

Resource-Bounded Measure and Dimension Bibliography

John M. Hitchcock
jhitchco@uwyo.edu

April 28, 2025

References

- [1] M. Agrawal, D. Chakraborty, D. Das, and S. Nandakumar. Dimension, pseudorandomness and extraction of pseudorandomness. *Computability*, 6(3):277–305, 2017. doi:10.3233/COM-160066.
- [2] E. Allender. Circuit complexity before the dawn of the new millennium. In *Proceedings of the 16th Annual Conference on Foundations of Software Technology and Theoretical Computer Science*, pages 1–18. Springer-Verlag, 1996. doi:10.1007/3-540-62034-6_33.
- [3] E. Allender. When worlds collide: Derandomization, lower bounds, and Kolmogorov complexity. In *Proceedings of the 21st Conference on Foundations of Software Technology and Theoretical Computer Science*, pages 1–15. Springer-Verlag, 2001. doi:10.1007/3-540-45294-x_1.
- [4] E. Allender and M. Strauss. Measure on small complexity classes with applications for BPP. In *Proceedings of the 35th IEEE Symposium on Foundations of Computer Science*, pages 807–818. IEEE Computer Society, 1994. doi:10.1109/SFCS.1994.365713.
- [5] E. Allender and M. Strauss. Measure on P : Robustness of the notion. In *Proceedings of the 20th International Symposium on Mathematical Foundations of Computer Science (MFCS 1995)*, pages 129–138. Springer-Verlag, 1995. doi:10.1007/3-540-60246-1_119.
- [6] K. Ambos-Spies. Resource-bounded genericity. In S. B. Cooper, T. A. Slaman, and S. S. Wainer, editors, *Computability, Enumerability, Unsolvability*, volume 224 of *London Mathematical Society Lecture Notes*, pages 1–59. Cambridge University Press, 1996. doi:10.1017/cbo9780511629167.002.
- [7] K. Ambos-Spies. Measure theoretic completeness notions for the exponential time classes. In *Proceedings of the 25th International Symposium on Mathematical Foundations of Computer Science (MFCS 2000)*, pages 152–161. Springer-Verlag, 2000. doi:10.1007/3-540-44612-5_11.
- [8] K. Ambos-Spies and T. Bakibayev. Comparing nontriviality for E and EXP. *Theory of Computing Systems*, 51(1):106–122, 2012. doi:10.1007/S00224-011-9370-3.

- [9] K. Ambos-Spies and T. Bakibayev. Nontriviality for exponential time w.r.t. weak reducibilities. *Theoretical Computer Science*, 494:2–12, 2013. doi:10.1016/J.TCS.2012.05.022.
- [10] K. Ambos-Spies and T. Bakibayev. Weak completeness notions for exponential time. *Theory of Computing Systems*, 63(6):1388–1412, 2019. doi:10.1007/S00224-019-09920-4.
- [11] K. Ambos-Spies and L. Bentzien. Separating NP-completeness notions under strong hypotheses. *Journal of Computer and System Sciences*, 61(3):335–361, 2000. doi:10.1006/jcss.1999.1674.
- [12] K. Ambos-Spies and T. Kräling. Quantitative aspects of speed-up and gap phenomena. *Mathematical Structures in Computer Science*, 20(5):707–722, 2010. doi:10.1017/S0960129510000174.
- [13] K. Ambos-Spies, S. Lempp, and G. Mainhardt. Randomness vs. completeness: On the diagonalization strength of resource-bounded random sets. In *Proceedings of the 23rd International Symposium on Mathematical Foundations of Computer Science (MFCS 1998)*, pages 465–473. Springer-Verlag, 1998. doi:10.1007/bfb0055796.
- [14] K. Ambos-Spies and E. Mayordomo. Resource-bounded measure and randomness. In A. Sorbi, editor, *Complexity, Logic and Recursion Theory*, Lecture Notes in Pure and Applied Mathematics, pages 1–47. Marcel Dekker, New York, N.Y., 1997. doi:10.1201/9780429187490-1.
- [15] K. Ambos-Spies, E. Mayordomo, Y. Wang, and X. Zheng. Resource-bounded balanced genericity, stochasticity, and weak randomness. In *Proceedings of the 13th Annual Symposium on Theoretical Aspects of Computer Science*, pages 63–74. Springer-Verlag, 1996. doi:10.1007/3-540-60922-9_6.
- [16] K. Ambos-Spies, E. Mayordomo, and X. Zheng. A comparison of weak completeness notions. In *Proceedings of the Eleventh IEEE Conference on Computational Complexity*, pages 171–178. IEEE Computer Society, 1996. doi:10.1109/CCC.1996.507679.
- [17] K. Ambos-Spies, W. Merkle, J. Reimann, and F. Stephan. Hausdorff dimension in exponential time. In *Proceedings of the 16th IEEE Conference on Computational Complexity*, pages 210–217. IEEE Computer Society, 2001. doi:10.1109/CCC.2001.933888.
- [18] K. Ambos-Spies, W. Merkle, J. Reimann, and S. A. Terwijn. Almost complete sets. *Theoretical Computer Science*, 306(1–3):177–194, 2003. doi:10.1016/s0304-3975(03)00262-7.
- [19] K. Ambos-Spies, H.-C. Neis, and S. A. Terwijn. Genericity and measure for exponential time. *Theoretical Computer Science*, 168(1):3–19, 1996. doi:10.1016/0304-3975(96)89424-2.
- [20] K. Ambos-Spies, S. A. Terwijn, and X. Zheng. Resource bounded randomness and weakly complete problems. *Theoretical Computer Science*, 172(1–2):195–207, 1997. doi:10.1016/s0304-3975(95)00260-x.
- [21] L. Antunes, A. Costa, A. Matos, and P. Vitányi. Computational depth of infinite strings revisited. In *Computation and Logic in the Real World, Third Conference on Computability in Europe, CiE 2007: local proceedings*, pages 36–44. University of Amsterdam, Digital Academic Repository, 2007. URL: <https://hdl.handle.net/11245/1.279234>.

