

## Hanmeng (Harmony) Zhan

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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	<b>Centre de Recherches Mathématiques</b> , Montréal, QC, Canada • Postdoctoral Fellow Supervisor: Luc Vinet	Oct 2018 - Present
EDUCATION	<b>University of Waterloo</b> , Waterloo, ON, Canada  • Ph.D. May 2014 - Sept 2018 Department of Combinatorics and Optimization, Faculty of Mathematics Thesis: <i>Discrete Quantum Walks on Graphs and Digraphs</i> Supervisor: Chris Godsil  • Master of Mathematics Sept 2012 - Apr 2014 Department of Combinatorics and Optimization, Faculty of Mathematics Thesis: <i>Uniform Mixing on Cayley Graphs over <math>\mathbb{Z}_3^d</math></i> Supervisor: Chris Godsil  • Bachelor of Arts Jan 2010 - Aug 2012 Department of Economics, Faculty of Arts Thesis: <i>Second-Price Auction with Resale</i> Supervisor: Philip Curry  <b>Xiamen University</b> , Xiamen, Fujian, China  • Bachelor of Economics Sept 2008 - Jun 2014 Department of Statistics, Faculty of Economics Thesis: <i>Multi-Player Multi-State Quantum Games</i> Supervisor: Zhengming Qian	
PUBLICATIONS	<b>Journal Publications</b>  1. C. Godsil, H. Zhan, <i>Discrete-time quantum walks and graph structures</i> . 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, <i>Quantum fractional revival on graphs</i> . Discrete Applied Mathematics (2019), doi.org/10.1016/j.dam.2018.12.017.  3. G. Coutinho, C. Godsil, K. Guo, H. Zhan, <i>A new perspective on the average mixing matrix</i> . Electronic Journal of Combinatorics (2018) 25(4): P4.14.  4. C. Godsil, H. Zhan, <i>Uniform mixing on Cayley graphs</i> . Electronic Journal of Combinatorics (2017) 24(3): P3.20.  5. G. Coutinho, C. Godsil, M. Shirazi, H. Zhan, <i>Equiangular lines and covers of the complete graph</i> . 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. *Some elegant results in algebraic graph theory*. In: Canadian Discrete and Algorithmic Mathematics Conference, Simon Fraser University, Vancouver, BC, Canada, May 28 - 31, 2019.
2. *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.
3. *Generating entanglement using quantum walks*. In: David A. Walsh Seminar Series, Clarkson University, Potsdam, NY, United States, February 8, 2019.
4. *Some open problems in discrete quantum walks*. In: Algebraic Graph Theory and Quantum Walks, University of Waterloo, Waterloo, ON, Canada, April 23 - 27, 2018.
5. *Recent progress in discrete quantum walks*. In: AMS Sectional Meeting, Northeastern University, Boston, MA, United States, April 21 - 22, 2018, 2018.
6. *Graph covers and equiangular frames*. In: AMS Sectional Meeting, Ohio State University, Columbus, OH, United States, March 16 - 18, 2018.
7. *From covers to tight frames*. In: AMS Sectional Meeting, College of Charleston, Charleston, SC, United States, March 10 - 12, 2017.
8. *Spectra of discrete quantum walks*. In: CMS Summer Meeting, University of Alberta, Edmonton, AB, Canada, June 24 - 27, 2016.
9. *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.
10. *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  
DISTINCTIONS

**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