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# Séminaire hebdomadaire de Recherche Opérationnelle

Mercredi 19/02/2025

11h30-12h30

Salle de conférences du Bolc CAM

Faculté de Mathématiques

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## Title: Multi-Objective Integer Linear Programming Under Uncertainty

## Abstract

In this presentation, we present a method for solving multi-objective optimization problems in a stochastic environment, particularly for stochastic integer linear programming problems (MOISLP). The key points are as follows : The primary goal is to find all Pareto-optimal solutions without exhaustively exploring the entire solution space. Additionally, the method aims to simulta-neously optimize multiple criteria in a stochastic environment, where data is uncertain and probabilistic.

The problem is formulated as a multi-objective optimization with integer variables and stochastic constraints. The objective functions and constraints depend on random variables, which introduces uncertainty into the problem. The proposed approach involves transforming the stochastic problem into an equivalent deterministic problem. Feasibility and optimality tests are used to verify solutions, and the feasible domain is progressively reduced by eliminating dominated solutions.

The algorithm begins by solving a parametric problem to find an initial solution. Feasibility and optimality tests are then applied to ensure the solution is admissible and optimal. At each iteration, the list of efficient solutions is updated, and the feasible domain is reduced to avoid dominated solutions. A numerical example is provided to demonstrate the application of the method. The different steps of the algorithm are detailed, including feasibility tests, optimality tests, and the reduction of the feasible domain.

The method avoids the exhaustive exploration of the Pareto-optimal solution set. Potential improvements include avoiding efficiency tests and extending the method to handle nonlinear criteria.

**Keywords** : Multi-objective Programming, stochastic Programming, 2-levels recourse model, the efficient solutions.