Johan Håstad

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1 Address

Department of Mathematics
KTH Royal Institute of Technology
100 44 Stockholm, SWEDEN
email:johanh@kth.se

2 Research Interests

Theory of computation. In particular, complexity theory, lower bounds, cryptography and pseudorandomness, randomized algorithms and approximation algorithms.

3 Education

- Bachelor of Science (Högskoleexamen) with major in mathematics, Stockholm University, 1981.
- Master of Science (Licentiat) in Mathematics, Uppsala University, 1984.
- Ph. D. in Mathematics, MIT, 1986.
- Accepted as "oavlönad docent" in Computer Science at the Royal Institute of Technology, 1988.

4 Major Awards and honors

- ACM Doctoral Dissertation Award, 1986.
- Swedish Mathematical Society's stipend, 1986.
- Chester Carlson's research prize, 1990.
- Gödel prize, 1994.

- Invited speaker at the ICM, Berlin, 1998.
- Göran Gustafsson prize in mathematics, 1999.
- ISI Highly Cited Researcher, 2001.
- Plenary speaker at the ECM, Stockholm, 2004.
- Gödel prize, 2011.
- Keynote speaker, COLT, 2018.
- Knuth prize, 2018.

5 Commissions of trust

- Member of the Royal Swedish Academy of Sciences, 2001. Head of the class of mathematics 2019-2024. Member of the board of the Royal Academy of Sciences ("Akademistyrelsen"), 2017-2023.
- Member of the board of the school of Computer Science and Communication at KTH, 2005-2011.
- Vice director of SSF-center Center for Industrial and Applied Mathematics, CIAM, 2006-2012.
- Member of the Nevanlinna Prize Committee, ICM, 2006.
- Member of "NT-rådet" at "Vetenskapsrådet", 2007-2009. (a position at the Research Council, the major funder of basic research in Sweden).
- Member of Gödel Prize committee, representative of SIGACT 2008-2010.
- Chairman of the board, Stockholm Mathmatics Center, 2009-2015.
- Member on the computer science panel for ERC advanced investigator grants, 2011,2013,2015.
- Fellow of the AMS, 2013.
- Member of Knuth Prize committee, 2015-2017.
- Member of Faculty Council ("fakultetsrådet") at KTH, 2015-2019.
- Member Scientific Advisory board, mathematical research institute Oberwolfach, 2016-2019.
- Chairman of program committee for Mathematics for AI, Wallenberg AI, Autonomous Systems and Programming (WASP) 2018-2022.
- Fellow of ACM, 2018.
- Member of committee for the EATCS award, 2021-2023.

6 Research funding

Has continuously held a grant from Swedish grant agencies TFR and VR, starting in the 1990'ies. Was a awarded an advanced investigator grant from ERC, for the period 2009-2014 and the total amount 2370 KEUR. In 2016 was awarded a grant from the Knut and Alice Wallenberg foundation for the perion 2017-2021 and the total amount 32.235 MSEK.

7 Visiting position

- Visiting scientist, fall 1994, Massachusetts Institute of Technology.
- Member for academic year 2000/2001, Institute for Advanced Study, Princeton.
- Visiting scientist, fall 2013, Simons Insitute in Berkeley.
- Visiting scientist, fall 2015 (two months), Simons Insitute in Berkeley.
- Visiting scientist, fall 2018 (two months), Simons Insitute in Berkeley.

8 Employment after Ph.D

- Post Doc position, (1986-1987), Massachusetts Institute of Technology.
- Associate Professor[1], (1988-1992), KTH - Royal Institute of Technology.
- Full Professor[2], (1992-), KTH - Royal Institute of Technology.

9 Editorial positions

Currently an editor of:

- *Theory of Computing*, open access journal (since 2004).
- *TheoretiCS*, (since 2021).

Previously an editor for *Information Processing Letters* (1990-1993), *SIAM Journal on Computing* (1991-1999), and *Journal of the ACM* (1997-2003) *Computational Complexity* (1991-2019), *ACM Transactions on Computation Theory*, (2008-2022), *Random Structures and Algorithms*, (2008-2022).
Member of the scientific board of *Electronic Colloquium on Computational Complexity* (since 1994).

