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Electrical and Computer Engineering,
University of Illinois at Urbana-Champaign

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appointments

- 2011 - **Professor of Mathematics and Electrical Engineering, Research Professor at Coordinated Sciences Lab, Affiliated member of Beckman Institute,** University of Illinois at Urbana-Champaign, IL.
- 2019-2020 **Professor at Institute of Mathematics for Industry,** Kyushu University, Fukuoka, Japan
- 2001 - 2011 **Department Head** (before 2006, **Member of Technical Staff**) Industrial Mathematics and Operations Research, Bell Laboratories, Murray Hill, NJ.
- 2000 - 2001 **Professor** at the Department of Mathematics, University of Versailles, France.
- 1998 - 2000 **Researcher** at EURANDOM, Technical University of Eindhoven.
- 1993 - 1997 **Habilitation Fellow** of Deutsche Forschungsgemeinschaft.
Habilitation in June 1998.
- 1995 - 1997 **Lecturer**, School of Mathematics, University of Hull, Kingston-upon-Hull, England.
- 1992 - 1993 **Wissenschaftlicher Mitarbeiter**, Department of Mathematics, Osnabrück University.
- 1991 - 1992 **Alexander-von-Humboldt Research Fellow** at the Department of Mathematics, Osnabrück University.
- 1986 - 1991 **Research Fellow**, Institute for Control Sciences, Moscow.

education

- 1983 - 1987 **PhD study**, Institute for Control Sciences, Moscow. PhD in Applied Mathematics in 1987.
- 1977 - 1982 **MSc**, Applied Mathematics, Moscow Institute of Railroad Engineering, Moscow.

awards

- 2006 Lady Davis Professorship at Technion
- 1993-1996 Habilitation Fellowship of the DFG (German Science Foundation)
- 1990-1991 Alexander von Humboldt Research Fellowship

select service

2022-	Column Editor, The Mathematical Intelligencer.
2021-	Director of Graduate Studies, Department of Mathematics, UIUC.
2019-	Associate Editor, Stochastic Models.
2017-	Associate Editor, International Journal of Mathematics for Industry.
2017-	Associate Editor, Journal of Applied and Computational Topology.
2017-2019	AMS Committee on Mathematical Research Communities, Chair.
2016	Organizer: ICERM topical semester on <i>Topology in Motion</i> .
2014-2019	Director: Program on Illinois Industrial and Interdisciplinary Internship.

select recent grants

2023 - 28	MURI: Hybrid Dynamics: Disaggregation and Analysis, AFOSR, \$1,250K, PI.
2018 - 23	MURI: Science of Embodied Innovation, Learning and Control, ARO, \$750K, Co-PI.
2016 - 21	Collaborative Research: Topological Invariants for Enhanced Data Analysis, NSF-DMS, \$190K, PI.
2014 - 20	Program for Interdisciplinary and Industrial Internships at Illinois, NSF-DMS, \$1,200K, PI.

extended research visits

6-7. 2019	Kyushu University, Fukuoka, Japan.
3-7. 2018	University of Bremen, Bremen, Germany.
8-12. 2017	University of Pennsylvania, PA, USA.
5-6. 2008	Hebrew University, Jerusalem, Israel.
1-2, 5. 2006	Technion, Haifa, Israel.
6. 2003	Hebrew University, Jerusalem, Israel.
1-2. 2000	DIMACS, Rutgers University, NJ, USA.
8-9. 1998	IHES, Bures-sur-Yvette, France.

research interests (with pointers to the publications):

applied topology, dynamical systems and singularities

applied topology: A-[2, 3, 6, 8, 18, 20, 17, 26, 27, 28, 34, 58, 68, 64, 84, 83, 85, 86], B-[1]; dynamics: A-[23, 24, 30, 46, 54, 66, 67, 75]; singularities: A-[16, 14, 19, 61, 58, 68, 84]; random walks on manifolds: A-[5, 7, 13, 32, 66, 67].

probability theory and applications, analytic combinatorics

Stochastic geometry, random convex hulls and multidimensional extrema: A-[29, 38, 43, 40, 59, 62, 63, 69, 71, 72, 74, 76, 87, 90, 91, 55, 48] B-[2]. characterization of probability distributions: A-[57, 73, 77, 78, 79, 80], analytic methods: A-[1, 4, 15, 10, 17, 31, 35].

networks, control, data analysis, mathematical economics, applications in physics and biology

sensor networks A-[37, 41, 42, 44]. control: A-[22], stochastic networks and queueing systems: A-[33, 59, 51, 52], optimal control: A-[60, 88, 92], topological theory of social choice: A-[61, 65, 70, 81, 89]

