




Shuvomoy Das Gupta

CONTACT	 6100 Main St MS-134, Houston, TX 77005, USA  https://shuvomoy.github.io/  sd158@rice.edu
CITIZENSHIP	Canada
RESEARCH INTERESTS	Optimization, Game Theory, Transportation
CURRENT POSITION	Rice University, Houston, TX, USA 2025–Present <i>Assistant Professor, Computational Applied Mathematics & Operations Research</i>
ACADEMIC EXPERIENCE	Columbia University, New York, NY, USA 2024–2025 <i>Postdoctoral Research Scientist, Industrial Engineering & Operations Research</i> HOSTS: Garud Iyengar & Christian Kroer Worked on designing optimal algorithms for large-scale game solving.
INDUSTRY EXPERIENCE	Thales Canada Inc., Toronto, Canada 2016–2018 <i>Researcher, Research & Technology Department</i> Worked on real-time embedded optimization and sensor fusion algorithms in autonomous transportation systems.
EDUCATION	Massachusetts Institute of Technology, Cambridge, USA 2019 – 2024 Ph.D. in Operations Research THESIS: Advances in Computer-Assisted Design and Analysis of First-Order Optimization Methods and Related Problems PDF: https://dspace.mit.edu/handle/1721.1/155495 ADVISORS: Robert M. Freund & Bart P.G. Van Parys University of Toronto, Toronto, Canada 2016 Master of Applied Science in Electrical and Computer Engineering THESIS: Optimization Models for Energy-Efficient Railway Timetables PDF: https://utoronto.scholaris.ca/items/b89b9f6b-f9db-4757-8971-6d1563f779fd ADVISOR: Lacra Pavel
GRANTS, AWARDS AND HONORS	AFOSR Grant: “Computer-Assisted Design of Provably Fastest Algorithms”. Co-PI. \$600,000. (my share: \$300,000) 2025–2028 Winner, INFORMS Computing Society Student Paper Award 2024 Honorable Mention & Finalist, INFORMS Nicholson Student Paper Competition 2024 Honorable Mention, MIT Operations Research Center Best Student Paper Award 2024

PUBLISHED
JOURNAL
PAPERS

Branch-and-Bound Performance Estimation Programming: A Unified Methodology for Constructing Optimal Optimization Methods
with Bart P.G. Van Parys and Ernest K. Ryu
Published in *Mathematical Programming*, 2024
PDF: <https://arxiv.org/pdf/2203.07305.pdf>

Nonlinear Conjugate Gradient Methods: Worst-Case Convergence Rates via Computer-Assisted Analyses
with Robert M. Freund, Andy Sun, and Adrien Taylor
Published in *Mathematical Programming*, 2024
PDF: <https://arxiv.org/pdf/2301.01530.pdf>

Computer-Assisted Design of Accelerated Composite Optimization Methods: OptISTA
with Uijeong Jang and Ernest K. Ryu
Published in *Mathematical Programming*, 2025
PDF: <https://arxiv.org/pdf/2305.15704.pdf>

Exterior-Point Optimization for Sparse and Low-Rank Optimization
with Bartolomeo Stellato and Bart P.G. Van Parys
Published in *the Journal of Optimization Theory and Applications*, 2024
PDF: <https://arxiv.org/pdf/2011.04552.pdf>

On Seeking Efficient Pareto Optimal Points in Multi-Player Minimum Cost Flow Problems with Application to Transportation Systems
with Lacra Pavel
Published in *the Journal of Global Optimization*, 2019
PDF: <https://arxiv.org/pdf/1805.11750.pdf>

A Two-Step Linear Programming Model for Energy-Efficient Timetables in Metro Railway Networks
with Lacra Pavel and J. Kevin Tobin
Published in *Transportation Research Part B: Methodological*, 2016
PDF: <https://arxiv.org/pdf/1506.08243.pdf>

PUBLISHED
CONFERENCE
PAPERS

Spatial Branch-and-Bound for Computing Multiplayer Nash Equilibrium
with Jakub Cerny and Christian Kroer
Accepted in *the Proceedings of AAAI*, 2026
PDF: <https://arxiv.org/pdf/2508.10204>

An Optimization Model to Utilize Regenerative Braking Energy in a Railway Network
with Lacra Pavel and J. Kevin Tobin
Published in *the Proceedings of American Control Conference*, 2015
PDF: <https://tinyurl.com/ACCRegenOpt>

PAPERS
UNDER
REVIEW

On the $O(1/T)$ Convergence of Alternating Gradient Descent-Ascent in Bilinear Games
with Tianlong Nan, Garud Iyengar, and Christian Kroer
PDF: <https://arxiv.org/pdf/2510.03855>

TEACHING

CMOR 467/567: Optimization for Energy Systems, Rice

Fall 2025

Instructor. I have designed and launched this new course for advanced undergraduate and graduate students.

