Hanmeng (Harmony) Zhan

CONTACT INFORMATION	Department of Mathematics and Statistics N520 Ross, York University 4700 Keele Street, Toronto, ON M3J 1P3	h3zhan@yorku.ca (416) 736-5250 hanmengzhan.com

RESEARCH INTERESTS

Algebraic graph theory, quantum walks, orthogonal polynomials, equiangular lines, association schemes, covering graphs, graph embeddings

CURRENT POSITION

York Science Fellow <div align="right">Oct 2019 - Present</div>

- Department of Mathematics and Statistics, York University, Toronto, ON, Canada
  Supervisor: Ada Chan

PREVIOUS POSITIONS

Postdoctoral Fellow <div align="right">Oct 2018 - Sep 2018</div>

- Centre de Recherches Mathématiques, Université de Montréal, Montréal, QC, Canada
  Supervisor: Luc Vinet

EDUCATION

University of Waterloo, Waterloo, ON, Canada

- Ph.D. <div align="right">May 2014 - Sept 2018</div>
  Department of Combinatorics and Optimization, Faculty of Mathematics
  Thesis: *Discrete Quantum Walks on Graphs and Digraphs*
  Supervisor: Chris Godsil
  Thesis awards:

  - University Finalist for the Governor General's Gold Medal
  - First Place in the Inaugural Mathematics Doctoral Prize Competition

- Master of Mathematics <div align="right">Sep 2012 - Apr 2014</div>
  Department of Combinatorics and Optimization, Faculty of Mathematics
  Thesis: *Uniform Mixing on Cayley Graphs over $\mathbb{Z}_3^d$*
  Supervisor: Chris Godsil
  Thesis award:

  - Outstanding Achievement in Graduate Studies

- Bachelor of Arts <div align="right">Jan 2010 - Aug 2012</div>
  Department of Economics, Faculty of Arts
  Thesis: *Second-Price Auction with Resale*
  Supervisor: Philip Curry

Xiamen University, Xiamen, Fujian, China

- Bachelor of Economics <div align="right">Sep 2008 - Jun 2014</div>
  Department of Statistics, Faculty of Economics
  Thesis: *Multi-Player Multi-State Quantum Games*
  Supervisor: Zhengming Qian

PUBLICATIONS **Journal Publications**

1. H. Zhan, *An infinite family of circulant graphs with perfect state transfer in discrete quantum walks*, accepted to Quantum Information Processing, arXiv:1707.06703.

2. G. Coutinho, L. Vinet, H. Zhan, A. Zhedanov. *Perfect state transfer in a spin chain without mirror symmetry.* Journal of Physics A: Mathematical and Theoretical 52 (2019), 455302.

3. C. Godsil, H. Zhan, *Discrete-time quantum walks and graph structures.* Journal of Combinatorial Theory, Series A (2019), 181212.

4. A. Chan, G. Coutinho, C. Tamon, L. Vinet, H. Zhan, *Quantum fractional revival on graphs.* Discrete Applied Mathematics (2019).

5. G. Coutinho, C. Godsil, K. Guo, H. Zhan, *A new perspective on the average mixing matrix.* Electronic Journal of Combinatorics (2018) 25(4): P4.14.

6. C. Godsil, H. Zhan, *Uniform mixing on Cayley graphs.* Electronic Journal of Combinatorics (2017) 24(3): P3.20.

7. G. Coutinho, C. Godsil, M. Shirazi, H. Zhan, *Equiangular lines and covers of the complete graph.* Linear Algebra and its Applications (2016) 488: 264-283.

8. R. Alvir, S. Dever, B. Lovitz, J. Myer, C. Tamon, Y. Xu, H. Zhan. *Perfect state transfer in Laplacian quantum walk.* Journal of Algebraic Combinatorics (2016) 43(4): 801-826.

Preprints

9. A. Chan, G. Coutinho, C. Tamon, L. Vinet, H. Zhan, *Fractional revival and association schemes.* arXiv:1907.04729 (2019). Submitted.

10. L. Vinet, H. Zhan, *Perfect state transfer on weighted graphs of the Johnson scheme.* arXiv:1904.08838 (2019). Submitted.

11. H. Zhan, *Quantum walks on embeddings.* arXiv:1711.08831 (2017). Submitted.

Book in Preparation

12. C. Godsil, H. Zhan, *Discrete Quantum Walks.*

PRESENTATIONS **Invited Talks**

1. *State transfer via orthogonal polynomials.* In: AMS Sectional Meeting, University of Wisconsin-Madison, Madison, WI, United States, September 14 - 15, 2019.

2. *Quantum state transfer in the algebra of the Johnson scheme.* In: CMS Summer Meeting, University of Regina, Regina, SK, Canada, June 7 - 10, 2019.