[1] Högskolelektor med forskningsinriktning
[2] Professor i teoretisk datalogi

10 Program Committees

Served as a member of the following program committees:

Eurocrypt 1989, SWAT 1990, STACS 1991, STOC 1992, ICALP 1993, NFRs beredningsgrupp i matematik 1993-95 (Swedish grant agency), FOCS 1994, ESA 1996, TFRs beredningsgrupp i datalogi 1996 (Swedish grant agency), CRYPTO 1998, Approx 1998, ICALP 2002, CRYPTO 2002, STOC 2003, Computational Complexity 2003, FOCS 2004, Eurocrypt 2005, Random 2005, Theory of Cryptography Conference 2006, ICALP 2006, Approx 2006, SWAT 2008, ESA 2008, Computational Complexity 2009 (chair), Theory of Cryptography Conference 2010, Crypto 2010, ITCS 2012, FOCS 2013, Computational Complexity 2015, FOCS 2021, Computational Complexity 2022.

11 Advising

Honors for supervised graduate students

- Jonas Holmerin, "Best Ph.D-thesis in Sweden in Computer Science during 2002" prize by Naturvetarförbundet.
- Jakob Nordström, shared "Best student paper"-award at STOC 2006.
- Per Austrin, "Best student paper"-award (Machtey-prize) at FOCS 2007.
- Jakob Nordström, Ackermann award 2009, given out by EACSL for outstanding thesis Ph.D thesis in Logic in Computer Science.
- Joel Gärtner, "Best paper" (and "Best student paper") at Crypto 2025.

Completed Ph. D.-theses supervised below. Only counting main supervisor.

- Viggo Kann "On the Approximability of NP-complete Optimization Problems" May 1992.
- Mikael Goldmann "On Threshold Circuits and Related Models of Computation" December 1992.
- Christer Berg "On Oracles and Circuits – Topics in Computational Complexity" December 1997.
- Mats Näslund "Bit Extraction, Hard-Core Predicates, and the Bit Security of RSA", October 1998.
- Staffan Ulfberg "On Lower Bounds for Circuits and Selection", December 1999.
- Jonas Holmerin "On Probabilistic Proof Systems and Hardness of Approximation", December 2002.

- Gustav Hast "Beating a Random Assignment", June 2005.
- Douglas Wikström "On the security of Mix-Nets and Hierarchical Group Signatures", December 2005.
- Mårten Trolin "Electronic Cash and Hierarchical Group Signatures", December 2006.
- Jakob Nordström "Short proofs may be spacious: Understanding space in resolution", May 2008.
- Per Austrin "Conditional Inapproximability and Limited Independence", November 2008.
- Gunnar Kreitz "Aspects of Secure and Efficient Streaming and Collaboration", May 2011.
- Cenny Wenner "Label Cover Reductins for Unconditional Approximation Hardness of Constrain Satisfaction", October 2014.
- Sangxia Huang "Hardness of Constraint Satisfaction and Hygergraph Coloring", October 2015.
- Aleksa Staković "Hardness of approximating Constraint Satisfaction Problems and Their Variants in Presence of Additional Structural Assumptions", June 2023.
- Martin Ekerå "On factoring integers and computing discrete logarithms, quantumly", October 2024.
- Joel Gärtner "Lattice-Based Post-Quantum Cryptography and Quantum algorithms", June 2025.

Completed Licentiate-theses supervised, who have not completed a Ph.D under my supervision. Only as main advisor.

- Lars Arvestad "Adapting to nature – some improvements on alignment algorithms in computational biology", October 1997.
- Anna Redz "On equality testing protocols and their security", September 2003.
- Rafael Pass "Alternativ variants of zero-knowledge proofs", January 2005.
- Lukáš Poláček "Efficient Use of Exponential Size Linear Programs", March 2015.
- Björn Martinsson "Approximability and inapproximability of fundamental problems", September 2025.

12 Patents

- Patent nr 512.279 "Elektroniska transaktionssystem", Swedish patent, granted Februari 2000. Co-inventor Stefan Hellberg.

13 Journal Publications

[J1] J. Lagarias and J. Håstad "Simultaneous Diophantine Approximations of Rationals by Rationals", *Journal of Number Theory*, 1985, Vol 24, No 2, pp 200–228.

[J2] R. Boppana, J. Håstad and S. Zachos "Does co-NP have Short Interactive Proofs'?', *Information Processing Letters*, Vol. 25, No 2, May 1987, pp 127–132.

