Krystal **Guo**

Assistant Professor · Researcher in Discrete Mathematics

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

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Current Position

Assistant Professor — *Korteweg-De Vries Institute*

2020–current — *University of Amsterdam*

- also affiliated with QuSoft (Research Centre for Quantum Software)
- tenured as of August 2023

Previous Employment

Laboratory of Mathematical Physics, Centre de Recherches Mathématiques — *Montréal, Canada*

Postdoctoral Fellow — *2019–2020*

- *Research focus:* applications of algebraic combinatorics in mathematical physics
- Supervisor: Dr. Luc Vinet

Department of Mathematics, Université libre de Bruxelles — *Brussels, Belgium*

Postdoctoral Fellow — *2017–2019*

- *Research focus:* applications of algebraic combinatorics on extension complexity
- Supported by ERC Consolidator grant FOREFRONT of Dr. Samuel Fiorini
- Supervisor: Dr. Samuel Fiorini

Simons Institute for the Theory of Computing, University of California, Berkeley — *Berkeley, USA*

Visiting Scholar — *2017*

Department of Combinatorics & Optimization, University of Waterloo — *Waterloo, Canada*

Postdoctoral Fellow — *2015–2017*

- *Research focus:* Algebraic graph theory, algebraic combinatorics
- Supervisor: Dr. Christopher Godsil

Education

Simon Fraser University — *Burnaby, Canada*

Ph.D. in Mathematics — *2011–2015*

- Thesis title: *Simple eigenvalues of graphs and digraphs*
- Supervisor: Dr. Bojan Mohar
- Degree Conferred: June 9, 2015

University of Waterloo — *Waterloo, Canada*

Master of Mathematics in Combinatorics & Optimization — *2009–2010*

- Thesis title: *Quantum walks on strongly regular graphs*
- Supervisor: Dr. Christopher Godsil

University of Waterloo — *Waterloo, Canada*

Bachelor of Mathematics — *2004–2009*

- Honours Combinatorics & Optimization
- Honours Pure Mathematics
- Co-operative Program, Double Major, completed *with distinction*

Publications

Published

Selected Open Problems in Continuous-Time Quantum Walks

K. Guo, G. Coutinho

2024

Special Matrices, vol. 12, no. 1, doi:10.1515/spma-2024-0025

2024

New eigenvalue bound on fractional chromatic number

K. Guo, S. Spiro

Journal of Graph Theory 106 (1), 167-181

2024

Perfect state transfer in quantum walks on orientable maps

K. Guo, V. Schmeits

Algebraic Combinatorics, Volume 7 (2024) no. 3, pp. 713-747.

2024

Simple eigenvalues of vertex-transitive cubic graphs

K. Guo and B. Mohar

Canadian Journal of Mathematics. 76. 1-22. 10.4153/S0008414X23000482.

2023

Positive and Negative Square Energies of Graphs

A. Abiad, L. de Lima, D.N. Desai, K. Guo, L. Hogben, J. Madrid

The Electronic Journal of Linear Algebra, Vol. 39

2023

Diagonal entries of the average mixing matrix

C. Godsil, K. Guo, M. Sobchuk

Australasian Journal of Combinatorics, Vol. 86(3):373–386

2023

The chromatic index of strongly regular graphs

W. Haemers, S. Cioaba, K. Guo

Ars Mathematica Contemporanea, Vol. 20, No. 2, DOI: 10.26493/1855-3974.2435.ec9

2020

Entanglement of free Fermions on Hadamard graphs

N. Crampé, K. Guo, L. Vinet

Nuclear Physics B, Vol. 960, DOI: 10.1016/j.nuclphysb.2020.115176

2020

Short rainbow cycles in sparse graphs

M. DeVos, M. Drescher, D. Funk, S. González Hermosillo de la Maza, K. Guo, T. Huynh, B. Mohar, A. Montejano

Journal of Graph Theory, Vol. 96, Issue 2, DOI: 10.1002/jgt.22607

2020

State transfer in strongly regular graphs with an edge perturbation

C. Godsil, K. Guo, M. Kempton, G. Lippner, F. Münch

Journal of Combinatorial Theory, Series A, Vol. 172, DOI: 10.1016/j.jcta.2019.105181

2020

Partially ordering the class of invertible trees

K. Guo

European Journal of Combinatorics, Vol. 83, DOI: 10.1016/j.ejc.2019.103019

2020

The biclique covering number of grids

K. Guo, T. Huynh, M. Macchia

Electronic Journal of Combinatorics, Vol. 26, DOI: 10.37236/8316

2019

Using the existence of t-designs to prove Erdős-Ko-Rado

C. Godsil, K. Guo

Discrete Mathematics, Vol. 342, Issue 10, pp. 2846–2849

2019

A new perspective on the average mixing matrix

G. Coutinho, C. Godsil, K. Guo, H. Zhan

Electronic Journal of Combinatorics, Vol. 25, Issue 4, P4.14

2018

Average mixing matrix of trees
C. Godsil, K. Guo, J. Sinkovic
Electronic Journal of Linear Algebra, Vol. 34, pp. 269–282
2018