- [22] L. Antunes, A. Matos, A. Souto, and P. Vitányi. Depth as randomness deficiency. *Theory of Computing Systems*, 45(4):724–739, 2009. arXiv:0809.2546, doi:10.1007/s00224-009-9171-0.
- [23] V. Arvind and J. Köbler. On pseudorandomness and resource-bounded measure. *Theoretical Computer Science*, 255(1–2):205–221, 2001. doi:10.1016/s0304-3975(99)00164-4.
- [24] K. B. Athreya, J. M. Hitchcock, J. H. Lutz, and E. Mayordomo. Effective strong dimension in algorithmic information and computational complexity. *SIAM Journal on Computing*, 37(3):671–705, 2007. arXiv:cs.CC/0211025, doi:10.1137/s0097539703446912.
- [25] T. Bakibayev. *Weak Completeness Notions For Exponential Time*. PhD thesis, Ruprecht-Karls-Universität Heidelberg, 2010. doi:10.11588/heidok.00010499.
- [26] R. Beigel, L. Fortnow, and F. Stephan. Infinitely-often autoreducible sets. *SIAM Journal on Computing*, 36(3):595–608, 2006. doi:10.1137/s0097539704441630.
- [27] R. V. Book. Relativizations of the $P =?$ NP and other problems: Developments in structural complexity theory. *SIAM Review*, 36(2):157–175, 1994. doi:10.1137/1036051.
- [28] R. V. Book and J. H. Lutz. On languages with very high space-bounded Kolmogorov complexity. *SIAM Journal on Computing*, 22(2):395–402, 1993. doi:10.1137/0222029.
- [29] R. V. Book, J. H. Lutz, and S. Tang. Additional queries to random and pseudorandom oracles. In *Proceedings of the 17th International Colloquium on Automata, Languages and Programming*, pages 283–293, 1990. doi:10.1007/BFb0032039.
- [30] R. V. Book and E. Mayordomo. On the robustness of ALMOST-R. *Rairo Informatique Théorique et Applications*, 30(2):123–133, 1996. URL: http://www.numdam.org/item?id=ITA_1996__30_2_123_0.
- [31] J. M. Breutzmann and J. H. Lutz. Equivalence of measures of complexity classes. *SIAM Journal on Computing*, 29(1):302–326, 2000. doi:10.1137/S0097539796302269.
- [32] H. Buhrman, S. Fenner, and L. Fortnow. Results on resource-bounded measure. In *Proceedings of the 24th International Colloquium on Automata, Languages and Programming*, pages 188–194. Springer-Verlag, 1997. doi:10.1007/3-540-63165-8_176.
- [33] H. Buhrman and L. Fortnow. Two queries. *Journal of Computer and System Sciences*, 59(2):182–194, 1999. doi:10.1006/jcss.1999.1647.
- [34] H. Buhrman, B. Hescott, S. Homer, and L. Torenvliet. Non-uniform reductions. *Theory of Computing Systems*, 47(2):317–341, 2010. doi:10.1007/s00224-008-9163-5.
- [35] H. Buhrman and L. Longpré. Compressibility and resource bounded measure. *SIAM Journal on Computing*, 31(3):876–886, 2002. doi:10.1137/S0097539797317123.
- [36] H. Buhrman and E. Mayordomo. An excursion to the Kolmogorov random strings. *Journal of Computer and System Sciences*, 54(3):393–399, 1997. doi:10.1006/jcss.1997.1484.

- [37] H. Buhrman and L. Torenvliet. On the structure of complete sets. In *Proceedings of the Ninth Annual Structure in Complexity Theory Conference*, pages 118–133. IEEE Computer Society, 1994. doi:[10.1109/SCT.1994.315811](https://doi.org/10.1109/SCT.1994.315811).
- [38] H. Buhrman and L. Torenvliet. Complete sets and structure in subrecursive classes. In *Logic Colloquium '96*, volume 12 of *Lecture Notes in Logic*, pages 45–78. Association for Symbolic Logic, 1998. doi:[10.1017/9781316716816.003](https://doi.org/10.1017/9781316716816.003).
- [39] H. Buhrman and D. van Melkebeek. Hard sets are hard to find. *Journal of Computer and System Sciences*, 59(2):327–345, 1999. doi:[10.1006/jcss.1999.1650](https://doi.org/10.1006/jcss.1999.1650).
- [40] H. Buhrman, D. van Melkebeek, K. W. Regan, D. Sivakumar, and M. Strauss. A generalization of resource-bounded measure, with application to the BPP vs. EXP problem. *SIAM Journal on Computing*, 30(2):576–601, 2001. doi:[10.1137/S0097539798343891](https://doi.org/10.1137/S0097539798343891).
- [41] J. Cai and A. L. Selman. Fine separation of average time complexity classes. *SIAM Journal on Computing*, 28(4):1310–1325, 1999. doi:[10.1137/s0097539796311715](https://doi.org/10.1137/s0097539796311715).
- [42] J. Cai, D. Sivakumar, and M. Strauss. Constant-depth circuits and the Lutz hypothesis. In *Proceedings of the 38th Symposium on Foundations of Computer Science*, pages 595–604. IEEE Computer Society, 1997. doi:[10.1109/SFCS.1997.646149](https://doi.org/10.1109/SFCS.1997.646149).
- [43] C. Calude and M. Zimand. Effective category and measure in abstract complexity theory. *Theoretical Computer Science*, 154(2):307–327, 1996. doi:[10.1016/0304-3975\(95\)00066-6](https://doi.org/10.1016/0304-3975(95)00066-6).
- [44] D. Chakraborty, S. Nandakumar, and H. Shukla. On resource-bounded versions of the van Lambalgen theorem. In *International Conference on Theory and Applications of Models of Computation*, pages 129–143. Springer, 2017. arXiv:1704.01101, doi:[10.1007/978-3-319-55911-7_10](https://doi.org/10.1007/978-3-319-55911-7_10).
- [45] R. Chang and S. Purini. Bounded queries and the NP machine hypothesis. In *Proceedings of the Twenty-Second Annual IEEE Conference on Computational Complexity*, pages 52–59. IEEE Computer Society, 2007. doi:[10.1109/ccc.2007.7](https://doi.org/10.1109/ccc.2007.7).
- [46] Y. Chen and J. Flum. A logic for PTIME and a parameterized halting problem. Technical Report TR08-083, Electronic Colloquium on Computational Complexity, 2008. URL: <https://eccc.weizmann.ac.il/eccc-reports/2008/TR08-083/index.html>.
- [47] Y. Chen and J. Flum. From almost optimal algorithms to logics for complexity classes via listings and a halting problem. *Journal of the ACM*, 59(4), Aug. 2012. doi:[10.1145/2339123.2339124](https://doi.org/10.1145/2339123.2339124).
- [48] Y. Chen and J. Flum. On optimal inverters. *Bulletin of Symbolic Logic*, 20(1):1–23, 2014. doi:[10.1017/bsl.2013.2](https://doi.org/10.1017/bsl.2013.2).
- [49] Y. Chen, J. Flum, and M. Müller. Hard instances of algorithms and proof systems. *ACM Transactions on Computation Theory*, 6(2):7:1–25, 2014. doi:[10.1145/2601336](https://doi.org/10.1145/2601336).
- [50] J. J. Dai. *Some results in probability and theoretical computer science*. PhD thesis, Iowa State University, 2001. URL: <https://www.proquest.com/dissertations-theses/some-results-probability-theoretical-computer/docview/304701687/se-2>.

- [51] J. J. Dai. A stronger Kolmogorov zero-one law for resource-bounded measure. *Theoretical Computer Science*, 292(3):723–732, 2003. doi:10.1016/s0304-3975(02)00320-1.
- [52] J. J. Dai. An outer-measure approach for resource-bounded measure. *Theory of Computing Systems*, 45(1):64–73, 2009. doi:10.1007/s00224-007-9075-9.
- [53] J. J. Dai and J. H. Lutz. Query order and NP-completeness. In *Proceedings of the 14th IEEE Conference on Computational Complexity*, pages 142–148. IEEE Computer Society, 1999. doi:10.1109/CCC.1999.766272.
- [54] D. Doty and P. Moser. Finite-state dimension and lossy decompressors. Technical Report arXiv:cs/0609096 [cs.CC], arXiv, 2006. arXiv:cs/0609096.
- [55] D. Doty and P. Moser. Feasible depth. In *Proceedings of the 3rd Conference on Computability in Europe*, pages 228–237. Springer-Verlag, 2007. arXiv:cs.CC/0701123, doi:10.1007/978-3-540-73001-9_24.
- [56] A. Drucker. High-confidence predictions under adversarial uncertainty. *ACM Transactions on Computation Theory*, 5(3):12:1–12:18, 2013. arXiv:1101.4446, doi:10.1145/2493252.2493257.
- [57] T. Ebert, W. Merkle, and H. Vollmer. On the autoreducibility of random sequences. *SIAM Journal on Computing*, 32(6):1542–1569, 2003. doi:10.1137/s0097539702415317.
- [58] F. Egidy and C. Glaßer. Optimal proof systems for complex sets are hard to find. In *Proceedings of the 57th Annual ACM Symposium on Theory of Computing*, 2025. To appear. arXiv:2408.07408.
- [59] A. Faragó and R. Xu. A new algorithm design technique for hard problems. *Theoretical Computer Science*, 821:45–56, 2020. arXiv:1608.08679, doi:10.1016/j.tcs.2020.03.012.
- [60] S. A. Fenner. Notions of resource-bounded category and genericity. In *Proceedings of the Sixth Annual Structure in Complexity Theory Conference*, pages 196–212. IEEE Computer Society Press, 1991. doi:10.1109/SCT.1991.160262.
- [61] S. A. Fenner. Resource-bounded category: a stronger approach. In *Proceedings of the Tenth Structure in Complexity Theory Conference*, pages 182–192. IEEE Computer Society Press, 1995. doi:10.1109/SCT.1995.514856.
- [62] S. A. Fenner. Functions that preserve p-randomness. *Information and Computation*, 231:125–142, 2013. arXiv:1202.6395, doi:10.1016/j.ic.2013.08.009.
- [63] S. A. Fenner, J. H. Lutz, E. Mayordomo, and P. Reardon. Weakly useful sequences. *Information and Computation*, 197(1–2):41–54, 2005. doi:10.1016/j.ic.2005.01.001.
- [64] S. Figueira, J. S. Miller, and A. Nies. Indifferent sets. *J. Log. Comput.*, 19(2):425–443, 2009. doi:10.1093/LOGCOM/EXN101.
- [65] S. Figueira and A. Nies. Feasible analysis, randomness, and base invariance. *Theory of Computing Systems*, 56(3):439–464, 2015. doi:10.1007/s00224-013-9507-7.

