Jinsu Kim

CONTACT INFORMATION

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RESEARCH INTERESTS

Probability, Reaction networks, Mathematical biology.

EMPLOYMENT

POSTECH

September 2021–present, Assistant Professor at Department of Mathematics

University of California, Irvine

July 2020–August 2021, Postdoctoral fellow at the NSF-Simons Center for Multiscale Cell Fate Research.
August 2018– August 2021, 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)

PUBLICATIONS

1. Hyukpyo Hong, Bryan S. Hernandez, Jinsu Kim, and Jae Kyoung Kim, *Computational translation framework identifies biochemical reaction networks with special topologies and their long-term dynamics*, SIAM Journal of Applied Mathematics, 2023, 83(3), 1025-1048. https://doi.org/10.1137/22M150469X

2. David F. Anderson and Jinsu Kim, *Mixing times for two classes of stochastically modeled reaction networks*, Mathematical Biosciences and Engineering, 2023, 20(3), 4690-4713.

3. Jinsu Kim*, Katherine Sheu*, Quen Cheng, Alexander Hoffmann, and German Enciso. *Stochastic models of nucleosome dynamics reveal regulatory rules of stimulus-induced epigenome remodeling*, Cell Report, 2022.
https://doi.org/10.1016/j.celrep.2022.111076

4. German Enciso and Jinsu Kim, *Accuracy of Multiscale Reduction for Stochastic Reaction Systems*, Multiscale Modeling and Simulation 19(4), 1633–1658, 2021.
https://doi.org/10.1137/19M1301928
https://arxiv.org/abs/1909.11916.

5. 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*, Communications Biology, 4, 620 (2021).
https://doi.org/10.1038/s42003-021-02117-x

6. 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

7. 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

8. 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

9. 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.

10. 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

11. 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

12. 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

13. 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

Grants

- Samsung Electronics Co., Ltd (IO230407-05812-01) 3/2023-3/2024
- NRF Basic Science Research Institute Fund 2/2022-2/2026
  (No. 2022R1C1C1008491)
- POSCO HOLDINGS (2022Q019). 10/2022-10/2024
- NRF Basic Science Research Institute Fund 3/2023-2/2025
  (No. 2021R1A6A1A10042944).
- NRF Basic Science Research Institute Fund 2/2022-2/2023
  (No. 2021R1A6A1A10042944).
- NRF Basic Science Research Institute Fund 9/2021-2/2022
  (No. 2021R1A6A1A10042944).
- Interdisciplinary Opportunity Award program at the NSF-Simon Center for Multiscale Cell Fate. 11/2018-10/2020
  (Co-PI: Katherine Sheu at UCLA) $10,000

Awards

Research Award

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

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 Radek Erban), University of Oxford. June 2023
- 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

- SMB annual meeting 2023, Columbus, Ohio. July 2023
- Dynamical Systems in the Life Sciences July 2023
  The Ohio State University, Columbus, Ohio.
- WCMB seminar, University of Oxford. June 2023
- SIAMDS 2023 meeting, Portland. May 2023
- Korea Mathematical Society spring meeting 2023, Daejeon. May 2023
- LEDARE Workshop for Mathematical Biology, KNTEC, Sweden. April 2023
- Math Colloquium at Seoul National University , Seoul. March 2023
- ReaDiNet 2023 conference, France & Online. January 2023
- APCTP Non-equilibrium in physics and biology workshop, Gyeoungju. December 2022
- KSIAM fall workshop 2022, Jeju, November 2022.
- NSF-Simon Center for Multiscale Cell Fate annual meeting 2022, University of California, Irvine. October 2022
- 2022 Global KMS International Conference, Seoul, October 2022.
- UNIST, Math colloquium, Ulsan, September 2022.
- Yonsei University, Math colloquium, Seoul, September 2022.
- BIRS Workshop "Preparing for the next pandemic", UBC Okanagan, June 2022.
- KSMB annual meeting 2022, Yeosu, June 2022.
- KSIAM spring meeting 2022, Daejeon IBS, May 2022.
- A talk series for stochastic models of February–May 2022
  chemical reaction networks at NTHU. Online.
- Korea Mathematical Society spring meeting 2022, Online. May 2022
- MEEting Journal Club, Physics Department Inha University . April 2022
- POSTECH MINDS & IBS BIMAG & APCTP April 2022
  encountering, POSTECH.
- KAIST Math Colloquium, Online. March 2022
- Probability and applied math seminar, University of Nottingham, Online. January 2022
- IBS BIMAG journal club, Daejeon, January 2022
- KSMB Winter meeting, Jeju. December 2021
- Biophysics journal club, POSTECH. November 2021

