

# Tyler Perini, Ph.D.

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## POSITIONS

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- United States Naval Academy**, Annapolis, MD *2023 - Present*  
Mathematics Department  
Assistant Professor
- Rice University**, Houston, TX *2021-2023*  
Computational Applied Mathematics & Operations Research Department  
Pfeiffer Postdoctoral Instructor, working with Dr. Andrew J. Schaefer

## EDUCATION

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- 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

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[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

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### 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

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[GOOGLE SCHOLAR PAGE](#)

Refereed journal articles:

- 2023** A fast and robust algorithm for solving biobjective mixed integer programs.  
*Mathematical Methods of Operations Research*. Accepted November 2023.  
D. Pecin, I. Herszterg, **T. Perini**, N. Boland, M. Savelsbergh.
- 2023** Evaluating the effectiveness of potential intervention methods for Guinea worm disease in dogs.  
*The American Journal of Tropical Medicine and Hygiene*. Accepted June 2023.  
Y. Wang, **T. Perini**, P. Keskinocak, H. Smalley, and J. Swann.

- 2023** Analysis of the weighted Tchebycheff weight set decomposition for MODO problems.  
*Journal of Global Optimization*. Accepted April 2023.  
S. Helfrich, **T. Perini**, P. Halfmann, N. Boland, and S. Ruzika.
- 2023** Weight set decomposition for rank aggregation: Interpretable and visual decision support tool.  
*AMS Journal on Foundations of Data Science*. Accepted Jan 2023.  
**T. Perini**, A. Langville, G. Kramer, J. Shrager, M. Shapiro.
- 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:

- 2024** 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** Were Here: LGBTQ+ Stories of Identity, Mentorship, and Community.  
Submitted to *INFORMS Transactions on Education*.  
**T. Perini**
- 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. Soylu, and **T. Perini**.

Manuscripts in preparation:

- 2024** Computing Tchebychev weight space decomposition for multiobjective discrete optimization.  
**T. Perini**, S. Helfrich, P. Halfmann, N. Boland, and S. Ruzika.
- 2024** In pursuit of compact majority-minority districts  
S. Kroger, H. Validi, **T. Perini**, I. V. Hicks.
- 2024** A Neural Network Approach for Global Sensitivity Analysis of Linear and Quadratic Programs  
E. Antley, J. Huchette, A. J. Schaefer, **T. Perini**.
- 2024** On the structure of inverse multiobjective integer programs.  
D. Qiu\*, **T. Perini**, S. Valeva, A. J. Schaefer. \*former Rice Masters student, now PhD student

Other publications:

- 2023** From Numbers to Stories to Community: INFORMS PRIDE Forum.  
P. Arora, P. Dutta, A. Murphy, **T. Perini**, D. Roy. *ORMS Today*.
- 2021** Deconstruct this Calculus 1 Journal: Derivatives.  
A. Langville, **T. Perini**. *Vervante Press*.

## TEACHING EXPERIENCE

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**S24** Instructor for *Linear Programming* (USNA: SA 350).  
Sophomore & Junior (2nd & 3rd class midshipmen) OR & Econ majors (3 sections of 15 each).

*“I think Professor Perini takes a great deal of time and care into how he teaches and it is evident that he is here for the betterment of his students.”*

**F23** Instructor for *Advanced Mathematical Programming* (USNA: SA 450).  
Junior (2nd class midshipmen) OR majors (3 sections of 18 each).

*“Dr. Perini challenged us to think creatively and solve problems that have real-world applications. His class had the most application to real-world projects that I’ve experienced at the Academy so far which I believe I learned a lot from.”*

**S23** Instructor for *Graph Theory* (Rice: CAAM 470/570).  
Combined PhD & undergraduate students (~20 total). Hybrid synchronous & asynchronous.

*“Found ways to reduce complex abstract material into something intuitive and relatable. Beautifully and intuitively designed lecture slides.”*

**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

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**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

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### Sessions Organized:

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

### Research Presentations:

- 2024** On the structure of the inverse-feasible region of a multiobjective integer program  
*INFORMS Optimization Society Conference*  
D. Qiu, **T. Perini**, S. Valeva, A. J. Schaefer.
- 2023** We're Here: LGBTQ+ Stories of Identity, Mentorship, and Community from Informs Members  
*INFORMS Annual Meeting*  
**T. Perini.**
- 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

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<sup>†</sup> indicates students from underrepresented minority groups

### NSF GRFP Application Mentorship

- **2021**: C. Anderson<sup>†</sup>, M. Brun, J. Forner

### Undergraduate Research Mentorship

- **2021**: L. Kuhlman<sup>†</sup>, J. Yaffee, M. Brun, C. Tolbert
- **2022**: N. Patnaik<sup>†</sup>, D. Qiu

### Student Awards

- **2022**: M. Brun, INFORMS Undergraduate Operations Research Prize
- **2022**: N. Patnaik<sup>†</sup>, INFORMS undergraduate scholarship

## GRANT WRITING EXPERIENCE

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### 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

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### INFORMS Pride Forum

2023-Present

Vice President, Mentorship and Programs

### Referee for

*European Journal of Operational Research*, *SIAM Journal on Optimization*, *INFORMS Journal on Computing*, *Mathematical Programming Computation*, *Mathematical Methods of Operations Research*, *Multicriteria Decision Analysis*, *Optimization Letters*

## REFERENCES

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1. Andrew J. Schaefer. Rice University. Postdoc advisor; Noah Harding Chair and Professor. [andrew.schaefer@rice.edu](mailto:andrew.schaefer@rice.edu)
2. Natasha Boland. (Retired from) Georgia Institute of Technology. PhD advisor; former Fouts Family Professor. [natashia.boland@gmail.com](mailto: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](mailto:pinar@isye.gatech.edu)
4. Amy Langville. College of Charleston. Teaching reference; Professor; undergraduate advisor and ongoing collaborator. [langvillea@cofc.edu](mailto: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](mailto:damon.williams@isye.gatech.edu)

## PUBLICLY AVAILABLE TOOLS

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

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

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