SURESH BOLUSANI

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RESEARCH INTERESTS

Mixed Integer Bilevel Linear Optimization, Multilevel/Multistage Optimization, Computational Optimization, Stochastic Optimization, Intersection of Optimization and Machine Learning

EDUCATION

Ph.D., Industrial and Systems Engineering, Lehigh University, USA, **3.61/4**	*Aug. 2014 - Present*
M.Tech., Industrial Engineering and Operations Research, IIT Bombay, India, **9.68/10**	*Jul. 2012 - Jun. 2014*
B.Tech., Production and Industrial Engineering, IIT Roorkee, India, **8.52/10**	*Aug. 2005 - May 2009*

RESEARCH EXPERIENCE

Parametric Valid Inequalities and Their Application in Multilevel Optimization   *Aug. 2014 - Present*
Ph.D. Research, Lehigh University, Advisor: Dr. Ted Ralphs

- Developed parametric valid inequalities (PVIs) based on duality and the value functions of multilevel/multistage mixed integer linear optimization problems (MMILPs).
- Developed an abstract framework for generalizing Benders' technique for reformulation that encompasses MMILPs.
- Developed a generalized Benders' decomposition algorithm employing PVIs for mixed integer bilevel linear optimization problems (MIBLPs) and implemented it in MibS (an open-source MIBLP solver.)
- Enhancing warm-starting techniques for solving mixed integer linear optimization problems (MILPs) by utilizing PVIs, thereby accelerating the algorithm for solving MIBLPs.

Warm Starting Deterministic Security Constrained Unit Commitment   *Sep. 2016 - May 2017*
Internship Project, Argonne National Laboratory, Supervisor: Dr. Feng Qiu

- Reviewed the literature on MILP formulations and valid inequalities for both unit commitment (UC) and security constrained unit commitment (SCUC) problems for optimal power generation scheduling.
- Unified major UC MILP formulations and evaluated their performance in the presence of security constraints through extensive computational experimentation on MATPOWER and RTS bus systems using AMPL and CPLEX.
- Improved MILP warm-starting techniques in SYMPHONY (an open-source MILP solver) based on MILP duality theory to expedite the SCUC solution process.

Practical Branching Techniques for Convex Mixed Integer Nonlinear Optimization   *May 2013 - Jun. 2014*
Master Thesis, IIT Bombay, Advisor: Dr. Ashutosh Mahajan

- Reviewed existing branching techniques for branch-and-bound algorithms for solving mixed integer nonlinear optimization problems (MINLPs) and MILPs.
- Developed four new branching techniques for branch-and-bound algorithm for solving convex MINLPs.
- Implemented and evaluated these techniques in MINOTAUR (an open-source MINLP solver.)

Automated Timetabling System at IIT Bombay   *Dec. 2012 - Jul. 2013*
Consulting Project, IIT Bombay, Coordinator: Dr. Jayendran Venkateswaran

- Developed and implemented an automated timetabling system to generate a centralized timetable of all courses at IIT Bombay (around 700 courses per semester), as per the institute time slot pattern, in classrooms across the campus.
- Used AMPL for modeling, CPLEX and GuRoBi solvers for solving the integer optimization formulation, and Python programming for managing input data and results.

Computer Aided Process Planning of Sheet Metal Parts   *Jul. 2008 - May 2009*
Bachelor Thesis, IIT Roorkee, Advisor: Dr. N. K. Mehta

- Developed a heuristic for stock layout planning & an algorithm for operation sequencing of rectangular sheet metal parts.
- Achieved more than 90% utilization of sheet metal via the developed heuristic for sheet metal parts, which is an improvement of 3-7% over the then best heuristics.
- Used C++ for coding and OpenGL for visualizing the results.

PUBLICATIONS

S. Bolusani and T.K. Ralphs. A Framework for Generalized Benders' Decomposition and Its Application to Multilevel Optimization. Technical report, COR@L Laboratory Report 20T-004, Lehigh University, 2020. URL `https://coral.ise.lehigh.edu/bsuresh/files/papers/MultilevelBenders20.pdf`.

S. Bolusani, S. Coniglio, T.K. Ralphs, and S. Tahernejad. A Unified Framework for Multistage Mixed Integer Linear Optimization. In S. Dempe and A. Zemkoho, editors, *Bilevel Optimization: Advances and Next Challenges*, chapter 18, pages 513–560. Springer, 2020. ISBN 978-3-030-52118-9. doi: 10.1007/978-3-030-52119-6. URL `https://coral.ise.lehigh.edu/bsuresh/files/papers/MultistageFramework20.pdf`.