[J3] J. Håstad "Oneway Permutations in NC^0", *Information Processing Letters*, 1987/88, Vol 26, pp 153–155.

[J4] A. Frieze, J. Håstad, R. Kannan, J. Lagarias and A. Shamir "Reconstructing Truncated Integer Variables Satisfying Linear Congruences", *SIAM Journal on Computing*, 1988, Vol. 17, No 2, pp 262–280.

[J5] J. Håstad "Solving Simultaneous Modular Equations of Low Degree", *SIAM Journal on Computing*, 1988, Vol. 17, No 2, pp 336–341.

[J6] J. Håstad "Dual Vectors and Lower Bounds for the Nearest Lattice Point Problem", *Combinatorica*, Vol 8, No 1, 1988, pp 75–81.

[J7] J. Håstad "Lower Bounds in Computational Complexity Theory", *Notices of the AMS*, Vol. 35, No 5, 1988, pp 677–683.

[J8] J. Håstad, B. Just, J. Lagarias, and C. Schnorr "Polynomial Time Algorithms for Finding Integer Relations Among Real Numbers", *SIAM Journal on Computing*, 1989, Vol 18, No 5, pp 859–881.

[J9] J. Håstad "Almost Optimal Lower Bounds for Small Depth Circuits", in *Randomness and Computation*, Advances in Computing Research, Vol 5, ed. S. Micali, 1989, JAI Press Inc, pp 143–170.

[J10] P. Beame and J. Håstad "Optimal Bounds for Decision Problems on the CRCW PRAM", *Journal of ACM*, 1989, Vol 36, No 3, pp 643–670.

[J11] J. Håstad "Tensorrank is NP-complete", *Journal of Algorithms*, 1990, Vol 11, pp 644–654.

[J12] W. Aiello, J. Håstad and S. Goldwasser "On the Power of Interaction", *Combinatorica*, 1990, Vol 10, No 1, pp 3–25.

[J13] J. Håstad and J. Lagarias "Simultaneously Good Bases of a Lattice and its Reciprocal Lattice", *Mathematische Annalen* 287, 1990, pp 163–174.

[J14] J. Håstad and M. Goldmann "On the Power of Small-Depth Threshold Circuits", *Computational Complexity*, Vol 1, 1991, pp 113–129.

[J15] W. Aiello and J. Håstad "Statistical Zero-Knowledge Languages can be Recognized in Two Rounds", *Journal of Computer and System Sciences*, Vol 42, 1991, pp 327–345.

[J16] W. Aiello and J. Håstad "Relativized Perfect Zero-Knowledge is not BPP", *Information and Computation*, 1991, Vol 93, No 2, pp 223–240.

[J17] M. Goldmann, J. Håstad and A. Razborov "Majority Gates vs. General Weighted Threshold Gates", *Journal of Computation Complexity*, 1992, Vol 1, No 4, pp 277–300.

[J18] N. Alon, O. Goldreich, J. Håstad and R. Peralta. "Simple Constructions of Almost k-wise Independent Random Variables", *Random Stuctures and Algorithms*, Vol 3, No 3, 1992, pp 289–304.

[J19] M. Goldmann and J. Håstad, "A Simple Lower Bound for the Depth of Monotone Circuits Computing Clique using a Communication Game", *Information Processing Letters*, Vol 41, No 4, 1992, pp 221–226.

[J20] J. Håstad, A. Schrift och A. Shamir. "The Discrete Logarithm Modulo a Composite Hides $O(n)$ bits", *Journal of Computer and System Science*, 1993, Vol 47, No 3, pp 376–404.

[J21] J. Håstad and A. Wigderson, "Composition of the Universal Relation", in "Advances in Computational Complexity Theory", AMS-DIMACS book series, Volume 13, 1993 ed. J-Y. Cai, pp 119–134.

[J22] J. Håstad, S. Phillips and S. Safra, "A Well Characterized Approximation Problem", *Information processing letters*, Vol 47:6, 1993 pp. 301–305.

[J23] M. Goldmann, P. Grape, and J. Håstad, "On Average Time Hierarchies", *Information processing letters*, Vol 49:1, 1994, pp 15–20.

[J24] R. Chang, B. Chor, O. Goldreich, J. Hartmanis, J. Håstad, D. Ranjan and P. Rohatgi. "The Random Oracle Hypothesis is False", *Journal of Computer and System Sciences*, Volume 49, No 1, 1994 pp 24–39.

