

## Jinsu Kim

---

CONTACT INFORMATION Room 319, Mathematical Science Building, jinsukim@postech.ac.kr  
POSTECH  
77 Cheongam-ro, Nam-gu, Pohang-si, <http://mathjinsukim.com>  
Gyeongsangbuk-do, Korea Republic

RESEARCH INTERESTS Probability, Reaction networks, Mathematical biology, Markov processes, Mixing times of Markov models.

### EMPLOYMENT **POSTECH**

2026–Present, Associate Professor at Department of Mathematics  
2021–2025, 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. Minjun Kim, Seokhwan Moon, and Jinsu Kim, Classification for dynamics of Markov chains on non-negative integers with arbitrary transition rates and its application, submitted, 2025. <http://arxiv.org/abs/2510.20000>
2. Dongju Lim\*, Seokhwan Moon\*, Yun Min Song, Jinyeong Kim, Kangsan Kim, Byung-Kwan Cho, Jinsu Kim†, Jae Kyoung Kim†, *Toward Single-Cell Control: Noise-Robust Perfect Adaptation in Biomolecular Systems*, Nature Communications, 2025. <https://doi.org/10.1038/s41467-025-67736-y>
3. Sunghwa Kang and Jinsu Kim, *Noise-robust chemical reaction networks training artificial neural networks*, APL Machine Learning, 3, 036102, 2025. <https://arxiv.org/abs/2410.11919>
4. Wai-Tong (Louis) Fan, Jinsu Kim, and Chaojie Yuan, *Boundary-induced slow mixing for Markov chains and its application to stochastic reaction networks*, submitted, 2024. <https://arxiv.org/abs/2407.12166>
5. Minjoon Kim and Jinsu Kim, *A path method for non-exponential ergodicity of Markov chains and its application for chemical reaction systems*, Journal of Statistical Physics, Vol 192, Article number 74, 2025. <https://arxiv.org/abs/2402.05343>

6. Jinsu Kim, Christine Sütterlin, Ming Tan, and German Enciso, *Statistical analysis supports size control mechanism of Chlamydia development*, PLOS Computational Biology, 21(7): e1013227, 2025.
7. David F. Anderson, Daniele Cappelletti, Wai-Tong Louis Fan, and Jinsu Kim, *A new path method for exponential ergodicity of Markov processes on  $\mathbb{Z}^d$ , with applications to stochastic reaction networks*, to appear SIAM Journal on Applied Dynamical Systems.  
<https://arxiv.org/abs/2309.06970>
8. Jinsu Kim. A review of mathematical perspectives on chemical reaction computing, Journal of Korea Society for Industrial and Applied Mathematics. 28.4 (2024): 120-139.
9. Jinyoung Kim, Sean D. Lawley, and Jinsu Kim, *A reaction network model of microscale liquid-liquid phase separation reveals effects of spatial dimension*, Journal of Chemical Physics, 161, 204110 (2024).  
<https://arxiv.org/abs/2408.15303>
10. Keunsu Kim, Hanbaek Lyu, Jinsu Kim, and Jae-Hun Jung, *Supervised low-rank semi-nonnegative matrix factorization with frequency regularization for forecasting spatio-temporal data*, Journal of Scientific Computing, 100, 29 (2024).
11. 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 on Applied Mathematics, 2023, 83(3), 1025-1048.  
<https://doi.org/10.1137/22M150469X>
12. 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.
13. 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 Reports, 2022.  
<https://doi.org/10.1016/j.celrep.2022.111076>
14. German Enciso and Jinsu Kim, *Accuracy of Multiscale Reduction for Stochastic Reaction Systems*, SIAM Multiscale Modeling and Simulation 19(4), 1633–1658, 2021.  
<https://doi.org/10.1137/19M1301928>  
<https://arxiv.org/abs/1909.11916>.
15. 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>
16. 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>
17. 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>

18. 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>
19. 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>.
20. 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>
21. 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>
22. 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>
23. 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

- NRF (No. RS-2024-00406488) "Cultivating global medical scientists" (PI: Prof. Jiwon Oh, Yonsei Univ.)
- NRF Science Research Center (CM2LA), (No. RS-2023-00219980) 2023–2027
- Samsung Electronics Research Fund 3/2023-3/2026
- International Exchanges funding of the Royal Society 2/2023–2/2025  
(co-PI's: Jinsu Kim and Wasiur Khuda Bukhsh), No. IES\R2\222201
- 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
- KSIAM young researcher award December 2024.
  - Best poster, the NSF-Simon Center for Multiscale Cell Fate 2020 annual meeting. October 2020
- 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

