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Preface

Stochastic programming deals with optimizing decisions in the presence of uncertainty. This poses numerous challenges ranging from model building, via algorithm design and implementation, to the analysis of model outputs. An interplay of optimization and stochastics is inherent to the field: Traditional optimization models and algorithms have to be extended or adapted to cover limited data availability and to capture the alternating processes of making decisions and gaining information. Stochastics provides the framework to model uncertainty and to assess the quality of the relevant decisions under uncertainty of which the stochastic program picks a best one. The requirement to optimize under uncertainty results in added complexity of stochastic programming models and algorithms. This has a major impact on model management and poses various research problems in computer science related areas.

The IX International Conference on Stochastic Programming was held at the Humboldt-University in Berlin, Germany, August 25–31, 2001 to provide a forum for discussion of recent developments in the field. This volume contains fourteen papers that were presented in Berlin. The papers were submitted and refereed after the conference.

Jan-Arild Audestad, Alexei Gaivoronski, and Adrian Werner combine ideas from game theory and stochastic programming to model the situation when uncertainty faced by a decision maker is influenced by actions from another independent agent. Their general modeling approach is placed in a telecommunication environment with a network owner and operators without own network facilities.

K. Barty, P. Carpentier, J.-P. Chancelier, Guy Cohen, Michel de Lara, and T. Guilbaud consider stochastic control problems and characterize sets of control laws not suffering from what is known as the dual effect, which arises when present control affects future available information.

Marida Bertocchi, Jitka Dupačová, and Vittorio Moriggia discuss proper selection of horizon and stages in multi-stage stochastic programs at examples from bond portfolio management. The impact of alternative choices of stages on the optimal first-stage solutions is investigated in numerical experiments.

István Deák reports on computational experience with an algorithm for two-stage stochastic linear programs with normally distributed right-hand sides where the expected recourse function is computed by enhanced Monte Carlo integration and optimization is carried out by successive regression approximations.

Robert Fourer and Leo Lopes present a management system for decompositions in different areas of stochastic programming. They develop routines making stochastic programming instances more amenable for different solution approaches, and they propose a development environment for accessing these routines and for examining aspects of the problem structure.

Kjetil Haugen and Stein Wallace point to the hazards when random phenomena in stochastic programming are not purely external but rather used to reflect behaviour of other market participants. Simple game theoretic models are used to show that caution must be taken with stochastic programs in this situation.

Julia Higle and Suvrajeet Sen formulate multi-stage stochastic convex programs as optimization problems in spaces of measurable mappings and study duals obtained via conjugacy or the Lagrangian framework. The connection between nonanticipativity of dual multipliers and the expected value of perfect information is investigated.

Peter Kall and János Mayer identify classes of two-stage recourse and jointly chance constrained stochastic programs which can be solved efficiently by deterministic algorithms, namely successive discrete approximation for the recourse models and a central cutting plane method for the chance constrained problems. Computational results support argumentation and findings.

Using variational analysis, Lisa Korf develops approximation techniques for a class of stationary, infinite-horizon stochastic optimization problems with discounted cost criterion. Intuitive lower bounds, suitable for numerical application in finite-time horizon models, are obtained via averaging the future.

For topological spaces where the epi-topology induces epi-convergence, Petr Lachout suggests approximations to random functions in the spirit of almost sure convergence, convergence in probability, and convergence in distribution. This provides a basis for sensitivity statements on abstract stochastic programs.

Jeff Linderoth, Alexander Shapiro, and Stephen Wright perform experiments with sample-average approximations to two-stage stochastic linear programs. A computational grid is used to obtain high-quality solutions to many large problem instances and to verify optimality or near-optimality in various ways.

Vincenzina Messina and Valentina Bosetti propose a multi-stage stochastic programming model for finding optimal land portfolios under market uncertainty. By integration into a decision tree framework the model is extended to account for environmental uncertainty that may depend on the decisions taken.

Teemu Pennanen and Markku Kallio combine features of scenario-wise and node-wise decomposition into a splitting-based decomposition algorithm for multi-stage stochastic programs with convex objectives. Two derivations of the algorithm are given, from Douglas-Rachford splitting and from the method of partial inverses, the latter yielding a preconditioner resulting in considerable numerical speed-ups.

Silvia Vogel studies upper semicontinuity in distribution of sequences of random closed sets. Results on the convergence in distribution of functions of converging sequences of sets are derived. These results lead to stability statements for random optimization problems where objective function and constraint set are approximated simultaneously.

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