

## Dr. Nikolai (Nick) Gravin

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CONTACT INFORMATION	School of Information Management & Engineering, 100 Wudong Road Yangpu District, Shanghai 200433 China	<i>ITCS, SUFE</i> <i>E-mail: nikolai@mail.shufe.edu.cn</i> <a href="http://logic.pdmi.ras.ru/~gravin/">http://logic.pdmi.ras.ru/~gravin/</a>
ACADEMIC POSITIONS	<b>Professor</b> ITCS, Shanghai University of Finance and Economics <b>Associate Professor</b> ITCS, Shanghai University of Finance and Economics <b>Postdoctoral Researcher</b> MIT: Computer Science and Artificial Intelligence Laboratory • Host: Constantinos Daskalakis <b>Postdoctoral Researcher</b> Microsoft Research New England • Supervising manager: Jennifer Chayes	2020 – Present 2017 – 2020 2016 – 2017 2013 – 2015
EDUCATION	(2nd) Ph.D., <b>Nanyang Technological University</b> , Singapore, December 2013 • Thesis: <i>Incentive Compatible Design of Reverse Auctions</i> • Adviser: Dmitrii Pasechnik • G.P.A.: 4.00/4  (1st) Ph.D., <b>V. A. Steklov Institute of Mathematics</b> , St. Petersburg, Russia, April 2011 • Thesis: <i>Some aspects of proper graph colorings</i> • Adviser: Dmitrii Karpov  Specialist (M.S. & B.S.), <b>Saint-Petersburg State University</b> , Russia, June 2008 • Thesis: <i>Non-degenerate colorings in Brook's theorem</i> • Adviser: Dmitrii Karpov • graduated cum laude	
AWARDS & GRANTS	Research Fund for International Scientists, RMB 400,000 per year, China 2021-present WINE Best paper award, UK, 2018. National Science Foundation Grant RMB 160,000, China 2018-2019 MOE Tier 2 Grant SGD 740,000 (USD 600,000), co-investigator, Singapore 2011-2014 PhD Microsoft Research Asia Fellowship, 2011. SINGA PhD scholarship, Singapore 2009-2013 Euler Foundation Scholarship for Young Mathematicians, Russia 2008. Semi-finals of ACM International, Collegiate Programming Contest, 2006. Gold Medal at International Mathematical Olympiad, 2003.	

PROFESSIONAL  
SERVICES

**Programm committee:** ACM EC 2014-2018, 2020, 2021, SAGT 2015, WINE 2017-2019, 2021, WINE 2020 (**Chair**), SAGT 2021, ICALP 2022.

**Subreferee:** ACM EC 2013, ALT 2014, CATS 2012, CIAC 2013, CSR (2010, 2011), FOCS 2014, ICALP (13, 17), ESA 17, MFCS 13, SAGT 14, SODA (13, 15, 17, 18), SOFSEM 2014, SPAA 2011, STOC (11, 13, 14, 15, 16), WINE (09, 10, 11, 12, 13, 16).

**Journal Reviews:** Journal of ACM, SIAM Journal on computing, Journal of computer and system sciences, ACM Transactions on Algorithms, Games and Economic Behavior, Mathematics of Operation Research, Operation Research, Annals of Applied probability, Discrete and Computational Geometry, Annels de l'institute Fourier, Journal of Artificial Intelligence Research, IEEE Transactions on Signal Processing, Advances in Computational Mathematics, ACM transactions on Economics and Computation.

**Other services:** Grant review for the Israeli Science Foundation, mathematical reviews for AMS, session organizer at international symposium on mathematical programming 2015.