Quantum walks on generalized quadrangles
C. Godsil, K. Guo, T. Myklebust
Electronic Journal of Combinatorics, Vol. 24, Issue 4, P4.16
2017

Digraphs with Hermitian spectral radius below 2 and their cospectrality with paths
K. Guo, B. Mohar
Discrete Mathematics, Vol. 340, Issue 11, pp. 2616–2632
2017

Pretty good state transfer between internal nodes of paths
G. Coutinho, K. Guo, C. M. van Bommel
Quantum Information & Computation, Vol. 17, No. 9&10, pp. 825–830
2017

Spectral bound for separations in Eulerian digraphs
K. Guo
Electronic Journal of Linear Algebra, Vol. 32, pp. 291–300
2017

Hermitian adjacency matrix of digraphs and mixed graphs
K. Guo, B. Mohar
Journal of Graph Theory, Vol. 85, Issue 1, pp. 217–248
2017

Perfect state transfer on distance-regular graphs and association schemes
G. Coutinho, C. Godsil, K. Guo, F. Vanhove
Linear Algebra and its Applications, Vol. 478, pp. 108–130
2015

Large regular bipartite graphs with median eigenvalue 1
K. Guo, B. Mohar
Linear Algebra and its Applications, Vol. 449, pp. 68–75
2014

Quantum walks on regular graphs and eigenvalues
C. Godsil, K. Guo
Electronic Journal of Combinatorics, Vol. 18, Issue 1, P165 (9 pages)
2011

Preprints

Spectral approaches for d-improper chromatic number
K. Guo, R.J. Kang, G. Zwaneveld
arXiv:2409.02678
11 Nov 2024

State transfer in discrete-time quantum walks via projected transition matrices
K. Guo, V. Schmeits
arXiv:2411.05560
Nov 8, 2024

Characteristic Polynomials and Hypergraph Generating Functions via Heaps of Pieces
J. Cooper, K. Guo, U. Okur
arXiv:2411.03567
6 Nov 2024

Cubic graphs with no eigenvalues in the interval (-1,1)
K. Guo, G. Royle
arXiv:2409.02678
4 Sep 2024

Pseudo-Geometric Strongly Regular Graphs with a Regular Point
E. van Dam, K. Guo
arXiv:2204.04755
2023

Transversal polynomial of r-fold covers
C. Godsil, K. Guo, G. Royle
arXiv:1910.05478
2022

Cycle space of digraphs
C. Godsil, K. Guo
arXiv:1609.09118

Conference Proceedings

Lower bound computations for the nonnegative rank
S. Fiorini, K. Guo, M. Macchia, M. Walter
Proceedings, 17th Cologne-Twente Workshop on Graphs and Combinatorial Optimization
2019

New constructions of completely non-cyclic Hadamard matrices, related function families and LCZ sequences

K. Guo, G. Gong

Proceedings, Sequences and their Applications 2010, Lecture Notes in Computer Science, Vol. 6338, pp. 259–269

2010

Teaching

University Teaching Qualification (Basiskwalificatie Onderwijs BKO)

University of Amsterdam

Portfolio complete and submitted September 2022

Courses Taught

Instructor

Algebraic Methods in Combinatoricss

Fall 2024

MasterMath, University of Amsterdam

6 EC, shared with Guus Regts. Master's course, one of core courses of discrete math and quantum information master's track.

Instructor

Graph Symmetries and Combinatorial Designs

Winter 2024

MasterMath, University of Amsterdam

8 EC. Overall student evaluation: 8.5

Instructor

Combinatorial Enumeration

Winter 2024

University of Amsterdam

Second-year, elective course, 6 EC

5122COEN6_23-24/S2B2

Overzicht resultaten

	Onderwerp	Dimensie	%(Zeer) ontevreden	%(Zeer) tevreden	M	SD
Kernresultaten	Algemeen oordeel	Leerzaam	0,0	84,6	4,1	0,7
	Kwaliteit van het vak	Duidelijke opzet	1,8	75,4	4,1	0,8
		Academische uitdaging	6,9	79,3	4,0	0,8
		Voldoende feedback	0,0	76,7	4,2	0,8
		Activerend onderw ijs	3,4	74,1	3,9	0,8
		Werkdruk	0,0	96,7	3,1	0,4
		Niveau	0,0	89,3	3,1	0,5
		Studiemateriaal	6,7	90,0	4,1	0,8
Onderwijsvormen	Hoorcolleges	Leerzaam	3,6	82,1	4,2	0,8
		Niveau	0,0	96,2	3,2	0,5
	Werkcolleges	Leerzaam	0,0	92,9	4,3	0,6
		Niveau	0,0	100,0	3,3	0,5
Toetsvormen	Opdracht	Leerzaam	0,0	90,0	4,3	0,7
		Instructie	6,7	76,7	4,0	0,9
		Niveau	0,0	100,0	3,5	0,5
	Deeltentamen	Instructie	0,0	90,0	4,3	0,7
		Passend tentamen	0,0	89,7	4,3	0,7
		Niveau	3,4	75,9	2,9	0,7
	Tentamen	Instructie	3,3	83,3	4,2	0,8
		Passend tentamen	3,3	86,7	4,2	0,8
		Niveau	3,2	90,3	3,3	0,6

