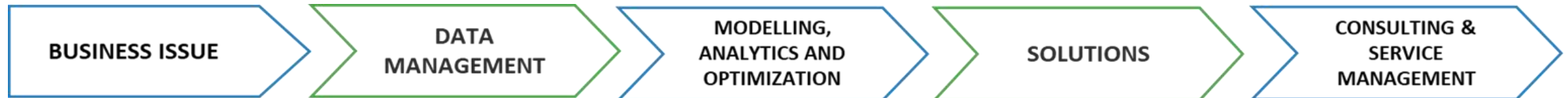
We apply **DECISION SCIENCE** to support our partners in solving complex problems in multiple sectors like **Energy**, **Logistics**, **Waste Management** and **Industry**.



A Team of \approx 50 of **Mathematical Modelers**,
Algorithm Engineers, **Computer Scientists**,
Subject Matter Experts, **Project Managers**



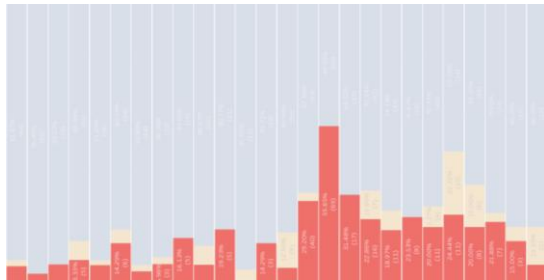
Bologna: HQ
Cesena: Software Factory
New York: US Office



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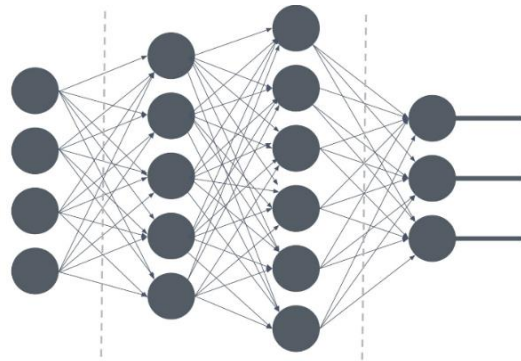
DESCRIPTIVE

“What happened?”
“What is happening?”



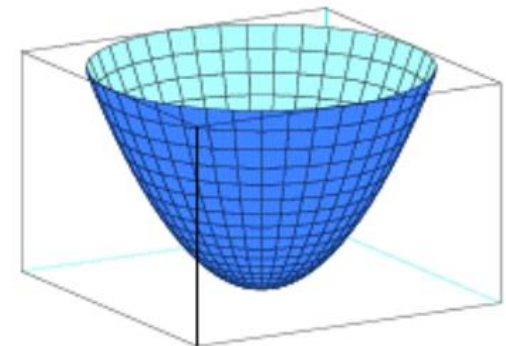
PREDICTIVE

“What will happen (if ...)?”



PRESCRIPTIVE

“What should we make happen?”



Consulting services

Software with IT systems integrations



STRATEGIC

- Facility location
- Network design
- Infrastructure maintenance planning

TACTICAL

- Fleet sizing
- Demand forecast, seasonality and trend analysis
- Clustering and districting
- Budgeting

OPERATIONAL

- Production / inventory planning
- Task assignment
- Routing and scheduling
- Bin packing
- Energy market trading

REAL-TIME

- Process monitoring
- Disruption management
- Dynamic re-optimization

- 
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Energy production

- Optimize the **energy dispatching plan**, maximizing the **economic function** while providing an actionable solution
- Schedule the **unit commitment** of the energy generation assets, given **operative and topological** constraints, an **economic and regulatory** framework and a **variable time window** (from 1 day to 1 year)
- **Web-based enterprise solution** embedding a Mixed Integer Linear Programming (**MILP**) model solved directly with an exact algorithm by means of a solver





Energy production



Bin packing

- Given a set of items and a set of containers (bins), **arrange all the items inside the minimum number of bins** (packing problems in transportation logistics)
- Library of optimization algorithms** and a **web-based visualization tool** to navigate the solutions
- Detailed model of **costs and tariffs**, as well as **operational constraints** (ensuring safety and stability of the cargo)

The screenshot displays the OPTIT software interface. The top section shows a table with columns for 'Start import', '# Item', '# Colonne stimate', '# Colonne reali', and 'Warning anagrafiche'. Below this, a 'Load building' section features a 3D visualization of a bin structure with various colored blocks representing items. To the right, a 'Dettaglio strutture ordine' table provides detailed data for each bin structure, including columns for 'ID Colonna', 'N° legni', 'm3', 'Kg', 'Altezza [m]', 'N° pallet mono', 'N° pallet strati', 'N° pallet sfuso', and 'Totale debordo in cm2'.

