

TRAVIS GAGIE

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Personal information

Full name: Travis Alan Gagie
Date of birth: April 10th, 1977
Place of birth: Georgetown, Canada
Citizenships: Canadian and British
Languages: native English, functional Spanish and Italian

Employment

2016–present	assistant professor	Diego Portales University, Chile
2013–2016	post-doctoral researcher	University of Helsinki, Finland
winter 2015	visiting researcher	University of A Coruña, Spain
2010–2012	post-doctoral researcher	Aalto University, Finland
2009–2010	post-doctoral researcher	University of Chile, Chile
2007–2008	research assistant	University of Eastern Piedmont, Italy
2001–2005	teaching assistant	University of Toronto, Canada
summer 2000	research assistant	University of Waterloo, Canada
summer 1999	research assistant	Queen’s University, Canada
spring 1999	teaching assistant	Queen’s University, Canada

Education

2015	docentship	University of Helsinki, Finland
2014	docentship	Aalto University, Finland
2009	Dr rer. nat. in Bioinformatics (PhD equivalent)	Bielefeld University, Germany
2005–2006	exchange student	National Research Council, Italy
2003–2006	PhD student	University of Toronto, Canada
2000–2003	MSc in Computer Science	University of Toronto, Canada
1996–2000	BSc in Cognitive Science	Queen’s University, Canada

Awards and funding

Marie Skłodowska-Curie RISE grant
initial University of Helsinki local coordinator
€189 000 (€648 000 total between 8 organizations), 2016–2019.

Habilitation as Associate Professor
qualification to work in Italy, 2014.

Academy of Finland Post-Doctoral Grant
€254 450 total, 2013–2016.

Best Student Paper Award (shared)
20th International Workshop on Combinatorial Algorithms (IWOCA), 2009.

Doctoral Fellowship supported by the Humboldt Foundation
€4500, spring 2009.

Queen’s University Medal in Cognitive Science
for highest graduating mark in program, 2000.

Miscellaneous scholarships and research assistantships
approximately \$125 000 CAD total, 1996–2006.

Editing, committees and reviewing

Currently co-editing and editing special issues of *Algorithmica* (Springer) and the *Journal of Discrete Algorithms* (Elsevier).

Chair of the Bioinformatics Data Structures summer school in Helsinki in August, 2016. Co-chair of the special session on compressed data structures at the IEEE Data Compression Conference (DCC) 2016; a StringMasters workshop in A Coruña in January, 2016; and the Workshop on Compression, Text and Algorithms (WCTA) 2015.

Member of the program and/or organizing committees of the IEEE Data Compression Conference (DCC) 2014–2017; the Symposium on Algorithms and Data Structures (WADS) 2017; the Bioinformatics Research and Education Workshop (BREW) 2016; Intelligent Systems for Molecular Biology (ISMB) 2016; the International Workshop on Combinatorial Algorithms (IWOCA) 2016; the Symposium on String Processing and Information Retrieval (SPIRE) 2015 and 2016; and the Symposium on Combinatorial Pattern Matching (CPM) 2011–2013 and 2015.

Reviewer for many journals and conferences (e.g., *ACM Transactions on Algorithms*, *Algorithmica*, *Journal of Computer and System Sciences*, FOCS, STOC, SODA, ICALP, ESA).

Teaching and supervising

Teaching Introductory Data Structures
Diego Portales University, winter 2016.

Teaching Advanced Data Compression
Diego Portales University, winter 2016.

Supervising MSc student Aleksi Hartikainen
(now a software engineer at Google and finishing his thesis).

MSc thesis reviewer for Tuukka Norri
University of Helsinki, 2016.

Taught Compressed Data Structures
University of A Coruña, winter 2015.

Co-supervised research visits by PhD students Andrea Farruggia (University of Pisa), Héctor Ferrada (University of Chile), Tsung-Han Ku (National Tsing Hua University, Taiwan), Alberto Ordóñez (University of A Coruña) and Marco Previtali (University of Milano-Bicocca).

Completed 50059 Practical Teaching Skills
University of Helsinki, spring 2015.

Taught 582682 Data Compression Project
University of Helsinki, spring 2015 (with Simon Puglisi).

Taught 582487 Data Compression Techniques
University of Helsinki, spring 2015 (with Simon Puglisi).

Taught T-106.5400 String Algorithms
Aalto University, spring 2012 (with Jorma Tarhio) and spring 2014.

