Branch-and-Benders-Cut Algorithms for the Single Source Capacitated Facility Location Problems

Furkan Enderer[*1], Claudio Contardo[†2], and Bernard Gendron[1]

[1]Université de Montréal - CIRRELT – Canada
[2]ESG-UQAM – Canada

Abstract

In this talk, we present a unified Benders-Branch-and-Cut (BBC) algorithm for discrete location problems. First we present two
Benders decompositions chemes and a Benders-Branch-and-Cut based exact algorithm for the Single Source Capacitated Facility Location Problem (SSCFLP). We reformulate the Benders subproblem as a set partitioning problem from which we derive LP-based Benders cuts as well as canonical cuts. At each node of the BBC's branching tree we solve the linear programming relaxation of the Benders subproblem corresponding to a Set -Partitioning formulation and add Benders cuts to the master problem accordingly. By the end of the tree exploration, we solve the Benders subproblem to optimality by Branch-and-Price and add canonical cuts until we obtain the optimal solution value to the problem. Numerical results on benchmark instances demonstrate the effectiveness of the proposed algorithm in reasonable computation times. Finally, we discuss the possible implementations of the proposed algorithm to various discrete location problems.

[*]Speaker
[†]Corresponding author: contardo.claudio@uqam.ca