

Evolvability of Functions with Few Relevant Variables

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Abstract

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References

David Aldous and James Fill. Reversible markov chains and random walks on graphs, 2002. Draft available at www.stat.berkeley.edu/~aldous/RWG/book.html.

David Aldous and Umesh Vazirani. A markovian extension of valiant’s learning model. *Inf. Comput.*, 117(2):181–186, 1995.

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- Benny Applebaum, Boaz Barak, and David Xiao. On basing lower-bounds for learning on worst-case assumptions. In *Proceedings of the 2008 49th Annual IEEE Symposium on Foundations of Computer Science*, pages 211–220, 2008.
- Peter L. Bartlett, Paul Fischer, and Klaus-Uwe Höffgen. Exploiting random walks for learning. In *Proceedings of the seventh annual conference on Computational learning theory*, COLT '94, pages 318–327, 1994.
- Avrim Blum. Learning boolean functions in an infinite attribute space. *Mach. Learn.*, 9(4):373–386, 1992.
- Nader H. Bshouty, Elchanan Mossel, Ryan O'Donnell, and Rocco A. Servedio. Learning dnf from random walks. *J. Comput. Syst. Sci.*, 71(3):250–265, Oct 2005.
- Koby Crammer, Eyal Even-Dar, Yishay Mansour, and Jennifer Wortman Vaughan. Regret minimization with concept drift. In *Proceedings of the 23rd annual conference on learning theory*, 2010.
- David Gamarnik. Extension of the pac framework to finite and countable markov chains. In *Proceedings of the twelfth annual conference on Computational learning theory*, COLT '99, pages 308–317, 1999.
- Mark Jerrum. *Counting, Sampling and Integrating: Algorithms and Complexity*. Birkhäuser, 2003.
- Mark Jerrum and Alistair Sinclair. Polynomial-time approximation algorithms for the ising model. In *Proceedings of the seventeenth international colloquium on Automata, languages and programming*, pages 462–475, New York, NY, USA, 1990. Springer-Verlag New York, Inc.
- Mark Jerrum, Alistair Sinclair, and Eric Vigoda. A polynomial-time approximation algorithm for the permanent of a matrix with nonnegative entries. *J. ACM*, 51(4):671–697, jul 2004.
- Adam Tauman Kalai, Yishay Mansour, and Elad Verbin. On agnostic boosting and parity learning. In *Proceedings of the 40th annual ACM symposium on Theory of computing*, pages 629–638, 2008.
- Varun Kanade and Thomas Steinke. Learning hurdles for sleeping experts. In *Proceedings of the 3rd Innovations in Theoretical Computer Science Conference*, ITCS '12, pages 11–18.
- Michael J. Kearns and Umesh Vazirani. *An Introduction to Computational Learning Theory*. The MIT Press, 1994.
- Ross Kinderman and J. Laurie Snell. *Markov Random Fields and Their Applications*. AMS, 1980.

- Nathan Linial, Yishay Mansour, and Noam Nisan. Constant depth circuits, fourier transform, and learnability. *J. ACM*, 40(3):607–620, 1993.
- Nick Littlestone. From on-line to batch learning. In *Proceedings of the second annual workshop on Computational learning theory*, pages 269–284, 1989.
- Michael Luby, Dana Randall, and Alistair Sinclair. Markov chain algorithms for planar lattice structures. In *Proceedings of the 36th Annual Symposium on Foundations of Computer Science*, FOCS '95, pages 150–, Washington, DC, USA, 1995. IEEE Computer Society.
- Elchanan Mossel and Allan Sly. Exact thresholds for ising-gibbs samplers on general graphs. *Annals of Probability*, 41(1):294–328, 2013.
- Elchanan Mossel, Ryan O’Donnell, and Rocco A. Servedio. Learning functions of k relevant variables. *J. Comput. Syst. Sci.*, 69(3):421–434, 2004.
- Gergely Neu, András György, and Csaba Szepesvári. The adversarial stochastic shortest path problem with unknown transition probabilities. In *AISTATS*, 2012.
- Oded Regev. On lattices, learning with errors, random linear codes, and cryptography. In *Proceedings of the thirty-seventh annual ACM symposium on Theory of computing*, pages 84–93, 2005.
- Leslie G. Valiant. A theory of the learnable. *Commun. ACM*, 27(11):1134–1142, Nov 1984.