Taught 58313302 Seminar on Advanced Data Structures
University of Helsinki, fall 2013 (with Juha Kärkkäinen and Simon Puglisi).

Taught T-106.5800 Seminar on Advanced Data Structures
Aalto University, fall 2012.

Completed PED-131.1000 Introduction to University Pedagogy
Aalto University, fall 2011.

Taught T-106.6200 Software Techniques: Data Compression
Aalto University, spring 2011.

References

Associate Professor Ferdinando Cicalese
(doctoral supervisor)
Department of Computer Science, University of Verona
`ferdinando.cicalese@univr.it`

Professor Veli Mäkinen
(post-doctoral research supervisor)
Department of Computer Science, University of Helsinki
`vmakinen@cs.helsinki.fi`

Professor Giovanni Manzini
(exchange and research supervisor)
Department of Computer Science, University of Eastern Piedmont
`giovanni.manzini@uniupo.it`

Professor Gonzalo Navarro
(post-doctoral research supervisor)
Department of Computer Science, University of Chile
`gnavarro@dcc.uchile.cl`

Professor Jens Stoye
(doctoral supervisor)
Faculty of Technology, Bielefeld University
`jens.stoye@uni-bielefeld.de`

Professor Jorma Tarhio
(post-doctoral research supervisor)
Department of Computer Science, Aalto University
`jorma.tarhio@aalto.fi`

Publications

Peer-reviewed journal articles

- [1] T. Gagie, C. Hoobin, and S. J. Puglisi. Block graphs in practice. *Mathematics in Computer Science*, to appear. Special issue for ICABD 2014.
- [2] T. Gagie, G. Manzini, and D. Valenzuela. Compressed spaced suffix arrays. *Mathematics in Computer Science*, to appear. Special issue for ICABD 2014.
- [3] A. I. Tomescu, T. Gagie, A. Popa, R. Rizzi, A. Kuosmanen and V. Mäkinen. Explaining a weighted DAG with few paths for solving genome-guided multi-assembly. *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, 12(6):1345–1354, 2015.
- [4] T. Gagie, D. Hermelin, G. M. Landau and O. Weimann. Binary jumbled pattern matching on trees and tree-like structures. *Algorithmica*, 73(3):571–588, 2015. Special issue for ESA 2013.
- [5] T. Gagie, G. Navarro, Y. Nekrich and A. Ordóñez. Efficient and compact representations of prefix codes. *IEEE Transactions on Information Theory*, 61(9):4999–5011, 2015.
- [6] T. Gagie and S. J. Puglisi. Searching and indexing genomics databases via kernelization. *Frontiers in Bioengineering and Biotechnology*, 3:12, 2015.
- [7] T. Gagie, P. Gawrychowski and S. J. Puglisi. Approximate pattern matching in LZ77-compressed texts. *Journal of Discrete Algorithms*, 32:64–68, 2015.
- [8] G. Fici, T. Gagie, J. Kärkkäinen, and D. Kempa. A subquadratic algorithm for minimum palindromic factorization. *Journal of Discrete Algorithms*, 28:41–48, 2014.
- [9] H. Ferrada, T. Gagie, T. Hirvola and S. J. Puglisi. Hybrid indexes for repetitive datasets. *Philosophical Transactions of the Royal Society A*, 327, 2014
- [10] A. Farzan, T. Gagie and G. Navarro. Entropy-bounded representation of point grids. *Computational Geometry: Theory and Applications*, 47(1):1–14, 2014.

