Jinsu Kim

CONTACT INFORMATION

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RESEARCH INTERESTS

Probability, Reaction networks, Mathematical systems biology, System biology, Epigenetic dynamics, Markov processes, Mixing times of Markov models.

EMPLOYMENT

University of California, Irvine

July 2020–present, Postdoctoral fellow at the NSF-Simons Center for Multiscale Cell Fate Research.
August 2018– present, Postdoctoral scholar at Department of Mathematics.

- Mentor : German Enciso

EDUCATION

University of Wisconsin-Madison

2012–2018, Ph.D., Mathematics.

- Thesis Topic : *Stochastically modeled reaction networks: positive recurrence and mixing times*
- Advisor: David F. Anderson

Seoul National University, Republic of Korea.

2005–2012, B.S., Mathematics (*military service* 2007–2009)

PREPRINTS

1. David F. Anderson, Daniele Cappelletti, Wai-Tong (Louis) Fan, and Jinsu Kim. *Mixing times for stochastically modeled reaction networks*, in preparation.
2. Jinsu Kim*, Katherine Sheu*, Quen Cheng, Alexander Hoffmann, and German Enciso. *Stochastic models of nucleosome dynamics reveal regulatory rules of stimulus-induced epigenome remodeling*, submitted, 2021.

PUBLICATIONS

1. German Enciso and Jinsu Kim, *Accuracy of Multiscale Reduction for Stochastic Reaction Systems*, accepted to Multiscale Modeling and Simulation, 2021. https://arxiv.org/abs/1909.11916.
2. Hyuckpyo Hong*, Jinsu Kim*, M Ali Al-Radhawi, Eduardo Sontag and Jae Kyoung Kim, *Derivation of stationary distributions of biochemical reaction networks via structure transformation*, accepted to Communications Biology, 2021. https://www.biorxiv.org/content/10.1101/2021.03.23.436681v1
3. German Enciso, Radek Erban and Jinsu Kim, *Identifiability of Stochastically Modeled Reaction Networks*, European Journal of Applied Mathematics, 1-23, 2021. https://doi.org/10.1017/S0956792520000492 https://arxiv.org/abs/2006.02272
4. Jinsu Kim, Jason K. Dark, German Enciso, and Suzanne S. Sindi. *Slack Reactants: A State-Space Truncation Framework to Estimate Quantitative Behavior of the Chemical Master Equation*, The Journal of Chemical Physics, 153(054117), 2020. https://doi.org/10.1063/5.0013457
5. Enrico Bibbona, Jinsu Kim and Carsten Wiuf, *Stationary distributions of systems with Discreteness Induced Transitions*, Journal of Royal Society Interface, 17:20200243, 2020. https://doi.org/10.1098/rsif.2020.0243

6. Jinsu Kim and German Enciso, *Absolutely Robust Controllers for Stochastic Chemical Reaction Networks*, Journal of Royal Society Interface, 17: 20200031, 2020. https://doi.org/10.1098/rsif.2020.0031.

7. David F. Anderson, Daniele Cappelletti, Jinsu Kim and Tung Nguyen *Tier structure of strongly endotactic reaction networks and applications to stochastic models*, Stochastic Processes and their Applications, 130, 7218-7259, 2020.. https://doi.org/10.1016/j.spa.2020.07.012

8. David F. Anderson, Daniele Cappelletti and Jinsu Kim, *Stochastically modeled weakly reversible reaction networks with a single linkage class*, Journal of Applied Probability, 57(3):792–810, 2020. https://dx.doi.org/10.1017/jpr.2020.28

9. German Enciso and Jinsu Kim, *Embracing Noise in Chemical Reaction Networks*, J. Bull Math Biol, 81, 1261–1267, 2019. https://doi.org/10.1007/s11538-019-00575-3

10. David F. Anderson and Jinsu Kim, *Some network conditions for positive recurrence of stochastically modeled reaction networks*, SIAM J. Appl. Math., 78(5), 2692-–2713., 2018. https://doi.org/10.1137/17M1161427

Awards

Research Award

- Best poster, the NSF-Simon Center for Multiscale Cell Fate 2020 annual meeting.

Grant

- Interdisciplinary Opportunity Award program at the NSF-Simon Center for Multiscale Cell Fate. Nov 2018 – Oct 2020
  (Co-PI: Katherine Sheu at UCLA) $10,000

Teaching award

- Nominated for the Most Promising Future Faculty Award, University of California, Irvine. January 2020
- Teaching Assistant Award, Department of Mathematics, University of Wisconsin-Madison. Spring 2013
- Honored Instructor Award, Division of University Housing, University of Wisconsin-Madison. November 2012

Travel Awards

- Research visit (supported by Louis Fan), Indiana University. February 2020
- Conference Presentation Funds of University of Wisconsin-Madison Dec 2017
- 2017 annual meeting of Society for Mathematical Biology July 2017
- 2017 annual meeting of SIAM July 2017
- MSRI summer program January 2011
  Seminaire de Mathematiques Superieures 2016: Dynamics of Biological Systems

Scholarship

- Merit-based scholarship, Lotte scholarship foundation 2009–2011

Talks

- Mathematics of Reaction Networks, Online seminar. January 2021
- Applied Math Seminar, University of California, Santa Cruz. January 2021
- 2020 Korea Mathematical Society Fall meeting, Virtual workshop October 2020
- Probability seminar, University of Illinois Urbana-Champaign, October 2020

