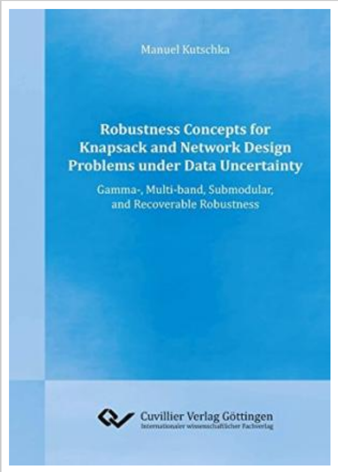


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# Robustness Concepts for Knapsack and Network Design Problems under Data Uncertainty

By Manuel Kutschka

Cuvillier Verlag Dez 2013, 2013. Taschenbuch. Book Condition: Neu. 213x149x17 mm. Neuware - This thesis is concerned with mathematical optimization under data uncertainty using mixed integer linear programming (MILP) techniques. Our investigations follow the deterministic paradigm known as robust optimization. It allows to tackle an uncertain variant of a problem without increasing its complexity in theory or decreasing its computational tractability in practice. We consider four robustness concepts for robust optimization and describe their parametrization, application, and evaluation. The concepts are -robustness, its generalization multi-band robustness, the more general submodular robustness, and the two-staged adaptive approach called recoverable robustness. For each concept, we investigate the corresponding robust generalization of the knapsack problem (KP), a fundamental combinatorial problem and subproblem of almost every integer linear programming (ILP) problem, and many other optimization problems. We present ILP formulations, detailed polyhedral investigations including new classes of valid inequalities, and algorithms for each robust KP. In particular, our results for the submodular and recoverable robust KP are novel. Additionally, the recoverable robust KP is experimentally evaluated in detail. Further, we consider the -robust generalization of the capacitated network design problem (NDP). For example, the NDP arises from many application areas such as telecommunications, transportation,...

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