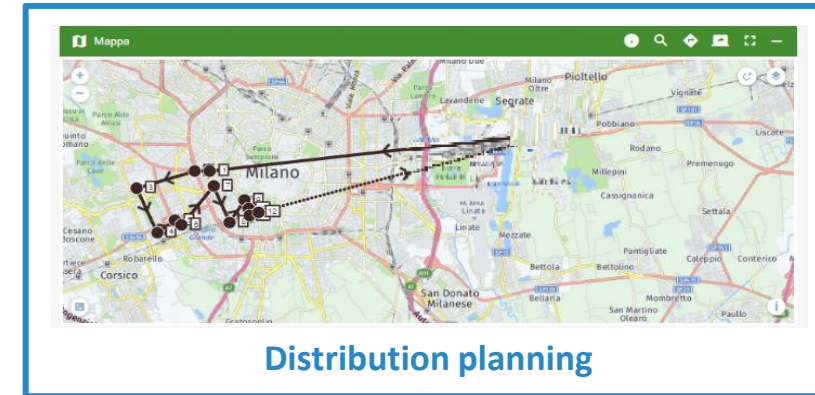
ID Colonna	N° legni	m3	Kg	Altezza [m]	N° pallet mono	N° pallet strati	N° pallet sfuso	Totale debordo in cm2
4194	3	1.96	570.54	2.44	1	1	1	0
4195	2	1.96	570.20	2.21	1	1	0	0
4196	2	2.00	454.30	2.17	1	1	0	0
4197	2	1.94	544.54	2.14	1	1	0	0
4198	2	1.95	455.06	2.13	1	1	0	0
4199	2	1.87	593.39	2.09	0	2	0	0
4200	2	1.80	504.09	1.99	2	0	0	0
4201	2	1.80	504.09	1.99	2	0	0	0
4202	2	1.48	516.71	1.95	0	2	0	0
4203	1	1.07	300.02	1.17	0	1	0	0
4204	1	0.91	405.29	1.07	1	0	0	0
4205	1	0.91	405.29	1.07	1	0	0	0
4206	1	0.91	405.29	1.07	1	0	0	0
4207	1	0.91	405.29	1.07	1	0	0	0
4208	1	0.91	405.29	1.07	1	0	0	0
4209	1	0.91	405.29	1.07	1	0	0	0
4210	1	0.91	405.29	1.07	1	0	0	0
4211								



Energy production



Bin packing



Distribution planning

- «**Rich Vehicle Routing Problems**»: multiple depots and pickup/delivery time windows, capacity constraints on volumes and weights, compatibility constraints...
- A **flexible and scalable approach** is needed: general **metaheuristic framework** that embeds problem-specific algorithms and operators
- The end users can **interact with the solution** proposed by the algorithm (**manual editing**)



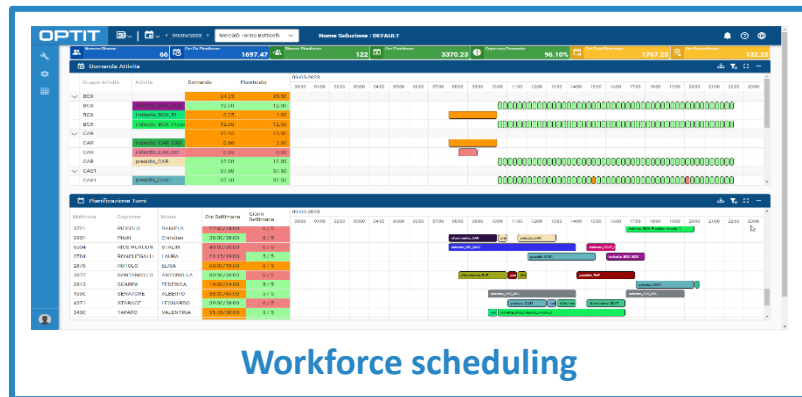
Energy production



Bin packing



Distribution planning



- **Assign tasks** to a staff, within different timeslots
- **Satisfy the required demand**, defined as number of hours devoted to a particular task within a time period
- **Hard constraints**: max number of working hours, days off, compatibility person-task...
- Several **soft constraints**, so need to tune penalties!