- 2020 Society for Mathematical Biology annual meeting, August 2020
  Virtual workshop.
- 2020 Korea Mathematical Society Spring meeting, Virtual workshop July 2020
- Early Career Researcher Symposium, May 2020
  Center for Multiscale Cell Fate Research, University of California, Irvine.
- Mathematical and Computational Methods in Biology, MBI. May 2020
- Probability seminar, Indiana University Bloomington. February 2020
- Mathbio seminar, University of California, Merced. December 2019
- AMS sectional meeting, University of California, Riverside. November 2019
- The 2nd Annual Symposium on Multiscale Cell Fate, October 2019
  University of California, Irvine.
- PDE/Applied math seminar, University of California, Riverside. October 2019
- Probability seminar, Indiana University Bloomington. September 2019
- AMS sectional meeting, University of Wisconsin, Madison September 2019
- 2019 Society for Mathematical Biology annual meeting, July 2019
  Montréal, Canada.
- Chemical reaction network workshop, DISMA Politecnico di Torino, July 2019
  Turin, Italy.
- Mathematical biology seminar, Korea Advanced Institute of Science May 2019
  and Technology (KAIST).
- Probability seminar, Tulane University. March 2019
- Biophysics and Systems Biology Seminar, March 2019
  University of California, Irvine
- Early-Career Research Symposium 2019, NSF-Simon Center March 2019
  for Multiscale Cell Fate, University of California, Irvine
- Analysis seminar, Korean Institute for Advanced Study (KIAS). December 2018
- Probability seminar, University of California, Irvine December 2018
- SIAM LS 2018 Annual Meeting, Minnesota, USA. August 2018
- Recent trends in continuous and discrete probability at Georgia tech. March 2018
- Probability seminar, University of Washington. January 2018
- Joint Mathematics Meeting 2018. January 2018
- Applied mathematics seminar, December 2017
  Pohang University of Science and Technology.
- Probability seminar, University of Wisconsin-Milwaukee October 2017
- 2017 annual meeting of Society of Mathematical Biology July 2017
- BIRS, Mathematical Analysis of Biological Interaction Networks June 2017
- 2107 Korean Math Society Spring meeting April 2017
- Probability seminar, Iowa State University December 2016

Departmental talks in University of Wisconsin-Madison

- Probability seminar April 2017
  Sufficient Conditions for Ergodicty of Stochastic Reaction Networks

and Mixing Times

- Reaction network seminar — April 2017
  Lyapunov Functions for Chemical Reaction Network Theory
- Graduate probability seminar — March 2017
  Donsker's theorem and its applications
- Graduate probability seminar — October 2016
  Coupling of random variables and applications for mixing times
- Graduate probability seminar — February 2016
  Foster-Lyapunov criteria for positive recurrence of Markov Chains
- Graduate probability seminar — April 2015
  Fundamental limits on the suppression of molecular fluctuations
- Graduate Applied Math Seminar — August 2014
  Flagellar synchronization through direct hydrodynamic interactions
- Physics and applied math seminar — November 2013
  Intermittent flow in Yield-Stress fluids slows down chaotic mixing
- RTG Seminar on mathematical fluid mechanics and applications — February 2013
  On squirt singularities in hydrodynamics

Teaching

University of California, Irvine.

- 2020 Fall Math 2A (Calculus 1, Online).
- 2019 Fall Math 2A (Calculus 1).

University of Wisconsin-Madison

- 2017 Fall Math320 (Differential equations and Linear Algebra)
- 2016 Fall Math375 (Multi-Variable Calculus and Linear Algebra)
- 2016 Spring Math222 (Calculus 2) WES
- 2015 Fall Math221 (Calculus 1) WES
- 2015 Summer PEOPLE program (Calculus for Precollege students)
- 2015 Spring Math320 (Linear Algebra and Differential Equation)
- 2014 Fall Math213 (Calculus for Business)
- 2014 Summer PEOPLE program (Calculus for Precollege students) (https://peopleprogram.wisc.edu/)
- 2014 Spring Math213 (Calculus for Business)
- 2013 Fall Math234 (Calculus 3)
- 2013 Spring Math222 (Calculus 2)
- 2012 Fall Math222 (Calculus 2) WES (https://www.math.wisc.edu/undergraduate/wes)

Mentoring

- Minseo Kim (Beckman High School, Tustin), November 2020–
  Research topic: Revealing the Effect of Hydration in Kidney Stone Formation Through Timescale Decomposition Analysis
- Direct reading program at University of Wisconsin-Madison — Spring 2017
  : Mentoring undergraduate students for research on mathematical biology

Service

- Organizing Committee, Virtual SMB 2021 — June 2021
- Q&A panel, MathBioU and MathExpLR at UCI — July 2020
  (a summer research program for high school and undergraduate students)
- California Workshop on the Mathematics of Reaction Networks — June 2020

University of California, Irvine (with German Enciso, Badal Joshi, Polly Yu) (Canceled due to COVID-19)

- SIAM Life Science 2020 meeting, Minisymposium organizer: June 2020
  Stochastic Modeling of Biochemical Reaction Networks and Applications (with German Enciso) (Canceled due to COVID-19)
- Mega Math May 2016
  : Grader role in mathematics competition for fifth and sixth grade students in south-central Wisconsin

Referee

- Journal of the Korean Mathematical Society
- Journal of Mathematical Biology
- PLOS Computational Biology
- PLOS one
- Physical Biology
- Bulletin of Mathematical Biology
- SIAM journal on Applied Mathematics
- Discrete and Continuous Dynamical Systems - Series B