

CURRICULUM VITAE

DAVID GAMARNIK

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Research interests

Applied probability and stochastic processes, applications to business and industrial processes, queueing theory, algorithms and optimization, probabilistic analysis of combinatorial structures, statistical learning theory.

Working Experience

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| 2005-Present | J. Spencer Standish Associate Professor of Operations Research, Sloan School of Management, MIT. |
| 1997-2005 | IBM, T.J.Watson Research Center. Department of Mathematical Sciences. Research Staff Member. |
| 1993-1997 | MIT, Operations Research Center. Research Assistant. |
| 1996 (Summer) | GMO & Co. mutual fund. Research Analyst. |
| 1994 | MIT, Department of EECS. Teaching Assistant. |

Teaching Experience

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| Fall 2007 | Data, Models and Decisions. |
| Fall 2006 | Fundamentals of Probability. |

Summer 2006 Systems Optimization and Analysis for Manufacturing.
Spring 2006 Queues: Theory and Applications.
Spring 2006,2007 Applied Probability Seminar.
Fall 2005 Advanced Stochastic Processes.

Education

1993-1998 Ph.D. in Operations Research, MIT.
1991-1993 B.A. in Mathematics, Courant Institute of Math. Sci., New York University.
1986-1991 Department of mathematics, State University of Georgia, USSR.

Awards

- IBM Faculty Award, 2006
- Buchsbaum Grant, 2006
- Erlang Prize, Applied Probability Society of INFORMS, 2004
- National Science Foundation Fellowship Honorable Mention List, 1993
- Hollis Cooley Memorial Prize presented for exceptional promise in mathematics Courant Institute of Mathematical Sciences, 1992
- Top 100 in Putnam Mathematical competition, 1991
- First place in Republic of Georgia College Student Olympiad in mathematics, 1988
- 1st Degree Diploma in Republic of Georgia High School Olympiad in mathematics, 1986
- 2nd Degree Diploma in Republic of Georgia High School Olympiad in mathematics, 1985
- Winner of the Quant journal competition in mathematics for high school students, 1985,1986

Professional Activities

- Affiliate member of MIT Laboratory for Information and Decision Systems (LIDS).
- Associate Editor of Annals of Applied Probability (2007 – Present).
- Associate Editor of Operations Research (2006 – Present).
- Council member of Applied Probability Society of INFORMS (term 2006–2008).
- Applied Probability Cluster Chair for INFORMS 2006 conference, Pittsburgh, PA.
- Panel discussion participant at the MSRI workshop Phase Transition and Reconstruction, 2005.
- Program committee:
 - 27th Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing (PODC 2008).
 - 13th INFORMS Applied Probability Conference, 2005.
 - Mathematical Performance Modeling and Analysis 2003-2007, 2001.
- Member of IMS (Institute of Mathematical Statistics), INFORMS (Institute for Operations Research and Management Science) AMS (American Mathematical Society), SIAM (Society for Industrial and Applied Mathematics)
- Refereeing for journals:
 - IEEE Transactions on Automatic Control
 - Annals of Applied Probability
 - Royal Society Proceedings A
 - Mathematics of Operations Research
 - Operations Research
 - Operations Research Letters
 - Queueing Systems: Theory and Applications
 - Random Structures and Algorithms
 - Management Science
 - Machine Learning
 - Journal of Algorithms
 - Journal of the ACM
 - Journal on Parallel and Distributed Computing
 - SIAM Journal on Computing
 - Discrete Applied Mathematics
 - Performance Evaluation
 - Algorithmica

Journal of Scheduling
Theory of Computing Systems
INFORMS Journal of Computation
INFOR: Canadian Journal on Operations Research

- Refereeing for conferences:
Symposium on the Theory of Computations 2008,2007,2006, 2003
LATIN (Latin American Theoretical INformatics) 2006
European Symposium on Algorithms (ESA) 2005
Symposium on Theoretical Aspects of Computer Science 2005
Symposium on Discrete Algorithms 2004, 2003
SIGMETRICS 2004
Conference on Decision and Control 2004, 1998
Symposium on Parallelism in Algorithms and Architectures 2004

