

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, Department of Industrial Engineering and Operations Research, HOSTS: Garud Iyengar & Christian Kroer</i> Worked on designing optimal algorithms for large-scale game solving.
	Massachusetts Institute of Technology, Cambridge, USA 2019 - 2024 <i>Graduate Research Assistant, MIT Operations Research Center</i> Worked on computer-assisted algorithm design for large-scale optimization.
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 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 ADVISOR: Lacra Pavel
GRANTS, AWARDS AND HONORS	AFOSR Grant: “Computer-Assisted Design of Provably Fastest Algorithms”. 2025-2028 Co-PI. \$600,000. (my share: \$300,000) Winner, INFORMS Computing Society Student Paper Award 2024 Honorable Mention & Finalist, INFORMS George Nicholson Student Paper Competition 2024 Honorable Mention, MIT Operations Research Center Best Student Paper Award 2024

**SELECTED
PUBLISHED
PAPERS**

**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>

**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>

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>

**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**

Spatial Branch-and-Bound for Computing Multiplayer Nash Equilibrium

with Jakub Cerny and Christian Kroer

PDF: <https://arxiv.org/pdf/2508.10204.pdf>

**On the $\mathcal{O}(1/T)$ Convergence of Alternating Gradient Descent–Ascent in Bilin-
ear Games**

with Tianlong Nan, Garud Iyengar, and Christian Kroer

PDF: <https://arxiv.org/pdf/2510.03855.pdf>

TEACHING

CMOR 467/567: Optimization for Energy Systems, Rice Fall 2025
Instructor. I have designed and launched this new course for advanced under-

graduate 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			
	<i>On the $O(1/T)$ Convergence of Alternating Gradient Descent–Ascent in Bilinear Games</i>		
	INFORMS Annual Meeting, Atlanta, GA		2025
	<i>Computer-Assisted Design of Provably Fastest Algorithms</i>		
	Invited talk, New Jersey Institute of Technology, New York, NY		2025
	<i>Nonlinear Conjugate Gradient Methods: Worst-case Convergence Rates via Computer-assisted Analyses</i>		
	ICCOPT, Los Angeles, CA		2025
	INFORMS Annual Meeting, Seattle, WA		2024
	<i>BnB-PEP: A Unified Methodology for Constructing Optimal Optimization Methods</i>		
	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
	<i>Design and Analysis of First-Order Methods via Nonconvex QCQP Frameworks</i>		
	One of just four invited “long talks” at the 1 st Workshop on Performance Estimation, UCLouvain, Belgium		2023
	<i>Energy-Optimal Timetable Design for Sustainable Metro Railway Networks</i>		
	INFORMS Annual Meeting, Phoenix, AZ		2023
	33rd Annual POMS Conference, Orlando, FL		2023
	2023 MIT Energy Initiative Annual Research Conference		2023
	<i>Exterior-Point Optimization for Sparse and Low-Rank Optimization</i>		
	INFORMS Annual Meeting (virtual)		2020
	<i>On Convergence of Heuristics Based on Douglas-Rachford Splitting and ADMM to Minimize Convex Functions over Nonconvex Sets</i>		
	56th Allerton Conference on Communication, Control, and Computing, Monticello, IL		2018

Multi-Player Minimum Cost Flow Problems with Nonconvex Costs and Integer Flows
55th IEEE Conference on Decision and Control, Las Vegas, NV 2018

SERVICE	Reviewer for <i>Mathematical Programming</i> , <i>Transportation Research Part B: Methodological</i> , <i>IEEE Transactions on Control of Network Systems</i> , <i>American Control Conference</i> , <i>IEEE Transactions on Intelligent Transportation Systems</i> , <i>IEEE Transactions on Automatic Control</i>	
	Session Chair, INFORMS Annual Meeting	2022, 2023, 2024
SOFTWARE	[1] BnB-PEP Computes optimal first-order algorithms for different convex and nonconvex setups LINK: https://github.com/Shuvomoy/BnB-PEP-code	
	[2] NCG-PEP Computes worst-case convergence rates of nonlinear conjugate gradient methods LINK: https://github.com/Shuvomoy/NCG-PEP-code	
	[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	
LANGUAGES	Fluent in English, Bengali, Hindi, Urdu Proficient in Julia, C, C++, MATLAB, Mathematica	
OTHER	I enjoy playing cricket, reading novels, cooking, and blogging at https://shuvomoy.github.io/blogs/ .	
MEDIA COVERAGE	“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 [1] being cited as the main inspiration for the discovery of long step gradient descent by Ben Grimmer. Also publicized in the <i>Nutilus 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/	