CONFERENCE PRESENTATIONS

T. Ralphs, S. Bolusani   *INFORMS Annual Meeting, 2020*
A Framework for Generalized Benders' Decomposition and Its Application to Multilevel Optimization

S. Bolusani, T. Ralphs   *MIP Workshop, 2020*
Generalized Benders' Decomposition for Multilevel/Multistage Optimization

T. Ralphs, S. Bolusani   *INFORMS Annual Meeting, 2019*
Parametric Valid Inequalities and the Solution of Multistage Optimization Problems

T. Ralphs, S. Bolusani, S. Tahernejad   *International Conference on Stochastic Programming, 2019*
Multistage/Multilevel Discrete Optimization

S. Bolusani, F. Qiu, T. Ralphs, A. Botterud, K. Kim   *INFORMS Annual Meeting, 2018*
Warm Starting For Security Constrained Deterministic Unit Commitment

S. Bolusani, T. Ralphs   *MOPTA, 2018; IWOBIP, 2018; INFORMS Annual Meeting, 2017*
Generalized Benders' Algorithm for Mixed Integer Bilevel Linear Optimization

S. Bolusani, T. Ralphs   *NemFest17, 2017*
Dual Functions and Warm Starting of Mixed Integer Linear Optimization Problems

S. Bolusani, T. Ralphs, A. Mahajan, M. Güzelsoy   *INFORMS Optimization Society, 2016*
Bilevel Optimization and the SYMPHONY MILP Solver (Tutorial, Part II)

S. Bolusani, T. Ralphs   *INFORMS Annual Meeting, 2015*
Solving Bilevel Linear Optimization Problems in Parallel

HONORS AND AWARDS

· Gottshall Fellowship, Rossin Doctoral Fellowship, Dean's Doctoral Assistantship, Lehigh University
· Mentorship Appreciation Award, Lehigh University   *2020*
· Van Hoesen Family Best Publication Award, ISE Department, Lehigh University   *2020*
· Featured in the ISE Newsletter, ISE Department, Lehigh University   *Fall 2017*
· Ph.D. Student of the Year, ISE Department, Lehigh University   *2015 - 2016*
· First in the class of M.Tech. in IEOR, IIT Bombay   *Class of 2014*

TEACHING EXPERIENCE

ISE Department, Lehigh University

Adjunct Lecturer
· ISE 426 - Optimization Models and Applications   *Summer 2020*

Teaching Assistant
· ISE 467/367 - Mining of Massive Datasets   *Fall 2020, 2019, 2018*
· ISE 172 - Algorithms in Systems Engineering   *Spring 2020, 2019*
· ISE 406 - Introduction to Mathematical Optimization   *Fall 2015*
· ISE 324 - Industrial Automation and Robotics   *Spring 2015*
· ISE 372 - Systems Engineering Design   *Fall 2014*
· ISE 224 - Information Systems Analysis and Design   *Fall 2014*

Guest Speaker for Various Course Lectures
- Generalized Benders' Decomposition framework.
- The Hungarian Method for solving assignment problems.
- Apache Spark SQL and DataFrames.
- Installation and usage of SYMPHONY solver for batch experimentation.
- Setup and usage of AMPL with various optimization solvers.
- Pygame Python package.
- Introduction to the COR@L Lab.

IEOR, IIT Bombay

Teaching Assistant
- ISE 507 - Modeling and Computation Lab   *Autumn 2013*

PROFESSIONAL EXPERIENCE

Lehigh University   *Nov. 2015 - Present*
System Administrator, COR@L Lab, Lehigh University
- Maintaining COR@L Laboratory resources, viz., Linux-based computational and web servers.

IIT Bombay   *Jul. 2013 - Jun. 2014*
Web Administrator, IEOR, IIT Bombay
- Improved and maintained the department website with relevant news across the globe.

NMDC Ltd.   *Aug. 2009 - Aug. 2012*
Assistant Manager, Industrial Engineering, Kirandul, India
- Handled resource planning (manpower, methods, and machinery), designed and modified incentive schemes.
- Optimized and coordinated MIS activities for Decision Support System.
- Ensured conformance to QMS ISO 9001:2008 standard (certified Internal Auditor.)

SKILL SET

Modeling and Analytical Tools	AMPL, Apache Spark, R, Spreadsheet
Optimization Solvers	SYMPHONY, MibS, CHiPPS Framework, MINOTAUR, CPLEX, GuRoBi
Computational/ Utility Tools	Scilab, Mathematica, LaTeX, AnyLogic
Programming Languages	C, C++, Python, BASH scripting, MATLAB
Operating Systems	Mac OS, Linux (Debian, Ubuntu), Windows

EXTRACURRICULAR ACTIVITIES

Leadership
- President of Lehigh INFORMS Student Chapter, Lehigh University   *May 2016 - Apr. 2017*
- Vice-President of Lehigh INFORMS Student Chapter, Lehigh University *Apr. 2015 - Apr. 2016*
- Joint Secretary (Library & Publications) at IEOR, IIT Bombay   *Jul. 2013 - Jun. 2014*

Trainings
- Research Leadership, Program Development, and Proposal Preparation, Lehigh University   *2018*
- Teacher Development Program, Levels 1 and 2 Certifications, Lehigh University   *2017*
- Symposium on Teaching and Learning, Lehigh University   *2016*

Volunteering
- OutreachISE Program, ISE Department, Lehigh University   *Spring 2021*
- ISE Student Council, ISE Department, Lehigh University   *2017 - 2018*
- Annual STEM-CON, Glen Ellyn, Illinois   *Apr. 2017*
- Family Codefest, Da Vinci Science Center, Allentown, Pennsylvania *Jun. 2016*
- Workshop on C++, OpenMP & MPI, ISE Department, Lehigh University   *Feb. 2016*

PROFESSIONAL MEMBERSHIP

INFORMS Student Member, SIAM Graduate Student Member, IEEE Student Member, Lehigh University INFORMS Student Chapter Member