Instructor

Algebraic Methods in Combinatorics

Winter 2023

MasterMath, University of Amsterdam

8 EC, shared with Guus Regts. Overall student evaluation: 8.5

Instructor

Combinatorial Enumeration

Winter 2023

University of Amsterdam

Second-year, elective course, 6 EC

5122COEN6__KGUO

Overzicht resultaten

	Onderwerp	Dimensie	% (Zeer) ontevreden	% (Zeer) tevreden	M	SD
Kernresultaten	Algemeen oordeel	Leerzaam	0,0	94,7	4,4	0,6
	Kwaliteit van het vak	Duidelijke opzet	4,3	76,1	4,1	0,9
		Academische uitdaging	8,3	62,5	3,8	1,0
		Voldoende feedback	0,0	83,3	4,1	0,7
		Activerend onderwijs	10,6	57,4	3,8	1,0
		Werkdruk	4,2	83,3	3,0	0,6
		Niveau	9,1	77,3	2,7	0,6
		Studiemateriaal	8,7	82,6	4,0	0,9
Onderwijsvormen	Hoorcolleges	Leerzaam	5,0	60,0	3,8	1,0
		Niveau	5,0	85,0	2,9	0,6
	Werkcolleges	Leerzaam	9,1	68,2	3,9	1,1
		Niveau	0,0	100,0	3,1	0,2
Toetsvormen	Opdracht	Leerzaam	4,3	95,7	4,4	0,7
		Instructie	4,3	69,6	3,9	0,8
		Niveau	0,0	82,6	3,0	0,6
	Deeltentamen	Instructie	0,0	91,3	4,4	0,7
		Passend tentamen	0,0	91,3	4,5	0,7
		Niveau	17,4	56,5	2,4	0,8
	Tentamen	Instructie	0,0	86,4	4,4	0,7
		Passend tentamen	0,0	90,9	4,5	0,7
		Niveau	19,0	66,7	2,5	0,8

Instructor

Graph Symmetries and Combinatorial Designs

Winter 2022

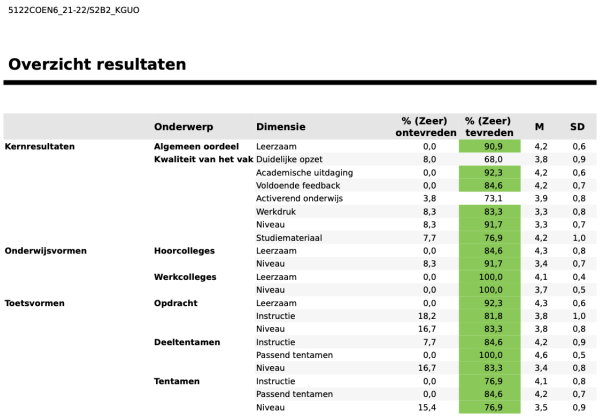
MasterMath, University of Amsterdam, VU

8 EC, first offering. Overall student evaluation: 8.1

Instructor — *Combinatorial Enumeration*

Winter 2022 — *University of Amsterdam*

Second-year, elective course, 6 EC, first offering



5122COEN6_21-22/S2B2_KGUO

Overzicht resultaten

	Onderwerp	Dimensie	% (Zeer) ontevreden	% (Zeer) tevreden	M	SD
Kernresultaten	**Algemeen oordeel**	Leerzaam	0,0	90,9	4,2	0,6
	Kwaliteit van het vak	Duidelijke opzet	8,0	68,0	3,8	0,9
		Academische uitdaging	0,0	92,3	4,2	0,6
		Voldoende feedback	0,0	84,6	4,2	0,7
		Activerend onderwijs	3,8	73,1	3,9	0,8
		Werkdruk	8,3	83,3	3,3	0,8
		Niveau	8,3	91,7	3,3	0,7
		Studiemateriaal	7,7	76,9	4,2	1,0
Onderwijsvormen	**Hoorcolleges**	Leerzaam	0,0	84,6	4,3	0,8
		Niveau	8,3	91,7	3,4	0,7
	Werkcolleges	Leerzaam	0,0	100,0	4,1	0,4
		Niveau	0,0	100,0	3,7	0,5
Toetsvormen	**Opdracht**	Leerzaam	0,0	92,3	4,3	0,6
		Instructie	18,2	81,8	3,8	1,0
		Niveau	16,7	83,3	3,8	0,8
	Deeltentamen	Instructie	7,7	84,6	4,2	0,9
		Passend tentamen	0,0	100,0	4,6	0,5
		Niveau	16,7	83,3	3,4	0,8
	Tentamen	Instructie	0,0	76,9	4,1	0,8
		Passend tentamen	0,0	84,6	4,2	0,7
		Niveau	15,4	76,9	3,5	0,9

