Research School for Operations
Management and Logistics

Mathematical optimization for decision-making under decision-dependent uncertainty

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Companies and policymakers take decisions under high levels of uncertainty. To deal with this uncertainty, they usually design a-priori plans that can easily be adapted when uncertainty is revealed. Most approaches in the scientific literature that deal with uncertainty in decision-making assume that the uncertain parameters (e.g. cost, demand, etc) can be observed for free and that the sequence in which they are revealed is independent of the decision maker's actions. Yet these assumptions fail to hold in many real-world applications where the time of information discovery is decision-dependent and the uncertain parameters only become observable after an often-costly investment. To fill this gap, optimization models need to be developed in which part of the decision variables control the time and amount of information discovery. This PhD project aims at making major advancements in this area of research by developing innovative models and algorithms using state-of the-art operations research tools such as linear and non-linear programming, benders decomposition, column generation, branch-and-price, cutting planes, etc. The project aims at solving both two-stage and multi-stage problems with objective and/or constraint uncertainty.