Taylor J. Smith

Contact Information

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		Antigonish, NS B2G 2W5			
		Canada		*Citizenship:*	Canadian

Research Interests

Primary interests in formal languages/automata theory (particularly in two dimensions), combinatorics on words (particularly in two dimensions), computability/complexity theory; secondary interests in analysis of algorithms, coding theory.

Education

2017 – 2021	Doctor of Philosophy, Queen's University Supervisor: Kai Salomaa
2015 – 2017	Master of Mathematics, University of Waterloo Supervisor: Jeffrey Shallit
2011 – 2015	Bachelor of Science (Honours), University of Western Ontario Supervisor: Helmut Jürgensen

Employment

2021 – present	Department of Computer Science, St. Francis Xavier University

	2023 – present	Assistant Professor (tenure-track appointment)
	2021 – 2023	Assistant Professor (limited term appointment)

2017 – 2021	School of Computing, Queen's University

	Jan. – Apr. 2019	Teaching Fellow
	2017 – 2021	Graduate Research Student

2015 – 2017	Cheriton School of Computer Science, University of Waterloo

	May – Aug. 2017	Sessional Instructor
	2015 – 2017	Graduate Research Student

2014 – 2015	Research Assistant, Department of Computer Science, University of Western Ontario

Affiliations

2021 – present	Director, Formal Languages and Automata Research Lab Department of Computer Science, St. Francis Xavier University
2021 – present	Associate Member, Formal Languages and Automata Theory Group School of Computing, Queen's University

Funding

2024 – 2029	Discovery Grant	(C\$125 000)
	Natural Sciences and Engineering Research Council of Canada	

2024 – 2025	Discovery Launch Supplement Natural Sciences and Engineering Research Council of Canada	(C\$12 500)
2023 – 2025	University Council for Research Grant St. Francis Xavier University	(C\$7 000)
2023 – 2028	Start-up funding Faculty of Science, St. Francis Xavier University	(C\$25 000)
2021 – 2024	Dr. H. Stanley and Doreen Alley Heaps Chair Endowment Faculty of Science, St. Francis Xavier University	(C\$15 000)
2017 – 2021	Ontario Graduate Scholarship Government of Ontario	(C\$60 000)
2017 – 2021	Queen's Graduate Scholarship School of Graduate Studies, Queen's University	(C\$12 000)
2015 – 2017	Graduate Student Award Faculty of Mathematics, University of Waterloo	(C\$5 000)

Honours and Awards

2021 – 2024	Dr. H. Stanley and Doreen Alley Heaps Associate, St. Francis Xavier University
2020	Ian A. Macleod Graduate Student Award, Queen's School of Computing (C\$650)
2020	TA/TF Excellence Award, Queen's Society of Graduate & Professional Students
2019	Sheng Yu Award for Best Paper, CIAA 2019 (€250)
2018	Excellence in Teaching Assistance Award, Queen's School of Computing
2017	Associate Member, Sigma Xi Scientific Research Honour Society
2015	Szilard Award in Theoretical Computer Science, University of Western Ontario (C\$1 000)
2015	First place in session, UWORCS 2015

Publications

Publications in theoretical computer science customarily list authors alphabetically.

Peer-reviewed Journal Articles

[J6] Alastair May and Taylor J. Smith. Illustrating finite automata with Grail+ and Ti*k*Z. *TUGboat: The Communications of the T_EX Users Group.* To appear.

[J5] Arto Salomaa, Kai Salomaa, and Taylor J. Smith. Descriptional complexity of finite automata – selected highlights. *Fundamenta Informaticae.* To appear.

[J4] Taylor J. Smith and Kai Salomaa. Recognition and complexity results for projection languages of two-dimensional automata. *Journal of Automata, Languages, and Combinatorics*, 28(1–3):201–220, 2023. Invited extended version of DCFS 2020 article.

[J3] Taylor J. Smith and Kai Salomaa. Decision problems and projection languages for restricted variants of two-dimensional automata. *Theoretical Computer Science*, 870:153–164, May 2021. Invited extended version of CIAA 2019 article.

[J2] Da-Jung Cho, Yo-Sub Han, Kai Salomaa, and Taylor J. Smith. Site-directed insertion: Language equations and decision problems. *Theoretical Computer Science*, 798:40–51, Dec. 2019. Invited extended version of DCFS 2018 article.