Instructor — *Calculus 900125ACC*

Fall 2021 — *Amsterdam University College*

Instructor — *Algebraic Graph Theory*

Winter 2017 — *University of Waterloo*

Instructor — *Introduction to Combinatorics for Electrical and Computer Engineering*

Spring 2016 — *University of Waterloo*

Instructor — *Calculus I for Social Sciences*

Spring 2015 — *Simon Fraser University*

Instructor and Course Coordinator — *Calculus I for Honours Mathematics*

Winter 2011 — *University of Waterloo*

Supervision

Ph.D. Supervision

Daily Supervisor

Gabriëlle Zwaneveld

2023–2027

University of Amsterdam

- Project topic: Extremal and spectral approaches in graph theory
- Co-supervisors: R. Kang and J. Ellis-Monaghan

Co-Supervisor

Sebastian Zur

2023–2027

University of Amsterdam & CWI

- Thesis title: Multidimensional Quantum Walks and the Multiplicative Ladder Adversary
- Supervisor: S.M. Jeffery

Daily Supervisor

Vincent Schmeits

2021–2025

University of Amsterdam

- Project topic: Algebraic graph theory and quantum walks
- Co-supervisors: J. Ellis-Monaghan

Masters Thesis Supervision

Examiner

Casper Loman

2022–2023

University of Amsterdam

- Project title: Disordered quantum systems on graphs.
- Double master's degree, 72 EC, Math and Physics.
- completed: July 2023
- Co-supervisors: J. Helsen and A. Safavi-Naini

Daily Supervisor

Siebe Verheijen

2022–2023

University of Amsterdam

- Project title: Transversal polynomial of r-fold covers.
- Master's degree, 36 EC.
- completed: July 2023.

Daily Supervisor

Lies Beers

2022–2023

University of Amsterdam

- Project title: Generalized Quadrangles: a Combinatorial View of Finite Geometry.
- Master's degree, 36 EC.
- completed: July 2023.

Examiner

Danlei Zhang

2022–2023

University of Amsterdam

- Master's degree, 36 EC.
- Daily supervisor: J. Briët.

Bachelor Supervision (3rd Year Thesis)

Daily Supervisor

Lois de la Mar

Spring 2024

University of Amsterdam

- Project title: Quantum spatial search on a trapped ion quantum computer.
- 3rd Year Double Bachelor Thesis in Mathematics and Physics & Astronomy.
- completed: July 2024.
- Physic Supervisor: A. Safavi-Naini

Daily Supervisor

Reijer Boodt

Spring 2023

University of Amsterdam

- Project title: An exploration of Association Schemes and Scaffolds.
- 3rd Year Bachelor Thesis in Mathematics
- completed: July 2023.

Daily Supervisor — *Ian de Ronde*

Spring 2023 — *University of Amsterdam*

- Project title: Supersymmetric lattice fermions.
- 3rd Year Double Bachelor Thesis in Mathematics and Physics & Astronomy.
- completed: July 2023.
- Physic Supervisor: K. Schoutens.

Examiner — *Jasper Rekveld*

Spring 2023 — *University of Amsterdam*

- Project title: Quantum walks on surfaces.
- 3rd Year Bachelor Thesis in Mathematics
- completed: July 2023.
- Daily supervisor: V. Schmeits.

Daily Supervisor — *Floor Beks*

Spring 2022 — *University of Amsterdam*

- Project title: Strongly cospectral & parallel vertices.
- 3rd Year Bachelor Thesis in Mathematics
- completed: July 2022.

Daily Supervisor — *Robert Taalman*

Spring 2022 — *University of Amsterdam*

- Project title: The core of quantum computing.
- 3rd Year Bachelor Thesis in Mathematics
- completed: July 2022.

Daily Supervisor — *Jasper Konijn*

Spring 2021 — *University of Amsterdam*

- Project title: The Discharging Method.
- 3rd Year Bachelor Thesis in Mathematics
- completed: July 2021.

Daily Supervisor — *Emma Schultz*

Spring 2021 — *University of Amsterdam*

- Project title: The Matching and Characteristic Polynomial of Graphs.
- 3rd Year Bachelor Thesis in Mathematics
- completed: July 2021.