- KSIAM Fall meeting, Busan BEXCO. December 2021
- Frontiers in Theoretical Biophysics, APTCP, Gyungju, November 2021
- Math Colloquium, POSTECH, Online. November 2021
- ReaDiNet 2021 conference, Online. October 2021
- Applied Math Colloquium, University of Maryland, Baltimore County, Online. October 2021
- 2021 ONRC Research Day, POSTECH, Online. October 2021
- APCTP Nonequilibrium collective phenomena workshop, Gyeonju. September 2021
- AIM Online workshop on July 2021
  "Limits and control of stochastic reaction networks"
- SMB annual meeting 2021, Online. June 2021
- SIAM on Applications of Dynamical Systems 2021, Online. May 2021
- IBS Biomedical Mathematics Group Seminar, IBS Korea. April 2021
- AMS Postdoc Talk - Mathematics & Biology, April 2021
  University of California, Irvine.
- CRM-ISM Probability/Applied Math Seminar, Online seminar. April 2021
- 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, Pohang University of Science and Technology. — December 2017
- 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
- 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 nixing
- RTG Seminar on mathematical fluid mechanics and applications — February 2013
  On squirt singularities in hydrodynamics

Teaching

POSTECH

- 2023 Fall Math 749 (Topics of Mathematical Biology).
- 2023 Spring Math 431 (Introduction of Probability Theory).
- 2022 Spring Math 230 (Probability and Statistics).
- 2022 Fall Math 230 (Probability and Statistics).
- 2022 Spring Math 231 (Applied and Experimental Statistics).
- 2021 Fall Math 230 (Probability and Statistics).

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)

Ph.D and Master Students

- Yongjoon Choi (POSTECH, Ph.D program), 2023–
- Minjoon Kim (POSTECH, Ph.D program), 2023–
- Jinyoung Kim (POSTECH, Ph.D program), 2022–

Mentoring

- Sung-Hwa Kang (POSTECH, Undergrad mentee), 2022–
  Now at Agency for Defence Development, Korea
- Minseo Kim (Beckman High School, Tustin), 2020-2021
- Direct reading program at University of Wisconsin-Madison Spring 2017
  : Mentoring undergraduate students for research on mathematical biology

Service

Editorial Board

- The Journal Mathematical Biosciences & Engineering July 2021–
  Special Issue of "Stochastic methods for biological systems"

Organization

- Minisymposium, KMS Spring meeting 2023. April 2023
- APTCT Workshop on Non-equilibrium Phenomena December 2022
  in Physics and Biology.
- Minisymposium , KSIAM Fall meeting 2022 December 2022
- Minisymposium, KMS Fall meeting 2022. October 2022
- POSTECH MINDS & IBS BIMAG & APCTP April 2022
  encountering, POSTECH.
- Minisymposium , KSIAM Fall meeting 2021, December 2021
- Global point of contact (Asia region), Virtual SMB 2021 June 2021
- 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)

Others

- IRP program at POSTECH (research intership for highschool studetns) 2021
- Mega Math May 2016
  : Grader role in mathematics competition for fifth and sixth grade
  students in south-central Wisconsin

Referee

- SIAM journal on applied dynamical systems

- International Journal of Robust and Nonlinear Control
- 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
- European Journal of Applied Mathematics