ICS NEWS
INFORMS Computing Society Newsletter

Inside This Issue

"One day I'm going to get help for my procrastination problem and research articles ..."

Message from the Chair

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To friends of the INFORMS Computing Society, it has been quite some time since our last newsletter. Former newsletter editor Jeff Linderoth asked the ICS officers to find a replacement and it took some time to identify the person and make the transition. I'm happy to let you all know that we now have a new newsletter editor: Yongpei Guan. This is Yongpei's first newsletter and I think it looks great.

Last January the ICS held its biennial society-sponsored conference. We met in beautiful Monterey California. There were many interesting talks. Rob Dell and Kevin Wood, both from the Naval Postgraduate School, were the co-chairs of the meeting. They, along with Mary Magrogan from INFORMS, did a superb job of making all arrangements and ensuring that everything ran smoothly. Many things to them and to all of the participants for making it a memorable meeting.

At the coming fall meeting, the computing society will present two awards: the ICS Prize for the best paper or group of related papers dealing with the Operations Research/Computer Science interface and the ICS Student Paper Award for the best paper on computing and operations research by a student author. More details on these awards can be found at the website: http://www.informs.org/Community/ICS/Prizes. Thanks for nominating worthy papers. Looking forward to seeing you in Charlotte!

Message from the Editor

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First of all, it is my great pleasure to serve for the society. In this issue, we have our regular collection of updates— a Mathematical Programming (Optimization?) Glossary update from Allen Holder, and an IJOC update from John Chinneck. We also add a new project update for Coopr Optimization Library provided by Sandia National Labs. Meanwhile, please act fast for the pre-proposals on ISMP 2015, since the deadline is approaching so fast. Finally, please do not forget to learn the updates of your colleagues by reading the members in the news.

This is the first year of my role as ICS Newsletter Editor. Special thanks to Harvey Greenberg and Jeff Linderoth for the latex template and source files. As always, I need your sincere supports in contributing research articles, any updates you want to share with colleagues, and challenging research topics. Many thanks in advance!

Call for Site Pre-Proposals ISMP 2015

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The Symposium Advisory Committee of the Mathematical Optimization Society issues a call for pre-proposals to organize and host ISMP 2015, the triennial International Symposium on Mathematical Programming.

ISMP regularly gathers over a thousand scientists from around the world. The conference will be held in or around the month of August, 2015. Hosting ISMP provides a vital service to the optimization community and often has a lasting effect on the visibility of the hosting institution.

Preliminary bids will be examined by the Symposium Advisory Committee (SAC), which will then issue invitations for detailed bids. The final decision will be made and announced during ISMP 2012 in Berlin. Member of the SAC are:

Jeff Linderoth, Chair <linderoth@wisc.edu>
Shabbir Ahmed, <sahmed@isye.gatech.edu>
Kurt Anstreicher <kurt-anstreicher@uiowa.edu>
Anders Forsgren, <andersf@kth.se>
Martine Labbe, <mlabbe@ulb.ac.be>
Philippe Toint <philippe.toint@fundp.ac.be>
Rüdiger Schultz <ruediger.schultz@uni-due.de>
Shuzhong Zhang, <zhangs@umn.edu>.

Preliminary bids should be brief and contain information pertaining to the

1) Location,
2) Facilities: Campus? Hotel? Convention Center?,
3) Logistics: Accommodation and transportation, and
4) Likely local organizers.

Further information can be obtained from any member of the advisory committee. Please address your preliminary bids until September 15, 2011 to Jeff Linderoth <linderoth@wisc.edu>.

Mathematical Optimization Society

Third Major Release of Sandia's Coopr Optimization Library

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Sandia National Laboratories (NM) released the third major version of its open-source Coopr optimization library on July 18, 2011. Coopr is a Python-based library for modeling and solving mathematical optimization problems. Coopr is designed to support advanced modeling capabilities, parallel computation, generic solution strategies, and advanced scripting capabilities in an open and flexible software architecture.