Undergraduate Research Project Mentor — *Mariia Sobchuk*

Spring 2017 — *University of Waterloo*

- Project title: Traces of Average Mixing Matrix of Quantum Walks.
- Co-supervisor: C. Godsil.

Undergraduate Research Project Mentor — *Linda Cook*

Spring 2016 — *University of Waterloo*

- Project title: Colin de Verdière Number of Strongly Regular Graphs.

Examination Committees for PhD Theses

Examiner for Ph.D. Thesis — *Jana Sotáková*

Fall 2024 — *University of Amsterdam, ILLC*

Thesis title: Isogenies and cryptography

Examiner for Ph.D. Thesis — *Pjotr Buys*

Fall 2022 — *University of Amsterdam, KdVI*

Thesis title: Partition functions: zeros, unstable dynamics, and complexity

External Examiner for Ph.D. Thesis — *Pepijn Wissing*

Fall 2022 — *Tilburg University*

Thesis title: Spectral characterizations of complex unit gain graphs

External Examiner for Ph.D. Thesis — *Mahsa N. Shirazi*

Fall 2022 — *University of Regina*

Thesis title: Extensions of the Erdős-Ko-Rado theorem to perfect matchings

Presentations

Plenary talks

Algebraic graph theory and quantum walks

45th Australasian Combinatorics Conference Conference
University of Western Australia, Perth, Australia

December 11-15, 2023.

Algebraic graph theory and quantum walks

Workshop on Spectral Graph Theory 2023
Niterói, Rio de Janeiro, Brazil

October 24–27, 2023.

Invited Minicourses

Graph isomorphisms and matrix algebras

Finite Geometry and Friends, Vrije Universiteit Brussel
Brussels, Belgium

September 18–23, 2023

Graph isomorphisms and matrix algebras

Graph theory, algebraic combinatorics, and mathematical physics at Symmetries: Algebras and Physics, Centre de Recherches Mathématiques

July–August 2022

Invited Talks

Algebraic graph theory and quantum walks (Plenary)

On the mathematics of Frédéric Vanhove
Ghent University, Ghent, Belgium

December 21, 2023

Bounding the fractional chromatic number using eigenvalues and symmetry

Belgian Graph Theory Conference: On Structure and Algorithms
Ghent, Belgium

August 9–11, 2023

Extensions of graph cospectrality from quantum walks

Workshop in honour of Professor Luc Vinet, Ghent University
Ghent, Belgium

June 26–30, 2023

Bounding the Fractional Chromatic Number with Eigenvalues Using Symmetry (Keynote)

10th Slovenian Conference on Graph Theory, Mini-symposium on Association Schemes and Related Algebras
Kranjska Gora, Slovenia

June 19–23, 2023

Phantom mates of strongly cospectral vertices (Invited Talk in Minisymposium)

25th Conference of the International Linear Algebra Society, Minisymposium MSC14 on Advances in Cospectrality
Madrid, Spain

June 12–16, 2023

What is algebraic graph theory? (Plenary Speaker)

Algebra, Geometry and Computation, Centrum Wiskunde & Informatica
Amsterdam, Netherlands

March 9, 2023

Strongly regular graphs with a regular point (Plenary Speaker)

Dutch Days of Combinatorics, Utrecht University
Utrecht, Netherlands

March 6–7, 2023

Transversal polynomial of covers of graphs

Workshop on Semidefinite and Polynomial Optimization, Centrum Wiskunde & Informatica

August–September 2022

Transversal polynomial of covers of graphs

14th NETWORKS-day, Centrum Wiskunde & Informatica

June 2022

Traces of average mixing matrices

Quantum Information on Graphs, Canadian Mathematics Society Winter Meeting

December 2019

Algebraic graph theory and quantum walks

Connect Combinatorics of Networks and Computation Research Day 2019, Universitat Politècnica de Catalunya

June 2019

Conference and Seminar Research Presentations

Algebraic graph theory and quantum walks

Hypergraphs: Theory and Applications
Isaac Newton Institute for Mathematical Science and Alan Turing Institute, London, U.K.

July 2024

Algebraic graph theory and quantum walks

Eindhoven Statistics, Probability, and Operations Research Cluster (SPOR) Seminar
Eindhoven University of Technology, Eindhoven, The Netherlands

May 3, 2024

Bounding the Fractional Chromatic Number with Eigenvalues Using Symmetry

On-line Combinatorics Seminar at U. Wisconsin-Madison
online

November 13, 2023

Algebraic graph theory and quantum walks

Geometry Seminar, Radboud University
Nijmegen, Netherlands

September 5, 2023

Strongly regular graphs with a regular point

General Mathematics Colloquium, Vrije Universiteit Amsterdam
Amsterdam, Netherlands

May 24, 2023

Strongly regular graphs with a regular point

CodEx Seminar; Codes and Expansion Seminar (online)
United States

March 7, 2023

Strongly regular graphs with a regular point

Discrete Mathematics and Combinatorics Seminar (online)
University of South Carolina