- [11] J. Barbay, F. Claude, T. Gagie, G. Navarro, and Y. Nekrich. Efficient fully-compressed sequence representations. *Algorithmica*, 69(1):232–268, 2014.
- [12] T. Gagie, J. Kärkkäinen, G. Navarro and S. J. Puglisi. Colored range queries and document retrieval. *Theoretical Computer Science*, 483: 36–50, 2013. Special issue for CPM 2011.
- [13] P. Gawrychowski and T. Gagie. Minimax trees in linear time with applications. *European Journal of Combinatorics*, 34(1):82–90, 2013. Special issue for IWOCA 2009.
- [14] H. Bannai, T. Gagie, T. I, S. Inenaga, G. M. Landau and M. Lewenstein. An efficient algorithm to test square-freeness of strings compressed by straight-line programs. *Information Processing Letters*, 112(9):711–714, 2012.
- [15] T. Gagie, G. Navarro and S. J. Puglisi. New algorithms on wavelet trees and applications to information retrieval. *Theoretical Computer Science*, 426–427:25–41, 2012.
- [16] P. Ferragina, T. Gagie and G. Manzini. Lightweight data indexing and compression in external memory. *Algorithmica*, 63(3):707–730, 2012. Special issue for LATIN 2010.
- [17] T. Gagie. A note on sequence prediction over large alphabets. *Algorithms*, 5(1):50–55, 2012. Special issue for CCP 2011.
- [18] T. Gagie. Bounds from a card trick. *Journal of Discrete Algorithms*, 10(1):2–4, 2012. Special issue for StringMasters 2009; featured in the *MIT Technology Review*.
- [19] F. Cicalese, T. Gagie, M. Milanič and E. Laber. Competitive boolean function evaluation: Beyond monotonicity, and the symmetric case. *Discrete Applied Mathematics*, 159(11):1070–1078, 2011.
- [20] T. Gagie and Y. Nekrich. Tight bounds for online stable sorting. *Journal of Discrete Algorithms*, 9(2):176–181, 2011.
- [21] T. Gagie and G. Manzini. Move-to-front, distance coding, and inversion frequencies revisited. *Theoretical Computer Science*, 411(31-33):2925–2944, 2010.

- [22] T. Gagie. A new algorithm for building alphabetic minimax trees. *Fundamenta Informaticae*, 97(3):321–329, 2009. Special issue for StringMasters 2007.
- [23] T. Gagie. Compressed depth sequences. *Theoretical Computer Science*, 410(8–10):958–962, 2009.
- [24] T. Gagie. Sorting streamed multisets. *Information Processing Letters*, 108(6):418–421, 2008.
- [25] T. Gagie. Dynamic asymmetric communication. *Information Processing Letters*, 108(6):352–355, 2008.
- [26] T. Gagie. Dynamic Shannon coding. *Information Processing Letters*, 102(2–3):113–117, 2007.
- [27] T. Gagie. Large alphabets and incompressibility. *Information Processing Letters*, 99(6):246–251, 2006.
- [28] T. Gagie. Compressing probability distributions. *Information Processing Letters*, 97(4):133–137, 2006.
- [29] T. Gagie. Restructuring binary search trees revisited. *Information Processing Letters*, 95(3):418–421, 2005.

Peer-reviewed conference papers

- [30] A. J. Cox, A. Farruggia, T. Gagie, S. J. Puglisi and J. Sirén. RLZAP: Relative Lempel-Ziv with adaptive pointers. In *Proceedings of the 23rd Symposium on String Processing and Information Retrieval (SPIRE)*, to appear, 2016.
- [31] A. Fariña, T. Gagie, G. Manzini, G. Navarro and A. Ordóñez. Efficient and compact representations of some non-canonical prefix-free codes. In *Proceedings of the 23rd Symposium on String Processing and Information Retrieval (SPIRE)*, to appear, 2016.
- [32] D. Belazzougui, T. Gagie, V. Mäkinen and M. Previtalli. Fully dynamic de Bruijn graphs. In *Proceedings of the 23rd Symposium on String Processing and Information Retrieval (SPIRE)*, to appear, 2016.
- [33] T. Gagie, S. J. Puglisi and D. Valenzuela. Analyzing Relative Lempel-Ziv reference construction. In *Proceedings of the 23rd Symposium on String Processing and Information Retrieval (SPIRE)*, to appear, 2016.