Core Coopr capabilities include the ability to model linear and non-linear optimization problems, both with and without parameter uncertainty. Interfaces to standard open-source and commercial solvers are provided, as are advanced decomposition algorithms for solving large-scale stochastic optimization problems. Coopr has been used in both undergraduate and graduate classroom environments, by researchers at numerous US and international universities, and at Lawrence Livermore National Laboratory. Example applications include electrical grid operations (unit commitment), nuclear weapons enterprise planning, natural resource management (forest harvesting, open-pit mining), biofuel distribution network design (e.g., see the figure in the next page for the biofuel production and distribution network design for the state of California. Graphic courtesy of Professor Yueyue Fan at the University of California Davis), sensor placement for detecting contaminants and gas leaks, and electrical grid expansion planning. At Sandia, Coopr is actively used in research and analysis projects involving electrical grid operations (LDRD, WFO), hierarchical parameter estimation (ASCR), and advanced decomposition algorithm research (ASCR).

Coopr development is led by Sandia's Computer Science Research Institute (Drs. William Hart, John Siirola, and Jean-Paul Watson), with core collaborators from the University of California Davis (Professors Roger Wets and David Woodruff) and Texas A&M University (Professor Carl Laird). Coopr is released under the BSD open-source software license, and was recently accepted into IBM's COIN-OR repository for open-source Operations Research software. Papers describing the core modeling library (Pyomo) and stochastic optimization library (PySP) are respectively scheduled to appear in and pending minor revisions with the Springer journal Mathematical Programming Computation.

Further information can be found at https://software.sandia.gov/trac/coopr, or by contacting Dr. Jean-Paul Watson, Discrete Math and Complex Systems Department, Sandia National Laboratories, Albuquerque, NM; jwatson@sandia.gov).

Mathematical Programming Glossary

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The Mathematical Programming Glossary is undergoing a slow, but steady, transition to a wiki-like format. The new format will broaden navigation by letting users design their own lists of terms. Traditional alphabetic listings remain possible. The new format uses texvc so that mathematical expressions are displayed in an eye pleasing LaTeX format. A preview is located at:
http://glossary.computing.society.informs.org/ver2/mpgwiki/

Letters H through M remain to be updated, and a thorough verification against the current list of terms is yet to be done. These tasks should be completed over the summer, and the new format should be ready for release at the next business meeting.

The Glossary, which receives about 50,000 hits per week, is more than a list of terms. The Glossary includes expanded supplements on related topics, and it houses H. Greenberg's *Myths and Counterexamples in Mathematical Programming.* The latter of these is downloaded about 13,000 times a month.

A new tour on constraint programming is being constructed under the leadership of J. Christopher Beck. He has directed the team of Andrea Rendl, Serdar Kadioglu, and Roger Kameugne, and I want to thank these individuals for their assistance. The new tour currently includes 66 terms.