JOURNAL  
PUBLICATIONS

- [1] N. Gravin, H. Wang, *Prophet Inequality for Bipartite Matching: Merits of Being Simple and Non-adaptive*, to appear in **Mathematics of Operation Research**.
- [2] T. Ezra, M. Feldman, N. Gravin, Z. Tang, *Prophet Matching with General Arrivals*, **Mathematics of Operation Research** 47:2, pp.878-898, 2022.
- [3] Y. Cheng, N. Gravin, K. Munagala, K. Wang, *A Simple Mechanism for a Budget-Constrained Buyer*, ACM Trans. Economics and Comput, 9(2), pp.10:1-10:25, 2021
- [4] N. Gravin, Y. Jin, P. Lu, C. Zhang *Optimal Budget-Feasible Mechanisms for Additive Valuations* **ACM Trans. Economics and Comput.** 8(4), pp. 21:1-21:15, 2020.
- [5] N. Gravin, D. V. Pasechnik, B. Shapiro, M. Shapiro, *On moments of a polytope*, **Analysis and Math. Phys.**, 8(2), pp. 255–287, 2018.
- [6] N. Gravin, P. Lu, *Correlation-Robust Mechanism Design*, **ACM SIGecom Exchanges**, 16(2), pp. 45-52, 2018.
- [7] X. Bei, N. Chen, N. Gravin, P. Lu. *Worst-Case Mechanism Design via Bayesian Analysis*, **SIAM Journal on Computing**, 46(4), pp. 1428-1448, 2017.
- [8] I. Caragiannis, A. Fanelli, N. Gravin, *Short Sequences of Improvement Moves Lead to Approximate Equilibria in Constraint Satisfaction Games*, **Algorithmica**, 77(4), pp. 1143-1158, 2017.
- [9] M. Feldman, N. Gravin, B. Lucier, *Combinatorial Walrasian Equilibrium*, **SIAM Journal on Computing**, 45(1), pp. 29-48, 2016.
- [10] J. Augustine, N. Chen, E. Elkind, A. Fanelli, N. Gravin, D. Shiryayev, *Dynamics of Profit-Sharing Games*, **Internet Mathematics**, 11(1), p. 1-22, 2015.
- [11] I. Caragiannis, A. Fanelli, N. Gravin, A. Skopalik, *Approximate Pure Nash Equilibria in Weighted Congestion Games: Existence, Efficient Computation, and Structure*, **ACM Transactions on Economics and Computation**, 3(1), pp. (2):1-(2):32, 2015.
- [12] M. Feldman, H. Fu, N. Gravin, B. Lucier, *Simultaneous auctions without complements are (almost) efficient*, **Games and Economic Behavior**, 123: 327-341, 2020.
- [13] N. Gravin, F. Petrov, D. Shiryayev, S. Robins, *Poisson imitation of lattices and convex curves*, **Mathematika**, 60(01), pp. 139- 152, 2014.

- [14] N. Chen, N. Gravin, P. Lu. *Truthful Generalized Assignments via Stable Matching*, **Mathematics of Operation Research**, 39(3), p. 722-736, 2014.
- [15] N. Gravin, M. Kolountzakis, S. Robins, D. Shiryayev, *Structure results for multiple tilings in 3D*, **Discrete and Computational Geometry**, 50(4), pp. 1033-1050, 2013.
- [16] N. Gravin, J. Lasserre, D. Pasechnik, S. Robins, *The inverse moment problem for convex polytopes*, **Discrete and Computational Geometry**, 48(3), pp. 596-621, 2012.
- [17] N. Gravin, S. Robins, D. Shiryayev, *Translational tilings by a polytope, with multiplicity*, **Combinatorica**, 32(6), pp. 629-649, 2012.
- [18] I. Caragiannis, A. Fanelli, N. Gravin, A. Skopalik, *Computing approximate pure Nash equilibria in congestion games*, **SIGecom Exchanges**, pp. 26-29, 2012
- [19] N. Chen, N. Gravin, *Note on Shortest k-Paths Problem*, **Journal of Graph Theory**, 67(1), pp. 34-37, 2011.
- [20] N. Gravin, D. Karpov, *On proper colorings of hypergraphs*, **Zap. Nauchn. Sem. POMI**, 391, pp. 79-89. (English translation) *Journal of Mathematical Sciences*, 184(5), pp. 595-600, 2011.
- [21] N. Gravin, *Construction of a spanning tree with many leaves*, **Zap. Nauchn. Sem. POMI**, 381, pp. 31-46. (English translation) *Journal of Mathematical Sciences*, 179(5), pp. 592-600, 2011.
- [22] N. Gravin, *Non-degenerate colorings in the Brook's theorem*, **Diskr. Mat.**, 21(4), pp. 105-128, 2009. (English translation) *Discrete Mathematics and Applications*, 19(5), pp. 533-553, 2009.
- [23] N. Gravin, D. Shiryayev, *Abnormal subgroups of classical groups corresponding to closed sets of roots*, **Zap. Nauchn. Sem. POMI**, 365, pp. 151-171, (English translation) *Journal of Mathematical Sciences*, 161(4), pp. 542-552, 2009.

