Seokhwan Moon

77 Cheongam-ro, Nam-gu, Pohang – 37673 – Republic of Korea

mseokhwan@postech.ac.kr • seokhwan-moon.github.io • sh-moon

Education

Pohang University of Science and Technology **Feb 2019 – Feb 2025 (Expected)**
B.S. in Mathematics *(Military Service : 2021 - 2022)*
Pohang, Republic of 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, Republic of Korea

Research Interest

Mathematical Interest : Mathematical biology, Probability, Dynamical Systems, Stochastic Process
Reaction Network Theory, Markov Chain, Evolutionary Game Theory

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.*

Research Experience

Spatial Models of Evolutionary Dynamics **Jan 2024 – Ongoing**

- As a participant of Illinois Mathematics Lab, project led by Daniel Cooney
- Create an evolutionary game theoretical model with spatial dynamics
- Studied evolutionary dynamics, game theory, and PDE

Nonexponential ergodicity for 1D stochastic reaction networks **Dec 2023 – Ongoing**

- Co-work with Minjoon Kim and Jinsu Kim
- Finding the condition that could identify the nonexponentially ergodic 1D reaction network
- Studied about the mixing time, recurrence, ergodicity of continuous-time markov chain

Stochastic law of localization **Sep 2023 – Ongoing**

- 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
- Studied antithetic integral feedback motif, infinitesimal generator, and control theory

Robust perfect adaptation of reaction fluxes **Jun 2023 – Sep 2023**

- As an undergraduate research intern in the Biomedical Mathematics Group, Institute of Basic Science
- Co-work with Hyukpyo Hong, Yuji Hirono, and Jae Kyoung Kim
- Identifying the structural conditions for the RPA of fluxes, and finding its biological meaning
- Studied 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
- Studied chemical reaction network theory, moment closure, stationary distribution of reaction network
- Results of this project is available here

Seminars

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)

Talks/Poster

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

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*

Skills/Languages

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