[J25] J. Håstad, J. Lagarias, and A. Odlyzko, "On the Distribution of Multiplicative Translates of Sets of Residues (mod p)", *Journal on Number Theory*, Vol 46, No 1, 1994, pp 108–122.

[J26] J. Håstad, I. Wegener, N. Wurm and S. Yi, "Optimal Depth, very Small Size Circuit for Symmetric Functions in AC^0, *Information and Computation*, Volume 108, No 2, 1994, pp 200–211.

[J27] J. Håstad, "On the Size of Weights for Threshold Gates", *SIAM J. on Discrete mathematics*, Vol 7, no 3, 1994, pp 484–492.

[J28] J. Håstad, A. Razborov and A. Yao, "On the Shrinkage Exponent of Read-Once Formulae", *Theoretical computer science*, 1995, Vol 141, pp 269–282.

[J29] J. Håstad, S. Jukna, and P. Pudlak "Top-Down Lower Bounds for Depth 3 Circuits", *Computational Complexity*, 1995, Vol 5, pp 99–112.

[J30] J. Håstad, T. Leighton and B. Rogoff "Analysis of Backoff Protocols for Multiple Access Channels", *SIAM Journal on Computing*, 1996, Vol 25, pp 740–774.

[J31] L. Cai, J. Chen, and J, Håstad "Circuit Bottom Fan-in and Computational Power", *SIAM Journal on Computing*, 1998, Vol 27, pp 341–355.

[J32] J. Håstad "The Shrinkage Exponent is 2", *SIAM Journal on Computing*, 1998, Vol 27, pp 48–64.

[J33] M. Goldmann and J. Håstad "Monotone Circuits for Connectivity have Depth $(\log n)^{2-o(1)}$" *SIAM Journal on Computing*, 1998, vol 27, pp 1283–1294.

[J34] M. Bellare, D. Coppersmith, J. Håstad, M. Kiwi, and M. Sudan, "Linearity Testing in Characteristic Two", *IEEE Transactions on Information Theory*, Vol 42, No 6, November 1996, pp 1781–1796.

[J35] J. Håstad, R. Impagliazzo, L. Levin, and M. Luby "A Pseudorandom Generator from any one-way function", *SIAM J. on Computing*, Vol, 28:4, 1999, pp 1364–1396. This paper was awarded SIAM Outstanding Paper Prize in 2003.

[J36] O. Goldreich, J. Håstad "On the complexity of interactive proof with bounded communication", *Information processing letters*, Vol. 67 (4), 1998, pp 205–214.

[J37] J. Håstad "Clique is Hard to Approximate within $n^{1-\epsilon}$", *Acta Mathematica*, Vol. 182, 1999, pp 105–142.

[J38] J. Håstad "On bounded occurrence constraint satisfaction", *Information Processing Letters*, Vol. 74 (1), 2000, pp 1–6.

[J39] A. Andersson, T. Hagerup, J. Håstad, and O. Petersson, "Tight bounds for searching a sorted array of strings", *SIAM J. on Computing*, Vol 30, 2001, pp 1552-1578.

[J40] J. Håstad "Some optimal inapproximability results", *Journal of ACM*, Vol 48, 2001, pp 798-859.

[J41] G. Andersson, L. Engebretsen, and J. Håstad "A New Way to Use Semidefinite Programming with Applications to Linear Equations mod p", *Journal of Algorithms*, Vol 39, 2001, pp 162-204.

[J42] D. Dor, J. Håstad, S. Ulfberg, and U. Zwick "On lower bounds for selecting the median", *SIAM Journal on Discrete Mathematics*, Vol 14, 2001, pp 299-311.

[J43] Y. Aumann, J. Håstad, M. Rabin, and M. Sudan "Linear consistency testing", *Journal of Computer and System Sciences,* Vol 62, 2001, pp 589-607.

[J44] J. Håstad, S. Linusson and J.Wästlund "A smaller sleeping bag for a baby snake", *Discrete and Computational Geometry*, Vol 26, 2001, pp-173-181.

[J45] J. Håstad, ' A slight sharpening of LMN", *Journal of Computer and System Sciences,*, Vol 63, 2001, pp 498-508.

[J46] V. Guruswami, J. Håstad, M. Sudan and D. Zuckerman, "Combinatorial Bounds for List Decoding", *IEEE Transactions on Information Theory*, Vol 48, 2002, pp 1021-1034.