Short term visiting positions

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| 06/2007 | Microsoft Research Lab. |
| 05/2007 | ETH. |
| 05/2007 | Georgia Institute of Technology. |
| 10/2005 | Microsoft Research Lab. |
| 04/2005 | EURANDOM (European research institute for the study of stochastic phenomena), Eindhoven, Netherlands. |
| 04/2005 | Department of Mathematics and Mathematical Statistics, Chalmers University, Sweden. |
| 03/2005 | Department of Mathematical Sciences, Carnegie Mellon University. |

Publications

Stochastic Processes, Queueing Theory and applications

1. D. Gamarnik and P. Momčilović. A call center model in a Quality-Efficiency driven regime. *Submitted.*
2. D. Gamarnik and D. Katz-Rogozhnikov. On deciding stability of queueing networks under priority scheduling policy. *Submitted.*
3. D. Gamarnik and S. P. Meyn. On exponential ergodicity of multiclass queueing networks. *Submitted.*

4. F. Cheng, D. Gamarnik, N. Jengte, W. Min, and B. Ramachandran. Modeling operational risks in business processes. *To appear in Journal of Risk*, 2005.
5. D. Gamarnik and A. Zeevi. Validity of heavy traffic steady-state approximations in open queueing networks. *Ann. Appl. Probab.*, 16(1):56–90, 2006.
6. N. Bansal and D. Gamarnik. Handling load with less stress. *Queueing Systems*, 54(1):45–54, 2006.
7. D. Gamarnik and P. Momčilović. An asymptotic optimality of the transition rule for linear lists. *Journal of Applied Probability*, 42(1):235–246, 2005.
8. D. Gamarnik and M. Squillante. Analysis of stochastic online bin packing processes. *Stochastic Models*, 21:401–425, 2005.
9. D. Gamarnik and J. Hasenbein. Instability in stochastic and fluid queueing networks. *Ann. Appl. Probab.*, 15(3):1652–1690, 2005.
10. D. Gamarnik. Computing stationary probability distribution and large deviations rates for constrained homogeneous random walks. The undecidability results. *Mathematics of Operations Research*, 27(2):272–293, 2007.
11. D. Gamarnik. Stochastic bandwidth packing process: Stability conditions via Lyapunov function technique. *Queueing Systems*, 48:339–363, 2004.
12. D. Gamarnik. Stability of adaptive and non-adaptive packet routing policies in adversarial queueing networks. *SIAM Journal on Computing*. (Conference version in *STOC99*), pages 371–385, 2003.
13. D. Bertsimas, D. Gamarnik, and J. Tsitsiklis. Performance of multi-class Markovian queueing networks via piecewise linear Lyapunov functions. *Ann. of Appl. Probab.*, 11(4):1384–1428, 2001.
14. D. Gamarnik. On deciding stability of constrained homogeneous random walks and queueing systems. *Mathematics of Operations Research*, 27(2):272–293, 2002.
15. D. Gamarnik. Using fluid models to prove stability of adversarial queueing networks. *IEEE Transactions on Automatic Control*. (Conference version in *FOCS98*), 4:741–747, 2000.
16. D. Gamarnik. *Stability and Performance of Multiclass Queueing Networks*. MIT Thesis, 1998.

17. D. Bertsimas, D. Gamarnik, and J. Tsitsiklis. Stability conditions for multiclass fluid queueing networks. *IEEE Trans. Automat. Control*, 41:1618–1631, 1996.

