Alejandro T. Erickson

CONTACT INFORMATION

School of Engineering and
Computing Sciences, Durham University
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EDUCATION

University of Victoria, Victoria, Canada

Ph.D., Department of Computer Science — Aug. 2013

- Dissertation title: *Monomino-Domino Tatami Coverings*
- Advisor: Prof. Frank Ruskey
- External examiner: Prof. Ron Graham
- Areas of Study: Combinatorial algorithms, computational complexity, computational geometry, matchings in graphs, nested recurrence relations.

University of Waterloo, Waterloo, Canada

M.Math, Combinatorics and Optimization — Dec. 2008

- Thesis title: *Negative correlation properties for matroids*
- Advisor: Prof. David G. Wagner
- Areas of Study: Matroid and graph theory, probability.

Simon Fraser University, Burnaby, Canada

B.Sc., First Class Honours, Department of Mathematics — May 2007

AWARDS

University of Victoria, Victoria, Canada

- Charles Humphrey Award, $2,550 — 2011
- Charles Humphrey Award, $2,500 — 2010
- Nominated for Vanier Canadian Graduate Scholarship — 2010
- University Fellowship, $28,500 — 2009-2010

Simon Fraser University, Burnaby, Canada

- Undergraduate Research Prize — 2007
- Natural Sciences and Engineering Research Council of Canada, Undergraduate Student Research Award (NSERC USRA), $4,500 — 2006
- University Open Scholarship, $8,900 — 2004–2006.

RESEARCH INTERESTS

Combinatorial algorithms, computational geometry, datacenter networks, graph theory and applications, tilings and coverings.

RESEARCH

Department of Computer Science, University of Victoria, Victoria, Canada

Visiting Scholar — Aug. 2015 to Nov. 2015

- Invited by Prof. Frank Ruskey and Prof. Yvonne Coady.

School of Engineering and Computing Sciences, **Durham University**, Durham, UK

Postdoctoral Research Associate — Sept. 2013 to Present

- EPSRC grant EP/K015680/1 and related grant EP/K015699/1 (University of Manchester): "Interconnection Networks: Practice Unites with Theory"
- Principal Investigator: Prof. Iain A. Stewart
- Area of research: Datacenter networks with a focus on topology, throughput, relating graph theoretic metrics to real-world performance, and innovative datacenter network designs.

Teaching Experience

Durham University, Durham, United Kingdom

Sessional Lecturer for Logic and Discrete Structures — Jan. to Apr. 2015

- Highly praised for creative use of classroom technology.
- Very favourable student evaluation scores.

Brilliant Club Tutor — July 2014 to July 2015

- Develop and deliver mini-course based on my Ph.D. research.
- Student's work selected for publication in *The Scholar*.

University of Victoria, Victoria, Canada

Guest Lecturer on SAT-solvers — Oct 2015

- Deliver two graduate-level lectures.

Teaching Assistant — 2011–2012

Grader for Numerical Analysis — Autumn 2012
Teaching Assistant for Foundations of Computer Science — Spring 2012
Grader for Algorithms and Data Structures II — Autumn 2011

University of Waterloo, Waterloo, Canada

Teaching Assistant — 2007–2008

Grader for Linear Optimization — Spring 2008
Teaching Assistant for Linear Algebra — Autumn 2007

Simon Fraser University, Burnaby, Canada

Teaching Assistant — 2006–2007

Teaching Assistant for Vector and Complex Analysis for Applied Sciences — Summer 2007
Teaching Assistant for 'The Maple Course' — Summer 2007
- Two day workshop on Maple mathematics software.

Grader and Lab Assistant for Calculus I for Biology — Autumn 2006

Undergraduate Research

Simon Fraser University, Burnaby, Canada

Research Assistant at the Centre for Experimental and Constructive Mathematics — Aug. 2007
- Supervisor: Prof. Michael Monagan
- `GraphTheory` package in Maple 13.

NSERC USRA at the Centre for Experimental and Constructive Mathematics — Summer 2006
- Supervisor: Prof. Michael Monagan
- `GraphTheory` package in Maple 12.

Research Assistant at the Centre for Experimental and Constructive Mathematics — Summer 2005
- Supervisor: Prof. Michael Monagan
- Univariate Polynomial Factorization in Maple via Combinatorial Trial Division.