6.7220: Nonlinear Optimization, MIT Spring 2023
Teaching Assistant. This is MIT's main doctoral course in optimization.
 RATING: 6.9/7.0

15.S60: Computing in Optimization and Statistics, MIT Winter 2022, 2023
Instructor. I taught the ORC's required three-hour module on advanced methods in computational optimization.
 RATING: 6.9/7

15.S08: Optimization of Energy Systems, MIT Spring 2022
Teaching Assistant. This is a graduate course in power systems modeling and optimization.
 RATING: 6.0/7.0

TALKS

On the $O(1/T)$ Convergence of Alternating Gradient Descent–Ascent in Bilinear Games
 INFORMS Annual Meeting, Atlanta, GA 2025

Computer-Assisted Design of Provably Fastest Algorithms
 Invited talk, New Jersey Institute of Technology, New York, NY 2025

Nonlinear Conjugate Gradient Methods: Worst-case Convergence Rates via Computer-assisted Analyses
 ICCOPT, Los Angeles, CA 2025
 INFORMS Annual Meeting, Seattle, WA 2024

BnB-PEP: A Unified Methodology for Constructing Optimal Optimization Methods
 INFORMS Annual Meeting, Phoenix, AZ 2023
 SIAM Conference on Optimization (OP23), Seattle, Washington 2023
 UTOrg Seminar, University of Toronto, Toronto, Canada 2023
 International Conference on Continuous Optimization, Bethlehem, PA 2022
 MIT Data Science Lab Seminar 2022

Design and Analysis of First-Order Methods via Nonconvex QCQP Frameworks
 One of just four invited “long talks” at the 1st Workshop on Performance Estimation, UCLouvain, Belgium 2023

Energy-Optimal Timetable Design for Sustainable Metro Railway Networks
 INFORMS Annual Meeting, Phoenix, AZ 2023
 33rd Annual POMS Conference, Orlando, FL 2023
 2023 MIT Energy Initiative Annual Research Conference 2023

Exterior-Point Optimization for Sparse and Low-Rank Optimization
 INFORMS Annual Meeting (virtual) 2020

On Convergence of Heuristics Based on Douglas-Rachford Splitting and ADMM to Minimize Convex Functions over Nonconvex Sets
 56th Allerton Conference on Communication, Control, and Computing, Monticello, IL 2018

	<p><i>Multi-Player Minimum Cost Flow Problems with Nonconvex Costs and Integer Flows</i> 55th IEEE Conference on Decision and Control, Las Vegas, NV 2018</p>
SERVICE	<p>Organizer, Friends of Optimization Seminar Series 2024– LINK: https://sites.google.com/view/friends-of-optimization</p> <p>Reviewer for <i>Mathematical Programming, Transportation Research Part B: Methodological, IEEE Transactions on Control of Network Systems, American Control Conference, IEEE Transactions on Intelligent Transportation Systems, IEEE Transactions on Automatic Control</i></p> <p>Session Chair, INFORMS Annual Meeting 2022–2025</p>
SOFTWARE	<p>[1] BnB-PEP Computes optimal first-order algorithms for different convex and nonconvex setups LINK: https://github.com/Shuvomoy/BnB-PEP-code</p> <p>[2] NCG-PEP Computes worst-case convergence rates of nonlinear conjugate gradient methods LINK: https://github.com/Shuvomoy/NCG-PEP-code</p> <p>[3] NExOS Implements the Nonconvex Exterior-point Optimization Solver (NExOS) algorithm for solving low-rank and sparse optimization problems LINK: https://github.com/Shuvomoy/NExOS.jl</p>
LANGUAGES	<p>Fluent in English, Bengali, Hindi, Urdu Proficient in Julia, C, C++, MATLAB, Mathematica</p>
OTHER	<p>I enjoy playing cricket, reading novels, cooking, and blogging at https://shuvomoy.github.io/blogs/.</p>
MEDIA COVERAGE	<p>“Risky Giant Steps Can Solve Optimization Problems Faster” August, 2023 by Allison Parshall in <i>Quanta Magazine</i> I was interviewed and quoted in the article along with my paper being cited as the main inspiration for the discovery of long step gradient descent by Ben Grimmer. Also publicized in the <i>Nautilus Quarterly Magazine</i> and in the Chinese magazine <i>Heart of the Machine</i>. URL: https://www.quantamagazine.org/risky-giant-steps-can-solve-optimization-problems-faster-20230811/</p>