

## HANBAEK LYU

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### EDUCATION

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<b>The Ohio State University</b>	Ph.D in Mathematics (Advised by David Sivakoff)	<i>Aug. 2013 - Apr. 2018</i>
<b>Seoul National University</b>	B.S. in Mathematics	<i>Mar. 2008 - Feb. 2013</i>

### RESEARCH INTEREST

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- **Fields of research:** probability, combinatorics, dynamical systems, statistical physics, and theoretical computer science
- **General interest:** emergent properties of spatial processes; distributed algorithms; hierarchical structures of large networks
- **Topics studied:** Persistence of Markov additive functionals, firefly cellular automata (on finite trees and  $\mathbb{Z}$ ), pulse-coupled oscillators (on finite trees), clock synchronization algorithms (on general graphs), 3-color cyclic cellular automaton and Greenberg-Hastings model (on general graphs), box-ball system (on  $\mathbb{Z}$ ), 3-color cyclic particle system (on  $\mathbb{Z}$ ), parking process (on transitive unimodular graphs), Euler characteristic, Lotka-Volterra model (4-dimension), stable operations on graphons (for network data analysis)

### PUBLICATIONS

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#### Journal Publications

- [1] E. Foxall and H. Lyu, "Clustering in three and four color cyclic particle systems in one dimension" Journal of Statistical Physics (to appear) [preprint](#) (2017)
- [2] H. Lyu, "Global synchronization of pulse-coupled oscillators on trees." SIAM Journal on Applied Dynamical Systems (to appear). [preprint](#) (2016)
- [3] J. Gravner, H. Lyu, and D. Sivakoff, "Limiting behavior of 3-color excitable media on arbitrary graphs." Annals of Applied Probability (to appear). [preprint](#) (2016)
- [4] H. Lyu, "Synchronization of finite-state pulse-coupled oscillators.", *Physica D: Nonlinear Phenomena* 303 (2015): 28-38.

#### Preprints

- [5] M. Damron, J. Gravner, M. Junge, H. Lyu, and D. Sivakoff, "Parking on transitive unimodular graphs." Submitted. [preprint](#) (2017)
- [6] H. Lyu and D. Sivakoff "Persistence of sums of correlated increments and clustering in cellular automata" Submitted. [preprint](#) (2017)
- [7] L. Levine, H. Lyu, and J. Pike, "Phase transition in random soliton cellular automaton." [preprint](#) (2017)
- [8] H. Lyu and D. Sivakoff "Synchronization of finite-state pulse-coupled oscillators on  $\mathbb{Z}$ ." Submitted. [preprint](#) (2017)
- [9] H. Lyu, "Phase transition in firefly cellular automata on finite trees" Submitted. [preprint](#) (2017)
- [10] H. Lyu, "Chromatic number, cycles, and non-separating cycles." Submitted. [preprint](#) (2016)
- [11] H. Lyu, "A Note on Graph Characteristics and Hadwiger's Conjecture." [preprint](#) (2012)
- [12] H. Lyu and P. Jablonski, "Four-Dimensional Discrete-time Lotka-Volterra Models with an Application to Ecology." [preprint](#) (2012)

## In preparation

[13] H. Lyu, F. Memoli, and D. Sivakoff, "*Hierarchical structure and combinatorial profiles of networks*" In preparation

## REFEREED JOURNALS

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IEEE Transactions on Cybernetics

## INVITED TALKS

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*TBD*, Southeastern Probability Conference, Duke University, May 14-15, 2018

*TBD*, Probability Seminar, University of Pennsylvania, Mar 27, 2018

*TBD*, Microsoft Research, Redmond, Feb 2018

"*Double jump phase transition in random soliton cellular automaton*", Combinatorics seminar, University of Minnesota, Feb 2, 2018

"*Double jump phase transition in random soliton cellular automaton*", Combinatorics seminar, University of Michigan, Jan 26, 2018

"*Global synchronization of pulse-coupled oscillators on trees*", AMS Contributing papers on Applied Mathematics III, Joint Mathematics Meetings 2018, San Diego

"*Limiting behavior of 3-color excitable media on arbitrary graphs*", AMS Special Session on Emergent Phenomena in discrete models, Joint Mathematics Meetings 2018, San Diego

"*Persistence of sums of correlated increments and clustering in cellular automata*", AMS Special Session on Markov chains, Markov processes and applications, Joint Mathematics Meetings 2018, San Diego

"*Phase transition in a random soliton cellular automaton*" Combinatorics and Probability Seminar, The Ohio State University, April 12, 2017

"*Discrete excitable media on graphs*" Probability Seminar, Indiana University, Sep 12, 2016

"*Synchronization of finite-state pulse-coupled oscillators and applications to distributed algorithms*" 2016 Combinatorics Conference, KAIST, Jul 23, 2016

"*Synchronization of finite-state pulse-coupled oscillators on various network topologies*" Hayes Graduate Research Forum, The Ohio State university, Feb 26, 2016

"*Synchronization of finite-state pulse-coupled oscillators on various graphs*" Probability Seminar, Cornell University, Feb 22, 2016

"*Synchronization of finite-state pulse-coupled oscillators on various graphs*" Korea Institute for Advanced Study, Jan 14, 2016

"*Synchronization of finite-state pulse-coupled oscillators*" HYKE seminar at Seoul National University, May 14, 2015

"*Synchronization of finite-state pulse-coupled oscillators on various network topologies*" Combinatorics and Probability seminar at the Ohio State University, Oct 1, 2015

"*Synchronization of finite-state pulse-coupled oscillators*" Graduate Student Seminar at the Ohio State University, Sep 22, 2015

## AWARDS AND FELLOWSHIPS

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Transdisciplinary Research In Principles Of Data Science (TRIPODS) grant, Spring 2018

The Ohio State University Presidential Fellowship (University research fellowship), Spring 2017 - Fall 2017

Special Graduate Associate (Departmental research fellowship), Fall 2016

Special Graduate Associate (Departmental research fellowship), Spring 2015

National Science & Technology Scholarship, 2008-2012

## CONFERENCES ATTENDED

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4th Lake Michigan Workshop on Combinatorics and Graph Theory, April 15-16, 2017, Western Michigan University, Kalamazoo, MI

Dynamics and Geometry from High Dimensional Data, March 14-16, 2017, Carnegie Mellon University, Pittsburgh, PA

38th Midwest Probability Colloquium, October 13-15, 2016, Northwestern University, Evanston, IL

The 28th Fall meeting of the Semi-annual Workshop in Dynamical Systems and Related Topics, October 5 - 8, 2017, Penn State University, State College, PA

2016 Charles River Lectures on Probability Theory and Related Topics, October 27, 2016, Microsoft Research New England

Stochastic Networks Conference, June 20 - July 24, 2016, University of California at San Diego, CA

CRM-PIMS Summer School in Probability, June 15 - July 11, 2015, McGill University, Canada

2015 Charles River Lectures on Probability Theory and Related Topics, October 2, 2015, Microsoft Research New England

37th Midwest Probability Colloquium, October 8-10, 2015, Northwestern University, Evanston, IL

Central Spring Sectional Meeting Michigan State University, East Lansing, MI March 14-15, 2015

## TEACHING

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Fall 2015: Math 2153 (Calculus 3) ([Notes](#))

Spring 2014: Math 1131 (Calculus for business)

Fall 2014: Math 1131 (Calculus for business)

Summer 2013: Math 1152 (Calculus 2)

Spring 2013: Math 1151 (Calculus 1)

Fall 2013: Math 1151 (Calculus 1)