Probabilistic Analysis of Combinatorial Structures

1. D. Gamarnik and D. Goldberg. Greedy algorithms for max-weight ind. sets and matchings in regular graphs with large girth. *Submitted*.
2. M. Bayati, D. Gamarnik, D. Katz, C. Nair, and P. Tetali. Simple deterministic approximation algorithms for counting matchings. In *Proc. 39th Ann. Symposium on the Theory of Computing*, 2007.
3. D. Gamarnik and D. Katz. Correlation decay and deterministic FPTAS for counting list-colorings of a graph. In *Proceedings of 18th ACM-SIAM Symposium on Discrete Algorithms (SODA)*, 2007.
4. D. Gamarnik and D. Katz. A deterministic approximation algorithm for computing a permanent of a 0,1 matrix. *Submitted*.
5. D. Gamarnik, T. Nowicki, and G. Swirszcz. Invariant probability measures and dynamics of exponential linear type maps. *To appear in Ergodic Theory and Dynamical Systems*.
6. A. Flaxman, D. Gamarnik, and G. Sorkin. First-passage percolation on a width-2 strip, and the path cost in a VCG auction. In *2nd international Workshop on Internet & Network Economics (WINE)*, 2006.
7. A. Bandyopadhyay and D. Gamarnik. Counting without sampling. New algorithms for enumeration problems using statistical physics. Accepted to *Random Structures and Algorithms*.
8. D. Gamarnik. Expectation of the random minimal length spanning tree of a complete graph. In *Proceedings of 16th ACM-SIAM Symposium on Discrete Algorithms*, 2005.
9. D. Gamarnik and M. Sviridenko. Hamiltonian completion of sparse random graphs. *Discrete Applied Mathematics*, 152:139–158, 2005.
10. D. Gamarnik, T. Nowicki, and G. Swirszcz. Maximum weight independent sets and matchings in sparse random graphs. Exact results using the local weak convergence method. *Random Structures and Algorithms*, 28(1):76–106, 2006.
11. A. Flaxman, D. Gamarnik, and G. Sorkin. Embracing the giant component. *Random Structures and Algorithms*, 27(3):277–289, 2005.

12. D. Gamarnik. Linear phase transition in random linear constraint satisfaction problems. *Probability Theory and Related Fields.*, 129(3):410–440, 2004.
13. D. Coppersmith, D. Gamarnik, M. Hajiaghayi, and G. Sorkin. Random MAXSAT, random MAXCUT, and their phase transitions. *Random Structures and Algorithms*, 24(4):502–545, 2004.
14. B. Bollobás, D. Gamarnik, O. Riordan, and B. Sudakov. On the value of a random minimum length Steiner tree. *Combinatorica*, 24(2):187–207, 2004.
15. D. Coppersmith, D. Gamarnik, and M. Sviridenko. The diameter of a long-range percolation graph. *Random Structures and Algorithms*, 21:1–13, 2002.

Algorithms and Combinatorial Optimization

1. D. Gamarnik, M. Lewenstein, and M. Sviridenko. An improved upper bound for TSP in cubic 3-connected graphs. *Operations Research Letters*, 33:467–474, 2005.
2. D. Bertsimas, D. Gamarnik, and J. Sethuraman. From fluid relaxations to practical algorithms for job shop scheduling: the holding cost objective. *Operations Research*, 51(5):798–813, 2003.
3. D. Gamarnik and M. Sviridenko. Static and dynamic hot-potato packet routing in communication networks. IBM Technical Report #RC 21918, 2000.
4. D. Bertsimas and D. Gamarnik. Asymptotically optimal algorithm for job shop scheduling and packet routing. *Journal of Algorithms*, 33(2):296–318, 1999.

Statistical Learning Theory and Other

1. D. Gamarnik. Extension of the PAC framework to finite and countable Markov chains. *IEEE Transactions on Information Theory*, 49(1):338–345, 2003.
2. D. Gamarnik. Efficient learning of monotone concepts via quadratic optimization. *Proc. 11th ACM Conf. on Computational Learning Theory*, 1998.
3. D. Bertsimas, D. Gamarnik, and J. Tsitsiklis. Estimation of time-varying parameters in statistical models: An optimization approach. Invited paper in *Machine Learning*, 35:225–245, 1999.
4. D. Gamarnik. Minimality of the group AUT(C). *SERDICA - Bulgaricae mathematicae publicationes*, 17:197–201, 1991.