Energy production



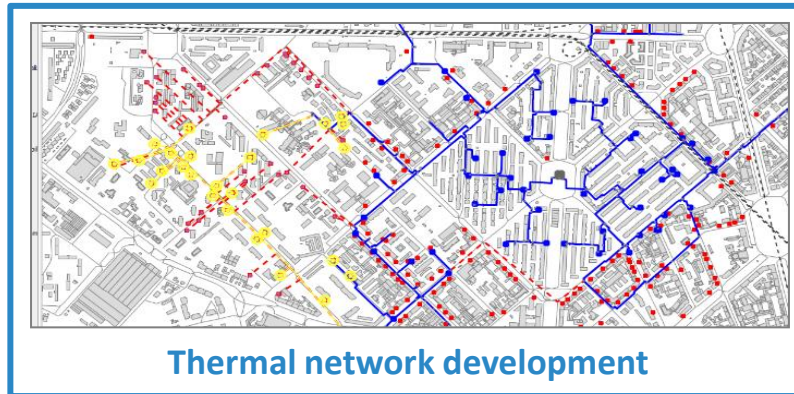
Bin packing



Distribution planning



Workforce scheduling



Thermal network development

- Optimize the **strategic development of thermal networks**, maximizing the NPV, while **satisfying physical, economic and urban requirements**
- Ensure feasibility of the proposed design (**pipe sizing and layout**)
- Provide **optimal commercial expansion of existing or brand-new systems**



