

Tyler Perini, Ph.D.

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POSITIONS

Rice University, Houston, TX

July 2021-Present

Computational Applied Mathematics & Operations Research Department
Pfeiffer Postdoctoral Instructor, working with Dr. Andrew J. Schaefer

EDUCATION

Georgia Institute of Technology, Atlanta, GA

2021

H. Milton Stewart School of Industrial and Systems Engineering

Ph.D. in Operations Research, supported by NSF GRFP, advisor Dr. Natasha Boland

College of Charleston, Charleston, SC

2016

B.S. in Applied Mathematics, Honors College, 3.9 GPA, advisor Dr. Amy Langville

DISSERTATION

[LINK](#)

Techniques for multiobjective optimization with discrete variables: Boxed line method and Tchebychev weight set decomposition.

Committee: Natasha Boland (advisor), M. Savelsbergh, S. Dey, P. Van Hentenryck, A. Langville

RESEARCH INTERESTS

Algorithms for Multiobjective Optimization

Advancing methodologies for multiobjective (mixed) integer programs, including dimension-reduction approaches such as criterion space search and weight space decomposition

Healthcare Analytics

Data analysis and visualization models for transmission and/or intervention, such as agent-based methods for Guinea Worm, data visualization for COVID-19 and cancer radiotherapy

Machine Learning for Discrete Optimization

Studying neural network representations for integer program value functions for global sensitivity analysis of combinatorial optimization problems

PUBLICATIONS

[GOOGLE SCHOLAR PAGE](#)

Refereed journal articles:

2022 Weighted Tchebycheff weight set decomposition for multiobjective discrete optimization.

Journal of Global Optimization - Accepted July 2022.

S. Helfrich, **T. Perini**, P. Halfmann, N. Boland, and S. Ruzika.

2020 An agent-based simulation for Guinea worm infections in dogs.

The American Journal of Tropical Medicine and Hygiene. 103(5): 1942.

T. Perini, J. Swann, P. Keskinocak, E. Ruiz-Tiben, and Z. Li.

2020 A criterion space method for biobjective mixed integer programming: the boxed line method.

INFORMS Journal on Computing. 32:1, pgs. 16-39. Student paper prize.

T. Perini, N. Boland, D. Pecin, and M. 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:

- 2023** On the strength of Lagrangian duality in multiobjective integer programming.
INFORMS Undergraduate Operations Research Prize. Submitted to *Math Programming*.
M. Brun*, **T. Perini**, S. Sinha, A. J. Schaefer. *former Rice undergrad, now PhD student at MIT.
- 2023** Weight set decomposition for rank aggregation: Interpretable and visual decision support tool.
AMS Journal on Foundations of Data Science. Accepted.
T. Perini, A. Langville, G. Kramer, J. Shrager, M. Shapiro.
- 2023** A fast and robust algorithm for solving biobjective mixed integer programs.
Mathematical Methods of Operations Research. Submitted.
D. Pecin, I. Herzberg, **T. Perini**, N. Boland, M. Savelsbergh.
- 2020** Book chapter: A survey of progress in algorithms for multiobjective MIP.
To appear in *Handbook on Multiobjective Combinatorial Optimization* by M. Ehrgott et al.
N. Boland, B. Soylyu, and **T. Perini**.

Manuscripts in preparation:

- 2023** In pursuit of compact majority-minority districts
S. Kroger, H. Validi, **T. Perini**, I. V. Hicks.
- 2023** Neural networks for complete sensitivity analysis of combinatorial optimization problems
T. Perini, M. C. Camur, J. Huchette, A. J. Schaefer.
- 2023** On the structure of inverse multiobjective integer programs.
D. Qiu*, **T. Perini**, S. Valeva, A. J. Schaefer. *former Rice undergrad, now Masters student
- 2023** We're here: Interviews with LGBTQ members of the INFORMS community.
T. Perini.
- 2023** Evaluating the effectiveness of potential intervention methods for Guinea worm disease in dogs.
Y. Wang, **T. Perini**, P. Keskinocak, H. Smalley, and J. Swann.
- 2023** Computing Tchebychev weight space decomposition for multiobjective discrete optimization.
T. Perini, S. Helfrich, P. Halfmann, N. Boland, and S. Ruzika.

Self-published educational materials:

- 2021** Deconstruct this Calculus 1 Journal: Derivatives.
A. Langville, **T. Perini**. *Vervante Press*.

TEACHING EXPERIENCE

- S23** Instructor for *Graph Theory* (Rice: CAAM 470/570).
Combined PhD & undergraduate students (~20 total). Hybrid synchronous & asynchronous.
In progress.
- F22** Instructor for *Real Analysis* (Rice: CAAM 501).
9 first-year PhD students. Qualifying exam.
“Lectures are very well organized, and in-class exercises like proof-coaching are really valuable.”

- F21-S22** Instructor for *Intro to OR and Optimization** (Rice: CAAM 378).
 Student evaluations: **74-90% outstanding**. 30+ students each semester.
 “One of the most interactive and engaging courses I’ve ever taken at Rice.”
- S22** Faculty Colloquy on Critical Reflective Pedagogy.
 Rice University Center for Teaching Excellence.
- S21** Graduate Student Instructor for *Engineering Optimization* (GT: ISYE 3133).
 2 sections of 30 students each. Virtual, synchronous.
 Student Recognition of Excellence in Teaching: Spring 2021 CIOS Honor Roll.
- 2021** Tech to Teaching Certification & Associate Level Certification.
 Georgia Institute of Technology Center for Integration of Research, Teaching, & Learning.
- 2016** Teaching Assistant for Probability with Applications (GT: ISYE 2027).