Patents

- *Method and Apparatus for Risk Assessment for a Disaster Recovery Process.*
Co-inventors: J. Hosking, W.F. Kane, T. Li, I. Yashchin.
- *Methods and Apparatus for the Design and Planning of Workforce Evolution.* (2 patents) Co-inventors: B. Dietrich, M. Hellander, M. Squillante.
- *Method and Apparatus for Operational Risk Assessment and Mitigation.*
Co-inventors: F. Chen, W. Min, B. Ramachandran, S. Takriti.
- *Method and Apparatus for Business Process Analysis & Optimization.* Co-inventors: B. Ramachandran, M. Squillante, Y. Lu, N. Jengte.

Plenary Talks

- 06/2008 ???, Sixth International Workshop on Matrix- Analytic Methods (MAM6), Beijing, China,
- 01/2008 *Lecture I: Algorithmic issues and undecidability in the theory of queueing networks,*
Lecture II: Large scale queueing systems in the Quality/Efficiency driven regime and applications,
33-d Conference on the Mathematics of Operations Research, Lunteren, Netherlands.

Invited Presentations

- 05/2007 *Correlation decay and applications to counting problems,*
Department of Mathematics, Georgia Institute of Technology.
Combinatorics Seminar, Princeton University.
- 04/2006 *Asymptotic Results in Single and Multiclass Type Queueing Networks,* Electrical and Computer Engineering, University of Waterloo.
- 04/2006 *Single class type queueing networks in heavy-traffic,* Engineering Systems Division, University of Illinois at Urbana-Champaign.
- 02/2006 *Asymptotic Results in Single and Multiclass Type Queueing Networks,* Kellogg School of Management, NWU.

- 10/2005 *Correlation decay in statistical physics and applications to counting problems*, Microsoft Research Lab.
- 04/2005 *Applications of the local weak convergence method to random graph problems*,
 Statistics Seminar, Chalmers University, Sweden;
 Discrete Mathematics Seminar, Carnegie-Mellon University;
 Discrete Mathematics Seminar, Princeton University;
 Combinatorics Seminar, MIT.
- 04/2005 *Validity of Heavy Traffic Steady-State Approximations in Open Queueing Networks*, EURANDOM, Eindhoven University of Technology, Netherland.
- 01/2005 *Asymptotic Results in Single and Multiclass Type Queueing Networks*, Probability and Statistics Seminar, Division of Applied Mathematics, Brown University.
- 10/2004 *Validity of Heavy Traffic Steady-State Approximations in Open Queueing Networks*, Stanford University.
- 10/2002 *Linear Phase Transition in Random Linear Constraint Satisfaction Problem*, Princeton University, Department of Mathematics.
- 05/2002 *Stochastic Networks, Analysis and Optimization*, MIT, Operations Research Center.
- 01/2002 *The Diameter of a Long-Range Percolation Graph*, Almaden Research Center, IBM.
- 03/2000 *On Deciding Stability of Scheduling Policies in Queueing Systems*, Boston University, Department of Manufacturing Engineering.
- 10/2000 *On deciding stability of scheduling policies in queueing systems*, Dept. of Math Sciences, T.J.Watson Research Center, IBM.
- 02/2000 *On Deciding Stability of Scheduling Policies in Queueing Systems*, MIT, Operations Research Center.
- 01/1999 *Stability of Adversarial Queues via Fluid Models*, Bell Labs.
- 12/1998 *Stability of Adversarial Queues via Fluid Models*, Systems Design, Analysis & Theory seminar. T.J.Watson Research Center, IBM.
- 01/1998 *Performance Analysis of Multiclass Queueing Networks*, Dept. of Math Sciences, T.J.Watson Research Center, IBM.

