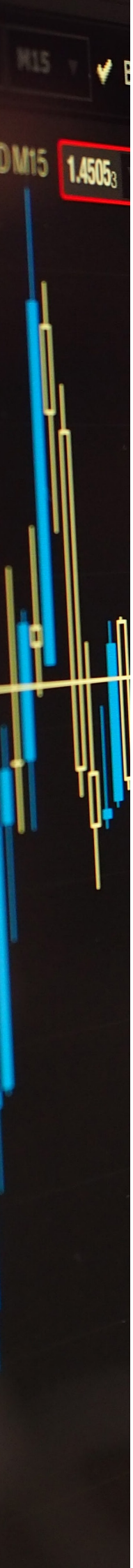
ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

OPERATIONS RESEARCH

Efficient decision making based on quantitative results is essential for success in business and management.

Project planning, network optimization, facility location, routing, supply chain management, scheduling, among others, are real problems tackled by Operation Research. Industrial sectors that benefit from Operation Research range from airlines (scheduling, tariff policy), to hospitals (scheduling), to electric utilities (production, trading) and logistics (route scheduling).



The University of Bologna is active in the Operations Research area developing innovative models and algorithms for the optimization of hard decision and planning problems in several application domains:

- Routing and logistics (Variants of traveling salesman and vehicle routing problems; Waste management; Demand analysis and network design for freight transportation; Drone and autonomous vehicle routing)
- Cutting and Packing (Large-size knapsack problems; Non-linear variants of knapsack problems; Two and three-dimensional bin packing problems)
- Energy Production and Distribution (Plant location for wind farms; Design of district heating and cooling networks; Relocation operations in electric car-sharing)
- Railways and Airlines (Crew and resource scheduling problems (Rail, Airline, Integrated and Robust planning); Timetabling and resource optimization (i.e. Rolling stock circulation, platforming); Online train rescheduling and disruption management; Rail freight transportation; Energy consumption optimization)
- Exact and heuristic algorithms for Integer Linear and Non-Linear Programs (Heuristic and matheuristics for Integer Linear Programs; Heuristics for multi-objective MINLPs; Decomposition techniques; Exact and heuristic algorithms for bilevel programming)
- Optimization on graphs (Exact and approximation algorithms for clustering, connectivity and node detection)
- Healthcare applications (Resource allocation and scheduling; Robust planning)

HIGHLIGHTS

The research activity at **the Computer Science department** is active in design methodologies, modeling techniques and solving strategies for decision support and optimization systems.

Laboratory on Optimization of Operations Management (LOOM): development of advanced models and algorithms for the optimization of freight distribution logistics, industrial packing and loading and waste logistics.

Several state-of-the-art instruments and advanced laboratories are available within **the Center for Industrial Research on Information and Communication Technologies** (CIRI ICT) of the University of Bologna in support of research activities on sustainable innovation.