Aykut Bulut, Software Engineer

CONTACT INFORMATION

Department of Industrial & Systems Engineering, Lehigh University
200 W. Packer Avenue Bethlehem, PA 18015

Cell: (+1) 484-602-4195
E-mail: aykut at lehigh dot edu
Website: coral.ise.lehigh.edu/aykut

RESEARCH INTERESTS

Mixed integer linear and nonlinear optimization, computational optimization, optimization solver software technologies, computational complexity of optimization problems

EDUCATION

University of Lehigh, Bethlehem, PA

Ph.D., Industrial & Systems Engineering — July 2011–Present
- Thesis Topic: *Computational Approaches to Mixed Integer Second Order Cone Optimization*
- Advisor: Ted Ralphs

Middle East Technical University (METU), Ankara, TURKEY

M.S., Industrial Engineering — September 2009–July 2011
- Thesis Topic: *Order Driven Flexible Shop Management*

B.S., Industrial Engineering — September 2004–June 2009
- With Honors degree.
- Minor in Math (advanced calculus, linear algebra, real analysis, combinatorics and numerical analysis courses)

PROFESSIONAL EXPERIENCE

Software Engineer, The Mathworks Inc, Natick, MA — January 2017-Present

Mathematical optimization software development.

SAS OR Intern, SAS Institute, Cary, NC — Summer 2013

High performance methods and their implementation for solving large scale Support Vector Machine (SVM) problem.

System Administrator, COR@L Lab, Lehigh — September 2012–Present

Maintenance of COR@L Laboratory resources, including GNU/Linux servers and a cluster for heavy computations.

SOFTWARE

OSI-CONIC

Solver interface for conic optimization problems. It extends COIN-OR's open solver interface (OSI) to conic optimization problems. It is fully compatible with COIN-OR framework and can replace OSI in all OSI dependant software.

COLA

COLA is a solver that solves second order cone optimization problems using outer approximation method. It uses COIN-OR's CLP to solve linear relaxations. It implements OSI-CONIC.

CGL-CONIC

Cut generation library (CGL) for conic optimization problems. It is designed similar to COIN-OR's CGL. It implements sevaral cutting procedures for second order conic optimization problems from literature.

OSI-Mosek, OSI-Cplex, OSI-IPOpt

These are solver Interfaces that implements OSI-CONIC. For OSI-Cplex and OSI-Mosek, we extend COIN-OR's linear Cplex and Mosek solver interfaces to conic problems. OSI-IPOpt implements OSI-CONIC for COIN-OR's IPOpt solver.

DisCO

DisCO is a solver to solve discrete second order cone optimization problems. DisCO uses OSI-CONIC to communicate with relaxation solver. It can use COLA, Ipopt, Mosek or Cplex to solve continuous relaxations. It uses CGL-CONIC for cut generation. It also implements an *outer approximation* algorithm. This algorithm relaxaes both integrality and conic constraints and searches solutions in branch and bound framework.

GiMPy

A graph class in Python and associated methods for visualizing various graph-based algorithms, including branch and bound. Available through Python Package Index (PyPI) and Coin-OR website.

GrUMPy

A graph class in Python and associated methods for visualizing various graph-based algorithms, including branch and bound. Available through Python Package Index (PyPI) and Coin-OR website.

Math. Modeller

Math. Modeller is a library to help building mathematical optimization problems through C++ interface of any kind of solver. C++ interface of solvers work on sparse data which becomes messy very quickly when problems get more complicated. Math. Modeller provides an interface closer to models written on paper and can get resulting structures in sparse forms which is preferred by most of the solvers.

Academic Experience

Teaching Assistant

Lehigh University, Department of I&SE

- ISE 495 Mining Massive Datasets, Fall 2015
- IE 172 Algorithms in System Engineering, Spring 2012/2013

METU, Department of Industrial Engineering

- Operations Research and Simulation Classes, September 2009–August 2011

Papers

- A. Bulut and T. K. Ralphs, "On the Complexity of Inverse Integer Programming", I&SE Technical Report 15T-001, Lehigh University, 2015

Working Papers

- A. Bulut and T. K. Ralphs, "Computational Approaches to Mixed Integer Second Order Cone Optimization"
- A. Bulut and T. K. Ralphs, "On The Complexity of Discrete Linear Optimization Problems"

Awards

- I&SE Department Ph.D. student of the year, Lehigh University, Spring 2014
- Gotshall Fellowship, Lehigh University, Spring 2014, Fall 2013
- SAS OR Fellowship, SAS Institute, Summer 2013
- Rossin Doctoral Fellowship, Lehigh University, Fall 2011, Spring 2012

Conference Presentations

- A. Bulut, T. Ralphs, Computational Approaches to Mixed Integer Second Order Cone Optimization (MISOCO), INFORMS Annual Conference, Philadelphia, PA, November 2015

- A. Bulut, T. Ralphs, Computational Approaches to Mixed Integer Second Order Cone Optimization (MISOCO), International Symposium on Mathematical Programming, Pittsburgh, PA, July 2015
- A. Bulut, T. Ralphs, COLA and DietCOLA: An Open Source Framework for Solution of Mixed Integer Second Order Cone Optimization (MISOCO) Problems, INFORMS Computing Society Conference, Richmond, VA, January 2015
- A. Bulut, T. Ralphs, Valid Inequalities for Mixed Integer Second Order Conic Optimization, INFORMS Annual Conference, San Francisco, CA, November 2014
- A. Bulut, T. Ralphs, On the Complexity and Solution of Inverse Mixed Integer Linear Programs, INFORMS Annual Conference, Mineapolis, MN, October 2013
- A. Bulut, T. Ralphs, An Algorithm for Solving Inverse Integer Programs, INFORMS Annual Conference, Phoenix, AZ, October 2012

Computing Skills

Programming Languages

C, C++, Python, Matlab, Octave, AMPL, BASH scripting

Parallel Programming Standards/Frameworks

MPI, OpenMP, Apache Spark

Software Engineering Tools

GNU build system, Git, Subversion, Trac, Doxygen

IDE/Editing Tools

Emacs, Eclipse, LaTeX

Discrete Event Simulation Tools

Arena, SimPy

Platforms

GNU/Linux (Debian), Windows