

Hanmeng (Harmony) Zhan

- CONTACT INFORMATION Centre de Recherches Mathématiques zhanhanm@crm.umontreal.ca
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- 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*. Journal of Combinatorial Theory, Series A (2019), 181212, doi:10.1016/j.jcta.2019.05.003.
 2. A. Chan, G. Coutinho, C. Tamon, L. Vinet, H. Zhan, *Quantum fractional revival on graphs*. Discrete Applied Mathematics (2019), 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. L. Vinet, H. Zhan, *Perfect state transfer on weighted graphs of the Johnson scheme*. arXiv:1904.08838 (2019). Submitted.
8. G. Coutinho, L. Vinet, H. Zhan, A. Zhedanov. *Perfect state transfer in a spin chain without mirror symmetry*. arXiv:1903.04707 (2019). Submitted.
9. H. Zhan, *Quantum walks on embeddings*. arXiv:1711.08831 (2017). Submitted.
10. H. Zhan, *An infinite family of circulant graphs with perfect state transfer in discrete quantum walks*. arXiv:1707.06703 (2017). Submitted.

In Preparation

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

PRESENTATIONS **Invited Talks**

1. *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.
2. *Generating entanglement using quantum walks*. In: David A. Walsh Seminar Series, Clarkson University, Potsdam, NY, United States, February 8, 2019.
3. *Some open problems in discrete quantum walks*. In: Algebraic Graph Theory and Quantum Walks, University of Waterloo, Waterloo, ON, Canada, April 23 - 27, 2018.
4. *Recent progress in discrete quantum walks*. In: AMS Sectional Meeting, Northeastern University, Boston, MA, United States, April 21 - 22, 2018, 2018.
5. *Graph covers and equiangular frames*. In: AMS Sectional Meeting, Ohio State University, Columbus, OH, United States, March 16 - 18, 2018.
6. *From covers to tight frames*. In: AMS Sectional Meeting, College of Charleston, Charleston, SC, United States, March 10 - 12, 2017.
7. *Spectra of discrete quantum walks*. In: CMS Summer Meeting, University of Alberta, Edmonton, AB, Canada, June 24 - 27, 2016.
8. *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.
9. *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 maintained 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
- Journal of Physics A: Mathematical and Theoretical

Seminar Organizer

- Algebraic Graph Theory Seminar Spring 2016, Fall 2017

AWARDS AND
DISTICTIONS

University of Waterloo

- 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