Invited and Refereed Conference and Workshop Presentations

- 07/2007 *Steady-state analysis of a multi-server queueing system in QED regime*, 14th INFORMS/Applied Probability Society Conference, Eindhoven, Netherlands.
- 07/2007 *Undecidability results in the theory of queueing networks and Skorokhod problem*, 14th INFORMS/Applied Probability Society Conference, Eindhoven, Netherlands.
- 07/2007 *Stability and Performance Analysis of a Feedforward Type Infinite Markov Chains*, 14th INFORMS/Applied Probability Society Conference, Eindhoven, Netherlands.
- 07/2007 *Correlation decay and counting list-colorings of a graph*. Common concepts in Statistical Physics and Computer Science, Trieste, Italy.
- 05/2007 *Correlation decay, statistical physics and applications to counting problems*. "Problems at the interface of discrete mathematics and statistical physics" minisymposium at 1st Canadian Discrete and Algorithmic Mathematics Conference, Banff, Alberta, Canada.
- 05/2007 *Correlation decay, statistical physics and applications to counting problems*. ETH Combinatorics Day, ETH, Zurich, Switzerland.
- 01/2007 *Correlation decay and counting list-colorings of a graph*, Symposium on Discrete Algorithms (SODA2007). New Orleans, LA.
- 12/2006 *Undecidability results in the theory of queueing networks*. Bertinoro Workshop on Adversarial Modeling and Analysis of Communication Networks.
- 11/2006 *Steady-state analysis of a multi-server queueing system in QED regime*. INFORMS.
- 10/2006 *Correlation decay in statistical physics and applications to counting problems*. DIMACS Workshop on Properties of Large Graphs: From Combinatorics to Statistical Physics and Back.
- 06/2006 *Correlation Decay in Statistical Physics and Applications to Counting Problems*, SIAM Conference on Discrete Mathematics, University of Victoria, Victoria, BC.

- 06/2006 *Spatial decay of correlations and efficient methods for computing partition functions*, Conference on Stochastic Networks 2006, invited presentation. University of Illinois at Urbana-Champaign.
- 01/2006 *Counting without sampling New algorithms for enumeration problems using statistical physics*, Symposium on Discrete Algorithms (SODA2006). Miami, FL.
- 10/2005 *Exponential Ergodicity in Multi-Class Queueing Networks*, INFORMS 2005, San-Francisco, CA.
- 07/2005 *Validity of Steady-State Heavy Traffic Approximations in Generalized Jackson Networks*, 13th INFORMS/Applied Probability Society Conference, Ottawa, Canada.
- 07/2005 *Exponential Ergodicity in Multi-Class Queueing Networks*, 13th INFORMS/Applied Probability Society Conference, Ottawa, Canada.
- 07/2005 *Counting without sampling New algorithms for enumeration problems using statistical physics*, 13th INFORMS/Applied Probability Society Conference, Ottawa, Canada.
- 03/2005 *Applications of the local weak convergence method to random graph problems*, MSRI Workshop of Phase Transition and Reconstruction Problems. Berkeley, CA.
- 01/2005 *The Expected Value of a Random Minimum Length Spanning Tree of a Complete Graphs*, Symposium on Discrete Algorithms (SODA2005). Vancouver, BC.
- 10/2004 *Validity of Heavy Traffic Steady-State Approximations in Open Queueing Networks*, INFORMS 2004, Denver, CO.
- 08/2004 *Maximum Weight Independent Sets and Matchings in Sparse Random Graphs*, Approx-Random 2004 workshop, Harvard University, Cambridge, MA.
- 07/2004 *Large Deviations Principle in Constrained Homogeneous Random Walks and Queueing Systems*, 12th INFORMS/Applied Probability Society Conference, Beijing, China.
- 07/2004 *Stochastic Online Bin Packing Problem*, 12th INFORMS/Applied Probability Society Conference, Beijing, China.
- 06/2004 *Asymptotic Optimality of the Transposition Rule in Linear Lists*, Mathematical Modeling and Analysis workshop, New York, NY.