- [66] L. Fortnow. Relativized worlds with an infinite hierarchy. *Information Processing Letters*, 69(6):309–313, 1999. doi:10.1016/s0020-0190(99)00034-4.
- [67] L. Fortnow, J. M. Hitchcock, A. Pavan, N. V. Vinodchandran, and F. Wang. Extracting Kolmogorov complexity with applications to dimension zero-one laws. *Information and Computation*, 209(4):627–636, 2011. doi:10.1016/j.ic.2010.09.006.
- [68] L. Fortnow and M. Kummer. On resource-bounded instance complexity. *Theoretical Computer Science*, 161(1-2):123–140, 1996. doi:10.1016/0304-3975(95)00097-6.
- [69] L. Fortnow and J. H. Lutz. Prediction and dimension. *Journal of Computer and System Sciences*, 70(4):570–589, 2005. doi:10.1016/j.jcss.2004.10.007.
- [70] L. Fortnow, J. H. Lutz, and E. Mayordomo. Inseparability and strong hypotheses for disjoint NP pairs. *Theory Comput. Syst.*, 51:229–247, 2012. doi:10.1007/s00224-011-9326-7.
- [71] L. Fortnow, A. Pavan, and A. L. Selman. Distributionally hard languages. *Theory of Computing Systems*, 34(3):245–261, 2001. doi:10.1007/s00224-001-0003-0.
- [72] G. S. Frandsen and P. B. Miltersen. Reviewing bounds on the circuit size of the hardest functions. *Information processing letters*, 95(2):354–357, 2005. doi:10.1016/j.ipl.2005.03.009.
- [73] A. Galicki. Polynomial-Time Rademacher Theorem, Porosity and Randomness. In *Proceedings of the 44th International Colloquium on Automata, Languages, and Programming (ICALP 2017)*, pages 30:1–30:13, 2017. doi:10.4230/LIPIcs.ICALP.2017.30.
- [74] R. Gavaldà, M. López-Valdés, E. Mayordomo, and N. V. Vinodchandran. Resource-bounded dimension in computational learning theory. Technical Report 1010.5470, arXiv, 2010. arXiv: 1010.5470.
- [75] C. Glaßer, M. Ogihara, A. Pavan, A. L. Selman, and L. Zhang. Autoreducibility, mitoticity, and immunity. *Journal of Computer and System Sciences*, 73(5):735–754, 2007. doi:10.1016/j.jcss.2006.10.020.
- [76] E. Grädel and A. Malmström. 0-1 laws for recursive structures. *Archive for Mathematical Logic*, 38(4):205–215, 1999. doi:10.1007/s001530050125.
- [77] J. A. Grochow. Polynomial-time axioms of choice and polynomial-time cardinality. *Theory of Computing Systems*, 67(4):627–669, 2023. doi:10.1007/s00224-023-10118-y.
- [78] X. Gu. A note on dimensions of polynomial size circuits. *Theoretical Computer Science*, 359(1–3):176–187, 2006. doi:10.1016/j.tcs.2006.02.022.
- [79] X. Gu. *Fractals in complexity and geometry*. PhD thesis, Iowa State University, 2009. URL: <https://www.proquest.com/dissertations-theses/fractals-complexity-geometry/docview/304907670/se-2>.
- [80] X. Gu, J. M. Hitchcock, and A. Pavan. Collapsing and separating complete notions under worst-case and average-case hypotheses. *Theory of Computing Systems*, 51(2):248–265, 2012. doi:10.1007/s00224-011-9365-0.

- [81] X. Gu and J. H. Lutz. Dimension characterizations of complexity classes. *Computational Complexity*, 17:459–474, 2008. doi:10.1007/s00037-008-0257-x.
- [82] X. Gu, J. H. Lutz, S. Nandakumar, and J. S. Royer. Axiomatizing resource bounds for measure. In B. Löwe, D. Normann, I. Soskov, and A. Soskova, editors, *Models of Computation in Context*, pages 102–111. Springer, 2011. arXiv:1102.2095, doi:10.1007/978-3-642-21875-0_11.
- [83] R. C. Harkins. Applications of resource-bounded measure in double-exponential time. Master’s thesis, University of Wyoming, 2006. URL: <https://www.proquest.com/dissertations-theses/applications-resource-bounded-measure-double/docview/304982914/se-2>.
- [84] R. C. Harkins. *Randomness, learnability, and betting games*. PhD thesis, University of Wyoming, 2012. URL: <https://www.proquest.com/dissertations-theses/randomness-learnability-betting-games/docview/1026776374/se-2>.
- [85] R. C. Harkins and J. M. Hitchcock. Upward separations and weaker hypotheses in resource-bounded measure. *Theoretical Computer Science*, 389(1–2), 2007. doi:10.1016/j.tcs.2007.08.012.
- [86] R. C. Harkins and J. M. Hitchcock. Dimension, halfspaces, and the density of hard sets. *Theory of Computing Systems*, 49(3):601–614, 2011. doi:10.1007/S00224-010-9288-1.
- [87] R. C. Harkins and J. M. Hitchcock. Exact learning algorithms, betting games, and circuit lower bounds. *ACM Transactions on Computation Theory*, 5(4):article 18, 2013. doi:10.1145/2539126.2539130.
- [88] R. C. Harkins, J. M. Hitchcock, and A. Pavan. Stronger reductions and isomorphism of complete sets. *Computability*, 3(2):91–104, 2014. doi:10.3233/COM-140028.
- [89] M. Hauptmann. The measure hypothesis and efficiency of polynomial time approximation schemes. In *Proceedings of the Tenth Italian Conference on Theoretical Computer Science*, pages 151–163. World Scientific, 2007. doi:10.1142/9789812770998_0017.
- [90] M. Hauptmann. Scaled dimension and the Berman-Hartmanis conjecture. Technical Report 85300-CS, University of Bonn, 2008.
- [91] L. A. Hemachandra, M. Ogiwara, and O. Watanabe. How hard are sparse sets? In *Proceedings of the Seventh Annual Structure in Complexity Theory Conference*, pages 222–238. IEEE Computer Society Press, 1992. doi:10.1109/SCT.1992.215396.
- [92] J. M. Hitchcock. Resource-bounded dimension, nonuniform complexity, and approximation of MAX3SAT. Master’s thesis, Iowa State University, Ames, IA, USA, 2001. doi:10.31274/rtd-20201118-233.
- [93] J. M. Hitchcock. MAX3SAT is exponentially hard to approximate if NP has positive dimension. *Theoretical Computer Science*, 289(1):861–869, 2002. doi:10.1016/S0304-3975(01)00340-1.