joc.pubs.informs.org/

Message from the Editor of INFORMS Journal on Computing

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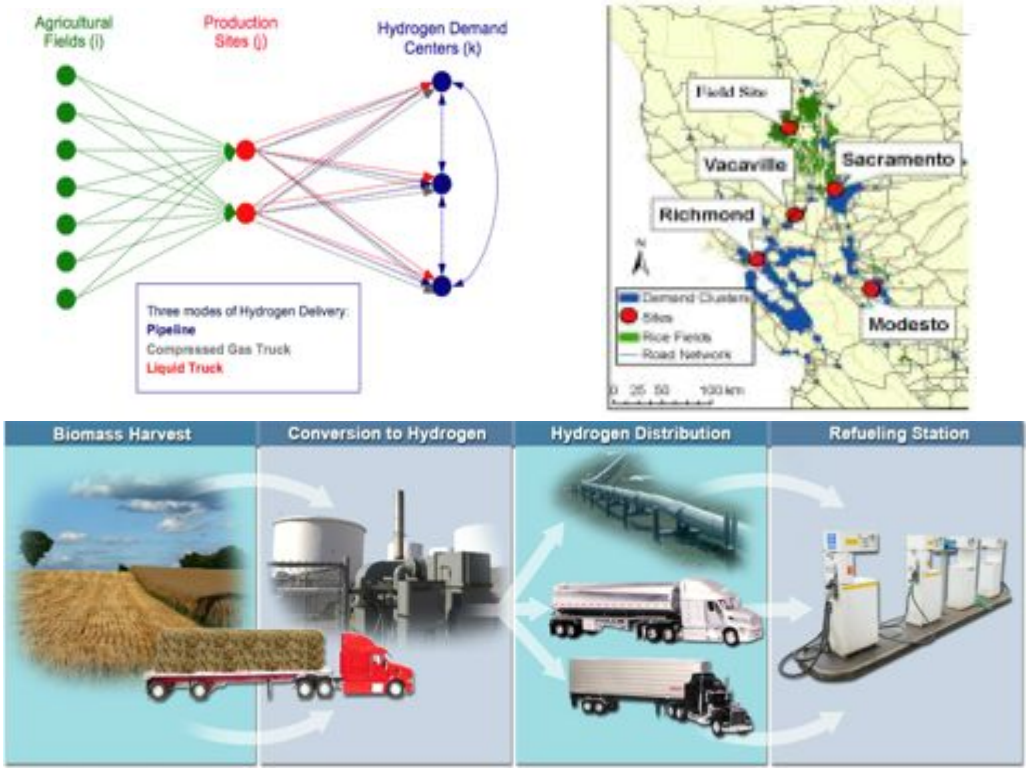
As always, things are busy at the INFORMS Journal on Computing! We published a total of 44 papers over the last year (four issues) on a wide range of topics. The rate of submissions continues to be high: there are 79 papers currently in our hands for processing. Our print queue has become a bit lengthy, and we are taking steps to bring it down (though of course papers appear online via Articles in Advance before too long). We have secured some extra pages for this purpose, using funds from our sponsors: AIMMS by Paragon Decision Technology, ARKI Consulting and Development A/S, GAMS Development Corporation, Haverly Systems, Inc., the IBM T.J. Watson Research Center, the INFORMS Computing Society, LINDO Systems, Inc., and Palisade Corporation.

I'm pleased to announce that the JOC will once again be featuring book reviews of volumes that are of interest to our readership. JOC Founding Editor Harvey Greenberg will be returning to the Journal as the new Book Review editor. The



book reviews will appear online only, on the JOC web site, but will be listed in the Table of Contents for the Journal. Please direct any suggestions for books to be reviewed to Harvey at hjgreenberg@gmail.com. He is also recruiting reviewers, so if you are interested in that role contact Harvey with a summary of your expertise.

The growing activity at the Journal has seen the addition of a number of new Associate Editors in the past year. Raghu Pasupathy of Virginia Tech is assisting Marvin Nakayama in the *Simulation* area, Maytal Saar-Tsechansky of the University of Texas at Austin is assisting Alexander Tuzhilin in the *Knowledge and Data Management* area, Maarten H. Van der Vlerk of the University of Groningen is assisting Karen Aadal in the *Design and Analysis of Algorithms* area, and Arie Koster of RWTH Aachen University is assisting Raghu Raghavan in the *Telecommunications and Electronic Commerce* Area. Long-serving Associate Editors Martin Fischer and Bob Cooper have rotated off after many years of fine service to the journal.

The Area formerly known as *Constraint Programming and Optimization* and edited by Michela Milano has been renamed *Constraint Programming and Hybrid Optimization* to differentiate it from more traditional optimization and to put the emphasis on the *hybrid optimization* aspect. Papers on standard optimization topics should continue to be directed to the *Design and Analysis of Algorithms* area, edited by Karen Aardal.

I'd like to close with some approximate statistics from Google Scholar that I reported in the Spring 2011 issue. The most cited JOC paper (actually a pair of papers consisting of Part I and Part II) is Fred Glover's tutorial on tabu search, published in 1989 and 1990. That pair of papers has amassed more than 5000 citations! That is certainly an outstanding accomplishment, but there are other highly cited JOC papers: there is another paper with more than 1000 citations, 4 having 500-999 citations, 13 having 200-499 citations, 40 having 100-199 citations, 67 having 50-99 citations, and 104 having 25-49 citations. Clearly the research published in the JOC is having an impact!

