*Lecture*

# Mathematical Optimization and Polyhedral Approaches

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# Aim of this module

Aims :

- introducing mathematical and algorithmic principles, with practical tools in order to solve efficiently continuous and combinatorial optimization problems
  both linear and nonlinear.
- presenting well-known practical industrial problems coming from Operations Research (transportation, energy managent, network design...).

Among many approaches we propose to introduce

- Polyhedral approaches for combinatorial optimization problems.
- Mathematical Optimization method for optimizing mixed integer problems under constraints (like the Column Generation method...).

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# Useful knowledge

Useful previously known knowledge

- Some knowledge are required about continuous optimization (Newton methods)
- Linear Programming
- Some knwoledge about Combinatorial Optimization : graphes, algorithms
- Basic programming skills

**This lecture proposes some practical session on computers :**

- to discover some simple optimization exercises on practical subjects
- to study some mathematical tools dealing with Mixed Linear and Nonlinear Mathematical Programs and polyhedra.

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# Schedule

- Tuesday January 20 : Introduction to Combinatorial Optimization
- Monday January 26 : Practical session about MIP tools
- Tuesday January 27 : Polyhedral approaches
- Monday February 2 : Practical session about MIP tools
- Tuesday February 3 : Polyhedral characterizations
- Monday February 9 : Practical session about Porta tool
- Tuesday February 10 : Decomposition approachs and column generation
- Monday February 16 : Practical session about SDP tools
- Tuesday February 17 : Convex sets
- Tuesday March 10 : Semi-definite programming
- Tuesday March 17 : Exam

And we will decide a date to submit a practical/theoretical exercice at home