

THOMAS P. HAYES

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Education

Ph.D. Computer Science, University of Chicago, 2003.
Thesis title: Rapidly Mixing Markov Chains for Graph Colorings
M.S. Mathematics, University of Chicago, 1994.
B.A. Mathematics, Michigan State University, 1993.

Recent employment

2008–present. The University of New Mexico, Albuquerque, NM. Assistant Professor.
2006–2008. Toyota Technological Institute, Chicago, IL. Research Assistant Professor.
2004–2006. Univ. California, Berkeley, CA. NSF Postdoctoral Research Fellow.

Selected honors and awards

NSF Faculty Early Career Development (CAREER) Award 2012–2017.
NSF Postdoctoral Fellowship in Mathematical Sciences, 2004–2006.
Danny Lewin best student paper award, ACM STOC 2003.
National Science Foundation Graduate Fellowship, 1993–1998.

Program and review committee memberships

2013 RANDOM (International Workshop on Randomization and Computation)
2012 STOC (Annual ACM Symposium on Theory of Computation)
2011 NSF Algorithmic Foundations Program Review Panel
2008 FOCS (Annual IEEE Symposium on Foundations of Computer Science)
2007 RANDOM (International Workshop on Randomization and Computation)

Journal papers

T. P. Hayes. *Local uniformity properties for Glauber dynamics on graph colorings.* Random Structures and Algorithms, 2013, to appear.

M. Dyer, A. Frieze, T. P. Hayes, and E. Vigoda. *Randomly Coloring Constant Degree Graphs.* Random Structures and Algorithms, 2013, to appear.

T. P. Hayes, J. Saia and A. Trehan. *The Forgiving Graph: A distributed data structure for low stretch under adversarial attack.* Distributed Computing (2012), 1–18,
<http://dx.doi.org/10.1007/s00446-012-0160-1>

T.P. Hayes. *Separating the k -party communication complexity hierarchy: an application of the Zarankiewicz problem.* Discrete Mathematics and Theoretic Computer Science, special issue dedicated to Laci Babai's 60th Birthday (2011).

T.P. Hayes and A. Sinclair. *A general lower bound for mixing of single-site dynamics on graphs.* Annals of Applied Probability **17/3** (2007), 931–952.

L. Babai and **T.P. Hayes.** *The probability of generating the symmetric group when one of the generators is random.* Publicationes Mathematicae Debrecen **69/3** (2006) 271–280.

T.P. Hayes and E. Vigoda. *Coupling with the stationary distribution and improved sampling for colorings and independent sets.* Annals of Applied Probability, **16/3** (2006) 1297–1318.

T.P. Hayes and E. Vigoda. *Variable-length path coupling.* Random Structures and Algorithms **31/3** (2007) 251–272.

S. Kutin, **T. Hayes** and D. van Melkebeek. *On the quantum black-box complexity of Majority.* Algorithmica **34** (2002) 480-501.

L. Babai, T. Hayes, P. Kimmel. *The Cost of the Missing Bit: Communication Complexity with Help.* Combinatorica **21** (2001) 455-488.

Refereed Conference and Workshop Publications

V. Dani, J. Diaz, **T. Hayes**, C. Moore. *The Power of Choice for Random Satisfiability.* To appear in: Proceedings of APPROX-RANDOM, 2013.

V. Potluru, S. Plis, S. Luan, V. Calhoun and **T. P. Hayes** *Sparseness and a Reduction from Totally Nonnegative Least Squares to SVM.* In: International Joint Conference on Neural Networks (IJCNN), 2011.

T. P. Hayes and A. Sinclair. *Liftings of Tree-Structured Markov Chains.* In: Proceedings of APPROX-RANDOM, 2010, 602–616.

T. P. Hayes, J. Saia and A. Trehan. *The Forgiving Graph: A distributed data structure for low stretch under adversarial attack.* In: Proceedings of Twenty-Eighth Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing (PODC 2009).

N.R. Devanur and **T.P. Hayes.** *The Adwords Problem: Online Keyword Matching with Budgeted Bidders under Random Permutations* In: Proceedings of Tenth Annual ACM Conference on Electronic Commerce (EC 2009).

T.P. Hayes, N. Rustagi, J. Saia and A. Trehan. *The Forgiving Tree: A Self-Healing Distributed Data Structure.* In: Proceedings of Twenty-Seventh Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing (PODC 2008).

V. Dani, **T.P. Hayes** and S.M. Kakade. *Stochastic bandit linear optimization.* In: Proceedings of 21st Annual Conference on Learning Theory (COLT 2008).

P. Bartlett, V. Dani, **T. P. Hayes**, S. M. Kakade, A. Rakhlin, and A. Tewari *High probability regret bounds for online optimization.* In: Proceedings of 21st Annual Conference on Learning Theory (COLT 2008).

P. Harsha, **T.P. Hayes**, H. Narayanan, H. Räcke, and J. Radhakrishnan. *Minimizing Average Latency in Oblivious Routing.* In Proc. 18th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2008), 200–207.