As always, we are looking for excellent research at that interesting intersection between operations research and computer science. Send us your best work: maybe you'll join that elite group of highly cited papers that influences the research community. You can find the JOC web site at http://www.informs.org/Pubs/IJOC.

Here are some recent statistics. For the one-year period February 1, 2009 through January 31, 2010 decisions were rendered on 253 papers. The rate of submission continues to be quite high. There are currently around 90 papers in process.

We are fortunate to have support from seven prominent sponsors for 2010: ARKI Consulting and Development, GAMS Development Corporation, Haverly Systems Inc., IBM T.J. Watson Research Center, the INFORMS Computing Society (of course), LINDO Systems Inc., and Palisade Corporation.

2009 also saw changes in personnel, with the addition of a number of knowledgeable new Associate Editors: Sanjeeb

Dash of the IBM T.J. Watson Research Center, Antonio Frangioni of the Universitáă di Pisa, Balaji Padmanabhan of the University of South Florida, and David Parkes of the Harvard University, William J. Stewart of North Carolina State University, Daniel Zeng of the University of Arizona. There were also changes in Area Editors as two of our long-time area experts stepped down from their posts. Allen Holder replaced founding JOC Editor-in-Chief Harvey Greenberg as the Area Editor for *Computational Biology and Medical Applications* (recently renamed Applications in Biology, Medicine and Health Care), while Michela Milano of the Universitá di Bologna replaced John Hooker as Area Editor for *Constraint Programming and Optimization*.

As always, we are on the lookout for excellent research at that interesting intersection between operations research and computer science: send us your best work! As a reminder, the journal has nine major areas (Applications in Biology, Medicine and Health Care; Computational Probability and Analysis; Constraint Programming and Optimization; Design and Analysis of Algorithms; Heuristic Search and Learning; Knowledge and Data Management; Modeling: Methods and Analysis; Simulation; and Telecommunications and Electronic Commerce) and well as Feature Articles. You can the Journal online at http://joc.pubs.informs.org.

De Loera, Lee, Malkin, Margulies, and Onn Win the ICS Prize

The 2010 ICS Prize was awarded to Jesús A. De Loera, Jon Lee, Peter N. Malkin, Susan Margulies, and Shmuel Onn for their papers:

(1) *Hilbert's Nullstellensatz and an Algorithm for Proving Combinatorial Infeasibility.* Proceedings of the 21st International Symposium on Symbolic and Algebraic Computation (ISSAC 2008, Linz/Hagenberg, Austria), Association for Computing Machinery, (2008), 197-206.

(2) *Expressing Combinatorial Optimization Problems by Systems of Polynomial Equations and Hilbert's Nullstellensatz.* Combinatorics, Probability and Computing, Volume 18, Issue 04, (2009), 551-582.

These two papers introduce a pioneering new approach for proving the optimality of solutions to combinatorial optimization problems. The approach begins by encoding the instance and an objective bound as a system of polynomial equations over a finite field. Then, using Hilbert's Nullstellensatz, the authors demonstrate the effectiveness of a computational method to certify the infeasibility of the polynomial system. The encoding is derived and analyzed for a number of problem classes, such as the k-coloring, stable set, longest cycle, largest planar subgraph, and minimum edge coloring problems. While the degree of the certifying polynomial could be exponentially large, the authors demonstrate that in many cases of interest the degree is low enough to allow for explicit, fast computations. The authors also develop a variety of computational enhancements, including computing over finite fields, exploiting symmetry, adding redundant equations, and applying alternative Nullstellensätze that allow them to solve 3-coloring problems significantly faster than existing methods.

In this impressive work, the authors take up a mathematical machinery that seemed very unlikely to be useful in practice and turn it into a useful computational algorithm. This work is likely to stimulate additional research into computational polynomial methods, perhaps placing them on the same footing as polyhedral techniques for solving combinatorial optimization problems.