3. *Some elegant results in algebraic graph theory.* In: Canadian Discrete and Algorithmic Mathematics Conference, Simon Frase University, Vancouver, BC, Canada, May 28 - 31, 2019.

4. *Quantum walks, orthogonal polynomials, and spectral graph theory.* In: Quantum Walks and Information Tasks, Banff International Research Station for Mathematical Innovation and Discovery, Banff, AB, Canada, April 21 - 26, 2019.

5. *Generating entanglement using quantum walks.* In: David A. Walsh Seminar Series, Clarkson University, Potsdam, NY, United States, February 8, 2019.

6. *Some open problems in discrete quantum walks.* In: Algebraic Graph Theory and Quantum Walks, University of Waterloo, Waterloo, ON, Canada, April 23 - 27, 2018.

7. *Recent progress in discrete quantum walks.* In: AMS Sectional Meeting, Northeastern University, Boston, MA, United States, April 21 - 22, 2018, 2018.

8. *Graph covers and equiangular frames.* In: AMS Sectional Meeting, Ohio State University, Columbus, OH, United States, March 16 - 18, 2018.

9. *From covers to tight frames.* In: AMS Sectional Meeting, College of Charleston, Charleston, SC, United States, March 10 - 12, 2017.

10. *Spectra of discrete quantum walks.* In: CMS Summer Meeting, University of Alberta, Edmonton, AB, Canada, June 24 - 27, 2016.

11. *Lines and covers of complete graphs 2.* In: Systems of Lines: Applications of Algebraic Combinatorics, Worcester Polytechnic Institute, Worcester, MA, United States, August 10 - 14, 2015.

12. *Some open problems in uniform mixing.* In: Summer Research Program, Clarkson University, Potsdam, NY, United States, July 20, 2015.

Conference Talks

1. *The vertex-face walk.* In: Finite Geometry and Extremal Combinatorics, University of Delaware, Newark, DE, United States, August 21 - 24, 2019.

2. *Combinatorial aspects of quantum walks.* In: Prairie Discrete Math Workshop, Brandon University, Brandon, MB, Canada, June 12 15, 2018.

3. *Discrete-time quantum walks and graph embeddings.* In: CMS Winter Meeting, University of Waterloo, Waterloo, ON, Canada, December 8 - 11, 2017.

4. *Quantum walks and mixing.* In: Algebraic and Extremal Graph Theory, University of Delaware, Newark, DE, United States, August 7 - 10, 2017.

5. *Discrete-time quantum walks and graph structures.* In: Canadian Discrete and Algorithmic Mathematics Conference, Ryerson University, Toronto, ON, Canada, June 12 - 15, 2017.

6. *Uniform mixing in quantum walks.* In: 22nd Ontario Combinatorics Workshop, York University, Toronto, ON, Canada, May 16 - 17, 2014.

RESEARCH
EXPERIENCE

University of Waterloo

- Graduate Research Assistant 2014 – 2016
  Generated data on continuous and discrete quantum walks, and created websites introducing average mixing matrices, periodic vertices and strongly cospectral vertices

TEACHING EXPERIENCE	**University of Waterloo**

- Instructor   Winter 2018
  MATH 135: Algebra for Honors Mathematics

- Substitute Instructor   Winter 2017
  CO 444/644: Algebraic Graph Theory

- Teaching Assistant   2012 – 2017
  Algebraic Enumeration, Algebraic Graph Theory, Calculus, Coding Theory, Introduction to Graph Theory, Graph Theory, Introduction to Combinatorics, Linear Algebra, Portfolio Optimization Models, Special Topics in Mathematical Connections

SERVICE	**Conference, Workshop and Seminar Organizer**

- Algebraic Graph Theory and Quantum Information, Fields Institute   May 4 - 8, 2020
- Quantum Information on Graphs, CMS Winter Meeting   Dec 6 - 9, 2019
- Discrete Mathematics Seminar, York University   Fall, 2019
- Algebraic Graph Theory Seminar, University of Waterloo   Spring 2016, Fall 2017

Journal Reviewer

- Discrete Mathematics
- Electronic Journal of Combinatorics
- ICALP
- Journal of Physics A: Mathematical and Theoretical
- Linear Algebra and Its Applications
- Linear and Multilinear Algebra
- SampTA

AWARDS AND DISTICTIONS	**University of Waterloo**

- University Finalist for the Governor General's Gold Medal   2019
- First Place in the Inaugural Mathematics Doctoral Prize Competition   2019
- Outstanding Achievement in Graduate Studies   2015
- Cotton Family Women in Mathematics Graduate Scholarship   2014, 2016, 2017
- Faculty of Arts Upper-Year Scholarship   2011-2012
- Robin K. Banks Scholarship   2011-2012
- Dean's Honours List   2011-2012