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Institute addresses computational challenges posed by economic models

ARGONNE, Ill. (Aug. 22, 2007) — Computer scientists from the Department of Energy's Argonne National Laboratory joined with economists from the University of Chicago earlier this month for a conference designed to bridge the existing gulf between these two fields and teach young economists how to use state-of-the-art software and computational methods.

Economic models are vital for policy analysis, but some economists do not understand the mathematical techniques used to generate them. Even more important, many economists remain unaware of developments in computational science that could greatly advance their work. The [Institute on Computational Economics](#) (ICE2007), held at the University of Chicago from July 30 to Aug.

NEOS finds a new application in computational economics

What do shopping centers, game theory, and applied mathematics have in common? The answer is optimization – one of the fundamental modeling paradigms of mathematics.

Optimization techniques have been used for more than a decade to study price competition and marketing of new firms. But several key questions have not been addressed. For example, which store types are more important in determining the success of a shopping center? And how beneficial or harmful is it for similar types of stores to be in close proximity?

Maria Ana Vitorino, a doctoral student at the University of Chicago

Resources

For more information, please contact Steve McGregor (630/252-5580 or media@anl.gov) at Argonne.

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9, attempted to redress these problems by showing more than 50 economics graduate students, postdoctoral researchers and junior faculty from the United States and Europe how to use new computational tools to solve economic policy questions.

“We put great emphasis on helping these young scholars apply cutting-edge software and techniques in computational science to actual economics research problems,” said Sven Leyffer, Argonne computational mathematician and co-chair of the workshop.

Graduate School of Business, is seeking answers to such questions. Key to her work is the [Network-Enabled Optimization Server](#) (NEOS). Developed at the U.S. Department of Energy’s Argonne National Laboratory in conjunction with researchers at Northwestern University, NEOS allows users to solve optimization problems over the Internet with state-of-the-art optimization software and without downloading or linking code.

Vitorino's doctoral thesis examines the entry decisions of stores in regional shopping centers. A typical estimation problem involves approximately 4,000 parameters. Vitorino is using two of NEOS's more than 50 constrained optimization solvers to handle these parameters. With NEOS she can obtain the maximum likelihood estimates of the parameters in her economic model.

“NEOS is a great tool for me,” Vitorino said. “It allows me to submit and run several jobs simultaneously and has optimization solvers that can solve my problem easily.”

The institute consisted of morning tutorials on new analytical and numerical methods in such areas as dynamic programming, stochastic modeling, structural estimation and optimization problems with equilibrium constraints. Afternoon sessions included software presentations and hands-on workshops in which participants applied the new software to challenging economics applications.

Seminars featured during the second week were led by leading economists and focused

on recent advances in quantitative economic policy research, as well as continuous time models, Bayesian estimation, and the practical applications of optimization technology.

The conference was highlighted by the introduction of state-of-the-art software that the participants were able to use in the lab sessions. The free licenses for this software were made possible through the support of AMPL, Ziena, the Stanford Optimization Laboratory, the University of Dundee and the University of Wisconsin.

“The solvers are complete versions, not just test versions,” said workshop co-chair Kenneth Judd, senior fellow of the Hoover Institution and a visiting professor of economics at the University of Chicago. “The ICE participants were allowed to take these free solvers home and use them for the duration of their graduate studies,” he said. “In that way, we hope to foster a worldwide community in this emerging area of computational science.”

ICE2007 was the third in this annual series of computational economics workshops. Previous institutes have been only five days. The expanded program provided time for informal discussions as well as a poster session in which participants presented their current research.

“ICE2007 provided an exciting opportunity to raise the level of sophistication in economics by creating an interface between economists and computer scientists so that they can address the computational challenges posed by modern economic models,” said Leyffer.

More information on the institute can be found at ice.uchicago.edu/.

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