- [94] J. M. Hitchcock. *Effective Fractal Dimension: Foundations and Applications*. PhD thesis, Iowa State University, 2003. URL: <https://www.proquest.com/dissertations-theses/effective-fractal-dimension-foundations/docview/305335849/se-2>.
- [95] J. M. Hitchcock. Fractal dimension and logarithmic loss unpredictability. *Theoretical Computer Science*, 304(1–3):431–441, 2003. doi:10.1016/S0304-3975(03)00138-5.
- [96] J. M. Hitchcock. The size of SPP. *Theoretical Computer Science*, 320(2–3):495–503, 2004. doi:10.1016/s0304-3975(04)00128-8.
- [97] J. M. Hitchcock. Small spans in scaled dimension. *SIAM Journal on Computing*, 34(1):170–194, 2004. arXiv:cs/0304030, doi:10.1137/S0097539703426416.
- [98] J. M. Hitchcock. Hausdorff dimension and oracle constructions. *Theoretical Computer Science*, 355(3):382–388, 2006. doi:10.1016/j.tcs.2006.01.025.
- [99] J. M. Hitchcock. Online learning and resource-bounded dimension: Winnow yields new lower bounds for hard sets. *SIAM Journal on Computing*, 36(6):1696–1708, 2007. arXiv: cs/0512053, doi:10.1137/050647517.
- [100] J. M. Hitchcock. Limitations of efficient reducibility to the Kolmogorov random strings. *Computability*, 1(1):39–43, 2012. doi:10.3233/COM-2012-006.
- [101] J. M. Hitchcock. Effective dimension bibliography. <https://www.eecs.uwyo.edu/~jhitchco/bib/dim/>, 2025.
- [102] J. M. Hitchcock. Resource-bounded measure and dimension bibliography. <https://www.eecs.uwyo.edu/~jhitchco/bib/rbmd/>, 2025.
- [103] J. M. Hitchcock, M. López-Valdés, and E. Mayordomo. Scaled dimension and the Kolmogorov complexity of Turing-hard sets. *Theory of Computing Systems*, 43(3–4):471–497, 2008. doi:10.1007/s00224-007-9013-x.
- [104] J. M. Hitchcock and J. H. Lutz. Why computational complexity requires stricter martingales. *Theory of Computing Systems*, 39(2):277–296, 2006. doi:10.1007/s00224-005-1135-4.
- [105] J. M. Hitchcock, J. H. Lutz, and E. Mayordomo. Scaled dimension and nonuniform complexity. *Journal of Computer and System Sciences*, 69(2):97–122, 2004. doi:10.1016/j.jcss.2003.09.001.
- [106] J. M. Hitchcock, J. H. Lutz, and E. Mayordomo. The fractal geometry of complexity classes. *SIGACT News*, 36(3):24–38, September 2005. doi:10.1145/1086649.1086662.
- [107] J. M. Hitchcock and E. Mayordomo. Base invariance of feasible dimension. *Information Processing Letters*, 113(14–16):546–551, 2013. doi:10.1016/j.ipl.2013.04.004.
- [108] J. M. Hitchcock and A. Pavan. Resource-bounded strong dimension versus resource-bounded category. *Information Processing Letters*, 95(3):377–381, 2005. doi:10.1016/j.ipl.2005.05.001.

- [109] J. M. Hitchcock and A. Pavan. Comparing reductions to NP-complete sets. *Information and Computation*, 205(5):694–706, 2007. doi:10.1016/j.ic.2006.10.005.
- [110] J. M. Hitchcock and A. Pavan. Hardness hypotheses, derandomization, and circuit complexity. *Computational Complexity*, 17(1):119–146, 2008. doi:10.1007/s00037-008-0241-5.
- [111] J. M. Hitchcock and A. Pavan. Length-increasing reductions for PSPACE-Completeness. In *Proceedings of the 38th International Symposium on Mathematical Foundations of Computer Science*, pages 540–550. Springer-Verlag, 2013. doi:10.1007/978-3-642-40313-2_48.
- [112] J. M. Hitchcock, A. Pavan, and N. V. Vinodchandran. Partial bi-immunity, scaled dimension, and NP-completeness. *Theory of Computing Systems*, 42(2):131–142, 2008. doi:10.1007/s00224-007-9000-2.
- [113] J. M. Hitchcock and A. Sekoni. Nondeterministic sublinear time has measure 0 in P. *Theory of Computing Systems*, 63(3):386–393, 2019. doi:10.1007/s00224-018-9875-0.
- [114] J. M. Hitchcock, A. Sekoni, and H. Shafei. Polynomial-time random oracles and separating complexity classes. *ACM Transactions on Computation Theory*, 13(1), 1 2021. doi:10.1145/3434389.
- [115] J. M. Hitchcock and H. Shafei. Autoreducibility of NP-complete sets under strong hypotheses. *Computational Complexity*, 27:63–97, 2018. doi:10.1007/s00037-017-0157-z.
- [116] J. M. Hitchcock and H. Shafei. Nonuniform reductions and NP-completeness. *Theory of Computing Systems*, 66(4):743–757, 2022. doi:10.1007/s00224-022-10083-y.
- [117] J. M. Hitchcock and N. V. Vinodchandran. Dimension, entropy rates, and compression. *Journal of Computer and System Sciences*, 72(4):760–782, 2006. doi:10.1016/j.jcss.2005.10.002.
- [118] S. Homer and S. Mocas. Nonuniform lower bounds for exponential time classes. In *Mathematical Foundations of Computer Science 1995: 20th International Symposium, MFCS'95 Prague, Czech Republic, August 28–September 1, 1995 Proceedings*, pages 159–168. Springer, 1995. doi:10.1007/3-540-60246-1_122.
- [119] X. Huang and D. M. Stull. Polynomial Space Randomness in Analysis. In *41st International Symposium on Mathematical Foundations of Computer Science (MFCS 2016)*, pages 86:1–86:13, 2016. arXiv:1509.08825, doi:10.4230/LIPIcs.MFCS.2016.86.
- [120] R. Impagliazzo and P. Moser. A zero-one law for RP and derandomization of AM if NP is not small. *Information and Computation*, 207(7):787 – 792, 2009. doi:10.1016/j.ic.2009.02.002.
- [121] G. Istrate. Resource-bounded measure and autoreducibility. Technical Report 644, Department of Computer Science, University of Rochester, December 1996. URL: <http://hdl.handle.net/1802/660>.
- [122] D. W. Juedes. *The Complexity and Distribution of Computationally Useful Problems*. PhD thesis, Iowa State University, 1994. URL: <https://www.proquest.com/>

dissertations-theses.complexity-distribution-computationally-useful/docview/304124437/se-2.