- 01/2004 *Linear Phase Transition in Random Linear Constraint Satisfaction Problem*, Symposium on Discrete Algorithms (SODA2004). New Orleans, LA.
- 10/2003 *Weak Instability in Stochastic and Fluid Queueing Networks*, INFORMS 2003, Atlanta, GA.
- 09/2003 *Linear Phase Transition in Random Linear Constraint Satisfaction Problem*, Discrete Random Walk: Theory and Applications, Institute Henri Poincare, Paris, France.
- 05/2003 *Weak Instability in Stochastic and Fluid Queueing Networks*, Mathematical Modeling and Analysis workshop, San Diego, CA.
- 09/2002 *The Diameter of a Long-Range Percolation Graph*, "Algorithms, Trees, Combinatorics and Probability" Colloquium, University of Versailles, France.
- 01/2002 *The Diameter of a Long-Range Percolation Graph*, Symposium on Discrete Algorithms (SODA2002). San-Francisco, CA.
- 07/2001 *Computing Fluid Limits and Stationary Distributions for Constrained Random Walks and Queueing Systems*, 11th INFORMS/Applied Probability Society Conference, New York, NY.
- 07/2001 *Stochastic Online Bin Packing Problem: Exact Conditions for Stability under the Best Fit Heuristic*, 11th INFORMS/Applied Probability Society Conference, New York, NY.
- 07/2001 *Static and Dynamic Packet Routing in Communications Networks*, 11th INFORMS/Applied Probability Society Conference, New York, NY.
- 06/2001 *Stochastic Online Bin Packing Problem: Exact Conditions for Stability under the Best Fit Heuristic*, Mathematical Performance Modeling and Analysis workshop. Cambridge, MA.
- 12/2000 *Performance of Multiclass Markovian Queueing Networks via Piecewise Linear Lyapunov Functions*, Conference on Decision and Control. Invited presentation. Sydney, Australia.
- 12/2000 *Static and Dynamic Packet Routing in Communications Networks*, INFORMS. Invited presentation. San-Antonio, TX.
- 06/2000 *Performance of Multiclass Markovian Queueing Networks via Piecewise Linear Lyapunov Functions*, Conference on Stochastic Networks. Madison, WI.

- 06/2000 *On Deciding Stability of Constrained Homogeneous Random Walks and Queueing Systems*, Mathematical Performance Modeling and Analysis workshop. Santa Jose, CA.
- 02/2000 *On Deciding Stability of Scheduling Policies in Queueing systems*, Symposium on Discrete Algorithms (SODA2000). San-Francisco, CA.
- 12/1999 *Asymptotically Optimal Algorithm for Job Shop Scheduling*, Conference on Decision and Control. Invited presentation. Phoenix, AZ.
- 10/1999 *On Deciding Stability of Scheduling Policies in Queueing Systems*, INFORMS. Invited presentation. Philadelphia, PA.
- 07/1999 *Performance Analysis of Multiclass Markovian Queueing Networks*, Conference on Applied Probability, Ulm, Germany.
- 07/1999 *Extension of the PAC Framework to Finite and Countable Markov Chains*, 12-th Annual Conference on Computational Learning Theory, U of Santa Cruz, CA.
- 05/1999 *Performance Analysis of Multiclass Markovian Queueing Networks*, Mathematical Performance Modeling and Analysis workshop. Invited presentation. Atlanta, GA.
- 05/1999 *Stability of Adaptive and Non-Adaptive Packet Routing Policies in Adversarial Queueing Networks*. Proc. 31st ACM Symposium on Theory of Computing (STOC1999). Atlanta, GA.
- 10/1998 *Stability of Adversarial Queues via Fluid Models*, 29th IEEE Conf. on Foundations of Computer Science (FOCS1998). San-Francisco, CA.
- 07/1998 *Efficient Learning of Monotone Concepts via Quadratic Optimization*, 11-th Annual Conference on Computational Learning Theory. Madison, WI.
- 07/1997 *Estimation of Time-Varying Parameters in Statistical Models: An Optimization Approach*, 10-th Annual Conference on Computational Learning Theory. Nashville, TN.
- 08/1995 *Stability Conditions for Multiclass Fluid Queueing Networks under Priority and FIFO policies*, Stochastic Networks Workshop. Edinburgh, UK.
- 06/1995 *Stability Conditions for Multiclass Fluid Queueing Networks*, Conference on Applied Probability, Atlanta, GA.