Academic Service

Durham University, Durham, United Kingdom

Organiser of Computer Science Junior Seminar — Sept. 2014 to Aug. 2015

Department of Computer Science, **University of Victoria**, Victoria, Canada

Member of Prize and Awards Committee — Sept. 2010 to Aug. 2011

Graduate representative to Graduate Student Society — Sept. 2010 to Aug. 2011

Department of Mathematics, **Simon Fraser University**, Burnaby, Canada

President of Canadian Undergraduate Mathematics Conference 2007

Three times *elected President of the Math Student Union* Jan. 2006 to Aug. 2007

Member of student panel for external review Mar. 2006

Professional Service

Programme Committees

IEEE International Conference on Communications (ICC) 2016, technical programme committee for Cloud Communications and Networking.

Editorial Service

Crux Mathematicorum, Guest Editor Jan. 2015 to Present

Referee Service

The Computer Journal	2013–Present
International Symposium on Algorithms and Data Structure (WADS)	2015
International Colloquium on Automata, Languages, and Programming (ICALP)	2015
International Journal of Computer Mathematics	2015
Journal of Parallel and Distributed Computing	2014
Transactions of the Royal Society of South Africa	2013
International Workshop on Combinatorial Algorithms (IWOCA)	2013
ACM-SIAM Symposium on Discrete Algorithms (SODA)	2012
International Workshop on Combinatorial Algorithms (IWOCA)	2012
International Conference on the Theory and Application of Diagrams	2012
International Conference on the Theory and Application of Diagrams	2010

American Mathematical Society Mathematical Reviews

(MR3007213) L. Sallows. On self-tiling tile sets. *Mathematics Magazine*, 85(5):pp. 323–333, 2012.

(MR2843659) M. Kirby and R. Umble. Edge tessellations and stamp folding puzzles. *Mathematics Magazine*, 84(4):283–289, 2011.

(MR2914179) I. Gambini and L. Vuillon. Non-lattice-periodic tilings of $\mathbb{R}^3$ by single polycubes. *Theoretical Computer Science*, 432:52–57, 2012.

(MR2854227) A. M. Berkoff, J. M. Henle, A. E. McDonough, and A. P. Wesolowski. Possibilities and impossibilities in square-tiling. *International Journal of Computational Geometry & Applications*, 21(5):545–558, 2011.

(MR2853056) I. Gambini and L. Vuillon. How many faces can polycubes of lattice tilings by translation of $\mathbb{R}^3$ have? *Electronic Journal of Combinatorics*, 18(1):Paper 199, 2011.

Service in the Community

Founder and Managing Director of GeoBurst: Zest for Mathematics

Nov. 2011 to Aug. 2013

- Develop and organize mathematics-themed interactive shows for children at schools, summer camps, private functions, trade shows, and major science exhibits for over 1000 participants.

Activity Developer and Coordinator for Math Catcher

Dec. 2011 to Aug. 2013 and in Oct. 2015

- Travel with award winning educator, Prof. Veselin Jungic, to give joint mathematics-themed presentations at Aboriginal schools in British Columbia and First Nations Education Steering Committee conference.

Contributor of math-themed content to Instructables.com, YouTube.com, and thingiverse.com

Dec. 2010 to Present

- Winner of First Prize in the "Hands-on Learning" contest on Instructables.com.

Skilled photographer and contributor to flickr and Wikipedia 2006 to Present

REFEREED JOURNAL PUBLICATIONS

[1] X. Wang, A. Erickson, J. Fan, and X. Jia. Hamiltonian properties of DCell networks. *The Computer Journal*, 58(11):2944–2955, 2015.

[2] A. Erickson and M. Schurch. Monomer-dimer tatami tilings of square regions. *Journal of Discrete Algorithms*, 16(0):258–269, Oct. 2012.

[3] A. Erickson. Sums of squares and negative correlation for spanning forests of series parallel graphs. *The Australasian Journal of Combinatorics*, 52:75–89, 2012.

[4] A. Erickson, A. Isgur, B. W. Jackson, F. Ruskey, and S. M. Tanny. Nested recurrence relations with conolly-like solutions. *SIAM Journal on Discrete Mathematics*, 26(1):206–238, Jan. 2012.

[5] A. Erickson, F. Ruskey, M. Schurch, and J. Woodcock. Monomer-dimer tatami tilings of rectangular regions. *The Electronic Journal of Combinatorics*, 18(1):24, 2011.