CONFERENCE  
PROCEEDINGS

- [1] M. Feldman, N. Gravin, Z. Tang, A. Wald, *Lookahead Auctions with Pooling*, to appear in *International Symposium on Algorithmic Game Theory*, **SAGT 2022**
- [2] M. Feldman, V. Gkatzelis, N. Gravin, D. Schoepflin: *Bayesian and Randomized Clock Auctions*. ACM conference on Economics and Computation, pp. 820-845, **EC 2022**.
- [3] T. Ezra, M. Feldman, N. Gravin, Z. Tang, *General Graphs are Easier than Bipartite Graphs: Tight Bounds for Secretary Matching* ACM conference on Economics and Computation, pp. 1148-1177, **EC 2022**.
- [4] N. Gravin, Z. Tang, K. Wang, *Online Stochastic Matching with Edge Arrivals*, *Int. Colloq. on Automata, Languages, and Programming*, pp.74:1-74:20, **ICALP 2021**.
- [5] N. Gravin, S. Guo, T. C. Kwok, P. Lu, *Concentration bounds for almost k-wise independence with applications to non-uniform security*, *ACM-SIAM Symposium on Discrete Algorithms*, pp. 2404-2423, **SODA 2021**.
- [6] I. Caragiannis, N. Gravin, P. Lu, Z. Wang, *Relaxing the Independence Assumption in Sequential Posted Pricing, Prophet Inequality, and Random Bipartite Matching*, *Web and Internet Economics*, pp. 131-148, **WINE 2021**.
- [7] T. Ezra, M. Feldman, N. Gravin, Z. Tang, *Online Stochastic Max-Weight Matching: Prophet Inequality for Vertex and Edge Arrival Models*, *ACM conference on Economics and Computation*, pp. 769-787, **ACM EC 2020**.

- [8] N. Gravin, Y. Jin, P. Lu, C. Zhang, *Optimal Budget-Feasible Mechanisms for Additive Valuations*, ACM conference on Economics and Computation, pp. 887-900, **ACM EC 2019**.
- [9] N. Gravin, H. Wang, *Prophet inequality for bipartite matching: merits of being simple and non adaptive*, ACM conference on Economics and Computation, pp. 93-109, **ACM EC 2019**.
- [10] I. Caragiannis, N. Gravin, X. Huang, *Envy-freeness up to any item with high Nash welfare: The virtue of donating items*, ACM conference on Economics and Computation, pp. 527-545, **ACM EC 2019**.
- [11] X. Bei, N. Gravin, P. Lu, Z. Tang, *Correlation-Robust Analysis of Single Item Auction*, ACM-SIAM Symposium on Discrete Algorithms, pp. 193-208, **SODA 2019**.
- [12] C. Daskalakis, N. Dikkala, N. Gravin, *Testing Symmetric Markov Chains From a Single Trajectory*, Conference On Learning Theory, pp. 385-409, **COLT 2018**.
- [13] N. Gravin, P. Lu, *Separation in Correlation-Robust Monopolist Problem with Budget*, ACM-SIAM Symposium on Discrete Algorithms, pp. 2069-2080, **SODA 2018**.
- [14] Y. Cheng, N. Gravin, K. Munagala, K. Wang, *A Simple Mechanism for a Budget-Constrained Buyer*, Web and Internet Economics, pp. 96-110, **WINE 2018 [Best paper award]**.
- [15] N. Gravin, Y. Peres, B. Sivan, *Tight Lower Bounds for Multiplicative Weights Algorithmic Families*, Colloquium on Automata, Languages, and Programming, pp. 48:1-48:14, **ICALP 2017**.
- [16] Y. Azar, M. Feldman, N. Gravin, A. Roytman, *Liquid Price of Anarchy*, Algorithmic Game Theory Symposium, pp. 3-15, **SAGT 2017**.
- [17] N. Gravin, N. Immorlica, B. Lucier, E. Pountourakis, *Procrastination with Variable Present Bias*, ACM conference on Economics and Computation, p.361, **ACM EC 2016**.
- [18] N. Gravin, Y. Peres, B. Sivan, *Towards Optimal Algorithms for Prediction with Expert Advice*, ACM-SIAM Symposium on Discrete Algorithms, pp. 528-547, **SODA 2016**.
- [19] N. Chen, N. Gravin, P. Lu, *Competitive analysis via benchmark decomposition*, ACM conference on Economics and Computation, pp. 363-376, **ACM EC 2015**.
- [20] M. Feldman, N Gravin, B. Lucier, *Combinatorial Auctions via Posted Prices*, ACM-SIAM Symposium on Discrete Algorithms, pp. 123-135, **SODA 2015**.
- [21] I. Caragiannis, A. Fanelli, N. Gravin, *Short Sequences of Improvement Moves Lead to Approximate Equilibria in Constraint Satisfaction Games*, Symposium on Algorithmic Game Theory, pp. 49–60, **SAGT 2014**.
- [22] N. Chen, N. Gravin, P. Lu, *Optimal competitive auctions*, ACM Symposium on the Theory of Computing, pp. 253-262, **STOC 2014**.
- [23] N. Gravin, P. Lu, *Competitive Auctions for Markets with Positive Externalities*, International Colloquium on Automata, Languages and Programming, pp. 569-580, **ICALP 2013**.
- [24] M. Feldman, N Gravin, B. Lucier, *Combinatorial Walrasian Equilibrium*, ACM Symposium on the Theory of Computing, pp. 61-70, **STOC 2013**.
- [25] M. Feldman, Hu Fu, N Gravin, B. Lucier, *Simultaneous Auctions are (almost) Efficient*, ACM Symposium on the Theory of Computing, pp. 201–210, **STOC 2013**.