A: papers

- [1] Yu. Baryshnikov, K. Jin, R. Pemantle, Coefficient asymptotics of algebraic multivariable generating functions, *preprint*, 2023.
- [2] Yu. Baryshnikov, C. Klivans, N. Kosar, On the Topology of No-k-equal Spaces, *Adv. Appl. Math.*, 149, 102538, 2023.
- [3] Yu. Baryshnikov, R. Ghrist, Navigating the Negative Curvature of Google Maps, *Math. Intelligencer*, 2023.
- [4] Yu. Baryshnikov, S. Melczer, R. Pemantle, Asymptotics of multivariate sequences IV: generating functions with poles on a hyperplane arrangement, *Ann. Combinatorics*, to appear, 2023.
- [5] Yu. Baryshnikov, Isochrons and Martingales, *preprint*, 2021.
- [6] Yu. Baryshnikov, Topological Perplexity of Feedback Stabilization, *J. Appl. Comp. Topology*, 7, no. 1, 75–87, 2023.
- [7] Yu. Baryshnikov, M. Kvalheim, Flux in tilted potential systems: negative resistance and persistence, *Comm. Math. Phys.*, 2023.
- [8] Yu. Baryshnikov, Linear Obstacles in Linear Systems and Ways to Avoid Them, *preprint*, 2021.
- [9] M. Assif PK, Yu. Baryshnikov, Biparametric persistence for smooth filtrations, *preprint*, 2021.
- [10] Yu. Baryshnikov, S. Melczer, R. Pemantle, Asymptotics of multivariate sequences in the presence of a lacuna, *preprint*, 2021.

- [11] I. Abraham, B. Shahsavarani, B. Zimmerman, F. Husain, Yu. Baryshnikov, Slow Cortical Waves through Cyclicity Analysis, *preprint*, 2021.
- [12] Yu. Baryshnikov, Time Series, Persistent Homology and Chirality, *preprint*, 2021.
- [13] Yu. Baryshnikov, On Random Quantum Random Walks, *preprint*, 2020.
- [14] Yu. Baryshnikov, B. Shapiro, Quadratic Differentials and Signed Measures, *J. d'Analyse Math.*, 144 (1), 1-19, 2021.
- [15] Yu. Baryshnikov, S. Melczer, R. Pemantle, Stationary points at infinity for analytic combinatorics, *Found. of Comp. Math.*, 21, 3, 2021.
- [16] Yu. Baryshnikov, Euler Characteristics of Exotic Configuration Spaces, *Sém. Loth. de Comb.*, 84B, 12p, 2020.
- [17] M. Arnold, Yu. Baryshnikov, Yu. Mileyko, Typical representatives of free homotopy classes in multi-punctured plane, *Journal of Topology and Analysis*, 11, n. 3, pp. 623-659, 2019.
- [18] Yu. Baryshnikov, R. Ghrist, Minimal Unimodal Decomposition On Trees *J. Appl. Comp. Topology*, 4, pp. 199–209 (2020)
- [19] Yu. Baryshnikov, S. Melczer, R. Pemantle, A. Straub, Diagonal asymptotics for symmetric rational functions via ACSV, *29th International Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms*, Art. No. 12, 15 pp., LIPIcs. **110**, 2018.
- [20] Yu. Baryshnikov, R. Ghrist, Stokes's Theorem, Data, & the Polar Ice Caps, *The American Mathematical Monthly*, 125, n. 9, pp. 830–834, 2018.
- [21] B. J. Zimmerman, I. Abraham, S. A. Schmidt, Yu. Baryshnikov, F. T. Husain, Dissociating tinnitus patients from healthy controls using resting state cyclicity analysis and clustering, *Netw. NeuroSci.*, n. 1, pp. 67–89, 2018
- [22] A. Agrachev, Yu. Baryshnikov, A. Sarychev, Ensemble controllability by Lie algebraic methods, *ESAIM: Cont., Opt. and Calc. Var.*, 2016.
- [23] Yu. Baryshnikov, J. Duda, W. Szpankowski, Types of Markov Fields and Tilings, *IEEE Trans. on Information Theory*, 2016.
- [24] Yu. Baryshnikov, V. Blumen, K. Kim, V. Zharnitsky, Billiard dynamics of bouncing dumbbell, *Physica D: Nonlinear Phenomena*, 269, 21-27, 2015.
- [25] H. Wang, C. Chen, Yu. Baryshnikov, Topological Perspective on Cycling Robots for Full Tree Coverage, *Algorithmic Foundations of Robotics XI*, 659–675, Springer, 2015.
- [26] Yu. Baryshnikov, B. Shapiro, How to Run a Centipede: a Topological Perspective, In: *Geometric Control Theory and sub-Riemannian Geometry*, Springer INdAM Series 5, 37-51, 2014.
- [27] Yu. Baryshnikov, R. Ghrist, M. Wright, Hadwiger's Theorem for Definable Functions, *Adv. Math.*, 245, 573-586, 2013.

