Hanmeng (Harmony) Zhan

CONTACT INFORMATION	Centre de Recherches Mathématiques Université de Montréal, P.O. Box 6128 Centre-ville Station, Montréal, QC, H3C 3J7	zhanhanm@crm.umontreal.ca 514-343-7501 hanmengzhan.com

RESEARCH INTERESTS

Algebraic Graph theory, Orthogonal Polynomials, Quantum Walks, Quantum Information, Equiangular Lines

CURRENT POSITION

Centre de Recherches Mathématiques, Montréal, QC, Canada   Oct 2018 - Present

- Postdoctoral Fellow
  Supervisor: Luc Vinet

EDUCATION

University of Waterloo, Waterloo, ON, Canada

- Ph.D.   May 2014 - Sept 2018
  Department of Combinatorics and Optimization, Faculty of Mathematics
  Thesis: *Discrete Quantum Walks on Graphs and Digraphs*
  Supervisor: Chris Godsil

- Master of Mathematics   Sept 2012 - Apr 2014
  Department of Combinatorics and Optimization, Faculty of Mathematics
  Thesis: *Uniform Mixing on Cayley Graphs over $\mathbb{Z}_3^d$*
  Supervisor: Chris Godsil

- Bachelor of Arts   Jan 2010 - Aug 2012
  Department of Economics, Faculty of Arts
  Thesis: *Second-Price Auction with Resale*
  Supervisor: Philip Curry

Xiamen University, Xiamen, Fujian, China

- Bachelor of Economics   Sept 2008 - Jun 2014
  Department of Statistics, Faculty of Economics
  Thesis: *Multi-Player Multi-State Quantum Games*
  Supervisor: Zhengming Qian

PUBLICATIONS

Journal Publications

1. C. Godsil, H. Zhan, *Discrete-time quantum walks and graph structures*. To appear in Journal of Combinatorial Theory, Series A (2019+), arXiv: 1701.04474.

2. A. Chan, G. Coutinho, C. Tamon, L. Vinet, H. Zhan, *Quantum fractional revival on graphs*. Discrete Applied Mathematics (2019), https://doi.org/10.1016/j.dam.2018.12.017.

3. 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.

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

5. 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.

6. 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

7. G. Coutinho, L. Vinet, H. Zhan, A. Zhedanov. *Perfect state transfer in a spin chain without mirror symmetry.* arXiv:1903.04707 (2019). Submitted.

8. H. Zhan, *An infinite family of circulant graphs with perfect state transfer in discrete quantum walks.* arXiv:1707.06703 (2017). Submitted.

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

In Preparation

10. A. Chan, G. Coutinho, C. Tamon, L. Vinet, H. Zhan, *Fractional revival and association schemes* (2019+).

11. L. Vinet, H. Zhan, *Perfect state transfer on weighted graphs of the Johnson scheme* (2019+).

PRESENTATIONS **Invited Talks**

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

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

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

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

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

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

7. *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.

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

Conference Talks

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

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

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

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

5. *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
  Conducted mathematical experiments on continuous and discrete quantum walks, and maintaned a website of useful data on average mixing, 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	**Journal Reviewer**

- Discrete Mathematics
- Linear Algebra and Its Applications
- Electronic Journal of Combinatorics
- ICALP
- SampTA

Seminar Organizer

- Algebraic Graph Theory Seminar Spring 2016, Fall 2017

AWARDS AND DISTICTIONS	**University of Waterloo**

- 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