- [123] D. W. Juedes. Weakly complete problems are not rare. *Computational Complexity*, 5(3/4):267–283, 1995. doi:[10.1007/bf01206322](https://doi.org/10.1007/bf01206322).
- [124] D. W. Juedes, J. I. Lathrop, and J. H. Lutz. Computational depth and reducibility. *Theoretical Computer Science*, 132(1–2):37–70, 1994. doi:[10.1016/0304-3975\(94\)00014-x](https://doi.org/10.1016/0304-3975(94)00014-x).
- [125] D. W. Juedes and J. H. Lutz. Kolmogorov complexity, complexity cores, and the distribution of hardness. In O. Watanabe, editor, *Kolmogorov Complexity and Computational Complexity*, pages 43–65. Springer-Verlag, 1992. doi:[10.1007/978-3-642-77735-6_4](https://doi.org/10.1007/978-3-642-77735-6_4).
- [126] D. W. Juedes and J. H. Lutz. The complexity and distribution of hard problems. *SIAM Journal on Computing*, 24(2):279–295, 1995. doi:[10.1137/s0097539792238133](https://doi.org/10.1137/s0097539792238133).
- [127] D. W. Juedes and J. H. Lutz. Weak completeness in E and E_2 . *Theoretical Computer Science*, 143(1):149–158, 1995. doi:[10.1016/0304-3975\(95\)80030-D](https://doi.org/10.1016/0304-3975(95)80030-D).
- [128] D. W. Juedes and J. H. Lutz. Completeness and weak completeness under polynomial-size circuits. *Information and Computation*, 125(1):13–31, 1996. doi:[10.1006/inco.1996.0017](https://doi.org/10.1006/inco.1996.0017).
- [129] S. M. Kautz. Resource-bounded randomness and compressibility with respect to nonuniform measures. In *Proceedings of the International Workshop on Randomization and Approximation Techniques in Computer Science*, pages 197–211. Springer-Verlag, 1997. doi:[10.1007/3-540-63248-4_17](https://doi.org/10.1007/3-540-63248-4_17).
- [130] S. M. Kautz and P. B. Miltersen. Relative to a random oracle, NP is not small. *Journal of Computer and System Sciences*, 53(2):235–250, 1996. doi:[10.1006/jcss.1996.0065](https://doi.org/10.1006/jcss.1996.0065).
- [131] J. Köbler and W. Lindner. On the resource bounded measure of P/poly. In *Proceedings of the 13th IEEE Conference on Computational Complexity*, pages 182–185. IEEE Computer Society, 1998. doi:[10.1109/CCC.1998.694603](https://doi.org/10.1109/CCC.1998.694603).
- [132] J. Köbler and W. Lindner. On distribution-specific learning with membership queries versus pseudorandom generation. In *Proceedings of the 20th Conference on Foundations of Software Technology and Theoretical Computer Science*, pages 336–347. Springer-Verlag, 2000. doi:[10.1007/3-540-44450-5_27](https://doi.org/10.1007/3-540-44450-5_27).
- [133] J. Köbler, W. Lindner, and R. Schuler. Derandomizing RP if Boolean circuits are not learnable. Technical Report UIB-1999-05, Universität Ulm, 1999.
- [134] J. Köbler and R. Schuler. Average-case intractability vs. worst-case intractability. In *Proceedings of the 23rd International Symposium on Mathematical Foundations of Computer Science (MFCS 1998)*, pages 493–502. Springer-Verlag, 1998. doi:[10.1016/j.ic.2003.05.002](https://doi.org/10.1016/j.ic.2003.05.002).
- [135] J. I. Lathrop and J. H. Lutz. Recursive computational depth. *Information and Computation*, 153(2):139–172, 1999. doi:[10.1006/inco.1999.2794](https://doi.org/10.1006/inco.1999.2794).
- [136] W. Lindner. *On the polynomial time bounded measure of one-truth-table degrees and p-selectivity*. PhD thesis, Technische Universität Berlin, 1993.

- [137] W. Lindner and R. Schuler. A small span theorem within P. Technical Report UIB-1997-02, Universität Ulm, 1997.
- [138] W. Lindner, R. Schuler, and O. Watanabe. Resource-bounded measure and learnability. *Theory of Computing Systems*, 33(2):151–170, 2000. doi:10.1007/s002249910010.
- [139] M. López-Valdés and E. Mayordomo. Dimension is compression. *Theory of Computing Systems*, 52(1):95–112, 2013. doi:10.1007/S00224-012-9417-0.
- [140] A. K. Lorentz and J. H. Lutz. Genericity and randomness over feasible probability measures. *Theoretical Computer Science*, 207(1):245–259, 1998. doi:10.1016/s0304-3975(98)00067-x.
- [141] J. H. Lutz. One-way functions and balanced NP. Manuscript.
- [142] J. H. Lutz. Resource-bounded Baire category and small circuits in exponential space. In *Proceedings of the Second Structure in Complexity Theory Conference*, pages 81–91. IEEE Computer Society Press, 1987. doi:10.1109/psct.1987.10319257.
- [143] J. H. Lutz. *Resource-Bounded Category and Measure in Exponential Complexity Classes*. PhD thesis, California Institute of Technology, 1987. doi:10.7907/qny92-v6h14.
- [144] J. H. Lutz. Category and measure in complexity classes. *SIAM Journal on Computing*, 19(6):1100–1131, 1990. doi:10.1137/0219076.
- [145] J. H. Lutz. Pseudorandom sources for BPP. *Journal of Computer and System Sciences*, 41(3):307–320, 1990. doi:10.1016/0022-0000(90)90023-e.
- [146] J. H. Lutz. An upward measure separation theorem. *Theoretical Computer Science*, 81(1):127–135, 1991. doi:10.1016/0304-3975(91)90320-2.
- [147] J. H. Lutz. Almost everywhere high nonuniform complexity. *Journal of Computer and System Sciences*, 44(2):220–258, 1992. doi:10.1016/0022-0000(92)90020-j.
- [148] J. H. Lutz. On independent random oracles. *Theoretical Computer Science*, 92:301–307, 1992. doi:10.1016/0304-3975(92)90317-9.
- [149] J. H. Lutz. A pseudorandom oracle characterization of BPP. *SIAM Journal on Computing*, 22(5):1075–1086, 1993. doi:10.1109/SCT.1991.160261.
- [150] J. H. Lutz. A small span theorem for P/Poly-Turing reductions. In *Proceedings of the Tenth Annual Structure in Complexity Theory Conference*, pages 324–330. IEEE Computer Society, 1995. doi:10.1109/SCT.1995.514870.
- [151] J. H. Lutz. Weakly hard problems. *SIAM Journal on Computing*, 24(6):1170–1189, 1995. doi:10.1137/s0097539793249700.
- [152] J. H. Lutz. Observations on measure and lowness for Δ_2^P . *Theory of Computing Systems*, 30(4):429–442, 1997. doi:10.1007/BF02679469.