- [26] I. Caragiannis, A. Fanelli, N. Gravin, A. Skopalik, *Approximate Pure Nash Equilibria in Weighted Congestion Games: Existence, Efficient Computation, and Structure*, ACM conference on Electronic Commerce, pp. 284-301, **ACM EC 2012**.
- [27] X. Bei, N. Chen, N. Gravin, P. Lu, *Budget Feasible Mechanism Design: From Prior-Free to Bayesian*, ACM Symposium on the Theory of Computing, pp. 449-458, **STOC 2012**.
- [28] I. Caragiannis, A. Fanelli, N. Gravin, A. Skopalik, *Efficient computation of approximate pure Nash equilibria in congestion games*, IEEE Symposium on Foundations of Computer Science, pp. 532-541, **FOCS 2011**.
- [29] J. Augustine, N. Chen, E. Elkind, A. Fanelli, N. Gravin, D. Shiryayev, *Dynamics of Profit-Sharing Games*, International Joint Conference on Artificial Intelligence, pp. 37-42, **IJCAI 2011**.
- [30] N. Chen, N. Gravin, P. Lu, *On the Approximability of Budget Feasible Mechanisms*, ACM-SIAM Symposium on Discrete Algorithms, pp. 685-699, **SODA 2011**.
- [31] J. Augustine, N. Gravin, *On The Continuous CNN Problem*, International Symposium on Algorithms and Computation, pp. 254-265, **ISAAC 2010**.
- [32] N. Gravin. *Time optimal d-list colouring of a graph*, International Computer Science Symposium in Russia, pp. 156-168, **CSR 2010**.
- [33] N. Chen, E. Elkind, N. Gravin, F. Petrov, *Frugal Mechanism Design via Spectral Techniques*, the IEEE Symposium on Foundations of Computer Science, pp. 755-764, **FOCS 2010**.
- [34] N. Chen, E. Elkind and N. Gravin, *Refining the Cost of Cheap Labor in Set System Auctions*, Workshop on Internet and Network Economics, pp. 447-454, **WINE 2009**.

WORKING PAPERS

- [1] O. Badazhkova, N. Gravin, *Online  $k$ -median problem: a truthful  $O(\log k)$ -approximation*, under submission.
- [2] T. Ezra, M. Feldman, N. Gravin, Z. Tang, *“Who is Next in Line?” On the Significance of Knowing the Arrival Order in Bayesian Online Settings*, under submission.
- [3] X. Bei, N. Gravin, P. Lu, Z. Tang, *Auctions with Invitation Costs*, under submission.
- [4] N. Gravin, H. Li, Z. Tang, *Optimal Prophet Inequality with Less than One Sample*, under submission.

TECHNICAL REPORTS

N. Gravin, D. Nguyen, D. Pasechnik, S. Robins. *The Inverse Moment problem for convex polytopes: implementation aspects*, 2014.

TEACHING

At SHUFE

- “Discrete mathematics”, for undergraduate students (1st year Computer Science) & (1st year pilot class), (**3 credits**), spring semester 2021-2022.
- “Mechanism Design”, for graduate students, (**3 credits**), autumn semester 2020-2021.
- “Discrete mathematics”, for undergraduate students (1st year Computer Science), (**3 credits**), spring semester 2019-2020.
- “Discrete mathematics”, for undergraduate students (3rd year Operation Research, pilot class), (**4 credits**), autumn semester 2019-2020.
- “Discrete mathematics”, for undergraduate students (1st year Computer Science), (**3 credits**), spring semester 2018-2019.