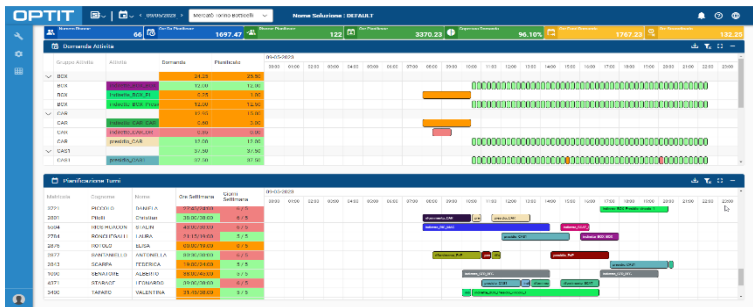
Energy production



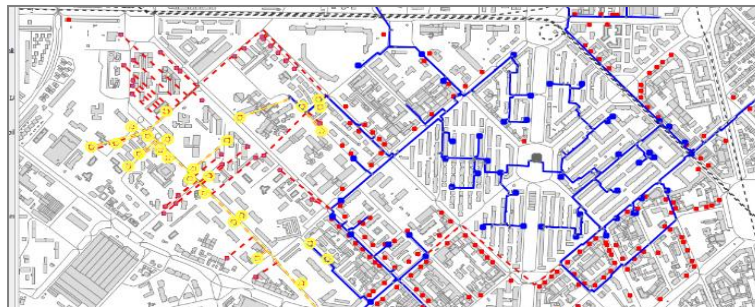
Bin packing



Distribution planning



Workforce scheduling



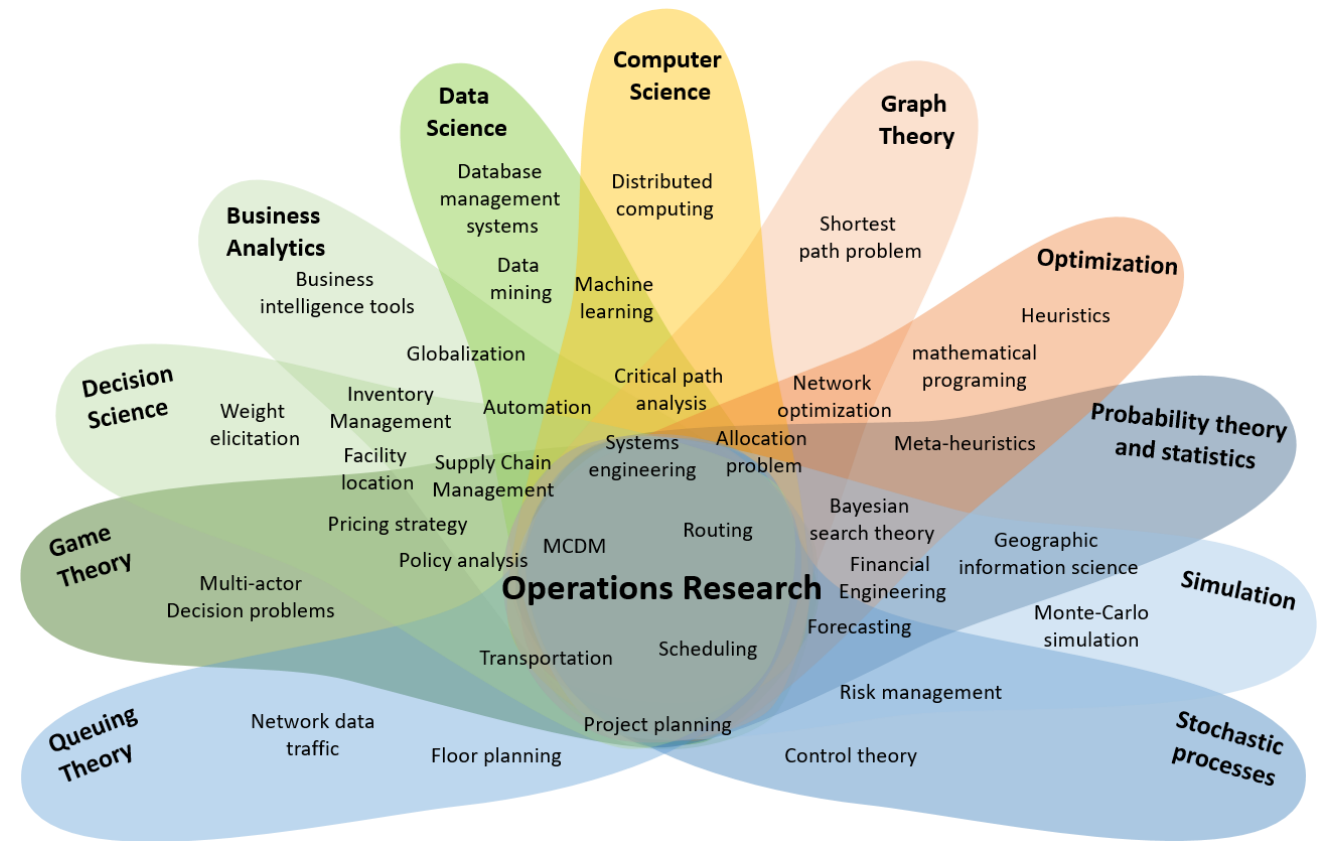
Thermal network development



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Key mantras

- ...keep calm and relax... that constraint
- ...think twice, code once
- ...one small step for you, a giant leap for your customer
- ...one objective, many skills
- ...never stop learning



Holistic illustration of the disciplines and problems related to operations research, by Alex Elkjær Vasegaard.

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Working at Optit: growth through innovation

Working at Optit means having the possibility to develop your skills and become part of a cohesive, motivated team with a shared passion for **Digital Innovation**.

It means immersing yourself in **challenging projects** for important national and international players, bringing state-of-the-art results from the academic world to reality.

Joining our team is an opportunity for mutual growth, integrating experience and discipline to manage, together, the complex systems of the world in **Industry 4.0**.

Join the Team

Optit is growing: we are always looking for young talents to enrich our teams.

If you are a young talent, and you think your profile is a good fit for our company, but you can't find an open position perfect for you, please contact us! We are always looking for passionate professionals to join our team.

[Submit your application](#)

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