

Krystal Guo

Curriculum Vitae

Department of Mathematics
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Current Position

2017–2019 **Postdoctoral fellow**, *Université libre de Bruxelles*, Department of Mathematics, Supervisor: Dr. Samuel Fiorini.

Previous Employment

2017 **Visiting scholar**, *Simons Institute for the Theory of Computing*, University of California, Berkeley.

2015–2017 **Postdoctoral fellow**, *University of Waterloo*, Combinatorics & Optimization, Supervisor: Dr. Christopher Godsil.

Education

2011–2015 **Ph.D. Mathematics**, *Simon Fraser University*.

Thesis title *Simple eigenvalues of graphs and digraphs*

Supervisor Dr. Bojan Mohar

Completion January 30, 2015

2009–2010 **Master of Mathematics**, *University of Waterloo*, Combinatorics & Optimization.

Thesis title *Quantum walks on strongly regular graphs*

Supervisor Dr. Christopher Godsil

2004–2009 **Bachelor of Mathematics**, *University of Waterloo*, Honours Combinatorics & Optimization Co-operative Program, Honours Pure Mathematics, *with distinction*.

Fields of Research Interest

Discrete mathematics; algebraic graph theory, linear algebra, quantum computing and related areas.

Publications

Published

C. Godsil, K. Guo, J. Sinkovic. Average mixing matrix of trees. *Electronic Journal of Linear Algebra* 34 (2018).

C. Godsil, K. Guo, T. Myklebust. Quantum walks on generalized quadrangles. *Electronic Journal of Combinatorics* 24 (2017) P4.16.

- K. Guo and B. Mohar. Digraphs with Hermitian spectral radius below 2 and their cospectrality with paths. *Discrete Mathematics* 340, Issue 11 (2017) P2616-2632.
- G. Coutinho, K. Guo and C. M. van Bommel. Pretty good state transfer between internal nodes of paths. *Quantum Information & Computation* 17, No. 9&10 (2017) P0825-0830.
- K. Guo. Spectral bound for separations in Eulerian digraphs. *Electronic Journal of Linear Algebra* 32 P291-300.
- K. Guo and B. Mohar. Hermitian adjacency matrix of digraphs and mixed graphs. *Journal of Graph Theory* (2016) doi:10.1002/jgt.22057.
- G. Coutinho, C. Godsil, K. Guo, and F. Vanhove. Perfect state transfer on distance-regular graphs and association schemes. *Linear Algebra and its Applications* 478 (2015) P108-130.
- K. Guo and B. Mohar. Large regular bipartite graphs with median eigenvalue 1. *Linear Algebra and its Applications* 449 (2014) P68-75.
- C. Godsil and K. Guo. Quantum walks on regular graphs and eigenvalues. *Electronic Journal of Combinatorics* 18 (2011) P165.
- K. Guo and G. Gong. New constructions of completely non-cyclic Hadamard matrices, related function families and LCZ sequences. In *Proceedings, Sequences and their Applications 2010*.

In submission

- K. Guo, T. Huynh, M. Macchia. The biclique covering number of grids. arXiv:1811.03396.
- S. M. Cioaba, K. Guo, W. H. Haemers. The chromatic index of strongly regular graphs. arXiv:1810.06660.
- M. DeVos, M. Drescher, D. Funk, S. González Hermosillo de la Maza, K. Guo, T. Huynh, B. Mohar, A. Montejano. Short rainbow cycles in sparse graphs. arXiv:1806.00825.
- K. Guo. Partially ordering the class of invertible trees. arXiv:1803.07181.
- C. Godsil and K. Guo. Using the existence of t -designs to prove Erdős-Ko-Rado. arXiv:1802.03444.
- C. Godsil, K. Guo, M. Kempton, G. Lippner. State transfer in strongly regular graphs with an edge perturbation. arXiv:1710.02181.
- G. Coutinho, C. Godsil, K. Guo, H. Zhan. A new perspective on the average mixing matrix. arXiv:1709.03591.
- C. Godsil and K. Guo. Cycle space of digraphs. arXiv:1609.09118.

Honors, Awards, & Scholarships

Major Awards

- 2011–2014 Postgraduate Scholarship, Natural Sciences and Engineering Research Council, \$21,000 per year for three years.

- 2011–2014 C. D. Nelson Memorial Graduate Entrance Scholarship, Simon Fraser University, \$18,000 per year for three years.
(This was the highest, most prestigious graduate entrance scholarship awarded by Simon Fraser University in 2011.)
- 2007, 2008 Undergraduate Student Research Award, Natural Sciences and Engineering Research Council.
- Honors and Minor Awards
- 2014 President’s Ph.D. Scholarship, Simon Fraser University.
- 2013 Finalist, Three Minute Thesis Competition, Simon Fraser University.
- 2013/2014 Travel and Minor Research Award, Department of Mathematics, Simon Fraser University.
- 2011–2014 Provost Prize of Distinction, Simon Fraser University.
- 2006–2009 Faculty of Mathematics GVMA Scholarship, University of Waterloo.
- 2004–2007 Academic All-Canadian Student Athlete, Canadian Interuniversity Sport.
- 2004 Rene Descartes Scholarship, University of Waterloo.