- “Discrete mathematics”, for undergraduate students (3rd year Operation Research, pilot class), (**4 credits**), autumn semester 2018-2019.
- “Discrete mathematics”, for undergraduate students (1st year Computer Science), (**4 credits**), spring semester 2017-2018.
- “Information, Incentives, and Mechanism design” for undergraduate students (interdisciplinary), (**2 credits**), spring semester 2017-2018.

Invited lectures at Jiaotong University

- “Theoretical computer science” for undergraduate students (2nd-3rd year, special class), spring semester 2017-2018, 2018-2019, 2019-2020.

## STUDENTS

Hao Li, supervising **Undergraduate project**, November 2019-present.

- undergraduate student at SUFE.

Mehrnaz Ayazi, **Visiting undergraduate student**, January-March 2020.

- Amirkabir University of Technology, Iran.

Ali Mortazavi, **Visiting undergraduate student**, July-September 2019.

- Amirkabir University of Technology, Iran.

Kangning Wang, **research intern**, April-June 2019.

- PhD student at Duke university, USA.

Xin Huang, **visiting PhD student**, May-October, 2018

- Now: Postdoc at Technion University, Israel.

Yaonan Jin, **undergraduate collaborator**, 2018.

- Now: PhD at Columbia University, USA.

Hongao Wang, **undergraduate visitor**, 2018.

- Now: visiting student at Nanyang Technological university, Singapore.

Chenhao Zhang, **undergraduate visitor**, 2017.

- Now: PhD at Northwestern University, USA.

Patel Neel Bharatkumar, **research intern**, May-July 2018.

- Now: research assistant at National University of Singapore.

Yingkai Li, **visiting PhD student**, July 2017.

- Now: PhD at Northwestern University, USA.

## TUTORIALS

“Budget Feasible Mechanisms”, Conference on Web and Internet Economics (WINE), Harvard University, Cambridge, MA, December 2013 (Co-taught with Yaron Singer)

## INVITED TALKS

St. Peterburg, Russia, Economic Design and Algorithms, “Envy-freeness up to any item with high Nash welfare”, July 2019.

Chania, Greece, workshop 20 years of Price of Anarchy, “PoA of simultaneous item auctions and Bayesian Mechanism Design”, July 2019.

Nanjing, China, National Conference on Mathematical Optimization “Correlation-Robust Analysis of Single Item Auction”, April 2019.

Shanghai, China, National Conference of Theoretical Computer Science (NCTCS), “Testing Markov Chains”, October 2018.

Nanjing, China, Jiangsu Artificial Intelligence Conference (JAIC), “Correlation-robust mechanism design”, September 2018.

Guangzhou, China, International Frontiers of Algorithmics Workshop (FAW) “Correlation-robust mechanism design”, May 2018.

Sanya, China, Algorithmic Game Theory and Internet Economics (AGTIE), “Correlation-robust mechanism design”, March 2018.

Shanghai, China, BASICS Symposium at Shanghai Jiaotong University, “Testing Markov Chains: Is the casino really using a riffle shuffle?”, January, 2018

Shanghai, China, Workshops on computational economics (CCF Advanced Disciplines Lectures) “Budget Feasible Mechanism Design”, October 2017.

Santiago, Chile, Dynamic Pricing Workshop, “Mechanism Design for Rational but lazy Agent”, December 2017.

Shanghai, China, China Theory Week, “Towards optimal algorithms for prediction with expert advice”, July 2017.

Seattle, Microsoft Theory Day “Play with your benchmarks”, October 2014

Barbados, Bellairs Workshop on Algorithmic Game Theory,  
“Competitive analysis: how to play with your benchmarks”, April 2014

Dagstuhl seminar on Electronic Markets and Auctions,  
“Competitive auctions for selling an item in unlimited supply ”, November 2013

New York Computer Science and Economics Day, “Optimal competitive auctions”,  
November 2013

MSR New England, Game Theory and Computation Seminar,  
“Optimal competitive auctions”, October, 2013

Singapore, Theory seminar “Combinatorial Walrasian Equilibrium”, November 2012

Copenhagen, CFEM workshop on New Trends in Mechanism Design,  
“On the power of random sampling in mechanism design”, September 2011

Aarhus, CTIC Theory seminar “Frugal Mechanism Design via Spectral Techniques”,  
August 2011

Hong-Kong, Joint Workshop on Applied Mathematics and Informatics,  
“An Improved Algorithm for Orthogonal CNN Problem”, March 2010.