- [34] G. Badkobeh, T. Gagie, S. Grabowski, Y. Nakashima, S. J. Puglisi and S. Sugimoto. In *Proceedings of the 23rd Symposium on String Processing and Information Retrieval (SPIRE)*, to appear, 2016.
- [35] D. Belazzougui, T. Gagie, V. Mäkinen, M. Previtali and S. J. Puglisi. Bidirectional variable-order de Bruijn graphs. In *Proceedings of the 12th Latin American Symposium on Theoretical Informatics (LATIN)*, volume 9644 of *LNCS*, pages 164–178, 2016.
- [36] J. Fischer, T. Gagie, P. Gawrychowski and T. Kociumaka. Approximating LZ77 via small-space multiple-pattern matching. In *Proceedings of the 23rd European Symposium on Algorithms (ESA)*, volume 9294 of *LNCS*, pages 533–544, 2015.
- [37] C. Boucher, A. Bowe, T. Gagie, G. Manzini and J. Sirén. Relative select. In *Proceedings of the 22nd Symposium on String Processing and Information Retrieval (SPIRE)*, volume 9309 of *LNCS*, pages 149–155, 2015.
- [38] H. Bannai, T. Gagie, S. Inenaga, J. Kärkkäinen, D. Kempa, M. Piątkowski, S. J. Puglisi and S. Sugimoto. Diverse palindromic factorization is NP-complete. In *Proceedings of the 19th Conference on Developments in Language Theory (DLT)*, volume 9168 of *LNCS*, pages 85–96, 2015.
- [39] D. Belazzougui, F. Cunial, T. Gagie, N. Prezza and M. Raffinot. Composite repetition-aware data structures. In *Proceedings of the 26th Symposium on Combinatorial Pattern Matching (CPM)*, volume 9133 of *LNCS*, pages 26–39, 2015.
- [40] D. Belazzougui, T. Gagie, P. Gawrychowski, J. Kärkkäinen, A. Ordóñez, S. J. Puglisi and Y. Tabei. Queries on LZ-bounded encodings. In *Proceedings of the IEEE Data Compression Conference (DCC)*, pages 83–92, 2015.
- [41] T. Gagie, J. I. González-Nova, S. Ladra, G. Navarro and D. Seco. Faster compressed quadrees. In *Proceedings of the IEEE Data Compression Conference (DCC)*, pages 93–102, 2015.
- [42] T. Gagie, A. Hartikainen, J. Kärkkäinen, G. Navarro, S. J. Puglisi and J. Sirén. Document counting in compressed space. In *Proceedings of the IEEE Data Compression Conference (DCC)*, pages 103–112, 2015.

- [43] C. Boucher, A. Bowe, T. Gagie, S. J. Puglisi and K. Sadakane. Variable-order de Bruijn graphs. In *Proceedings of the IEEE Data Compression Conference (DCC)*, pages 383–392, 2015.
- [44] D. Belazzougui, T. Gagie, S. Gog, G. Manzini and J. Sirén. Relative FM-indexes. In *Proceedings of the 21st Symposium on String Processing and Information Retrieval (SPIRE)*, volume 8799 of *LNCS*, pages 52–64, 2014.
- [45] H. Ferrada, T. Gagie, S. Gog and S. J. Puglisi. Relative Lempel-Ziv with constant-time random access. In *Proceedings of the 21st Symposium on String Processing and Information Retrieval (SPIRE)*, volume 8799 of *LNCS*, pages 13–17, 2014.
- [46] S. Durocher, R. Fraser, T. Gagie, D. Mondal, M. Skala, and S. V. Thankachan. Indexed geometric jumbled pattern matching. In *Proceedings of the 25th Symposium on Combinatorial Pattern Matching (CPM)*, volume 8486 of *LNCS*, pages 110–119, 2014.
- [47] T. Gagie, C. Hoobin, and S. J. Puglisi. Block graphs in practice. In *Proceedings of the 2nd International Conference on Algorithms for Big Data (ICABD)*, volume 1146 of *CEUR Workshop Proceedings*, pages 30–36, 2014.
- [48] T. Gagie, G. Manzini, and D. Valenzuela. Compressed spaced suffix arrays. In *Proceedings of the 2nd International Conference on Algorithms for Big Data (ICABD)*, volume 1146 of *CEUR Workshop Proceedings*, pages 37–45, 2014.
- [49] T. Gagie, P. Gawrychowski, J. Kärkkäinen, Y. Nekrich and S. J. Puglisi. LZ77-based self-indexing with faster pattern matching. In *Proceedings of the 11th Latin American Symposium on Theoretical Informatics (LATIN)*, volume 8392 of *LNCS*, pages 731–742, 2014.
- [50] F. Cicalese, T. Gagie, E. Giaquinta, E. S. Laber, Z. Lipták, R. Rizzi, and A. I. Tomescu. Indexes for jumbled pattern matching in strings, trees and graphs. In *Proceedings of the 20th Symposium on String Processings and Information Retrieval (SPIRE)*, volume 8214 of *LNCS*, pages 56–63, 2013.
- [51] T. Gagie, D. Hermelin, G. M. Landau, and O. Weimann. Binary jumbled pattern matching on trees and tree-like structures. In *Proceedings of the 21st European Symposium on Algorithms (ESA)*, volume 8125 of *LNCS*, pages 517–528, 2013.