Teaching

- Winter 2017 **Instructor**, Algebraic Graph Theory, University of Waterloo.
- Spring 2016 **Instructor**, Introduction to Combinatorics for Electrical and Computer Engineering, University of Waterloo.
- Spring 2015 **Instructor**, Calculus I for Social Sciences, Simon Fraser University.
- July 2012 **Assistant Instructor**, MITACS/PIMS/SFU Summer School of Undergraduates in Algebraic Graph Theory, Simon Fraser University.
- Winter 2011 **Instructor and Course Coordinator**, Calculus I for Honours Mathematics, University of Waterloo.

Undergraduate Supervision

- Spring 2017 **Undergraduate Research Project Mentor**, *Project title: Traces of Average Mixing Matrix of Quantum Walks*, University of Waterloo, Co-supervised with Dr. Chris Godsil.
- Spring 2016 **Undergraduate Research Project Mentor**, *Project title: Colin de Verdière Number of Strongly Regular Graphs*, University of Waterloo.

Invited Talks

- 2016 Discrete Math Day of the Northeast, Saint Michael’s College, Colchester, Vermont.
- 2016 Ottawa-Carleton Discrete Math Days 2016, Carleton University, Ottawa.
- 2015 Invited Minisymposium on Spectral Methods in Graph Theory, CanaDAM 2015. Saskatoon, Saskatchewan.
- 2014 Algebraic Combinatorics: Spectral Graph Theory, Erdős-Ko-Rado Theorems and Quantum Information Theory, University of Waterloo, Waterloo.

Conference and Seminar Presentations

- Dec 2018 Algebra Seminar, Vrije Universiteit Brussel.
- Nov 2018 Pure Mathematics Seminar, Royal Holloway, University of London.
- April 2018 Tutte Colloquium, University of Waterloo.
- July 2018 Symmetry vs. Regularity, University of West Bohemia, Czech Republic.
- April 2018 Tutte Colloquium, University of Waterloo.
- April 2018 Tree and Combinatorial Optimization TACO-day, Maastricht University.
- November 2017 Computer Science Seminar, Ghent University.
- October 2017 Combinatorics Seminar, University of Wisconsin-Madison.
- August 2017 Algebraic and Extremal Graph Theory, University of Delaware.
- July 2017 Meeting of the International Linear Algebra Society, Iowa State University.
- Apr 2016 Operations Research Seminar, Tilburg University, Tilburg, Netherlands.
- Apr 2016 Computer Science Seminar, Université Libre de Bruxelles, Brussels, Belgium.
- Sept 2015 Tutte Colloquium, University of Waterloo, Waterloo.
- Aug 2015 Systems of Lines: Applications of Algebraic Combinatorics, Worcester Polytechnic Institute.
- Feb 2014 Math Department Colloquium, California State University, Northridge.
- Dec 2013 37th ACCMCC, Perth, Australia.
- Nov 2013 Discrete Mathematics Seminar, Princeton University.
- Nov 2013 Discrete Mathematics Seminar, University of Delaware.
- Nov 2013 Discrete Mathematics Seminar, Simon Fraser University.
- June 2013 Rocky Mountain Mathematics Consortium Summer School: Algebraic Graph Theory, Laramie, Wyoming.
- June 2013 CanaDAM 2013, St. John's NL.
- Sept 2012 ICTP-IPM Workshop and Conference in Combinatorics and Graph Theory, Trieste, Italy.
- June 2012 PhD Summer School in Discrete Mathematics and Symmetries of Graphs and Networks III, Rogla, Slovenia.
- July 2011 Graphs, Designs and Algebraic Combinatorics Conference, University of Regina.
- Sept 2010 Sequences and their Applications, Telecom ParisTech.

Research Experience

Simon Fraser University

- Spring 2015 Research Associate
- University of Waterloo
- 2010, 2011 Graduate Research Assistant, Professor Chris Godsil.
- 2007, 2008 NSERC Undergraduate Research Assistant
- Fall 2006 Undergraduate Research Assistant, Professor Chris Godsil.

Academic Service

- 2018 Workshop co-organizer, “Algebraic graph theory and quantum walks”, University of Waterloo.
- 2017 Co-organizer, Contributed Mini-symposium “Algebraic graph theory in quantum computing”, CanaDAM 2017.
- 2015–2016 Seminar Organizer, Algebraic Graph Theory Seminar, University of Waterloo.
- 2013 Seminar Organizer, Seidel Seminar, Simon Fraser University.

Reviewer for:

Discrete Mathematics
Electronic Journal of Combinatorics
European Journal of Combinatorics
Journal of Algebraic Combinatorics
Linear Algebra and its Applications
Linear and Multilinear Algebra
SIAM Journal of Optimization

Service and Volunteer Work

- 2015–2017 Postdoctoral Representative, Women in Mathematics Committee, University of Waterloo.
- 2014 Volunteer, Math Catchers Outreach Program, Simon Fraser University.
(This program promotes mathematics by conducting school visits to elementary and high schools in rural British Columbia.)