REFEREED CONFERENCE PUBLICATIONS

[6] A. Erickson, A. Kiasari, J. Navaridas, and I. A. Stewart. An efficient shortest-path routing algorithm in the data centre network DPillar. In Z. Lu, D. Kim, W. Wu, W. Li, and D.-Z. Du, editors, *Proc. of the 9th Annual International Conference on Combinatorial Optimization and Applications (COCOA)*, volume 9486 of *LNCS*, pages 209–220. Springer International Publishing, Dec. 2015.

[7] A. Erickson, A. E. Kiasari, J. Navaridas, and I. A. Stewart. Routing algorithms for recursively-defined data centre networks. In *Trustcom/BigDataSE/ISPA, 2015 IEEE*, volume 3, pages 84–91. IEEE, Aug. 2015.

[8] A. Erickson and F. Ruskey. Generating tatami coverings efficiently. In *Proc. of the international conference Génération Aléatoire de Structures Combinatoires (GASCom), Bertinoro, Italy*, June 2014. 8 pages.

[9] A. Erickson and F. Ruskey. Domino Tatami Covering is NP-complete. In *Proc. of the International Workshop on Combinatorial Algorithms (IWOCA)*, volume 8288 of *LNCS*, pages 140–149. Springer Berlin / Heidelberg, July 2013.

[10] A. Erickson. TatamiMaker: A combinatorially rich mechanical game board. In G. Hart and R. Sarhangi, editors, *Proc. of the international conference Bridges: Mathematics, Music, Art, Architecture, Culture*, pages 63–70. Tessellations Publishing, Phoenix, Arizona, June 2013.

[11] A. Erickson and M. Schurch. Enumerating tatami mat arrangements of square grids. In *Proc. of the International Workshop on Combinatorial Algorithms (IWOCA)*, volume 7056 of *LNCS*, pages 223–235. Springer Berlin / Heidelberg, Jan. 2011.

[12] A. Erickson, F. Ruskey, M. Schurch, and J. Woodcock. Auspicious tatami mat arrangements. In *Proc. of the international Computing and Combinatorics Conference (COCOON)*, volume 6196 of *LNCS*, pages 288–297. Springer Berlin / Heidelberg, July 2010.

[13] E. Chambers, A. Erickson, S. Fekete, J. Lenchner, J. Sember, S. Venkatesh, U. Stege, S. Stolpner, C. Weibel, and S. Whitesides. Connectivity graphs of uncertainty regions. In *Proc. of the International Symposium on Algorithms and Computation (ISAAC)*, volume 6507 of *LNCS*, pages 434–445. Springer / Heidelberg, Jan. 2010.

[14] M. Cheng, E. Delisle, A. Erickson, S. Ganti, F. Mason, N. Vining, and S. Whitesides. Collaborative problem solving: integrating theory and practice in the classroom. In *Proc. of the 15th Western Canadian Conference on Computing Education*, WCCCE '10, pages 15:1–15:5. ACM, 2010.

THESIS AND DISSERTATION

[15] A. Erickson. *Monomino-Domino Tatami Coverings*. PhD thesis, University of Victoria, Canada, August 2013.

[16] A. Erickson. Negative correlation properties for matroids. Master's thesis, Combinatorics and Optimization, University of Waterloo, Waterloo, Ontario, Canada, 2008.

PAPERS IN PREPARATION OR SUBMITTED

[17] A. Erickson, A. Kiasari, J. Navaridas, and I. A. Stewart. Star-replaced networks: A generalised class of dual-port server-centric data centre networks. Manuscript in preparation, 2015.

[18] A. Erickson, A. Kiasari, J. Navaridas, and I. A. Stewart. Routing algorithms for the data centre network DPillar. Manuscript in preparation, 2015.

[19] A. Erickson, A. Kiasari, J. Navaridas, and I. A. Stewart. Bisection width of dual-port, server-centric data centre networks. Manuscript in preparation, 2015.

[20] A. Erickson and I. A. Stewart. The influence of data centre usage on symmetry in data centre network design. Manuscript in preparation, 2015.

[21] E. Chambers, A. Erickson, S. Fekete, J. Lenchner, J. Sember, S. Venkatesh, U. Stege, S. Stolpner, C. Weibel, and S. Whitesides. Connectivity graphs of uncertainty regions. 29 pages. Submitted to a journal, 2015.