- [52] D. Belazzougui, T. Gagie, and G. Navarro. Better space bounds for parameterized range majority and minority. In *Proceedings of the 13th Symposium on Algorithms and Data Structures (WADS)*, volume 8037 of *LNCS*, pages 121–132, 2013.
- [53] T. Gagie, P. Gawrychowski, and Y. Nekrich. Heaviest induced ancestors and longest common substrings. In *Proceedings of the 25th Canadian Conference on Computational Geometry (CCCG)*, 2013.
- [54] T. Gagie, W.-K. Hon, and T.-H. Ku. New algorithms for position heaps. In *Proceedings of the 24th Symposium on Combinatorial Pattern Matching (CPM)*, volume 7922 of *LNCS*, pages 95–106, 2013.
- [55] T. Gagie, K. Karhu, G. Navarro, S. J. Puglisi, and J. Sirén. Document listing on repetitive collections. In *Proceedings of the 24th Symposium on Combinatorial Pattern Matching (CPM)*, volume 7922 of *LNCS*, pages 107–119, 2013.
- [56] J. Fischer, T. Gagie, T. Kopelowitz, M. Lewenstein, V. Mäkinen, L. Salmela and N. Välimäki. Forbidden patterns. In *Proceedings of the 10th Latin American Theoretical Informatics Symposium (LATIN)*, volume 7256 of *LNCS*, pages 327–337, 2012.
- [57] T. Gagie, K. Karhu, J. Kärkkäinen, V. Mäkinen, L. Salmela and J. Tarhio. Indexed multi-pattern matching. In *Proceedings of the 10th Latin American Theoretical Informatics Symposium (LATIN)*, volume 7256 of *LNCS*, pages 399–407, 2012.
- [58] T. Gagie, P. Gawrychowski, J. Kärkkäinen, Y. Nekrich and S. J. Puglisi. A faster grammar-based self-index. In *Proceedings of the 6th Conference on Language and Automata Theory and Applications (LATA)*, volume 7183 of *LNCS*, pages 240–251, 2012.
- [59] T. Gagie, P. Gawrychowski and S. J. Puglisi. Faster approximate pattern matching in compressed repetitive texts. In *Proceedings of the 22nd International Symposium on Algorithms and Computation (ISAAC)*, volume 7074 of *LNCS*, pages 653–662, 2011.
- [60] T. Gagie, M. He, J. I. Munro and P. K. Nicholson. Finding frequent items in compressed 2D arrays and strings. In *Proceedings of the 18th Symposium on String Processing and Information Retrieval (SPIRE)*, volume 7024 of *LNCS*, pages 295–300, 2011.

- [61] T. Gagie and K. Kärkkäinen. Counting colours in compressed strings. In *Proceedings of the 22nd Symposium on Combinatorial Pattern Matching (CPM)*, volume 6661 of *LNCS*, pages 197–207, 2011.
- [62] J. Barbay, T. Gagie, G. Navarro and Y. Nekrich. Alphabet partitioning for compressed rank/select and applications. In *Proceedings of the 21st International Symposium on Algorithms and Computation (ISAAC)*, volume 6507 of *LNCS*, pages 315–326, 2010.
- [63] A. Farzan, T. Gagie and G. Navarro. Entropy-bounded representation of point grids. In *Proceedings of the 21st International Symposium on Algorithms and Computation (ISAAC)*, volume 6507 of *LNCS*, pages 327–338, 2010.
- [64] T. Gagie, G. Navarro, S. J. Puglisi. Colored range queries and document retrieval. In *Proceedings of the 17th Symposium on String Processing and Information Retrieval (SPIRE)*, volume 6393 of *LNCS*, pages 67–81, 2010.
- [65] F. Cicalese, T. Gagie, A. Macula, M. Milanič and E. Triesch. A better bouncer’s algorithm. In *Proceedings of the Fifth Conference on Fun with Algorithms (FUN)*, volume 6099 of *LNCS*, pages 113–120, 2010.
- [66] P. Ferragina, T. Gagie and G. Manzini. Lightweight data indexing and compression in external memory. In *Proceedings of the 9th Latin American Theoretical Informatics Symposium (LATIN)*, volume 6034 of *LNCS*, pages 697–710, 2010.
- [67] T. Gagie and P. Gawrychowski. Grammar-based compression in a streaming model. In *Proceedings of the 4th Conference on Language and Automata Theory and Applications (LATA)*, volume 6031 of *LNCS*, pages 273–284, 2010.
- [68] T. Gagie, G. Navarro and Y. Nekrich. Fast and compact prefix codes. In *Proceedings of the 36th Conference on Current Trends in Theory and Practice of Computer Science (SOFSEM)*, volume 5901 of *LNCS*, pages 419–427, 2010.
- [69] P. Gawrychowski and T. Gagie. Minimax trees in linear time with applications. Tied for *Best Student Paper Award* in *Proceedings of the 20th International Workshop on Combinatorial Algorithms (IWOCA)*, volume 5874 of *LNCS*, pages 278–288, 2009.