- [153] J. H. Lutz. The quantitative structure of exponential time. In L. A. Hemaspaandra and A. L. Selman, editors, *Complexity Theory Retrospective II*, pages 225–254. Springer-Verlag, 1997. doi:10.1007/978-1-4612-1872-2_10.
- [154] J. H. Lutz. Resource-bounded measure. In *Proceedings of the 13th IEEE Conference on Computational Complexity*, pages 236–248. IEEE Computer Society, 1998. arXiv:1101.5455, doi:10.1109/CCC.1998.694611.
- [155] J. H. Lutz. Dimension in complexity classes. *SIAM Journal on Computing*, 32(5):1236–1259, 2003. arXiv:cs/0203016, doi:10.1137/S0097539701417723.
- [156] J. H. Lutz. Computability versus exact computability of martingales. *Information Processing Letters*, 92(5):235–237, 2004. doi:10.1016/j.ipl.2004.08.008.
- [157] J. H. Lutz. Effective fractal dimensions. *Mathematical Logic Quarterly*, 51(1):62–72, 2005. doi:10.1002/malq.200310127.
- [158] J. H. Lutz. Algorithmic fractal dimensions: Lecture slides. Presented at the 2024 NSF-CBMS Regional Conference, Drake University, 2024. URL: <https://cbmsweb.org/regional-conferences/2024-conferences/algorithmic-fractal-dimensions-lecture-slides/>.
- [159] J. H. Lutz and N. Lutz. Lines missing every random point. *Computability*, 4(2):85–102, 2015. arXiv:1401.3063, doi:10.3233/COM-150038.
- [160] J. H. Lutz, N. Lutz, and E. Mayordomo. Dimension and the structure of complexity classes. *Theory of Computing Systems*, 67:473–490, 2023. arXiv:2109.05956, doi:10.1007/s00224-022-10096-7.
- [161] J. H. Lutz and E. Mayordomo. Measure, stochasticity, and the density of hard languages. *SIAM Journal on Computing*, 23(4):762–779, 1994. doi:10.1137/s0097539792237498.
- [162] J. H. Lutz and E. Mayordomo. Cook versus Karp-Levin: Separating completeness notions if NP is not small. *Theoretical Computer Science*, 164(1–2):141–163, 1996. doi:10.1016/0304-3975(95)00189-1.
- [163] J. H. Lutz and E. Mayordomo. Twelve problems in resource-bounded measure. *Bulletin of the European Association for Theoretical Computer Science*, 68:64–80, 1999. Also appears as [164].
- [164] J. H. Lutz and E. Mayordomo. Twelve problems in resource-bounded measure. In G. Păun, G. Rozenberg, and A. Salomaa, editors, *Current Trends in Theoretical Computer Science: Entering the 21st Century*, pages 83–101. World Scientific Publishing, 2001. doi:10.1142/9789812810403_0001.
- [165] J. H. Lutz, V. Mhetre, and S. Srinivasan. Hard instances of hard problems. In *Proceedings of the 17th Annual Symposium on Theoretical Aspects of Computer Science*, pages 324–333. Springer-Verlag, 2000. doi:10.1007/3-540-46541-3_27.
- [166] J. H. Lutz and W. J. Schmidt. Circuit size relative to pseudorandom oracles. *Theoretical Computer Science*, 107(1):95–120, 3 1993. doi:10.1016/0304-3975(93)90256-s.

- [167] J. H. Lutz and D. L. Schweizer. Feasible reductions to Kolmogorov-Loveland stochastic sequences. *Theoretical Computer Science*, 225(1–2):185–194, 1999. doi:10.1016/s0304-3975(99)00041-9.
- [168] J. H. Lutz and M. Strauss. Bias invariance of small upper spans. In *Proceedings of the 17th Annual Symposium on Theoretical Aspects of Computer Science*, pages 74–86. Springer-Verlag, 2000. doi:10.1007/3-540-46541-3_6.
- [169] J. H. Lutz and Y. Zhao. The density of weakly complete problems under adaptive reductions. *SIAM Journal on Computing*, 30(4):1197–1210, 2000. doi:10.1137/s0097539797321547.
- [170] N. Lutz. Some open problems in algorithmic fractal geometry. *ACM SIGACT News*, 48(4):35–41, 2017. doi:10.1145/3173127.3173134.
- [171] M. López-Valdés. *Aplicaciones de la dimensión efectiva a la complejidad computacional y a los algoritmos de comprensión de datos*. PhD thesis, Universidad de Zaragoza, 2011. URL: <https://zaguan.unizar.es/record/7035>.
- [172] D. Mandal. *Randomness in completeness and space-bounded computations*. PhD thesis, Iowa State University, 2015. URL: <https://www.proquest.com/dissertations-theses/randomness-completeness-space-bounded/docview/1762726923/se-2?accountid=14793>.
- [173] D. Mandal, A. Pavan, and R. Venugopalan. Separating Cook Completeness from Karp-Levin Completeness Under a Worst-Case Hardness Hypothesis. In *34th International Conference on Foundation of Software Technology and Theoretical Computer Science (FSTTCS 2014)*, volume 29 of *Leibniz International Proceedings in Informatics (LIPIcs)*, pages 445–456, 2014. doi:10.4230/LIPIcs.FSTTCS.2014.445.
- [174] E. Mayordomo. Almost every set in exponential time is P-bi-immune. *Theoretical Computer Science*, 136(2):487–506, 1994. doi:10.1016/0304-3975(94)00023-c.
- [175] E. Mayordomo. *Contributions to the study of resource-bounded measure*. PhD thesis, Universitat Politècnica de Catalunya, 1994. URL: https://eccc.weizmann.ac.il/static/books/Contributions_to_the_Study_of_Resource_Bounded_Measure/.
- [176] E. Mayordomo. Measuring in PSPACE. In *Proceedings of the 7th International Meeting of Young Computer Scientists*, volume 6 of *Topics in Computer Science*, pages 93–100. Gordon and Breach, 1994. URL: <http://hdl.handle.net/2117/369631>.
- [177] E. Mayordomo. Effective Hausdorff dimension. In B. Löwe, B. Piwinger, and T. Räsch, editors, *Classical and New Paradigms of Computation and their Complexity Hierarchies*, volume 23 of *Trends in Logic*, pages 171–186. Kluwer Academic Press, 2004. doi:10.1007/978-1-4020-2776-5_10.
- [178] E. Mayordomo. Two open problems on effective dimension. In *Proceedings of Second Conference on Computability in Europe*, pages 353–359. Springer-Verlag, 2006. doi:10.1007/11780342_37.

- [179] W. Merkle. The global power of additional queries to p-random oracles. *SIAM Journal on Computing*, 31(2):483–495, 2001. doi:10.1137/S0097539700366711.
- [180] W. Merkle and N. Mihailović. On the construction of effective random sets. *Journal of Symbolic Logic*, 69(3):862–878, 2004. doi:10.2178/jsl/1096901772.
- [181] W. Merkle, N. Mihailović, and T. A. Slaman. Some results on effective randomness. *Theory of Computing Systems*, 39(5):707–721, 2006. doi:10.1007/s00224-005-1212-8.
- [182] V. S. Mhetre. Instance complexities of hard and weakly hard problems. Master’s thesis, Iowa State University, Ames, IA, USA, 1999. URL: <https://dr.lib.iastate.edu/handle/20500.12876/gwW7op0w>.
- [183] P. Moser. A generalization of Lutz’s measure to probabilistic classes. Technical Report TR02-058, Electronic Colloquium on Computational Complexity, 2002. URL: <https://eccc.weizmann.ac.il/report/2002/058/>.
- [184] P. Moser. ZPP is hard unless RP is small. Technical Report TR02-015, Electronic Colloquium on Computational Complexity, 2002. URL: <https://eccc.weizmann.ac.il/report/2002/015/>.
- [185] P. Moser. BPP has effective dimension at most 1/2 unless BPP = EXP. Technical Report TR03-029, Electronic Colloquium on Computational Complexity, 2003. URL: <https://eccc.weizmann.ac.il//eccc-reports/2006/TR06-047/>.
- [186] P. Moser. RP is small in SUBEXP else ZPP equals PSPACE and NP equals EXP. Technical Report TR03-040, Electronic Colloquium on Computational Complexity, 2003. URL: <https://eccc.weizmann.ac.il/report/2003/040/>.
- [187] P. Moser. *Derandomization and Quantitative Complexity*. PhD thesis, Université de Genève, 2004.
- [188] P. Moser. Baire categories on small complexity classes and meager-comeager laws. *Information and Computation*, 206(1):15–33, 2008. doi:10.1016/j.ic.2007.10.002.
- [189] P. Moser. Generic density and small span theorem. *Information and Computation*, 206(1):1–14, 2008. URL: <http://dx.doi.org/10.1016/j.ic.2007.10.001>.
- [190] P. Moser. Martingale families and dimension in P. *Theoretical Computer Science*, 400(1–3):46–61, 2008. doi:10.1016/j.tcs.2008.02.013.
- [191] P. Moser. Resource-bounded measure on probabilistic classes. *Information Processing Letters*, 106(6):241–245, 2008. doi:10.1016/j.ipl.2007.11.019.
- [192] P. Moser. A zero-one SUBEXP-dimension law for BPP. *Information Processing Letters*, 111(9):429–432, 2011. doi:<http://dx.doi.org/10.1016/j.ipl.2011.01.019>.
- [193] P. Moser. On the polynomial depth of various sets of random strings. *Theoretical Computer Science*, 477:96–108, 2013. arXiv:1012.3548, doi:10.1016/J.TCS.2012.10.045.