PRIZES, FELLOWSHIPS, AWARDS

- 2022** Mentor for and Coauthor with Matthew Brun, Undergraduate Operations Research Prize
INFORMS
- 2020** INFORMS DEI Ambassador for *We’re here: Interviews with LGBTQ community*
INFORMS
- 2020** ICS Student paper prize for *A criterion space method for biobjective mixed integer programming*
INFORMS Computing Society
- 2019** Graduate Research Opportunities Worldwide for an international research collaboration
National Science Foundation
- 2017** Graduate Research Fellowship Program
National Science Foundation
- 2016** Presidential Fellowship
Georgia Tech H. Milton Stewart School of Industrial and Systems Engineering

CONFERENCE ACTIVITY

Sessions Organized:

- 2019** Simulation models in healthcare.
INFORMS Annual Meeting.
T. Perini, P. Keskinocak, and J. Swann.

Research Presentations:

- 2022** Neural networks for complete sensitivity analysis of combinatorial optimization problems
INFORMS Annual Meeting
T. Perini, M. C. Camur, J. Huchette, A. J. Schaefer.
- 2022** A Benders decomposition approach for solving the majority-minority districting problem
INFORMS Annual Meeting
 S. Kroger, H. Validi, **T. Perini**, I. V. Hicks.
- 2020** A Weight set decomposition algorithm for the weighted Tchebycheff scalarization.
Recent Advances in Multiobjective Optimization.
T. Perini, S. Helfrich, P. Halffman, and N. Boland.

- 2019** Enhanced algorithms for mixed integer biobjective optimization.
INFORMS Computing Society Conference.
T. Perini, I. Herszterg, D. Pecin, N. Boland, and M. Savelsbergh.
- 2019** An agent-based simulation for Guinea worm infections in dogs.
Institute of Industrial and Systems Engineers (IISE) Annual Expo.
T. Perini, P. Keskinocak, and J. Swann.
- 2018** Approximation of the frontier for a BOMILP: Comparing methods.
International Symposium on Mathematical Programming.
T. Perini, D. Pecin, N. Boland, and M. Savelsbergh.
- 2017** The boxed line algorithm for mixed integer biobjective optimization.
International Federation of Operations Research Societies.
T. Perini, N. Boland, M. Savelsbergh, and D. Pecin.

Diversity, Education, & Outreach Talks:

- 2022** Active learning in the STEM classroom using the deconstruct pedagogy.
Teaching, Learning, and Technology Conference.
A. Langville, K. Pedings-Behling, **T. Perini.**
- 2021** We're here: Interviews with LGBTQ members of the INFORMS community.
INFORMS Annual Meeting. Part of the INFORMS DEI Ambassador Program.
T. Perini.
- 2021** Put on your hard hat: Let's deconstruct calculus!
MAA Virtual Programming. Two-part webinar with 50+ attendees.
T. Chartier, A. Langville, K. Pedings-Behling, **T. Perini.**
- 2021** Multiobjective problem solving: When, why, and how?
Brown-bag talk for *LivePerson*, a company that utilizes conversational AI.
T. Perini.

STUDENT MENTORSHIP

[†] indicates students from underrepresented minority groups

NSF GRFP Application Mentorship

- **2021:** C. Anderson[†], M. Brun, J. Forner

Undergraduate Research Mentorship

- **2021:** L. Kuhlman[†], J. Yaffee, M. Brun, C. Tolbert
- **2022:** N. Patnaik[†], D. Qiu

Student Awards

- **2022:** M. Brun, INFORMS Undergraduate Operations Research Prize
- **2022:** N. Patnaik[†], INFORMS undergraduate scholarship

GRANT WRITING EXPERIENCE

Actively involved in

- **2022:** Administrative Supplement for the NCI to “Support Enhancement of Software Tools for Open Science”, Parent Grant *SCH: Personalized Rescheduling of Adaptive Radiation Therapy for Head and Neck Cancer*. PI: A. J. Schaefer. Co-Is: **T. Perini**, R. Myers. Submitted to NSF/NCI. Pending.
- **2022:** *Disrupting Opioid Distribution through Strategic Wastewater Monitoring*. NSF D-ISN. PI: A. J. Schaefer. Pending.

PROFESSIONAL SERVICE

Referee for

European Journal of Operational Research, SIAM Journal on Optimization, INFORMS Journal on Computing, Mathematical Programming Computation

REFERENCES

1. Andrew J. Schaefer. Rice University. Postdoc advisor; Noah Harding Chair and Professor. andrew.schaefer@rice.edu
2. Natashia Boland. (Retired from) Georgia Institute of Technology. PhD advisor; former Fouts Family Professor. natashia.boland@gmail.com or by phone +61-474-872-819 (daytime hours in Australian Western Standard Time)
3. Pinar Keskinocak. Georgia Institute of Technology. 2020 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
4. Amy Langville. College of Charleston. Teaching reference; Professor; undergraduate advisor and ongoing collaborator. langvillea@cofc.edu
5. Damon Williams. Georgia Institute of Technology. Teaching reference; Senior Lecturer and Director of the Center for Academics, Success, and Equity. damon.williams@isye.gatech.edu

PUBLICLY AVAILABLE TOOLS

Teaching dashboard for undergraduate optimization: ([link](#))

Research dashboard for weight space decomposition: ([link](#))

Github with multiobjective optimization code and instances: ([link](#))