



Pre-Conference Tutorials

Gallagher Theater, Student Memorial Union Center
University of Arizona

Tutorials Chair: David Morton, University of Texas, Austin

Saturday, October 9

1:00PM-2:00PM **Introduction to Modelling using Stochastic Programming**

Andy Philpott, University of Auckland

Abstract: We present an introductory survey of the field of stochastic programming from a modeler's perspective. The talk will introduce the basic concepts of stochastic programming, namely two-stage and multi-stage models, recourse, chance constraints, and risk. We also discuss the advantages and limitations of stochastic programming models in comparison with other models in stochastic optimization such as dynamic programming. The presentation will not focus on mathematical theory; rather our emphasis will be on giving some practical guidance to researchers developing stochastic programming models to solve problems of optimization under uncertainty.

2:30PM-3:30PM **Introduction to algorithms for recourse models**

Maarten H. van der Vlerk, University of Groningen

Abstract: In this tutorial we survey solution techniques for recourse problems. The main focus is on two-stage continuous recourse models, leading up to the multi-stage case. (Algorithms for chance-constrained and integer recourse models will be covered in other tutorials.) First we will discuss why recourse problems are hard to solve in general, motivating the need for special purpose algorithms. We then show how structural and mathematical properties of recourse problems can be used to address these difficulties, leading to various algorithms. The algorithms will be illustrated on small example problems.

4:00PM-5:00PM **Stochastic integer programming: An algorithmic perspective**

Shabbir Ahmed, Georgia Tech

Abstract: The tutorial will provide a survey of some algorithmic strategies for solving recourse type stochastic integer programs (SIPs). First, a discussion of the key computational challenges for SIPs will be presented. Then, descriptions of some of the algorithmic strategies aimed to overcome these challenges, along with the structural properties that the strategies exploit, will be detailed

Sunday, October 10

11:00AM-12:00 Noon **Optimization Problems with Probabilistic Constraints**

Rene Henrion, Weierstrass Institute, Berlin

Abstract: Many optimization problems arising in engineering or finance contain random parameters in their inequality constraints. The robustness of the modeled system with respect to future, unknown realizations of these parameters can be ensured by so-called probabilistic constraints. Here, a decision is considered to be feasible, if it satisfies all inequalities with high probability. The talk provides an introduction into main features of probabilistic constraints. Aspects of structure, numerics and stability will be discussed. As an example from finance, the cash-matching problem - modeled by probabilistic constraints - will be presented in some detail.

1:30PM-2:30PM **Scenario Estimation and Scenario Generation**

Georg Pflug, University of Vienna, Austria

Abstract: One of the most sensitive parts of a stochastic optimization model is the scenario model. By improperly choosing the scenarios, one may get unrealistic and misleading results, although the optimization itself was done properly. We first investigate the question of defining what is a "good" scenario model. We argue that two conditions have to be

fulfilled: The discrete probability should be “near” to the underlying estimated distribution and the information structure should be correctly specified. . While the former has to do with metrics for unconditional probabilities, the latter has to do with distances of conditional probabilities, conditioned by sigma-algebras of information. By choosing the approximation model and the information model right, one may capture the main features of a multistage problem by finitely many well chosen scenarios. We define the error as the amount of money lost by implementing the solution of the approximating model in reality (represented by the ideal model) and show how this error may be bounded.

3:00PM-4:00PM **Stochastic Programming Applications**

Pavel Popela, Brno University of Technology

Abstract: In this tutorial, several recommendations for developers of stochastic programming applications are introduced. It is assumed that they may help people who want to apply their stochastic programming knowledge to real world problems. Many examples of various application areas are presented in research papers. They are also different by their applicability level. Among them, educational exercises, illustrative instances, and research case studies can be found together with true real world applications. Instead of discussion on selected cases, the tutorial idea is to identify common principles of successful applications and present them in the form of straightforward (and even provocative) recommendations. They are based on the experience of many researchers and influenced by author’s personal experience with applications in engineering.

4:30PM-6:00PM **Software Tools for Stochastic Programming**

Gautam Mitra, Brunel University

Abstract: Whereas the theory of SP has progressed well and some selective applications have been reported, the deployment of SP based DSS has not achieved its full potential. In this tutorial we first identify the barriers to progress and user requirements. We then present software tools which support (i) SP model building, (ii) scenario generation, (iii) solver controls and (iv) simulation. Two prototype systems SPInE/SAMPL and SPInE/SMPL have been developed by our research group. The processing of an example problem by the two systems is shown in order to illustrate the software constructs and the underlying concepts.

Sunday, October 10

1:00PM-4:00PM **ILOG WORKSHOP: Understanding Best Approaches for Your Optimization Needs**

Room: Catalina Room, Student Memorial Union Center

Presenter: *Greg Glockner, Ph.D., ILOG CPLEX Product Manager*

Brief: Maximize your knowledge and application of ILOG optimization technologies by attending a comprehensive workshop that will provide a series of technical tutorials spanning ILOG’s optimization technologies. This workshop will help you understand best approaches for specific optimization application objectives, requirements and development environments. Share experiences and discuss ILOG technologies with other OR practitioners, researchers and instructors.

Agenda

1:00 - 1:15 Welcome, Agenda & Takeaway Benefits
1:15 - 1:45 ILOG Decision Support Technologies Technical Overview:
Optimization, Visualization and Business Rule

Management Systems

1:45 - 2:30 Introduction to ILOG CPLEX
2:30 - 3:15 ILOG CPLEX Robustness
3:15 - 3:30 Break
3:30 - 4:15 Methods for Embedding ILOG CPLEX
4:15 - 5:00 Decomposition in CPLEX and OPL