[J1] Guilhem Gamard, Gwenaël Richomme, Jeffrey Shallit, and Taylor J. Smith. Periodicity in rectangular arrays. *Information Processing Letters*, 118:58–63, Feb. 2017.

Peer-reviewed Conference Articles

[C6] Taylor J. Smith. Two-dimensional typewriter automata. In H. Bordihn, G. Horváth, and G. Vaszil, editors, *Short Papers of the 12th Workshop on Non-Classical Models of Automata and Applications (NCMA 2022)*, pages 38–45, Debrecen, Hungary. Faculty of Informatics, University of Debrecen, Aug. 2022.

[C5] Taylor J. Smith and Kai Salomaa. Degrees of restriction for two-dimensional automata. In S. Maneth, editor, *Proceedings of the 25th International Conference on Implementation and Application of Automata (CIAA 2021)*, volume 12803 of *Lecture Notes in Computer Science*, pages 77–89, Bremen, Germany. Springer, Jul. 2021.

[C4] Taylor J. Smith and Kai Salomaa. Concatenation operations and restricted variants of two-dimensional automata. In T. Bureš et al., editors, *Proceedings of the 47th International Conference on Current Trends in Theory and Practice of Computer Science (SOFSEM 2021)*, volume 12607 of *Lecture Notes in Computer Science*, pages 147–158, Bolzano-Bozen, Italy. Springer, Jan. 2021.

[C3] Taylor J. Smith and Kai Salomaa. Recognition and complexity results for projection languages of two-dimensional automata. In G. Jirásková and G. Pighizzini, editors, *Proceedings of the 22nd International Conference on Descriptional Complexity of Formal Systems (DCFS 2020)*, volume 12442 of *Lecture Notes in Computer Science*, pages 206–218, Vienna, Austria. Springer, Aug. 2020.

[C2] Taylor J. Smith and Kai Salomaa. Decision problems for restricted variants of two-dimensional automata. In M. Hospodár and G. Jirásková, editors, *Proceedings of the 24th International Conference on Implementation and Application of Automata (CIAA 2019)*, volume 11601 of *Lecture Notes in Computer Science*, pages 222–234, Košice, Slovakia. Springer, Jul. 2019.

[C1] Da-Jung Cho, Yo-Sub Han, Kai Salomaa, and Taylor J. Smith. Site-directed insertion: Decision problems, maximality and minimality. In S. Konstantinidis and G. Pighizzini, editors, *Proceedings of the 20th International Conference on Descriptional Complexity of Formal Systems (DCFS 2018)*, volume 10952 of *Lecture Notes in Computer Science*, pages 49–61, Halifax, Canada. Springer, Jul. 2018.

Technical Reports

[R1] Taylor J. Smith. Two-dimensional automata. Technical report 2019-637, School of Computing, Queen's University, Kingston, Canada, Jan. 2019. 27pp.

Theses

[T3] Taylor J. Smith. Closure, decidability, and complexity results for restricted variants of two-dimensional automata. Doctoral thesis, Queen's University, 2021. xi+147pp.

[T2] Taylor J. Smith. Properties of two-dimensional words. Master's thesis, University of Waterloo, 2017. vii+58pp.

[T1] Taylor J. Smith. A study of solid hypercodes. Bachelor's thesis, University of Western Ontario, 2015. v+30pp.

Submitted Works

[S1] Pantelis Andreou, Stavros Konstantinidis, and Taylor J. Smith. Improved randomized approximation of hard universality and emptiness problems, Mar. 2024. arXiv:2403.08707.

Presentations and Seminars

Conference Presentations

– Two-dimensional typewriter automata. Presented at *Workshop on Non-Classical Models of Automata and Applications (NCMA 2022)*, Debrecen, Hungary, Aug. 2022.

- Degrees of restriction for two-dimensional automata. Presented at *International Conference on Implementation and Application of Automata (CIAA 2021)*, Bremen, Germany (virtual conference), Jul. 2021.

- Concatenation operations and restricted variants of two-dimensional automata. Presented at *International Conference on Current Trends in Theory and Practice of Computer Science (SOFSEM 2021)*, Bolzano-Bozen, Italy (virtual conference), Jan. 2021.

