Improving Discrete Location Formulations

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Although there are many discrete location problems of interest, we will focus on the basic ones, i.e., the p-median problem, the simple plant location problem (also knows as uncapacitated facility location problem), the p-center problem and the k-centrum problem. If we have enough time, we will also build upon the DOMP (discrete ordered median problem) that brings together many basic problems.

In order to exactly solve all these particular or general models, we count on a very powerful tool: Integer Programming (or, better said, Discrete Optimization). Classical integer programming formulations for location problems are intuitive and well studied. But we will go deeper and present formulations made with imagination, and which are often better than the classical ones. What makes a formulation better than another one could be summarized in two characteristics of different importance: (i) bound provided by its linear relaxation (85%) and (ii) size (number of variables and constraints, 15%).

Formulating is an art and cannot be easily taught. Practice is the key.