- V. Dani, **T.P. Hayes** and S.M. Kakade. *The price of bandit information for online optimization*. In Proceedings of *Advances in Neural Information Processing Systems 20* (NIPS 2007).
- T.P. Hayes**, J.C. Vera and E. Vigoda. *Randomly coloring planar graphs with fewer colors than the maximum degree*. In Proceedings of the 39th Annual ACM Symposium on Theory of Computing (STOC 2007) 450–459.
- B. Awerbuch and **T.P. Hayes**. *Online collaborative filtering with nearly optimal dynamic regret*. In: Proceedings of Symposium on Parallelism in Algorithms and Architecture (SPAA 2007), 315–319.
- T.P. Hayes**. *A simple condition implying rapid mixing of single-site dynamics on spin systems*. In: Proc. IEEE Symposium on Foundations of Computer Science (FOCS 2006), 39–46.
- V. Dani and **T.P. Hayes**. *Robbing the bandit: Less regret in online geometric optimization against an adaptive adversary*. In: Proc. 16th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2006), 937 – 943.
- T.P. Hayes** and A. Sinclair. *A general lower bound for mixing of single-site dynamics on graphs (Extended Abstract)*. In: Proc. 46th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2005), 511–520.
- T.P. Hayes** and E. Vigoda. *Coupling with the stationary distribution and improved sampling for colorings and independent sets (Extended Abstract)*. In: Proc. 15th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2005), 971–979.
- L. Babai and **T.P. Hayes** *Near-independence of permutations and an almost-sure polynomial bound on the diameter of the symmetric group*. In: Proc. 15th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2005), 1057–1066
- A. Beygelzimer, V. Dani, **T. Hayes**, J. Langford and B. Zadrozny. *Error limiting reductions between classification tasks*. In: Proc. 22nd International Conference on Machine Learning (ICML 2005).
- M. Dyer, A. Frieze, **T. Hayes**, E. Vigoda. *Randomly coloring constant degree graphs (Extended Abstract)*. In: Proc. IEEE Symposium on Foundations of Computer Science (FOCS 2004), 582–589.
- T.P. Hayes** and E. Vigoda. *Variable-length path coupling (Extended Abstract)*. In: Proc. 14th Annual ACM-SIAM Symposium on Discrete Algorithms (SODA 2004), 103–110.
- T.P. Hayes** and E. Vigoda. *A non-Markovian coupling for randomly sampling colorings*. In: Proc. 44th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2003), 618–627.
- T.P. Hayes**. *Randomly coloring graphs of girth at least five*. In: Proc. 35th Annual ACM Symposium on Theory of Computing (STOC 2003) 269–278. Winner of Danny Lewin best student paper award)
- L. Babai, T. Hayes, P. Kimmel. *The Cost of the Missing Bit: Communication Complexity with Help (Extended Abstract)*. In: Proc. 30th ACM Symposium on Theory of Computing (STOC 1998) 673–682.

Manuscripts in Preparation

J. Bamberg, N. Gill, **T. Hayes**, H. Helfgott, G. Royle, A. Seress, and P. Spiga. *Bounds on the diameter of Cayley graphs of the symmetric group*. Manuscript in preparation.

T. P. Hayes. *How Not to Win a Million Dollars: A Counterexample to a Conjecture of L. Breiman*. Manuscript, 2011. Available at [arxiv:1112.0829](https://arxiv.org/abs/1112.0829) [math.PR], and on my web page.

T. P. Hayes. *Online Matchings via Randomized Queueing*. Manuscript, 2011. Available on my web page.

Invited Talks

“Randomized Queueing for Online Matching,” Information Theory and Applications Workshop, UCSD. February, 2012.

“Lifting Markov Chains for Faster Mixing”, Dagstuhl Seminar on *Design and Analysis of Randomized and Approximation Algorithms*, Schloss Dagstuhl, Wadern, Germany, June 2011.

“Faster Liftings for Markov Chains.” University of Chicago Theory Seminar, April 2011.

“Liftings of Tree-Structured Markov Chains.” Combinatorics, Groups, Algorithms, and Complexity, Conference in Honor of Laci Babai’s 60th Birthday, Ohio State University. March 2010.

“Online Learning for Sponsored Keyword Search with Budgets.” INFORMS Annual Meeting, San Diego, CA. October, 2009.

“Graph Spectra, Rapid Mixing and Dobrushin’s Uniqueness.” Physics of Algorithms, Santa Fe, New Mexico. September, 2009.

“Coupling using Spectral Information.” Working group on *Analysis of Markov Chains on Combinatorial and Statistical Mechanics Models*, part of the DIMACS/Georgia Tech Special Focus on Discrete Random Structures, Georgia Tech, Atlanta, GA, June 2009.

“Online Query Matching.” Information Theory and Applications Workshop, UCSD. February, 2009.

“Phase transitions for Graph Colorings” Summer workshop on *Complexity, Disorder, and Algorithms*, Aspen Center for Physics, May-June 2008.