Seokhwan Moon

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Education

Pohang University of Science and Technology *Feb 2019 - Feb 2025 (expected)*
B.S. in Mathematics *(Military Service : 2021 - 2022)*
Pohang, Korea Overall GPA: 3.93/4.30

University of Illinois, Urbana-Champaign *Jan 2024 - May 2024*
Exchange student, Department of Mathematics
Champaign, Illinois

Gwangju Science Academy for the Gifted *Mar 2016 - Feb 2019*
Gwangju, Korea

Research Interest

Mathematical interest : Mathematical Biology, Probability, Combinatorics, Reaction Network Theory, Markov Chain, Stochastic Process

Biological interest : Systems Biology, Network Biology

Papers/Preprints

† : (co-)first author

1. Yuji Hirono†, Seokhwan Moon†, Hyukpyo Hong, and Jae Kyoung Kim. Topological Criterion for Robust Perfect Adaptation of Reaction Fluxes in Biological Networks. Under review.

Experience

Nonexponential ergodicity for 1D stochastic reaction networks *Dec 2023 - Continued*
- Co-work with Minjoon Kim and Jinsu Kim
- Finding the condition that could identify the nonexponentially ergodic 1D reaction network
- Studying about the mixing time, recurrence, ergodicity of continuous-time markov chain

Stochastic law of localization *Aug 2023 - Continued*
- Co-work with Jinsu Kim, Yun Min Song, Dongju Lim and Jae Kyoung Kim
- Convert deterministic theorem to stochastic theorem, and applied control theoretic viewpoint
- Learned antithetic integral feedback motif, infinitesimal generator, and control theory

Robust perfect adaptation of reaction fluxes ensured by network topology *Jun 2023 - Sep 2023*
- Co-work with Hyukpyo Hong, Yuji Hirono, and Jae Kyoung Kim
- Undergraduate research intern in the Biomedical Mathematics Group of Institute of Basic Science
- Identifying the structural conditions for the RPA of fluxes, and finding its biological meaning

- Learned about robust perfect adaptation, reaction networks, and how to apply mathematics to biology

Moment closure method for stochastic reaction networks *Jan 2023 - Nov 2023*
- Advised by Jinsu Kim
- Applying various moment closure approximation to stochastic reaction networks
- A note on the application of moment closure to stochastic chemical reaction networks
- Studied chemical reaction network theory, moment closure, stationary distribution of reaction network

Developing educational RC car kit using deep learning video recognition *Mar 2019 - Jan 2020*
- Undergraduate Group Research Program at POSTECH
- Made codes for deep learning and remodeled RC cars
- Learned several programming techniques and basic deep learning

Seminar/Talks

Journal Club for stochastic analysis of biochemical systems, POSTECH *Nov 2023*
Paper : Briat, Corentin, Ankit Gupta, and Mustafa Khammash. "Antithetic proportional-integral feedback for reduced variance and improved control performance of stochastic reaction networks." Journal of The Royal Society Interface 15.143 (2018)

Journal Club, IBS Biomedical Mathematics Group *Aug 2023*
Paper : Ankit Gupta, Mustafa Khammash. "The Internal Model Principle for Biomolecular Control Theory", IEEE Open Journal of Control Systems 2 (2023): 63-69.

POSTECH SIAM Student Chapter *May 2023*
Title : What is the chemical master equation, and how to solve it?

Journal Club for stochastic analysis of biochemical systems, POSTECH *Mar 2023*
Paper : Lee, Chang Hyeong, Kyeong-Hun Kim, and Pilwon Kim. "A moment closure method for stochastic reaction networks." The Journal of chemical physics 130.13 (2009)

Poster

Robust Perfect Adaption of Reaction Fluxes Ensured by Network topology *Aug 2023*
ICIAM 2023 Satellite Workshop : Stochastic Modeling and Data Analysis for Biological Systems

Participations

2023 KSIAM Annual Meeting *Nov 2023*

ICIAM 2023 Satellite Workshop : Stochastic Modeling and Data Analysis for Biological Systems *Aug 2023*

The 8th CIJK Conference on Mathematical and Theoretical Biology *Jun 2023*

2023 KSIAM-NIMS School on Biomathematics *Jun 2023*

2023 KMS Spring Meeting *Apr 2023*

Teaching/Mentoring

Student Mentoring Program, POSTECH *Sep 2023 - Dec 2023*
Tutoring undergraduate students taking the course 'Applied Linear Algebra'

Student Advisor, POSTECH *Mar 2023 - Dec 2023*
Running programs and providing counseling for the university freshmen.

Educational Outreach Organization, POSTECH *Mar 2023 - Dec 2023*
Visited local children's center weekly and taught math and science

1st Pohang Academy of AI and Mathematics, POSTECH MINDS *Jan 2021 - Feb 2021*
Worked as TA to help students using Python to practice mathematical knowledge

Student Mentoring Program, POSTECH *Mar 2020 - Jun 2020*
Tutoring undergraduate students taking the course 'Applied Linear Algebra'

Educational Outreach Organization, POSTECH *Sep 2019 - Dec 2019*
Visited local middle school weekly and help learning math and science

2019 Summer Educational Outreach Science Camp, POSTECH *Jul 2019 - Aug 2019*
Invited middle school students, teaching scientific program and lead the students

Scholarship/Award

Exchange Program Scholarship, POSTECH *Mar 2024*

Academic Excellence Award, POSTECH Mathematics *Sep 2023*

National Scholarship of Excellence (Science & Engineering) *Feb 2023 - Continued*

Jigok Scholarship *Feb 2019 - Jan 2023*

Languages

Korean, English, C, Python, MATLAB, LaTeX, Julia

Miscellaneous

Linking numbers : Final project for the course "Introduction to Geometric Topology"

A glimpse of algebraic combinatorics : Final project for the course "Introduction to Combinatorics"

Approximating higher order reactions with lower order reactions by CRNN : Final project for the course "Topics in Applied Mathematics : Mathematical Biology"

A note on the application of moment closure to stochastic chemical reaction networks : Notes for the project "Moment closure method for stochastic reaction networks"

Non-professional interests : Baseball, Educational Outreach, Cooking, Biking