- University of South Florida, Math colloquium February 2026
- Boston University Stat, Prob seminar, February 2026
- KSIAM fall meeting 2025, December 2025
- SMB annual meeting 2025, July 2025
- SIAM Conference on Applied Algebraic Geometry (SIAM AG25) 2025, July 2025
- KIAS Geometry and AI seminar, May 2025
- KSIAM 2025 Spring meeting, May 2025
- Statistical Physics monthly seminar, March 2025
- CM2LA regular meeting, December 2024
- KSIAM 2024 fall meeting, December 2024
- MoRN semiar, November 2024
- SNU Department of Statistics colloquium, November 2024
- SNU Convergence applied biology seminar, November 2024
- POSTSECH Molecular imaging research center monthly seminar, October 2024.
- DNA30, Baltimore, US. September 2024
- SMB annual meeting 2024, Seoul, South Korea. July 2024
- SPT-CRN meeting, Pula, Italy. June 2024
- Korea Physics Society spring meeting 2024, April 2024
- KMS spring meeting 2024, April 2024
- Network seminar, University of Houston, February 2024
- Prob/Stat seminar, University of Nottingham, February 2024
- Workshop in Kinetic theory, thermodynamics, topology, IBS CGP. November 2023 and contact
- KSIAM Fall meeting 2023, November 2023
- KMS Fall meeting 2023, October 2023
- International Conference of Systems Biology 2023, Hartford, October 2023
- ICIAM 2023, Tokyo., August 2023
- ICIAM satellite meeting, August 2023  
Stochastic Modeling and Data Analysis for Biological Systems, IBS Daejeon
- 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, Gyeongju. 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 chemical reaction networks at NTHU. Online. February–May 2022
- Korea Mathematical Society spring meeting 2022, Online. May 2022
- MEEting Journal Club, Physics Department Inha University . April 2022
- POSTECH MINDS & IBS BIMAG & APCTP encountering, POSTECH. April 2022
- 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, Gyeongju. September 2021
- AIM Online workshop on "Limits and control of stochastic reaction networks" July 2021
- 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, University of California, Irvine. April 2021
- 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, Virtual workshop. August 2020
- 2020 Korea Mathematical Society Spring meeting, Virtual workshop July 2020
- Early Career Researcher Symposium, Center for Multiscale Cell Fate Research, University of California, Irvine. May 2020
- 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, University of California, Irvine. October 2019
- 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, Montréal, Canada. July 2019
- Chemical reaction network workshop, DISMA Politecnico di Torino, Turin, Italy. July 2019
- Mathematical biology seminar, Korea Advanced Institute of Science and Technology (KAIST). May 2019
- Probability seminar, Tulane University. March 2019
- Biophysics and Systems Biology Seminar, University of California, Irvine March 2019
- Early-Career Research Symposium 2019, NSF-Simon Center for Multiscale Cell Fate, University of California, Irvine March 2019
- 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  
*Sufficient Conditions for Ergodicity of Stochastic Reaction Networks and Mixing Times* April 2017
- Reaction network seminar  
*Lyapunov Functions for Chemical Reaction Network Theory* April 2017
- Graduate probability seminar  
*Donsker's theorem and its applications* March 2017
- Graduate probability seminar  
*Coupling of random variables and applications for mixing times* October 2016
- 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

POSTECH

- 2025 Spring Fall Math 749 (Topics of Mathematical Biology).
- 2024 Fall Math 230 (Probability and Statistics).
- 2024 Spring Math 230 (Probability and Statistics).
- 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>)

MEMBERS

- Dr. Devanand (POSTECH, Postdoc), 2024–
- Yongjoon Choi (POSTECH, Ph.D program), 2023–
- Minjoon Kim (POSTECH, Ph.D program), 2023–
- Jinyoung Kim (POSTECH, Ph.D program), 2022–
- Minji Kang (POSTECH, MS program), 2024–
- Jeongwoon Kim (POSTECH, MS program), 2023–2024
- Minseo Kim (Beckman High School, Tustin), 2020–2021  
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

Editorial Board

- Mathematical Biosciences & Engineering July 2021–August 2022  
Special Issue of “Stochastic methods for biological systems”

Organization

- Seorabol Research Station (CM2LA) on July 2024  
chemical reaction network theory
- KSMB-SMB 2024 organizing committee. July 2024
- POSTECH MINDS & IBS BIMAG & APCTP April 2022  
encountering, POSTECH.
- KSIAM Fall meeting 2021, Minisymposium December 2021  
“stochastic biochemical systems”.
- 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

- Q&A panel, MathBioU and MathExpLR at UCI July 2020  
(a summer research program for high school  
and undergraduate students)
- Mega Math May 2016  
: Grader role in mathematics competition for fifth and sixth grade  
students in south-central Wisconsin

REFEREE

- Reports on Progress in Physics
- Annals of Applied Probability
- Journal of Chemical Physics
- SIAM journal on applied dynamical systems
- International Journal of Robust and Nonlinear Control
- Journal of the Korean Mathematical Society
- Journal of Mathematical Biology
- Journal of Theoretical 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