- Decision problems for restricted variants of two-dimensional automata. Presented at *International Conference on Implementation and Application of Automata (CIAA 2019)*, Košice, Slovakia, Jul. 2019.

- Site-directed insertion: Decision problems, maximality and minimality. Presented at *International Conference on Descriptional Complexity of Formal Systems (DCFS 2018)*, Halifax, Canada, Jul. 2018.

Conference Presentations (with no corresponding article)

- Extending the Lyndon-Schützenberger theorem. Presented at *Southern Ontario Graduate Mathematics and Statistics Conference (SOGMSC 2016)*, Guelph, Canada, Jun. 2016.

- Solid hypercodes. Presented at *University of Western Ontario Research in Computer Science (UWORCS 2015)*, London, Canada, Apr. 2015.

Seminars

- Formal languages and automata theory in two dimensions. Presented at *St. Francis Xavier University Department of Computer Science seminar*, Antigonish, Canada, Feb. 2023.

- Some results on words in two dimensions. Presented at *Queen's University Formal Languages & Automata Theory seminar*, Kingston, Canada, Oct. 2017.

- Periodicity in rectangular arrays. Presented at *University of Waterloo Algorithms & Complexity seminar*, Waterloo, Canada, Apr. 2016.

Teaching

For more details, please see my Teaching Portfolio.

Instructor

Winter 2024	CSCI 355: Algorithm Design and Analysis	(18 students, rating TBD)
	CSCI 544: Computational Logic	(31 students, rating TBD)
Fall 2023	CSCI 356: Theory of Computing	(9 students, rating 5.00/5.00)
	CSCI 541: Theory of Computing	(32 students, rating 5.00/5.00)
Winter 2023	CSCI 355: Algorithm Design and Analysis	(7 students, rating 5.00/5.00)
	CSCI 435: Algorithms and Complexity	(6 students, rating 4.67/5.00)
	CSCI 544: Computational Logic	(38 students, rating 4.86/5.00)
Fall 2022	CSCI 356: Theory of Computing	(6 students, rating 5.00/5.00)
	CSCI 541: Theory of Computing	(34 students, rating 4.77/5.00)
	CSCI 550: Approximation Algorithms	(31 students, rating 4.87/5.00)
Winter 2022	CSCI 355: Algorithm Design and Analysis	(22 students, rating 4.50/5.00)
	CSCI 544: Computational Logic	(29 students, rating 4.83/5.00)
	CSCI 554: Matrix Computation	(27 students, rating 4.87/5.00)
Fall 2021	CSCI 356: Theory of Computing	(35 students, rating 4.38/5.00)
	CSCI 541: Theory of Computing	(18 students, rating 5.00/5.00)
	CSCI 550: Approximation Algorithms	(21 students, rating 4.40/5.00)
Winter 2019	CISC 203: Discrete Mathematics for Computing II	(49 students, rating 4.7/5.0)

Spring 2017   CS 240: Data Structures and Data Management   (340 students, rating 4.3/5.0)

Teaching Assistant/Instructional Apprentice

2017 – 2021   CISC 203: Discrete Mathematics for Computing II (2×)
(Queen's)   CISC/CMPE 223: Software Specifications (3×)
                        CISC 462: Computability and Complexity (2×)

2015 – 2017   CS 234: Data Types and Structures (1× TA, 1× IA)
(Waterloo)   CS 240: Data Structures and Data Management (1× TA, 1× IA)
                        CS 462/662: Formal Languages and Parsing (1×)

Curriculum Development

Fall 2023   Revised ∼60 pages of lecture materials, CSCI 541: Theory of Computing

Winter 2023   Fully developed new course offering, CSCI 435: Algorithms and Complexity

Winter 2022   Created ∼75 pages of lecture materials, CSCI 544: Computational Logic
                        Created ∼65 pages of lecture materials and code, CSCI 554: Matrix Computation

Fall 2021   Fully developed new course offering, CSCI 550: Approximation Algorithms
                        Created ∼110 pages of lecture materials, CSCI 356/541: Theory of Computing

Winter 2019   Created ∼110 pages of lecture materials, CISC 203: Discrete Mathematics for Computing II

