Institut für Optimierung und Diskrete Mathematik

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Submodular Optimization and Approximation Algorithms

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Submodular functions are discrete analogue of convex functions, arising in various fields of applied mathematics including game theory, information theory, and queueing theory. This talk aims at providing an overview on fundamental properties of submodular functions and recent algorithmic developments of their optimization and approximation. Most efficiently solvable combinatorial optimization problems are closely related to submodular function minimization, for which the ellipsoid method had been the only polynomial algorithm until combinatorial strongly polynomial algorithms appeared. In contrast, for submodular function maximization, which is NP-hard and known to refuse any polynomial algorithms, constant factor approximation algorithms have been developed with applications to combinatorial auction, machine learning, and social networks. An efficient method for approximating submoduar functions everywhere leads to a generic framework of designing approximation algorithms for combinatorial optimization problems with submodular costs. In some specific cases, however, one can devise better approximation algorithms.

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