[22] A. Erickson and F. Ruskey. Enumerating maximal tatami mat coverings of square grids with v vertical dominoes. Manuscript in preparation. http://arxiv.org/abs/1304.0070, 2013.

OTHER PUBLICATIONS

[23] A. Erickson, M. Guay-Paquet, and J. Lenchner. Zero sumz: The 7-card challenge. Published at The Game Crafter, April 2012.

[24] A. Erickson. Tomoku! 80 challenging puzzles. Self Published, Victoria, Canada, Jan. 2012.

[25] A. Erickson. Japanese tatami mat tilings: No four tiles meet. *Canadian Mathematical Society Student Committee Quarterly: Notes from the Margin*, 2:1–3, 2011.

ARTISTIC ENDEAVOURS

[26] A. Erickson. Five 2-colourings of the Petersen graph. *Juried art exhibition at Bridges 2014: Mathematics, Music, Art, Architecture, Culture, Seoul, Korea*, August 2014. Also on display at Durham University, United Kingdom, Feb. 2014 – May 2015; and, in the logo of *Connections in Discrete Mathematics, A celebration of the work of Ron Graham,* Simon Fraser University, Vancouver, Canada, June 15–19, 2015.

Conference and Workshop Participation

Conference presentations

(C1) A. Erickson, A. Kiasari, J. Navaridas, and I. A. Stewart. An efficient shortest-path routing algorithm in the data centre network DPillar. In *the 9th Annual International Conference on Combinatorial Optimization and Applications (COCOA)*, Houston, USA, Dec. 18–20, 2015.

(C2) A. Erickson, A. Kiasari, J. Navaridas, and I. A. Stewart. Routing algorithms for recursively-defined data centre networks. In *the 13th IEEE International Symposium on Parallel and Distributed Processing with Applications (ISPA)*, Helsinki, Finland, Aug. 20–22, 2015.

(C3) A. Erickson and F. Ruskey. Generating tatami coverings efficiently. In the international conference *Génération Aléatoire de Structures Combinatoires (GASCom),* Bertinoro, Italy, July 23–25, 2014.

(C4) A. Erickson and F. Ruskey. Domino Tatami Covering is NP-complete. In *International Workshop on Combinatorial Algorithms (IWOCA),* Rouen University, Rouen, France, July 10–12, 2013.

(C5) A. Erickson. Domino Tatami Cover is NP-complete. In *The 4th biennial Canadian Discrete and Algorithmic Mathematics Conference (CanaDAM)*, Memorial University of Newfoundland, Canada, June 10–13, 2013.

(C6) A. Erickson and M. Schurch. Enumerating tatami mat arrangements of square grids. In *International Workshop on Combinatorial Algorithms (IWOCA),* University of Victoria, Canada, June 20–22, 2011.

(C7) A. Erickson. Enumerating tatami tilings. In *The 3rd biennial Canadian Discrete and Algorithmic Mathematics Conference (CanaDAM)*, University of Victoria, Canada, May 31–June 3, 2011.

(C8) A. Erickson, F. Ruskey, M. Schurch and J. Woodcock. Auspicious tatami mat arrangements. In *The 16th Annual International Computing and Combinatorics Conference (COCOON)*, Nha Trang, Vietnam, July 19–21, 2010.

(C9) A. Erickson. Transformations in the complex plane. In *Canadian Undergraduate Mathematics Conference (CUMC)*, Simon Fraser University, Canada, July 18–21, 2007.

Poster presentations

(P1–P2) A. Erickson. Tatami mat arrangements of square grids with v vertical dimers. In *Computational Math Day (CMD 2012)*, Simon Fraser University, Canada, Aug. 8, 2012. Also in *Research Day 2014*, Durham University, Durham, UK, Oct. 2, 2014.

(P3) A. Erickson. Monomer-dimer tatami tilings. In *2010 Canadian Mathematical Society (CMS) Winter Meeting*, Vancouver, Canada, Dec. 4–6, 2010.

(P4–P5) A. Erickson, M. Ghebleh, S. Lo, M. Monagan. New features of the `GraphTheory` package. In *Centre for Experimental and Constructive Mathematics (CECM) Annual Summer Meeting 2006*, Simon Fraser University, 2006. Also in *Maple Conference 2006*, Waterloo, Canada, July 23–26, 2006.

