

MANOJ GOPALKRISHNAN

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Positions

- **Indian Institute of Technology Bombay**—June 2016 to present
Associate Professor, Department of Electrical Engineering
- **Tata Institute of Fundamental Research, Mumbai**—February 2009 to June 2016
Faculty Member, School of Technology and Computer Science
- **Indian Institute of Technology Bombay**—January 2015 to June 2016
Adjunct Associate Professor, Department of Electrical Engineering
- **International Center for Theoretical Sciences, Bangalore**—January 2010 to January 2012
Joint Faculty Member
- **Tata Institute of Fundamental Research Hyderabad**—March 2011 to March 2012
Joint Faculty Member, Center for Interdisciplinary Science
- **Duke University, Durham, USA**—August 2010 to December 2010
Visiting Assistant Professor, Department of Mathematics

Education

- **University of Southern California**—Los Angeles, CA
Ph.D., Computer Science, December 2008
 - Advisor: Professor Leonard Adleman
 - Thesis: Theoretical and Experimental Self-Assembly
- **Indian Institute of Technology**—Kharagpur, India
B. Tech., Computer Science and Engineering, May 2003

Awards & Honors

- **Ramanujan fellowship**, Department of Science and Technology — February 2010
- **Annenberg graduate fellowship** — August 2007 to May 2008
- **Academic achievement award**, USC Office of International Studies — April 2008
- **Alpha Association Phi Beta Kappa** international graduate student award — October 2007
- **Mishra Cup** at IIT Kharagpur for excellence in sports — 2003
- **Mitra Cup** at IIT Kharagpur for excellence in social & cultural activities — 2003
- **National Talent Search scholarship**, Government of India — 1998 to 2003

Journal Publications

- Gopalkrishnan, M., Kandula, V., Sriram, P., Deshpande, A., Muralidharan, B. (2017). Bayesian view of single-qubit clocks, and an energy versus accuracy tradeoff. *Physical Review A*, 96(3), 032339
- Deshpande, A., Gopalkrishnan, M., Ouldridge, T. E., Jones, N. S. (2017). Designing the optimal bit: balancing energetic cost, speed and reliability. *Proc. R. Soc. A*, 473(2204), 20170117
- Gopalkrishnan, M. (2016). A Cost/ Speed/ Reliability Trade-Off to Erasing. *Entropy*, 18(5), 165
- Anderson, D. F., Craciun, G., Gopalkrishnan, M., Wiuf, C. (2015). Lyapunov functions, stationary distributions, and non-equilibrium potential for reaction networks, *Bull. Math. Biol.*, 77(9), 1744-1767
- Deshpande, A., Gopalkrishnan, M. (2014). Autocatalysis in Reaction Networks, *Bull. Math. Biol.*, 76(10), 2570-2595

- Gopalkrishnan, M., Miller, E., Shiu, A. (2014). A geometric approach to the global attractor conjecture, *SIAM J. Appl. Dyn. Sys.*, 13(2), 758-797
- Gopalkrishnan, M., Miller, E., & Shiu, A. (2013). A projection argument for differential inclusions, with applications to persistence of mass-action kinetics, *SIGMA*, 9(0), 25 pages
- Gopalkrishnan, M. (2011). Catalysis in reaction networks, *Bull. Math. Biol.*, 73(12), 2962-2982
- Chelyapov N., Brun Y., Gopalkrishnan M., Reishus D., Shaw B., & Adleman L. (2004). DNA Triangles and Self-Assembled Hexagonal Tilings, *JACS*, 126(43), 13924-13925

