Schedule for Workshop

Network Interdiction and Stochastic Integer Programming

March 15th 2002, University of California Davis

Problems associated with protecting and attacking computer, transportation, and social networks gain importance as the world becomes more dependent on interconnected systems. This workshop will discuss these issues along with the more general problem of solving multi-stage, stochastic, integer optimization problems.

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All talks in Room 174, AOB IV (SW Corner of 1st and A). Schedule at glance:

- 8:30 Coffee, juice and rolls
- 9:00 Kevin Wood - Naval Postgraduate School Network Interdiction
- 10:00 Cynthia Phillips - Sandia National Laboratories Network Interdiction
- 11:00 Raymond Hemmecke - UC Davis Network Interdiction
- Catered Lunch
- 1:30 Julie Higle - University of Arizona Stochastic Programming
- 2:15 Suvrajeet Sen - Univerisity of Arizona Stochastic Programming
- 3:00 David Morton - University of Texas Network Interdiction
- 4:00 Ruediger Schultz - University of Duisburg Stochastic programming
- Catered Dinner

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Titles and abstracts:

Kevin Wood

Naval Postgraduate School

"Network Interdiction"

Abstract: This talk will cover a number of techniques for solving, and related to solving, deterministic and stochastic network interdiction problems: Efficient enumeration of $s-t$ cuts; an optimization-based heuristic for the max-flow interdiction problem; and a "covering algorithm" for both deterministic and stochastic interdiction problems. New avenues of research on interdicting and hardening communications networks will also be discussed.

Cynthia Phillips

Sandia National Laboratories

Pseudoapproximation algorithm for the (flow) inhibition problem

Abstract: In the network inhibition problem, we wish to expend a limited budget removing edges or pieces of edges so as to minimize the resulting maximum s-t flow. The problem is strongly NP-hard. In this talk, I will summarize previous results on the structure and complexity of this problem (e.g. fully polynomial-time approximation schemes for planar graphs). I will then present a simple polynomial-time pseudoapproximation algorithm, based on a linear-programming relaxation of an integer program. This algorithm returns either a $(1, 1+1/epsilon)$-approximation or a $(1+\epsilon. 1)$-pseudoapproximation for $\epsilon > 0$, but we do not know which a priori. The parameter epsilon biases the nature of the solution, but does not effect the running time.

This is joint work with Carl Burch (College of St Benedict and St John's University), Bob Carr (Sandia National Laboratories), Sven Krumke (Konrad-Zuse-Zentrum), Madhav Maranthe (Los Alamos National Laboratory), and Eric Sundberg (Rutgers).

Raymond Hemmecke

UC Davis

Interdiction and Hardening of Computer Networks

Abstract: Reliance on computer networks gives rise to the problem of allocating resources to the task of hardening them against interdiction. In this talk we describe models for optimal hardening against an optimal network interdiction that can involve attacks on both arcs and nodes. Preliminary computational results are presented. This is joint work with with Jesus De Loera, David L. Woodruff, and Ruriko Yoshida

David Morton

University of Texas

Stochastic Network Interdiction of Nuclear Material Smuggling

Abstract: The U.S. Department of Energy collaborates with the Russian Federation State Customs Committee, and other countries of the former Soviet Union, to help strengthen the overall capability of preventing the illicit trafficking of sensitive nuclear materials, equipment, and technology. We describe a stochastic network interdiction model designed to help select sites for installing detection equipment. Multiple variants of our basic stochastic integer program are developed to handle smugglers with different levels of information. (This is joint work with Bill Charlton and Feng Pan.)

Julie Higle

University of Arizona

The C^3 Theorem and a D^2 Algorithm for Stochastic Integer Programming

Suvrajeet Sen

University of Arizona

A Branch-and-Price Algorithm For SMIP and its Applications in Stochastic Batch-Sizing Problems"

Ruediger Schultz

University of Duisburg

Mean-risk models in two-stage stochastic integer programming

Abstract: The traditional mean-value-based linear stochastic program with recourse can be extended towards risk aversion by adding suitable dis-

persion terms to the objective. This leads to new questions regarding structure and algorithmics of such models. With accent on excess probabilities as dispersion terms we will report some first results along these lines. Special attention is paid to integer models.