Global Optimization
Models, Algorithms, Software, and Applications

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Summary

In today’s competitive global economy, companies and other organizations aim for resource-efficient operations that deliver high quality products and services. Optimization models and solvers can effectively assist their users to make better quantitative decisions. Within this general framework, the development and solution of nonlinear decision models is essential in many areas of the sciences, engineering, economics, and finances.

Global optimization (GO) is aimed at finding the best solution of nonlinear models, in the presence of multiple optima. For illustration, please see the figure that shows a multimodal function: traditional local optimization methods will often fail to find the global minimum/maximum of such functions. GO is an emerging area of research, with significant existing and potential applications.

We will briefly review the key GO model types, and the most prominent exact and heuristic algorithmic solution approaches. This discussion will be followed by the introduction of several professional software implementations, available for (C and Fortran) compiler platforms, for optimization modeling languages (AIMMS, GAMS, MPL), and for integrated scientific-technical computing systems (Maple, Mathematica, and MATLAB/TOMLAB). The illustrative examples presented include standard test models from GO libraries, famous optimization challenges, and practically motivated examples. We will also review several advanced applications and case studies.

The lecture(s) are offered in an interactive atmosphere. Questions, comments, test challenges and real-world GO applications are welcome.

Topics Covered

- Introductions; Workshop Objectives
- Operations Research, Optimization Models, and Solution Techniques
- The Relevance of Nonlinear and Global Optimization
- Traditional (Local) Nonlinear Optimization Methods
- The Global Optimization Model and Several Important Special Cases
- Exact and Heuristic GO Algorithms
- Modeling Environments
- Global (and Local) Nonlinear Optimization Software Implementations
- Software Demonstrations
Illustrative References


Software Product Web References

LGO stand-alone solver engine (for C and Fortran compilers and other links):
   www.pinterconsulting.com
AIMMS/LGO solver engine: www.aimms.com/aimms/product/solvers/lgo.html
GAMS/LGO solver engine: www.gams.com/solvers/solvers.htm#LGO
Global Optimization Toolbox for Maple:
   www.maplesoft.com/products/toolboxes/globaloptimization/
About the Lecturer

János D. Pintér (MSc, Budapest; PhD, Moscow; DSc, Budapest) is a researcher and practitioner with over three decades of work experience. Dr. Pintér is president/owner of Pintér Consulting Services (PCS Inc., founded in 1994). He is also an adjunct professor at the Faculty of Computer Science, Dalhousie University.

Dr. Pintér’s main area of interest is advanced nonlinear systems modeling and optimization, including algorithm and software development, and a range of applications. He is the author of a monograph, a tutorial book, an electronic book, as well as the editor of another book. He also wrote over 170 other scientific publications and technical reports (as of 2006).

He is, or has been, a member of the Canadian and Hungarian Operations Research Societies, INFORMS, the Mathematical Programming Society, and of SIAM. He currently serves on the editorial board of the *Journal of Global Optimization*, the *Journal of Applied Mathematics and Decision Sciences*, *Algorithmic Operations Research*, the *International Journal of Modeling, Identification, and Control*, and of the web fora *GAMS Global World* and *GAMS Performance World*.

Dr. Pintér received the 2000 INFORMS Computing Society Prize for his book *Global Optimization in Action*. He also received research awards, grants and fellowships in Australia, Austria, Canada, Germany, Hungary, Italy, the Netherlands, the United States, and elsewhere. From 2002 to 2004 he served as Global Optimization Vice-Chair of the INFORMS Optimization Society. He is an INFORMS Speaker and a CORS Traveling Speaker, and he has presented lectures, tutorials, and workshops in over 25 countries.

Dr. Pintér is the principal developer or co-developer of the LGO, AIMMS/LGO, GAMS/LGO, Global Optimization Toolbox for Maple, MPL/LGO, MathOptimizer, MathOptimizer Professional, TOMLAB/LGO, and other modeling and optimization related software products. These products – developed and supported with partners and through his company – have been in use by businesses, government, and academic organizations around the world.

For further professional details, please visit www.pinterconsulting.com, or contact Dr. Pintér at jdpinter@hfx.eastlink.ca.