Professional Development

2020   Certificate in Professional Development in University Teaching and Learning
                        Centre for Teaching and Learning, Queen's University

2016   Fundamentals of University Teaching Program
                        Centre for Teaching Excellence, University of Waterloo

Mentorship and Supervision

Undergraduate Students

2024   Alastair May, undergraduate summer research student
                        Project: *"Improving student learning via interactive AI"*

2023   Liam Johnston, undergraduate summer research student
                        (co-supervised with Milton King, St. Francis Xavier University)
                        Project: *"Detecting authors with depression using natural language processing"*

2023   Alastair May, undergraduate summer research student
                        Project: *"Creating visual representations of finite automata"*

2022   Alastair May, undergraduate summer research student
                        Project: *"Augmenting a symbolic computation tool with two-dimensional automata"*

Student Honours and Awards

2024   Alastair May, Alley Heaps Undergraduate Research Internship (C$8 500)
2023   Liam Johnston, Alley Heaps Undergraduate Research Internship (C$8 000)
2023   Alastair May, Alley Heaps Undergraduate Research Internship (C$8 000)
2022   Alastair May, Science Atlantic Computer Science Communication Award
2022   Alastair May, Canada Summer Jobs Grant (C$1 870)
2022   Alastair May, Alley Heaps Undergraduate Research Internship (C$7 500)

Membership on Thesis Committees

2023 – present	Aravind Raghuraman, master's student Thesis: *TBD*
2023 – 2024	Jay Turnsek, undergraduate honours student Thesis: *"Live play type prediction in Canadian university football"*
2022 – 2023	Chenhao Qi, undergraduate honours student Thesis: *"Observing the performance of KV store under different energy saving strategies"*

Service

Department Committees

2022 – present	Promotion, Outreach, and Inclusion Committee, StFX Department of Computer Science
2020	Graduate Committee, Queen's School of Computing
2017 – 2020	School Council, Queen's School of Computing
2014 – 2015	Curriculum Committee, Western Department of Computer Science

Faculty and University Committees

2023	Faculty Listserv Committee (ad hoc), St. Francis Xavier University
2016 – 2017	Graduate Studies Committee, Waterloo Faculty of Mathematics

External Committees

2024 – present	International Federation for Information Processing (IFIP) Working Group 1.2 on Descriptional Complexity

Conferences and Seminars

2018	Program Committee Chair, Queen's Computing Student Research Conference (CSearch)
2015 – 2017	Organizer, Algorithms and Complexity Open Problems Seminar, University of Waterloo
2015	Organizing Committee Chair, Western Computer Science Academic Colloquium

Outreach

2021 – 2023	Judge, Science Atlantic Mathematics, Statistics, and Computer Science Conference
2017	Judge, Western Student Research Conference

Professional Memberships

2016 – present	Association for Computing Machinery (ACM) (including membership in SIG on Algorithms and Computation Theory)

	2022 – present	Member
	2016 – 2021	Student Member

2016 – present	Institute of Electrical and Electronics Engineers (IEEE) (including memberships in Computer Society, TC on Mathematical Foundations)

	2022 – present	Member
	2016 – 2021	Student Member

Refereeing and Reviewing

Referee	*Information and Computation*
	International Journal of Foundations of Computer Science
	Journal of Automata, Languages, and Combinatorics
	Mathematical Reviews
	Theoretical Computer Science
External reviewer	Conference on Implementation and Application of Automata (CIAA)
	Descriptional Complexity of Formal Systems (DCFS)
	Developments in Language Theory (DLT)
	Non-Classical Models of Automata and Applications (NCMA)
	Current Trends in Theory and Practice of Computer Science (SOFSEM)
	Symposium on Theoretical Aspects of Computer Science (STACS)

Miscellaneous

2019 – 2020	President, Queen's Graduate Computing Society
2014 – 2015	President, Western Computer Science Undergraduate Society

Other Information

Erdős number	2 (via Paul Erdős → Jeffrey Shallit → me)
Balance, Bank of San Serriffe	0x$1.00
Personal interests	Genealogy, heraldry, numismatics, philately, vexillology, language learning (i.e., French). Curator of the Montréal 1976 Olympic Collection.