[J47] V. Guruswami, J. Håstad, and M. Sudan "Hardness of Approximate Hypergraph Coloring", *SIAM Journal on Computing*, Vol 31, 2002, pp 1663-1686.

[J48] J. Håstad, L. Ivansson, and J. Lagergren "Fitting points on the real line and its application to RH mapping", *Journal of Algorithms* Vol. 49:1, 2003, pp 42-62.

[J49] J. Håstad and A. Wigderson, "Simple Analysis of graph tests for linearity and PCP", *Random Structures and Algorithms*, Vol 22, 2003, pp 139-160.

[J50] J. Håstad and M. Näslund "The Security of all RSA and Discrete Log Bits", *Journal of the ACM*, Vol 51:2, 2004, pp 187-230.

[J51] J. Håstad and V. Srinivasan, "On the advantage over a random assignment", *Random structures and Algorithms*, Vol 25:2, 2004, pp 117-149.

[J52] J. Håstad and S. Khot, "Query efficient PCPs with perfect completeness", *Theory of Computing*, Vol 1, 2005, pp 119-149.

[J53] J. Håstad, "The square lattice shuffle", *Random structures and Algorithms*, Vol 29, 2006, pp 466-474.

[J54] J. Håstad, "The security of the IAPM and IACBC modes", *Journal of Cryptology*, Volume 20:2, 2007, pp 153-163.

[J55] J. Håstad and A. Wigderson "The randomized communication complexity of set disjointness" *Theory of Computing*, Vol 3, 2007, pp 211-219.

[J56] J. Håstad "Every 2-CSP Allows Nontrivial Approximation", *Computational Complexity*, Volume 17, 2008, pp 549-566.

[J57] J. Håstad and M. Näslund "Practical Construction and Analysis of Pseudo-randomness Primitives", *Journal of Cryptology*, Volume 21:1, 2008, pp 1-26.

[J58] J. Håstad "On the Approximation Resistance of a Random Predicate", *Computational Complexity*, Volume 18, 2009, pp 413-434.

[J59] V. Guruswami, J. Håstad, and S. Kopparty "On the List-Decodability of Random Linear Codes", *IEEE transactions on Information Theory*, vol 57, 2011, pp 718-725.

[J60] P. Austrin and J. Håstad, "Randomly supported independence and resistance", *SIAM Journal on Computing*, volume 40, 2011, pp 1-27.

[J61] V. Guruswami, J Håstad, R. Manokaran, P. Raghavendra, and M. Charikar "Beating the Random Ordering Is Hard: Every Ordering CSP is Approximation Resistant", *SIAM Journal on Computing*, volume 40, 2011, pp 878-914.

[J62] M. Cheraghchi, J. Håstad, M. Isaksson and O. Svensson, "Approximating Linear Threshold Predicates", *ACM Transactions on Computation Theory*, Vol 4, 2012, pp 1–31.

[J63] P. Austrin and J. Håstad, "One the usefulness of Predicates", *ACM Transactions on Computation Theory*, Vol 5, 2013, pp 1–24.

[J64] J. Nordström and J. Håstad, "Towards an Optimal Separation of Space and Length in Resolution", *Theory of Computing*, Vol 9, 2013, pp 471–557.

[J65] J. Håstad, "Satisfying degree-d equations over $GF[2]^n$", *Theory of Computing*, Vol 9, 2013, pp 845–862.

[J66] J. Håstad, "On the NP-hardness of Max-Not-2", *SIAM Journal on Computing*, Vol 43, 2014, pp 179–193.

[J67] J. Håstad "On the correlation of parity and small-depth circuits", *SIAM Journal on Computing*, 2014, Vol 43, pp 1699-1708.

[J68] B. Barak, P. Gopalan, J. Håstad, R. Mekha, P. Raghavendra, and D. Steurer "Making the Long Code Short", *SIAM Journal on Computing*, 2015, Vol 44, pp 1287-1324.

[J69] J. Håstad, S. Huang, R. Manokaran, R. O'Donnell, J. Wright "Improved NP-inapproximability for 2-variable linear equations", *Theory of Computing*, 2017, Vol 13(19), pp 1-51.

