

# Shuvomoy Das Gupta

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

PUBLISHED  
JOURNAL  
PAPERS

Uijeong Jang, Shuvomoy Das Gupta, and Ernest K. Ryu, “**Computer-Assisted Design of Accelerated Composite Optimization Methods: OptISTA**,” published in *Mathematical Programming Series A*, 2025.  
PDF: <https://arxiv.org/pdf/2305.15704.pdf>

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

Shuvomoy Das Gupta, Robert M. Freund, Xu Andy Sun, Adrien B. Taylor, “**Nonlinear Conjugate Gradient Methods: Worst-case Convergence Rates via Computer-assisted Analyses**,” published in *Mathematical Programming Series A*, 2024.  
PDF: <https://arxiv.org/pdf/2301.01530.pdf>

Shuvomoy Das Gupta, Bartolomeo Stellato, and Bart P.G. Van Parys, “**Exterior-point Optimization for Sparse and Low-rank Optimization**,” published in the *Journal of Optimization Theory and Applications*, 2024.  
PDF: <https://arxiv.org/pdf/2011.04552.pdf>

Shuvomoy Das Gupta and Lacra Pavel, “**On Seeking Efficient Pareto Optimal Points in Multi-Player Minimum Cost Flow Problems with Application to Transportation Systems**,” published in the *Journal of Global Optimization* 74 (2019): 523–548.  
PDF: <https://arxiv.org/pdf/1805.11750.pdf>

Shuvomoy Das Gupta, J. Kevin Tobin, and Lacra Pavel, “**A Two-Step Linear Programming Model for Energy-Efficient Timetables in Metro Railway Networks**,” published in *Transportation Research Part B: Methodological* 93 (2016): 57–74.  
PDF: <https://arxiv.org/pdf/1506.08243.pdf>

PUBLISHED  
CONFERENCE  
PAPERS

Tianlong Nan, Shuvomoy Das Gupta, Garud Iyengar, Christian Kroer, “**On the  $O(1/T)$  Convergence of Alternating Gradient Descent–Ascent in Bilinear Games**,” accepted in *ICLR*, 2026.  
PDF: <https://arxiv.org/pdf/2510.03855>

Jakub Cerny, Shuvomoy Das Gupta, and Christian Kroer, “**Spatial Branch-and-Bound for Computing Multiplayer Nash Equilibrium**,” published in *AAAI*, 2026.  
PDF: <https://arxiv.org/pdf/2508.10204>

Shuvomoy Das Gupta, “**On Convergence of Heuristics Based on Douglas-Rachford Splitting and ADMM to Minimize Convex Functions over Nonconvex Sets**,” published in the *proceedings of the 56th Allerton Conference on Communication, Control, and Computing*, University of Illinois at Urbana-Champaign, IL, USA, October 2018.  
PDF: [https://shuvomoy.github.io/Papers/Allerton\\_2018.pdf](https://shuvomoy.github.io/Papers/Allerton_2018.pdf)

Shuvomoy Das Gupta and Lacro Pavel, “Multi-player Minimum Cost Flow Problems with Nonconvex Costs and Integer Flows,” published in the *proceedings of the 55th IEEE Conference on Decision and Control*, Las Vegas, NV, USA, December 12–14, 2016.

PDF: [https://shuvomoy.github.io/Papers/Multi-player\\_minimum\\_cost\\_flow\\_problems\\_with\\_nonconvex\\_costs\\_and\\_integer\\_flows.pdf](https://shuvomoy.github.io/Papers/Multi-player_minimum_cost_flow_problems_with_nonconvex_costs_and_integer_flows.pdf)

Shuvomoy Das Gupta, Lacro Pavel, and J. Kevin Tobin, “An Optimization Model to Utilize Regenerative Braking Energy in a Railway Network,” published in the *proceedings of 2015 American Control Conference (ACC)*, Chicago, IL, USA, July 2015.

PDF: [https://shuvomoy.github.io/Papers/An\\_Optimization\\_Model\\_to\\_Utilize\\_Regenerative\\_Braking\\_Energy\\_in\\_a\\_Railway\\_Network.pdf](https://shuvomoy.github.io/Papers/An_Optimization_Model_to_Utilize_Regenerative_Braking_Energy_in_a_Railway_Network.pdf)

#### PREPRINTS

Manu Upadhyaya, Shuvomoy Das Gupta, Adrien B. Taylor, Sebastian Banert, and Pontus Giselsson, “The AutoLyap Software Suite for Computer-Assisted Lyapunov Analyses of First-Order Methods,” arXiv preprint, 2026.

PDF: <https://arxiv.org/pdf/2506.24076>

#### TEACHING

**CMOR 537: Computer-assisted Algorithm Design for Optimization and Machine Learning, Rice** Spring 2026

*Instructor.* New graduate course for its inaugural offering.

**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 2023

*Instructor.* I taught the ORC’s required three-hour module on advanced methods in computational optimization.

RATING: 7/7

**15.S60: Computing in Optimization and Statistics, MIT** Winter 2022

*Instructor.* I taught the ORC’s required three-hour module on advanced methods in computational optimization.

RATING: 6.8/7

**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 1<sup>st</sup> 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

*NExOS.jl for Nonconvex Exterior-point Optimization*  
 JuliaCon 2021

*Exterior-point Optimization for Sparse and Low-rank Optimization*  
 Seoul National University 2020  
 INFORMS Annual Meeting (virtual) 2020  
 MIT LIDS student conference 2021

*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

*Multi-Player Minimum Cost Flow Problems with Nonconvex Costs and Integer Flows*  
 55th IEEE Conference on Decision and Control, Las Vegas, NV 2016

*On seeking efficient Pareto optimal points in multi-player minimum cost flow problems*  
 MIT LIDS student conference 2020

SERVICE

Organizer, Friends of Optimization Seminar Series 2024–  
 LINK: <https://sites.google.com/view/friends-of-optimization>

Reviewer for *Mathematical Programming, Management Science, 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*

Session Chair, INFORMS Annual Meeting 2022–2025

SOFTWARE

**[1] PEPit.jl**  
Native Julia implementation of the Performance Estimation Programming (PEP) methodology.  
LINK: <https://github.com/PerformanceEstimation/PEPit.jl>

**[2] AutoLyap.jl**  
Native Julia implementation of the AutoLyap methodology.  
LINK: <https://github.com/AutoLyap/AutoLyap.jl>

**[3] BnB-PEP**  
Computes optimal first-order algorithms for different convex and nonconvex setups  
LINK: <https://github.com/Shuvomoy/BnB-PEP-code>

**[4] NCG-PEP**  
Computes worst-case convergence rates of nonlinear conjugate gradient methods  
LINK: <https://github.com/Shuvomoy/NCG-PEP-code>

**[5] 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 *Quanta Magazine*  
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 *Nautilus Quarterly Magazine* and in the Chinese magazine *Heart of the Machine*.  
URL: <https://www.quantamagazine.org/risky-giant-steps-can-solve-optimization-problems-faster-20230811/>