

# Algorithms for combinatorial optimisation

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Combinatorial optimisation's applicability spans from health care to data science, from logistic and transportation to life science, from production and scheduling to health care.

This short course (8 hours) introduces the mathematical programming principles to design exact and heuristics algorithms to solve combinatorial optimisation problems, and unfolds as follows:

- Mathematical optimisation
  - Definitions, history and context
  - Applications to the real world
  - Simple examples
- Formulation of very popular combinatorial optimisation problems
  - Knapsack problem
  - Assignment problem
  - (Perfect) matching problem
  - Set covering, set packing, and set partitioning problem
  - Travelling salesman problem
- An exact algorithm for integer linear programming
  - Brief introduction to continuous linear programming
  - Bounds and linear relaxation
  - The Branch & Bound algorithm
- Heuristic algorithms for integer linear programming
  - Greedy algorithms
  - Local search algorithms
  - Approximate algorithmsand their applications to the Knapsack problem and to the Travelling salesman problem