[J70] V. Guruswami, P. Harsha, J. Håstad, S. Srinivasan, and G. Varma, "Super-polylogarithmic hypergraph coloring hardness via low-degree long codes", *SIAM Journal on Computing*, 2017, Vol 46:1, pp 132-159.

[J71] B. Bukh, V. Guruswami, and J. Håstad "An improved bound on the fraction of correctable deletions", *IEEE Transactions on Information Theory*, 2017, Vol 63:1, pp 93-103.

[J72] P. Austrin, V. Guruswami, and J. Håstad, "$(2+\epsilon)$-Sat is NP-hard", *SIAM Journal on Computing*, Vol 46, 2017, pp 1554-1573.

[J73] J. Håstad, and R. Manokaran, "On the Hardness of Approximating Homogenous 3-Lin", *Theory of Computing*, 2017, Vol 13, pp 1-19..

[J74] J. Håstad, B. Rossman, R. Servedio and L.-Y. Tan, "An average-depth hierarchy theorem for Boolean Circuts", *Journal of the ACM*, 2017, Vol 64, pp 1–27.

[J75] R. Boppana, J. Håstad, C. Lee, and E. Viola "Bounded independence vs. moduli", *ACM Transactions on Computation Theory*, 2019, Volume 4, Article 21, pp 1-27.

[J76) J. Håstad, G. Lagarde, and J. Swernofsky "d-Galvin families", The Electronic Journal of Combinatorics, Volume 27, Issue 1, 2020, pp 1-36.

[J77] J. Håstad "On small-depth Frege proof for Tseitin for grids", 2020, Journal of the ACM, volume 68, pp 1-31.

[J78] V. Guruswami and J. Håstad, "Explicit two-deletion codes with redundancy matching the existential bound", IEEE Transactions on Information theory, 2021, Volume 67, pp 6384-6394.

[J79] P. Austrin, J. Brown-Cohen, and J. Håstad, Optimal Inapproximability with Universal Factor Graphs, ACM Transactions on Algoirthms, 2023,https://doi.org/10.1145/3631119.

[J80] J. Håstad, B. Martinsson, T-V Nakajim, and S. Živný, "A logartithmic approximation of linearly-ordered colurings", accepted in Theory of Computing.

[J81] J. Håstad and K. Risse, "Bounded depth proofs for Tseitin formulas on the grid; revisited", Siam Journal on Computing, volume 54, pp FOCS22-288-FOCS22-339, doi: 10.1137/22M153851X.

[J82] J. Håstad, "On small-depth Frege proofs for PHP", Theoretics, Volume Phase 2, 2025, http://dx.doi.org/10.46298/theoretics.25.27,doi: 10.46298/theoretics.25.27.

14 Conference Publications

[C1] J. Håstad and A. Shamir "The Cryptographic Security of Truncated Linearly related Variables" *17th Annual ACM Symposium on Theory of Computation*, 1985, pp 356–362, full version [J4].

[C2] J. Håstad "On using RSA with Low Exponent in a Public Key Network" *Crypto 85*, 1985, pp 403–408, full version [J5].

[C3] B. Chor, J. Friedman, O. Goldreich, J. Håstad, S. Rudich and R. Smolensky "The Bit Extraction Problem or t-resilient Functions", *Proceedings 26th Annual IEEE Symposium of Foundations of Computer Science, 1985*, pp 396–407.

[C4] J. Håstad "Almost Optimal Lower Bounds for Small Depth Circuits", *18th Annual ACM Symposium on Theory of Computation*, 1986, pp 6–20, full version in [J9].

[C5] W. Aiello, J. Håstad and S. Goldwasser "On the Power of Interaction", *Proceedings 27th Annual IEEE Symposium of Foundations of Computer Science, 1986*, pp 368–379, full version in [J12].

[C6] P. Beame and J. Håstad, "Optimal Bounds for Decision Problems on the CRCW PRAM", *19th Annual ACM Symposium on Theory of Computation*, 1987, pp 83–93, full version in [J10].

[C7] J. Håstad, T. Leighton and B. Rogoff "Analysis of Backoff Protocols for Multiple Access Channels", *19th Annual ACM Symposium on Theory of Computation*, 1987, pp 241–253, full version in [J30].

[C8] J. Håstad, T. Leighton and M. Newman "Reconfiguring a Hypercube in the Presence of Faults", *19th Annual ACM Symposium on Theory of Computation*, 1987, pp 274–284.