- [28] Yu. Baryshnikov, P. Bubenik, M. Kahle Min-Type Morse Theory for Configuration Spaces of Hard Spheres, *Int. Math. Res. Notices*, doi:10.1093/imrn/rnt012, 2013.
- [29] M. Arnold, Yu. Baryshnikov, S. M. LaValle, Convex Hull Asymptotic Shape Evolution, *In: Algorithmic Foundations of Robotics X*, 349-364, Springer, 2012.
- [30] Yu. Baryshnikov, V. Zharnitsky, Search on the brink of chaos, *Nonlinearity* **25**, 3023-3047, 2012.
- [31] Yu. Baryshnikov and R. Pemantle, Asymptotics of multivariate sequences: quadratic points, *Adv. Math.*, **228**, no. 6, 3127-3206, 2011
- [32] Yu. Baryshnikov, W. Brady, A. Bressler and R Pemantle, Two-dimensional quantum random walk, *J. Stat. Phys.*, **142**, pp. 78-107, 2011.
- [33] Yu. Baryshnikov, F. Bonahon, E. Jonckheere and M. Lou Euclidean versus hyperbolic congestion in idealized versus experimental networks. *Internet mathematics*, 7, no. 1, 1-27, 2011.
- [34] Y. Baryshnikov and R. Ghrist, Unimodal Category and Topological Statistics, *Proc. NOLTA*, 2011.
- [35] Yu. Baryshnikov, D. Romik, Enumeration formulas for Young tableaux in a diagonal strip, *Israel J. Math.*, **178**, pp.157-186, 2010.
- [36] Yu. Baryshnikov, R. Ghrist, Euler integration over definable functions, *Proc. Natl. Acad. Sci. USA*, **107**, pp.9525-9530, 2010.
- [37] Yu. Baryshnikov, R. Ghrist, Target enumeration via Euler characteristic integrals, *SIAM J. Appl. Math.*, **70**, pp. 825-844, 2009.
- [38] Yu. Baryshnikov, M. Penrose, J. Yukich, Gaussian limits for generalized spacings, *Ann. Appl. Probab.*, **19**, pp. 158-185, 2009.
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- [40] Yu. Baryshnikov, On expected number of maximal points in polytopes, *DMTCS, 2007 Conference on Analysis of Algorithms, AofA 07*, pp. 227-236, 2008.
- [41] Yu. Baryshnikov, E. G. Coffman, K. J. Kwak, W. Moran Target Count Recovery from Sensing Error, or: Noise is Good , *LNCS (DCOSS'08 Proceedings)*, 2008.
- [42] Yu. Baryshnikov, E. G. Coffman, K. J. Kwak High Performance Sleep-Wake Sensor Systems based on Cyclic Cellular Automata , *LNCS (IPSN'08 Proceedings)*, 2008.
- [43] Yu. Baryshnikov, P. Eichelsbacher, T. Schreiber and J. Yukich Moderate deviations for some point measures in geometric probability, *Ann. Inst. Henri Poincaré Probab. Stat.* **44**, 422-446, 2008.
- [44] Yu. Baryshnikov and J. Tan On localization problem in anchoritic sensor networks, *Springer LNCS*, **4549**, 82-96, 2007.

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patents

- [1] US Patent **10,959,670** Automated, Objective Method of Assessing Tinnitus Condition

[2] US Patent **8,355,324** Method and apparatus for filtering data packets

[3] US Patent **8,140,261** Locating sensor nodes through correlations

books, chapters in books

[1] V. I. Arnol'd, Yu. Baryshnikov and I. A. Bogayevsky In: S. N. Gurbatov, A. N. Malakhov, and A. I. Saichev. *Nonlinear random waves and turbulence in nondispersive media: waves, rays, particles*. Manchester University Press, Manchester, 1991.

[2] B. A. Berezovskii, Yu. Baryshnikov, V. I. Borzenko, and L. M. Kempner. *Mnogokriterialnaya optimizatsiya*. "Nauka", Moscow, 1989.