Conference Publications

- Poole, W., Ortiz-Munoz, A., Behera, A., Jones, N. S., Ouldridge, T. E., Winfree, E., Gopalkrishnan, M. (2017, September). Chemical Boltzmann Machines. In International Conference on DNA-Based Computers (pp. 210-231). Springer, Cham.
- Virinchi, M. V., Behera, A., Gopalkrishnan, M. (2017, September). A stochastic molecular scheme for an artificial cell to infer its environment from partial observations. In International Conference on DNA-Based Computers (pp. 82-97). Springer, Cham.
- Gopalkrishnan, M. (2016, September). A scheme for molecular computation of maximum likelihood estimators for log-linear models. In International Conference on DNA-Based Computers (pp. 3-18). Springer, Cham.
- Gopalkrishnan, M., Kandula, V., Sriram, P., Deshpande, A., Muralidharan, B. (2016). A Bayesian view of Single-Qubit Clocks, and an Energy versus Accuracy tradeoff, *Proceedings of the 2016 IEEE International Symposium on Information Theory*
- Gopalkrishnan, M. (2015). A Cost/ Speed/ Reliability Trade-Off to Erasing. In *Unconventional Computation and Natural Computation* (pp. 192-201). Springer International Publishing
- Gopalkrishnan, M. (2014). On the Lyapunov function for complex-balanced mass-action systems. *21st International Symposium on Mathematical Theory of Networks and Systems (MTNS 2014)*, Gröningen, Netherlands, 4 pages
- Gopalkrishnan M., Gopalkrishnan N., Adleman L. (2008), Self-assembly of cylinders and Möbius strips by DNA origami, *Proceedings of the 14th International Meeting on DNA computing*, June 2–6, 2008, Prague, Czech Republic
- Brun Y., Gopalkrishnan M. (2006) Toward In Vivo Disease Diagnosis and Treatment Using DNA, *Proceedings of the 2006 International Conference on Bioinformatics & Computational Biology*, June 26–29, 2006, Las Vegas, Nevada
- Brun Y., Gopalkrishnan M., Reishus D., Shaw B., Chelyapov N., & Adleman L. (2004). Building Blocks for DNA Self-Assembly, *Proceedings of the Foundations of Nanoscience 2004*, Snowbird, Utah, vol. 1, p. 2-15

Book Chapters, Reviews, Perspectives, Contributed Articles

- Radhakrishnan J.; Cook S.A.; Parikh R.J.; Gopalkrishnan M.; Sohoni M. (2014). Conversations: from Alan Turing to NP-completeness, *Current Science*, 106(12), 1696
- Adleman L., Gopalkrishnan M., Huang M. D., Moisset P., & Reishus D. (2014). On the Mathematics of the Law of Mass Action, In *A Systems Theoretic Approach to Systems and Synthetic Biology I: Models and System Characterizations* (pp. 3-46). Springer Netherlands
- Gopalkrishnan M., Autocatalysis in Reaction Networks, **The Azimuth Project**, 11 October 2013, web, editor John Baez.
- Gopalkrishnan M., Lyapunov Functions in Complex-Balanced Reaction Networks, **The Azimuth Project**, 7 January 2014, web, editor John Baez.

Preprints

- Virinchi, M. V., Behera, A., Gopalkrishnan, M. (2018). A reaction network scheme which implements the EM algorithm. arXiv preprint arXiv:1804.09062
- Gopalkrishnan, M., & Varma, G. (2014). Playing games in an uncertain world, arXiv preprint arXiv:1402.4570
- Gopalkrishnan, M. (2013). The Hot Bit I: The Szilard-Landauer Correspondence, arXiv preprint arXiv:1311.3533, 11 pages
- Gopalkrishnan, M. (2013). A coercion-resistant protocol for conducting elections by telephone, arXiv preprint arXiv:1305.5359

Students supervised

- Abhishek Deshpande, Ph. D. thesis, Beyond the two-state model of switching in biology and computation
- Viswa Virinchi, B. Tech. Project, E-projection with reaction networks
- Girish Varma, Masters' thesis, Approximate counting, uniform generation, and rapidly mixing Markov chains
- Pritam Bhattacharya, Masters' thesis, Switching in Boolean circuits and modelling cognition through neuroids
- Short-term students: Sreedev Basu, Sahil Mahajan, Tanya Singh, Dhashrath Raghuram, Shaunak Kar, Vinay Gopalakrishnan, Abhishek Deshpande, Revant Soni, Shashank Mohan, Ramya Pillutla, Abhishek Behera, Sabyasachi Ghosh, Abhinav Singh

Teaching

- Spring 2017: Science of Information, Statistics, and Learning
- Fall 2017, Fall 2018: Network Theory
- Spring 2015: Abstract Nonsense and its Application (A category theory course covering Monads)
- Fall 2014, Fall 2011: Mathematical Foundations for Computer Science (Linear Algebra, Set Theory, Combinatorics)
- Spring 2013: Stochastic Thermodynamics of Computation
- Spring 2011: Biobytes seminar series
- Fall 2010 at Duke university, department of mathematics: Foundations of nanoscience
- Fall 2009: Graduate seminar in algorithms and complexity