February 3, 2023

Quantum walks on graphs

Operations Research Seminar
Tilburg University, Netherlands

January 26, 2023

Algebraic graph theory and quantum walks

AlgoComp Seminar, joint with Graph Theory Seminar
Université Cité, Paris

January 17, 2023

Strongly regular graphs with a regular point

Math Seminar (cancelled due to inclement weather)
Paris Dauphin University

January 16, 2023

Strongly regular graphs with a regular point

Discrete Math Seminar (online)
Illinois State University

December 1, 2022

Strongly regular graphs with a regular point

Seminar of Combinatorial Mathematics Society of Australasia (online)

November 15, 2022

Spin models, knot invariance, and triply regular graphs

Discrete Math Seminar, Korteweg-de Vries Institute
University of Amsterdam

October 12, 2022

Strongly regular graphs with a regular point

Tutte Colloquium
University of Waterloo

July 2022

Quantum walks on graphs

Complex Quantum Systems Research Seminar
Paderborn University

June 2022

Transversal polynomial of covers of graphs

AMS Special Session on Enumerative and Extremal Problems in Chromatic Graph Theory
AMS Spring Western Virtual Sectional Meeting

May 14–15, 2022

Entanglement of free Fermions on distance-regular graphs

Combinatorial Designs and Codes, Satellite event of the 8th European Congress of Mathematics (online)

July 12–16, 2021

Entanglement of free Fermions on distance-regular graphs

Session on Modern Trends in Graph Theory, 75th+1 Anniversary Summer Meeting of the Canadian Mathematics Society (online)

Ottawa, Canada

Entanglement of free Fermions on distance-regular graphs

Contributed mini-symposium on Spectral Graph Theory, Canadian Discrete and Algorithmic Mathematics Conference (online)

May 2021

Introduction of association schemes

Dynamics and Combinatorics Seminar, Korteweg-de Vries Institute for Mathematics (online)

University of Amsterdam

October 2020

Simple eigenvalues of graphs

Algebraic Graph Theory Seminar (online)

University of Waterloo

November 2020

Quantum walks: linear algebra, graphs, and quantum computing

General Mathematics Colloquium, Korteweg-de Vries Institute for Mathematics (online)

University of Amsterdam

November 2020

Inverses of Trees

Combinatorics Seminar

University of California, San Diego

March 2020

Transversal polynomial of covers of graphs

Discrete Mathematics and Optimization Seminar

McGill University

February 2020

Inverses of trees

Séminaire de combinatoire et d'informatique mathématique, LACIM

Université du Québec à Montréal

January 2020

Inverses of trees

Séminaire de Physique Mathématique, Centre de Recherches Mathématiques

Université de Montréal

January 2020

Inverses of trees

Algebraic Combinatorics Seminar

University of Waterloo

December 2019

Transversal polynomials of covers of graphs

Theory Seminar

University of Toronto Computer Science

November 2019

Inverses of trees

Discrete Mathematics Seminar
York University

November 2019

Algebraic graph theory and quantum walks

Discrete Mathematics and Algebra Seminar
University of Delaware

October 2019

Transversal polynomials of covers of graphs

Comparative Theory for Graph Polynomials Workshop, Schloss Dagstuhl
Leibniz-Zentrum für Informatik

October 2019

Average mixing matrix of quantum walks

Canadian Discrete and Algorithmic Mathematics Conference
Simon Fraser University

May 2019

Average mixing of quantum walks

Quantum Walks and Information Task Workshop
Banff International Research Station

April 2019

Average mixing matrix of quantum walks

Quantum Lunch Seminar, Centre for the Mathematics of Quantum Theory
University of Copenhagen