- [70] T. Gagie, S. J. Puglisi and A. Turpin. Range quantile queries: Another virtue of wavelet trees. In *Proceedings of the 16th Symposium on String Processing and Information Retrieval (SPIRE)*, volume 5721 of *LNCS*, pages 1–6, 2009.
- [71] T. Gagie and Y. Nekrich. Worst-case optimal adaptive prefix coding. In *Proceedings of the 11th Algorithms and Data Structures Symposium (WADS)*, volume 5664 of *LNCS*, pages 315–326, 2009.
- [72] T. Gagie. On the value of multiple read/write streams for data compression. In *Proceedings of the 20th Symposium on Combinatorial Pattern Matching (CPM)*, volume 5577 of *LNCS*, pages 68–77, 2009.
- [73] T. Gagie, M. Karpinski and Y. Nekrich. Low-memory adaptive prefix coding. In *Proceedings of the IEEE Data Compression Conference (DCC)*, pages 13–22, 2009.
- [74] T. Gagie. Sorting streamed multisets. In *Proceedings of the 10th Italian Conference on Theoretical Computer Science (ICTCS)*, pages 130–138, 2007.
- [75] T. Gagie and G. Manzini. Space-conscious compression. In *Proceedings of the 32nd Symposium on Mathematical Foundations of Computer Science (MFCS)*, volume 4708 of *LNCS*, pages 206–217, 2007.
- [76] T. Gagie and G. Manzini. Move-to-front, distance coding, and inversion frequencies revisited. In *Proceedings of the 18th Symposium on Combinatorial Pattern Matching (CPM)*, volume 4580 of *LNCS*, pages 71–82, 2007.
- [77] T. Gagie. Dynamic asymmetric communication. In *Proceedings of the 13th Symposium on Structural Information and Communication Complexity (SIROCCO)*, volume 4056 of *LNCS*, pages 310–318, 2006.
- [78] T. Gagie. A note on sequence prediction. In *Proceedings of the 9th Canadian Workshop on Information Theory (CWIT)*, pages 304–306, 2005.
- [79] T. Gagie. Dynamic Shannon coding. In *Proceedings of the 12th European Symposium on Algorithms (ESA)*, volume 3221 of *LNCS*, pages 359–370, 2004.
- [80] T. Gagie. New ways to construct binary search trees. In *Proceedings of the 14th International Symposium on Algorithms and Computation (ISAAC)*, volume 2906 of *LNCS*, pages 537–543, 2003.

Other publications

- [81] T. Gagie and G. Manzini. Dictionary-based data compression. In M.-Y. Kao, editor, *Encyclopedia of Algorithms*, 2nd Edition, pages 538–543. Springer, 2016.
- [82] T. Gagie. Rank and select operations on sequences. In M.-Y. Kao, editor, *Encyclopedia of Algorithms*, 2nd Edition, 1776–1780. Springer, 2016.
- [83] T. Gagie. On the value of multiple read/write streams for data compression. In *Information Theory, Combinatorics, and Search Theory - In Memory of Rudolf Ahlswede*, volume 7777 of *LNCS*, pages 284–297. Springer, 2013.
- [84] T. Gagie. *New Algorithms and Lower Bounds for Sequential-Access Data Compression*. Doctoral thesis, Bielefeld University, 2009.
- [85] T. Gagie and G. Manzini. Dictionary-based data compression. In M.-Y. Kao, editor, *Encyclopedia of Algorithms*, 1st Edition. Springer, 2008.
- [86] T. Gagie. *Dynamic Length-Restricted Coding*. MSc thesis, University of Toronto, 2003.