(P6–P7) A. Erickson, M. Monagan and H. Le. Univariate Polynomial Factorization in Maple via Combinatorial Trial Division. In *Centre for Experimental and Constructive Mathematics (CECM) Annual Summer Meeting 2005*, Simon Fraser University, Aug. 3, 2005. Also in *Maple Conference 2005*, Waterloo, Canada, July 17–21, 2005.

Workshops attended / invited

(W1) Life as an Early Career Academic or Research Associate. *Research Day*, School of Engineering and Computing Sciences, Durham University, Durham, UK, Oct. 8, 2015. Invited to speak (declined).

(W2) *Second International Conference on Creative Mathematical Sciences Communication (CMSC)*. Institute for Mathematical Sciences in Chennai, Dec. 9–12, 2014. Invited to speak (declined).

(W3) Computer science takes back data centre networks from engineering. *Research Day*, School of Engineering and Computing Sciences, Durham University, Durham, UK, Oct. 2, 2014.

(W4) *The first international conference on: Creative Mathematical Sciences Communication Computer Maths: Curiosity Art, Story!* Charles Darwin University, Australia, Aug. 2–10, 2013. Invited to participate with support (declined).

(W5) *Workshop on First Nations Math Education*. Banff International Research Station, Canada, Nov. 18–Nov. 23, 2012. By invitation.

(W6) *9th McGill – INRIA Workshop on Computational Geometry,* Bellairs Research Institute of McGill University, Barbados, Jan. 29–Feb. 5, 2010. By invitation.

(W7) *8th McGill – INRIA Workshop on Computational Geometry,* Bellairs Research Institute of McGill University, Barbados, Jan. 31–Feb. 6, 2009. By invitation.

(W8) *V Escuela de Verano en Matemáticas Discretas,* Universidad de Chile, Valparaíso, Chile, Jan. 4–8, 2010. By invitation.

Seminars and Invited Talks

(S1) Graphs are at the heart of the cloud. *Discrete Math Seminar*, University of Victoria, Victoria, Canada, Nov. 19, 2015.

(S2) Graphs are at the heart of the cloud. *Discrete Math Seminar*, Simon Fraser University, Burnaby, Canada, Oct. 27, 2015.

(S3) Make a mathematical discovery with tatami tiles. *A Taste of* π, Simon Fraser University, Burnaby, Canada, Oct. 17, 2015.

(S4) Graphs are at the heart of the cloud. *Department of Computer Science Colloquium*, University of Victoria, Victoria, Canada, Sep. 21, 2015.

(S5) Graphs are at the heart of the cloud. *Algorithms and Complexity in Durham Seminar (ACiD)*, Durham University, Durham, UK, Apr. 28, 2015.

(S6) Computer science takes back data centre networks from engineering. *Computer Science Junior Seminar*, Durham University, Durham, UK, May 19, 2014.

(S7) Monomino-Domino Tatami Coverings. *Algorithms and Complexity in Durham Seminar (ACiD)*, Durham University, Durham, UK, Dec. 4, 2013.

(S8) Brick laying on square walls with k horizontal bricks and their mystery factor. *Discrete Math Seminar*, University of Victoria, Victoria, Canada, Mar. 12, 2012.

(S9) Auspicious tatami mat arrangements. *Algebraic Combinatorics Seminar*, University of Waterloo, Waterloo, Canada, Nov. 2, 2010.

(S10–S11) Negative correlation properties for graphs. *Discrete Math Seminar*, University of Victoria, Victoria, Canada, Apr. 12, 2010. Also, *Discrete Math Seminar*, Simon Fraser University, Burnaby, Canada, Apr. 13, 2012.

(S12–S13) Tatami tilings. *Seminario Matemáticas Discretas,* Universidad de Chile, Santiago, Chile, Jan. 15, 2010. Also, *Combinatorial Algorithms Group,* University of Victoria, Victoria, Canada, Jan. 22, 2010.

Expertise

Mathematics/Computer science:

Combinatorial algorithms, combinatorial games, combinatorial generation, combinatorics, computational complexity, computational geometry, cryptography, data centre networks, exact enumeration problems, games on graphs, generating functions, graph algorithms, graph theory, integer partitions, matroid theory, nested recurrence relations, symbolic computation, tilings and coverings, Venn diagrams.

Spoken Languages:

Native speaker of English and Spanish, and Fluent speaker of French.

References

Available upon request.