March 2019

Quantum walks and graph invariants

Graph Theory Seminar
Technical University of Denmark

March 2019

Quantum walks, state transfer, and perturbations of graphs

Algebra Seminar
Vrije Universiteit Brussel

December 2018

Transversals in covers of graphs

Pure Mathematics Seminar
Royal Holloway, University of London

November 2018

Average mixing of quantum walks on graphs

Symmetry vs. Regularity Conference
University of West Bohemia, Czech Republic

July 2018

Transversals in covers of graphs

Tutte Colloquium
University of Waterloo

April 2018

Inverses of trees

Algorithms Seminar
Université Libre de Bruxelles, Belgium

March 2018

Transversals in covers of graphs

Tree and Combinatorial Optimization Day
Maastricht University

April 2018

Discrete-time quantum walks and quantum search

Algorithms Seminar
Université Libre de Bruxelles, Belgium

December 2017

Quantum walks, state transfer, and perturbations of graphs

Computer Science Seminar
Ghent University

November 2017

Quantum walks, state transfer, and perturbations of graphs

Combinatorics Seminar
University of Wisconsin-Madison

October 2017

Quantum walks on graphs

Algebraic and Extremal Graph Theory Conference
University of Delaware

August 2017

Quantum walks and graph isomorphism

Meeting of the International Linear Algebra Society
Iowa State University

July 2017

Quantum walks on regular graphs

Tutte Colloquium
University of Waterloo

October 2016

Quantum walks on regular graphs

Operations Research Seminar
Tilburg University, Netherlands

April 2016

Quantum walks on regular graphs

Computer Science Seminar
Université Libre de Bruxelles, Belgium

April 2016

Eigenvalue interlacing in digraphs

Tutte Colloquium
University of Waterloo

September 2015

Hermitian adjacency matrix of digraphs

Systems of Lines: Applications of Algebraic Combinatorics Conference
Worcester Polytechnic Institute

August 2015

Hermitian adjacency matrix of digraphs

Connections in Discrete Mathematics Conference
Simon Fraser University

June 2015

Perfect state transfer in distance regular graphs

Math Department Colloquium
California State University, Northridge

February 2014

Simple eigenvalues of vertex transitive graphs

37th Australasian Conference on Combinatorial Mathematics and Combinatorial Computing
Perth, Australia

December 2013

Simple eigenvalues of vertex transitive graphs

Discrete Mathematics Seminar
Princeton University

November 2013

Simple eigenvalues of vertex transitive graphs

Discrete Mathematics Seminar
University of Delaware

November 2013

Quantum walks on strongly regular graphs

Discrete Mathematics Seminar
Simon Fraser University and Pacific Institute for the Mathematical Sciences

November 2013

Simple eigenvalues of vertex transitive graphs and digraphs

Rocky Mountain Mathematics Consortium Summer School: Algebraic Graph Theory
Laramie, Wyoming

June 2013

Simple eigenvalues of vertex transitive graphs and digraphs

Canadian Discrete and Algorithmic Mathematics Conference
St. John's, NL

June 2013

Quantum walks on strongly regular graphs

ICTP-IPM Workshop and Conference in Combinatorics and Graph Theory
The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy

September 2012

Quantum walks on strongly regular graphs

PhD Summer School in Discrete Mathematics and Symmetries of Graphs and Networks III
Rogla, Slovenia

June 2012

Quantum walks on regular graphs

Graphs, Designs, and Algebraic Combinatorics Conference
University of Regina

July 2011

New constructions of completely non-cyclic Hadamard matrices, related function families, and LCZ sequences

6th Conference on Sequences and their Applications
Telecom ParisTech

September 2010

Summer School Lectures and Math Outreach

Graphs, Matrices and Quantum walks

Axioma event 2024, University of Groningens

- May 23, 2024
- Outreach talk aimed at bachelor students in all areas of math.

Algebraic graph theory and quantum walks

Graphs meet Quantum, University of Amsterdam

- October, 2023
- Mini-course for bachelors, masters and PhD students, taught with C. Godsil.

Algebraic graph theory

University of Amsterdam

- Winter 2022
- First-year orientation talk for Bachelor Wiskunde.

Isomorphisms and Algebras

University of Waterloo (online)

- May 13–July 8, 2021
- A weekly online lecture series covering quantum walks, graph isomorphism, and matrix algebras, aimed at graduate students, post-doctoral fellows, and other researchers.

Are these graphs the same?

Brussels Summer School in Mathematics, Université Libre de Bruxelles

- September 2019
- Presentation aimed at undergraduate students in their first or second year.

Mini-course: Using the Sage Mathematics Software System in algebra and discrete math

2019 Canadian Mathematical Society Summer Meeting, University of Regina

- June 2019
- A three-hour invited mini-course on the SageMath software.

Graph theory: helping map-makers and tourists since 1735

A Taste of Pi Lecture Series, Simon Fraser University

- March 2015
- Presented to high school students to introduce areas of mathematics beyond the standard school curriculum.

Algebraic graph theory

MITACS/PIMS/SFU Summer School for Undergraduates in Algebraic Graph Theory, Simon Fraser University

- July 2012
- Provided lectures on spectral graph theory, tutorials on SageMath, and supervised students' research projects.

Grants, Honors, and Awards

Grant Applications

VIDI Scheme, NWO talent program

2022-2023

Grant title: Combinatorics of Quantum Walks. Status: rejected.

ERC Starting Grant, European Research Council

2022

Grant title: Combinatorics of Quantum Search. Status: rejected.

Travel Funding

Cheryl E. Praeger Visiting Research Fellowship

2023

- funds visits to The University of Western Australia (UWA) by early-career mathematicians algebra and combinatorics.

Co-Investigator

2023–

- status: Funded by Pesquisadora Visitante Especial
- Project title: Spectra of graphs and quantum models for clustering
- approx 100K Eur total for collaboration between G. Coutinho, K. Guo and A. Abiad.