[C9] W. Aiello and J. Håstad "Perfect Zero-Knowledge Languages can be Recognized in Two Rounds", *Proceedings 28th Annual IEEE Symposium of Foundations of Computer Science, 1987*, pp 439–448, full version in [J15]

[C10] J. Håstad, T. Leighton and M. Newman "Fast Computation Using Faulty Hypercubes", in proceedings of *21st Annual ACM Symposium on Theory of Computation*, 1989, pp 251–263.

[C11] M. Ben-Or, O. Goldreich, S. Goldwasser, J. Håstad, J. Kilian, S. Micali and P. Rogaway "Everything Provable is Provable in Zero-Knowledge", in *Crypto 88 Advances in Cryptology*, Lecture Notes in Computer Science 403, ed. S. Goldwasser, 1989, pp 37–56.

[C12] J. Håstad "Tensorrank is NP-complete", Proceedings of ICALP 1989, Lecture Notes in Computer Science, Vol 372, pp 451–460, full version in [J11].

[C13] J. Håstad "Pseudorandom Generators under Uniform Assumptions", in proceedings of *22nd Annual ACM Symposium on Theory of Computation*, 1990, pp 395–40, full version in [J35].

[C14] N. Alon, O. Goldreich, J. Håstad and R. Peralta."Simple Constructions of Almost k-wise Independent Random Variables", *Proceedings 31st Annual IEEE Symposium of Foundations of Computer Science, 1990*, pp 544–553, full version in [J18].

[C15] J. Håstad and M. Goldmann "On the Power of Small-Depth Threshold Circuits",*Proceedings 31st Annual IEEE Symposium of Foundations of Computer Science, 1990*, pp 610–618, full version in [J14].

[C16] M. Goldmann, J. Håstad and A. Razborov "Majority Gates vs. General Weighted Threshold Gates", *Proceedings 7th Structure in Complexity theory annual conference*, 1992, full version appeared in [J17].

[C17] J. Håstad, S. Phillips and S. Safra, "A well Characterized Approximation Problem", *Israeli conference on the theory of computing and systems*, Haifa, 1993, pp 261–265, full version appeared in [J22].

[C18] J. Håstad, S. Jukna, and P. Pudlak "Top-Down Lower Bounds for Depth 3 Circuits", *Proceedings 34th Annual IEEE Symposium of Foundations of Computer Science, 1993*, pp 124–129, full version appeared in [J29].

[C19] J. Håstad "The Shrinkage Exponent is 2", *Proceedings 34th Annual IEEE Symposium of Foundations of Computer Science, 1993*, pp 114–123, full version in [J32].

[C20] A. Andersson, T. Hagerup, J. Håstad and O. Petersson, "The Complexity of Searching a Sorted Array of Strings", *Proceedings of 26th Annual ACM Symposium on Theory of Computation*, 1994, pp 317–325, fullr version (combined with [C22]) in [J39].

[C21] J. Håstad "Recent results in hardness of approximation", (invited presentation) *4th Scandinavian Workshop on Algorithm Theory*, 1994, pp 231–239, Springer Lecture Notes in Computer Science 824.

[C22] A. Andersson, J. Håstad and O. Petersson, "A Tight Lower Bound for Searching a Sorted Array", *Proceedings of 27th Annual ACM Symposium on Theory of Computation*, 1995, pp 417–426. full version (combined with [C20]) in [J39].

[C23] M. Goldmann and J. Håstad "Monotone Circuits for Connectivity have Depth $(\log n)^{2-o(1)}$" *Proceedings of 27th Annual ACM Symposium on Theory of Computation*, 1995, pp 569–574, full version in [J33].

[C24] M. Bellare, D. Coppersmith, J. Håstad, M. Kiwi, and M. Sudan, "Linearity Testing in Characteristic Two", *Proceedings 36th Annual IEEE Symposium of Foundations of Computer Science*, 1995, pp 432–441, full version in [J34].

[C25] J. Håstad "Testing of the Long Code and Hardness for Clique" *28th Annual ACM Symposium on Theory of Computation*, 1996, pp 11–19. Complete version (combined with [C26]) in [J37].

[C26] J. Håstad "Clique is Hard to Approximate within $n^{1-\epsilon}$" *Proceedings 37th Annual IEEE Symposium of Foundations of Computer Science*, 1996, pp 627–636. Complete version (combined with [C25]) in [J37].

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