- [194] P. Moser. Polylog depth, highness and lowness for E. *Information and Computation*, 271:104483, 2020. [arXiv:1602.03332](https://arxiv.org/abs/1602.03332), doi:10.1016/J.IC.2019.104483.
- [195] C. Mukhopadhyay. Resource bounded measure and P versus NP problem-a critical study. Master’s thesis, Indian Statistical Institute, 2000. URL: <https://www.proquest.com/dissertations-theses/resource-bounded-measure-p-versus-np-problem/docview/2618193239/se-2>.
- [196] A. V. Naik, K. W. Regan, and D. Sivakumar. On quasilinear-time complexity theory. *Theoretical Computer Science*, 148(2):325–349, 1995. doi:10.1016/0304-3975(95)00031-q.
- [197] S. Nandakumar and S. Pulari. Ergodic theorems and converses for PSPACE functions. *Theory of Computing Systems*, 67(3):491–520, 2023. [arXiv:2012.11266](https://arxiv.org/abs/2012.11266), doi:10.1007/s00224-022-10094-9.
- [198] S. Nandakumar, S. Pulari, A. S, and S. Sarma. One-way functions and polynomial time dimension. Technical Report 2411.02392, arXiv, 2025. [arXiv:2411.02392](https://arxiv.org/abs/2411.02392).
- [199] A. Nies. Differentiability of polynomial time computable functions. In E. W. Mayr and N. Portier, editors, *31st International Symposium on Theoretical Aspects of Computer Science (STACS 2014)*, volume 25 of *Leibniz International Proceedings in Informatics (LIPIcs)*, pages 602–613, Dagstuhl, Germany, 2014. Schloss Dagstuhl – Leibniz-Zentrum für Informatik. doi:10.4230/LIPIcs.STACS.2014.602.
- [200] A. Nies and F. Stephan. Closure of Resource-Bounded Randomness Notions Under Polynomial-Time Permutations. In *35th Symposium on Theoretical Aspects of Computer Science (STACS 2018)*, volume 96 of *Leibniz International Proceedings in Informatics (LIPIcs)*, pages 51:1–51:10, 2018. [arXiv:1709.08792](https://arxiv.org/abs/1709.08792), doi:10.4230/LIPIcs.STACS.2018.51.
- [201] A. Pavan. *Average-case complexity theory and polynomial-time reductions*. PhD thesis, State University of New York at Buffalo, 2001. URL: <https://www.proquest.com/dissertations-theses/average-case-complexity-theory-polynomial-time/docview/304752740/se-2>.
- [202] A. Pavan. Comparison of reductions and completeness notions. *SIGACT News*, 34(2):27–41, June 2003. doi:10.1145/882116.882125.
- [203] A. Pavan and A. L. Selman. Complete distributional problems, hard languages, and resource-bounded measure. *Theoretical Computer Science*, 234(1–2):273–286, 2000. doi:10.1016/s0304-3975(99)00295-9.
- [204] O. Powell. Measure on P revisited. Technical Report TR02-065, Electronic Colloquium on Computational Complexity, 2002. URL: <https://eccc.weizmann.ac.il/report/2002/065/>.
- [205] O. Powell. PSPACE contains almost complete problems. Technical Report TR03-028, Electronic Colloquium on Computational Complexity, 2003. URL: <https://eccc.weizmann.ac.il/report/2003/028/>.

- [206] O. Powell. A note on measuring in P. *Theoretical Computer Science*, 320(2–3):229–246, 2004. doi:10.1016/j.tcs.2004.01.037.
- [207] O. Powell. Almost completeness in small complexity classes. Technical Report TR05-010, Electronic Colloquium on Computational Complexity, 2005. URL: <https://eccc.weizmann.ac.il/report/2005/010/>.
- [208] R. J. Pruim. *Weakly hard languages and Kuratowski-Ulam theorems for resource-bounded category*. PhD thesis, University of Wisconsin-Madison, 1995. URL: [https://www.proquest.com/dissertations-theses/studies-bounded-query-hierarchies/docview/304426254/se-2](https://www.proquest.com/dissertations-theses/weakly-hard-languages-kuratowski-ulam-theorems/docview/304238392/se-2).
- [209] V. S. R. Purini. *Studies in bounded query hierarchies*. PhD thesis, University of Maryland, Baltimore County, 2008. URL: <https://www.proquest.com/dissertations-theses/studies-bounded-query-hierarchies/docview/304426254/se-2>.
- [210] K. W. Regan and D. Sivakumar. Improved resource-bounded Borel-Cantelli and stochasticity theorems. Technical Report UB-CS-TR 95-08, Computer Science Department, University at Buffalo, 1995.
- [211] K. W. Regan and D. Sivakumar. Probabilistic martingales and BPTIME classes. In *Proceedings of the 13th Annual IEEE Conference on Computational Complexity*, pages 186–200. IEEE Computer Society, 1998. doi:10.1109/CCC.1998.694604.
- [212] K. W. Regan, D. Sivakumar, and J. Cai. Pseudorandom generators, measure theory, and natural proofs. In *Proceedings of the 36th Symposium on Foundations of Computer Science*, pages 26–35. IEEE Computer Society, 1995. doi:10.1109/SFCS.1995.492459.
- [213] J. Reimann. *Computability and fractal dimension*. PhD thesis, Ruprecht-Karls Universität Heidelberg, 2004. doi:10.11588/heidok.00005543.
- [214] D. Ronneburger. *Kolmogorov complexity and derandomization*. PhD thesis, Rutgers, The State University of New Jersey, 2004. URL: <https://www.proquest.com/dissertations-theses/kolmogorov-complexity-derandomization/docview/305117533/se-2>.
- [215] M. Schaefer and F. Stephan. Strong reductions and immunity for exponential time. In *Proceedings of the 20th Annual Symposium on Theoretical Aspects of Computer Science*, pages 559–570. Springer-Verlag, 2003. doi:10.1007/3-540-36494-3_49.
- [216] R. Schuler. Truth-table closure and turing closure of average polynomial time have different measures in EXP. In *Proceedings of the Eleventh Annual IEEE Conference on Computational Complexity*, pages 190–197. IEEE Computer Society, 1996. doi:10.1109/CCC.1996.507681.
- [217] R. Schuler and T. Yamakami. Sets computable in polynomial time on average. In *Proceedings of the 1st Annual International Computing and Combinatorics Conference*, pages 400–409. Springer-Verlag, 1995. doi:10.1007/bfb0030859.
- [218] A. Sekoni. Polynomial-space randomness and DNF complexity. Master’s thesis, University of Wyoming, 2014. URL: <https://www.proquest.com/dissertations-theses/polynomial-space-randomness-dnf-complexity/docview/1652874097/se-2>.