Major Awards

Postgraduate Scholarship

Natural Sciences and Engineering Research Council of Canada

2011–2014

CAD $21,000 per year for three years.

C. D. Nelson Memorial Graduate Entrance Scholarship

Simon Fraser University

2011–2014

CAD $18,000 per year for three years. (This was the highest, most prestigious graduate entrance scholarship awarded by Simon Fraser University in 2011.)

Honors and Minor Awards

President's Ph.D. Scholarship

Simon Fraser University

2014

CAD $6,250.

Finalist, Three Minute Thesis Competition

Simon Fraser University

2013

Travel and Minor Research Award — *Department of Mathematics, Simon Fraser University*

2013/2014

CAD $2,500.

Provost Prize of Distinction — *Simon Fraser University*

2011–2014

CAD $5,000 per year for three years.

Faculty of Mathematics GVMA Scholarship — *University of Waterloo*

2006–2009

Total value CAD $3,900.

Academic All-Canadian Student Athlete — *Canadian Interuniversity Sport*

2004–2007

Rene Descartes Scholarship — *University of Waterloo*

2004

Graduate and Undergraduate Research Fellowships

Research Associate — *Simon Fraser University*

Spring 2015

Graduate Research Assistant — *Professor Chris Godsil, University of Waterloo*

2010, 2011

Undergraduate Research Assistant — *Professor Chris Godsil, University of Waterloo*

Spring 2008

Funded by the Undergraduate Student Research Award, Natural Sciences and Engineering Research Council of Canada.

Undergraduate Research Assistant — *Professor Chris Godsil, University of Waterloo*

Spring 2007

Undergraduate Research Assistant — *Professor Chris Godsil, University of Waterloo*

Fall 2006

Professional Activities

Journal Service

Managing Editor — *Electronic Journal of Combinatorics*

2022–

Conference, Workshop and Seminar organization

Colloquium co-organizer — *KdVI General Mathematics Colloquium, University of Amsterdam*

2021–

- Organizers: E. Musta, K. Guo, and J. Zuiddam.

Workshop co-organizer — *Spectral Graph and Hypergraph Theory Connections and Applications*, *American Institute of Mathematics*

2021

- Organizers: S. Cioaba, K. Guo, and N. Srivastava.

Conference co-organizer — *Graph Theory: Structure, Surfaces, Spectra*, *Shanghai Center for Mathematical Sciences, Fudan University*

2019–2020

- Organizers: Z. Dvorak, K. Guo, A. Harutyunyan, K. Kawarabayashi, and H. Wu.
- Cancelled due to COVID-19.

Conference co-organizer — *Algebraic Graph Theory and Quantum Information*, *The Fields Institute for Research in Mathematical Sciences*

May 4–8, 2020

- Organizers: A. Chan, G. Coutinho, K. Guo, C. Tamon, H. Zhan, and L. Vinet.
- Funding granted by the Fields Institute, with supplementary funding applied for from the NSF, U.S.A.

Workshop co-organizer — *Algebraic Graph Theory and Quantum Walks*, *University of Waterloo*

April 23–27, 2018

- Organizers: G. Coutinho, C. Godsil, and K. Guo.
- Funded by NSERC and the Dept of Combinatorics & Optimization, University of Waterloo.

Co-organizer — *Contributed Mini-symposium on "Algebraic Graph Theory in Quantum Computing"*, *Canadian Discrete and Algorithmic Mathematics Conference 2017*

2017

- Organizers: A. Chan, C. Godsil, K. Guo, and C. Tamon.

Seminar Organizer — *Algebraic Graph Theory Seminar*, *University of Waterloo*

2015–2016

Seminar Organizer — *Seidel Seminar*, *Simon Fraser University*

2013

Committee work

Programme Committee — *Canadian Discrete and Algorithmic Mathematics conference (CanaDAM) 2025*

2024

Refereeing

Discrete Mathematics (Elsevier)
Electronic Journal of Combinatorics
European Journal of Combinatorics
SIAM Journal of Optimization
Annals of Combinatorics
Journal of Geometry
Journal of Algebraic Combinatorics
Linear Algebra and its Applications
Linear and Multilinear Algebra
Journal of Graph Theory
SciPost Physics

Representation and Volunteer Work

Committee Member — *KdVI Diversity Committee*
2021– — *University of Amsterdam*

Postdoctoral Representative — *Women in Mathematics Committee*
2015–2017 — *University of Waterloo*

Volunteer — *Math Catchers Outreach Program*
2014 — *Simon Fraser University*

This program promotes mathematics through school visits to elementary and high schools in rural British Columbia, using 3D-printed models, mathematical puzzles, and interactive presentations. Over four days, I visited multiple schools, giving one or two two-hour presentations at each, interacting with students from grade two to twelve and introducing them to mathematical concepts and STEM career paths.