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Dealing with uncertainty: robustness in combinatorial optimization

Uncertainties are everywhere in optimization problems: in the cost, in the weights or in the demand. Robust optimization is a classical way to include these uncertainties into the optimization process. A solution is called robust, if it remains feasible in every single realization of the uncertain parameters. Furthermore, we aim at minimizing the worst-case cost. This setting is suitable if we need a solution with a high guaranteed performance as it is the case for infrastructure development.

In this workshop, we will consider different forms of robust optimization as strict robustness and two-stage robustness. We will analyze the complexity of the corresponding problems according to the most classical uncertainty sets. Especially for the so-called budget uncertainties, we will show that the robust version is as difficult as the problem without uncertainties. Finally, we will consider to two-stage robust problem motivated by applications in health care.