Tyler Perini

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EDUCATION

Georgia Institute of Technology, Georgia *expected summer 2021*
H. Milton Stewart School of Industrial and Systems Engineering
Ph.D. (Candidate) in Operations Research
Thesis advisor: Natashia Boland

College of Charleston, South Carolina *2016*
B.S. in Applied Mathematics

RESEARCH INTERESTS

Multiobjective Optimization

- Developing algorithms for multiobjective (mixed) integer linear programs with optimization software and efficient implementation.
- Focus on dimension-reduction approaches, including criterion space search, weight space decomposition, and dynamic programming.

Epidemiological Modeling

- Simulation models, such as agent-based methods, for testing hypotheses about the transmission of disease.
- Data analysis and ranking for prediction of localized hot-spots for COVID-19 in Georgia.

PRIZES & FELLOWSHIPS

2020 Student Paper Prize for "A criterion space method... (2019)"
INFORMS Computing Society
Best paper at the interface of computing and operations research with student author.

2019 Graduate Research Opportunities Worldwide
National Science Foundation
Funding for NSF GRFP Fellows to be used for international research collaboration.

2017 Graduate Research Fellowship Program
National Science Foundation

2016 Presidential Fellowship
Georgia Tech H. Milton Stewart School of Industrial and Systems Engineering

PUBLICATIONS

Refereed journal articles:

2020 An agent-based simulation for Guinea worm infections in dogs.
The American Journal of Tropical Medicine and Hygiene.
Tyler Perini, Julie Swann, Pinar Keskinocak, Ernesto Ruiz-Tiben, and Zihao Li.

2020 A criterion space method for biobjective mixed integer programming: the boxed line method.
INFORMS Journal on Computing. 32:1, pgs. 16-39.
Tyler Perini, Natashia Boland, Diego Pecin, and Martin Savelsbergh.

2019 A data-driven support strategy for a sustainable research software repository.
Concurrency Computational Practical Experience. 31:20.
M. Belgin, T. Perini, F. Liu, N. Zhang, S. Sarajlic, A. McNeill, P. Manno, and N.C. Bright.

Manuscripts submitted:

2020 The weighted Tchebycheff weight set decomposition for multiobjective discrete optimization...
Submitted to *Mathematical Programming.*
Stephan Helfrich, Tyler Perini, Pascal Halfmann, Natashia Boland, and Stefan Ruzika.

2020 A fast and robust algorithm for solving biobjective mixed integer programs.
Submitted to *Journal on Global Optimization.*
Ian Herszterg, Tyler Perini, Diego Pecin, Natashia Boland, and Martin Savelsbergh.

Manuscripts in preparation:

202- Book chapter: A Survey of Progress in Algorithms for Multiobjective [MIP].
Natashia Boland, Banu Soylu, and Tyler Perini.

202- Inner and outer approximation algorithms for the Tchebycheff weight set decomposition...
Tyler Perini, Stephan Helfrich, Pascal Halfmann, Natashia Boland, and Stefan Ruzika.

202- Extending dynamic programming with bounds to biobjective knapsack.
Tyler Perini, Peter Stuckey, and Natashia Boland.

PUBLICLY AVAILABLE TOOLS

COVID-19 Dashboard* `perinigraphics.shinyapps.io/coviddashboard/`
Biobjective MIP Instances* `github.com/perinita/BOMIPresearch`

CONFERENCE ACTIVITY

Invited talks:

2020 A Weight Set Decomposition Algorithm for the Weighted Tchebycheff Scalarization.
Recent Advances in Multiobjective Optimization.
Tyler Perini, Stephan Helfrich, Pascal Halffman, and Natashia Boland.

Sessons organized:

2019 Simulation models in healthcare.
INFORMS Annual Meeting.
Tyler Perini, Pinar Keskinocak, and Julie Swann.

Presentations:

2019 Enhanced algorithms for mixed integer biobjective optimization.
INFORMS Computing Society Conference.
Tyler Perini, Ian Herszterg, Diego Pecin, Natashia Boland, and Martin Savelsbergh.

2019 An agent-based simulation for Guinea worm infections in dogs.
Institute of Industrial and Systems Engineers (IISE) Annual Expo.
Tyler Perini, Pinar Keskinocak, and Julie Swann.

2018 Approximation of the frontier for a BOMILP: Comparing methods.
International Symposium on Mathematical Programming (ISMP).
Tyler Perini, Diego Pecin, Natashia Boland, and Martin Savelsbergh.

2017 The boxed line algorithm for mixed integer biobjective optimization.
International Federation of Operations Research Societies (IFORS).
Tyler Perini, Natashia Boland, Martin Savelsbergh, and Diego Pecin.

REFERENCES

1. Natashia Boland. Georgia Institute of Technology. Faculty advisor; Fouts Family Professor. `natashia.boland@isye.gatech.edu`
2. Pinar Keskinocak. Georgia Institute of Technology. INFORMS president; William W. George Chair and Professor, ISyE; ADVANCE Professor, College of Engineering; Director of the Center for Health and Humanitarian Systems. `pinar@isye.gatech.edu`
3. Martin Savelsbergh. Georgia Institute of Technology. James C. Edenfield Chair and Professor; Co-Director Supply Chain and Logistics Institute. `martin.savelsbergh@isye.gatech.edu`
4. Julie Swann. North Carolina State University. Head of Fitts Department of Industrial and Systems Engineering; A. Doug Allison Distinguished Professor. `jlswann@ncsu.edu`

DISSERTATION ABSTRACT

Despite recent interest in multiobjective integer programming, certain approaches were sparsely available in the literature. This work expands the available library of efficient algorithms for multiobjective integer programs of three particular classes of problems: (1) A criterion space search method, the boxed line method, is developed for biobjective mixed integer programs. (2) A new type of weight set decomposition method, based on the weighted Tchebychev scalarization, is introduced for triobjective (pure) integer programs. And (3) dynamic programming with bounds is extended from single-objective integer programs to the biobjective case, with particular focus on binary knapsack. This work includes significant theoretical results, including: the first significant complexity result for a biobjective criterion space search algorithm as well as a thorough analysis of the geometry of an entirely new weight space. The algorithms developed are efficiently implemented and made publicly available. Test instances are critically analyzed for "fairness" of comparison, and new classes of instances were constructed.

UNIVERSITY SERVICE

Graduate Student Advisory Council 2019 - 2021

Representing the school of industrial and systems engineering, I participated in the college of engineering's advisory council. Through various efforts our work improved the quality of life for all students. The primary focus of the 2019-2020 council was to improve access to quality mental health support for all students but with special focus on graduate students.

Student Assistant to Faculty Diversity and Inclusion Council 2019

As a graduate student employee in spring '09 semester and then as a volunteer in Fall '09, I assisted the faculty committee for diversity and inclusion. I was involved in difficult conversations surrounding measuring and improving the diversity of faculty, graduate students, and undergraduate students. I researched for existing publications and resources that educated the council on diversity-related problems, and I specifically helped to develop a respectfully inclusive survey for prospective faculty as an early step for the application process.

RELATED PROFESSIONAL SKILLS

Programming	C++, Python, R, Matlab, Cplex
Languages	English (native), ASL (conversational)