2010 ICS Prize Committee: Karen Aardal, Sam Burer, Jeff Linderoth, and Andreas Waechter (chair)

Wang Wins ICS Student Paper Prize

Yongqiang Wang, a Ph.D. student at the University of Maryland, College Park, was the winner of the 2010 ICS Student Paper Award for his paper entitled *A New Stochastic Derivative Estimator for Discontinuous Payoff Functions with Application to Financial Derivatives,* joint with his advisors Michael C. Fu and Steven I. Marcus.

Runners-up:

(1) Siqian Shen, University of Florida, for the paper "Expectation and Chance-constrained Models and Algorithms for Insuring Critical Paths." Advisors Cole Smith and Shabbir Ahmed.

(2) Necdet Aybat, Columbia University, for the paper "A First-order Augmented Lagrangian Method for Compressed Sensing." Advisor Garud Iyengar.

2010 ICS Student Award Committee: Ted Ralphs (chair), Ed Baker, and John Mitchell.

ICS Members in the News

Harvey Greenberg (hjgreenberg@gmail.com) is elected to be an INFORMS Fellow. Meanwhile, he has resumed consulting with Sandia National Laboratories in Albuquerque. Research projects include methods for analysis, measuring diversity among solutions, certificates of optimality, stochastic

programming, and more. Much of the research is tested with particular applications and some COOPR developments.

Robin Lougee (rlougee@us.ibm.com) is on a one-year assignment co-leading IBM's Global Technology Outlook 2012. The Global Technology Outlook is IBM's vision of the future for information technology, synthesizing enormous insight from academia, partners and clients around the world. After the team's year-long study and extensive vetting with Chairman and CEO Samuel Palmisano, the completed Global Technology Outlook is used to define IBM's technological areas of focus and investment. Externally, it is also shared broadly with a range of IT influencers - including clients, academics, and partners - through education and client briefings.

Jonathan Eckstein (jeckstei@rci.rutgers.edu) at the Rutgers University is very productive in research and has recently received two grant awards from NSF and AFOSR as follows:
1) NSF grant CCF-1115638, "Approximate Augmented Lagrangians: First-Order and Parallel Optimization Methods, with Applications to Stochastic Programming," Parallel/Distributed Algorithms Program, Computing and Communications Foundations, CISE directorate, July 2011-July 2014 (projected end date), $358,499.
2) AFOSR grant FA9550-11-1-0164, "Coherent Risk-Adjusted Decisions Over Time: a Bilevel Programming Approach," Optimization and Discrete Mathematics Program, Mathematics, Information and Life Sciences Directorate, July 2011-July 2014 (projected end date), $452,617 (Andrzej Ruszczyński, co-PI).

Ghaith Rabadi (grabadi@odu.edu) at the Old Dominion University founded the International Journal of Planning and Scheduling and established a very well respected board. He is also a member of a group of professors from US universities who have received a grant from Qatar Foundation in collaboration with Qatar University to address the Scheduling and Sequencing of Arriving and Departing flights over multiple runways. The project was granted about half million dollars over 2 years.

Book Review Section Reallocation

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The INFORMS Journal on Computing has created a Book Review section that covers books on subjects at the interface between operations research and computer science. We welcome books on theory, applications, computer systems, and generally any subject covered by a JOC Area, or any combination of these. This includes both printed and electronic books. In addition, we consider comparative reviews, i.e., several books on one relevant topic. Team reviews are also possible, particularly for a large, broad-scope book such as an encyclopedia. Please send your suggestions for books to be reviewed to the JOC Book Reviews Editor Harvey J. Greenberg at hjgreenberg@gmail.com. Detailed information can be observed at http://www.informs.org/Pubs/IJOC/Book-Reviews.

Acknowledgments

The Editor would like to thank all contributors who helped to make this newsletter available. Last, but not least, thanks to Harvey Greenberg and Jeff Linderoth.