- [219] A. Sekoni. *Polynomial-time Random Oracles, Nondeterministic Sublinear Time, and Boolean Function Complexity*. PhD thesis, University of Wyoming, 2018. URL: <https://www.proquest.com/dissertations-theses/polynomial-time-random-oracles-nondeterministic/docview/2115849725/se-2>.
- [220] H. Shafei. *Autoreducibility, Nonuniform Completeness, and Random Oracles*. PhD thesis, University of Wyoming, 2017. URL: <https://www.proquest.com/dissertations-theses/autoreducibility-nonuniform-completeness-random/docview/1984331847/se-2>.
- [221] J. G. Silveira. Invariancia por cambio de base de la aleatoriedad computable y la aleatoriedad con recursos acotados. Master's thesis, Universidad de Buenos Aires, 2011.
- [222] D. Sivakumar. *Probabilistic Techniques in Structural Complexity Theory*. PhD thesis, SUNY at Buffalo, 1996. URL: <https://www.proquest.com/dissertations-theses/probabilistic-techniques-structural-complexity/docview/304304565/se-2>.
- [223] S. Srinivasan. Average-case complexity and instance complexity. Master's thesis, Iowa State University, Ames, IA, USA, 2000. URL: <https://dr.lib.iastate.edu/handle/20.500.12876/Dw883X2w>.
- [224] M. Strauss. Measure on P: Strength of the notion. *Information and Computation*, 136(1):1–23, 1997. doi:10.1006/inco.1997.2639.
- [225] M. Strauss. Normal numbers and sources for BPP. *Theoretical Computer Science*, 178(1–2):155–169, 1997. doi:10.1016/s0304-3975(96)00099-0.
- [226] M. J. Strauss. *Measure in feasible complexity classes*. PhD thesis, Rutgers, The State University of New Jersey, 1995. URL: <https://www.proquest.com/dissertations-theses/measure-feasible-complexity-classes/docview/304224978/se-2>.
- [227] D. M. Stull. *Algorithmic Randomness and Analysis*. PhD thesis, Iowa State University, 2017. URL: <https://www.proquest.com/dissertations-theses/algorithmic-randomness-analysis/docview/2019695603/se-2>.
- [228] D. M. Stull. Resource bounded randomness and its applications. In J. N. Y. Franklin and C. P. Porter, editors, *Algorithmic Randomness: Progress and Prospects*, volume 50 of *Lecture Notes in Logic*, page 301–348. Cambridge University Press, Cambridge, 2020. doi:10.1017/9781108781718.010.
- [229] C. Sureson. Subcomputable Schnorr randomness. *Logical Methods in Computer Science*, 13(2):1–32, 2017. doi:10.23638/LMCS-13(2:2)2017.
- [230] C. Sureson. Subcomputable Hausdorff function dimension. *Theoretical Computer Science*, 891:59–83, 2021. doi:10.1016/j.tcs.2021.08.028.
- [231] A. Taraciuk. Nociones de aleatoriedad y transformaciones de cambio de base. Master's thesis, Universidad de Buenos Aires, 2010.
- [232] S. A. Terwijn. *Computability and Measure*. PhD thesis, University of Amsterdam, 1998. URL: <https://hdl.handle.net/11245/1.392530>.

- [233] S. A. Terwijn. On the quantitative structure of Δ_2^0 . In U. Berger, H. Osswald, and P. Schuster, editors, *Reuniting the Antipodes: Constructive and Nonstandard Views of the Continuum*, pages 271–283. Kluwer Academic Press, 2000. doi:10.1007/978-94-015-9757-9_23.
- [234] S. A. Terwijn and L. Torenvliet. Arithmetical measure. *Mathematical Logic Quarterly*, 44(4):277–286, 1998. doi:10.1002/malq.19980440211.
- [235] D. van Melkebeek. *Randomness and Completeness in Computational Complexity*, volume 1950 of *Lecture Notes in Computer Science*. Springer, Berlin, Heidelberg, 2000. doi:10.1007/3-540-44545-5.
- [236] D. van Melkebeek. The zero-one law holds for BPP. *Theoretical Computer Science*, 244(1–2):283–288, 2000. doi:10.1016/s0304-3975(00)00191-2.
- [237] V. Vassilevska, R. Williams, and S. L. M. Woo. Confronting hardness using a hybrid approach. Technical Report CMU-CS-05-125, School of Computer Science, Carnegie Mellon University, April 2005. URL: <http://reports-archive.adm.cs.cmu.edu/anon/2005/abstracts/05-125.html>.
- [238] F. Wang. Kolmogorov extraction and resource-bounded zero-one laws. Master’s thesis, Iowa State University, 2006. URL: <https://dr.lib.iastate.edu/handle/20.500.12876/73024>.
- [239] Y. Wang. The law of the iterated logarithm for p -random sequences. In *Proceedings of the Eleventh Annual IEEE Conference on Computational Complexity*, pages 180–189. IEEE Computer Society, 1996. doi:10.1109/CCC.1996.507680.
- [240] Y. Wang. *Randomness and Complexity*. PhD thesis, Department of Mathematics, University of Heidelberg, 1996. URL: https://eccc.weizmann.ac.il/static/books/Randomness_and_Complexity/.
- [241] Y. Wang. NP-hard sets are superterse unless NP is small. *Information Processing Letters*, 61(1):1–6, 1997. doi:10.1016/s0020-0190(96)00189-5.
- [242] Y. Wang. Genericity, randomness, and polynomial-time approximations. *SIAM Journal on Computing*, 28(2):394–408, 1999. doi:10.1137/S009753979630235X.
- [243] Y. Wang. Randomness, stochasticity, and approximations. *Theory of Computing Systems*, 32:517–529, 1999. doi:10.1007/s002240000130.
- [244] Y. Wang. A separation of two randomness concepts. *Information Processing Letters*, 69(3):115–118, 1999. doi:10.1016/s0020-0190(98)00202-6.
- [245] Y. Wang. Resource bounded randomness and computational complexity. *Theoretical Computer Science*, 237(1–2):33–55, 2000. doi:10.1016/s0304-3975(98)00119-4.
- [246] Y. Wang. On the design of LIL tests for (pseudo) random generators and some experimental results. Technical Report 1401.3307, arXiv, 2014. arXiv:1401.3307.
- [247] R. Williams. Defying hardness with a hybrid approach. Technical Report CMU-CS-04-159, School of Computer Science, Carnegie Mellon University, August 2004. URL: <http://reports-archive.adm.cs.cmu.edu/anon/2004/abstracts/04-159.html>.

- [248] T. Yamakami. *Average Case Computational Complexity Theory*. PhD thesis, University of Toronto, 1997. URL: https://eccc.weizmann.ac.il/static/books/Average_Case_Computational_Complexity_Theory/.
- [249] M. Zimand. *Existential Theorems in Computational Complexity Theory: Size and Robustness*. PhD thesis, University of Rochester, 1996. URL: <http://hdl.handle.net/1802/818>.
- [250] M. Zimand. How to privatize random bits. Technical Report 616, Department of Computer Science, University of Rochester, April 1996. URL: <http://hdl.handle.net/1802/649>.
- [251] M. Zimand. On the size of classes with weak membership properties. *Theoretical Computer Science*, 209(1–2):225–235, 1998. doi:10.1016/s0304-3975(97)00114-x.
- [252] M. Zimand. Relative to a random oracle, P/Poly is not measurable in EXP. *Information Processing Letters*, 69(2):83–86, 1999. doi:10.1016/s0020-0190(98)00197-5.
- [253] M. Zimand. *Computational Complexity: A Quantitative Perspective*. Elsevier, 2004. URL: <https://www.sciencedirect.com/bookseries/north-holland-mathematics-studies/vol/196/>.
- [254] M. Zimand. Possibilities and impossibilities in Kolmogorov complexity extraction. Technical Report 1104.0872, arXiv, 2011. arXiv:1104.0872.