

# Seokhwan Moon

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## Education

### Pohang University of Science and Technology

*B.S. in Mathematics*

Pohang, Republic of Korea

Feb 2019 – Feb 2025 (Expected)

(Military Service : 2021 - 2022)

Overall GPA : 3.93/4.30

### University of Illinois, Urbana-Champaign

*Exchange student, Department of Mathematics*

Champaign, Illinois

Jan 2024 – May 2024

### Gwangju Science Academy for the Gifted

Gwangju, Republic of Korea

Mar 2016 – Feb 2019

## 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

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<b>Journal Club for stochastic analysis of biochemical systems, POSTECH</b> 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)	<b>Nov 2023</b>
<b>Journal Club, IBS Biomedical Mathematics Group</b> Paper : Ankit Gupta, Mustafa Khammash. "The Internal Model Principle for Biomolecular Control Theory", IEEE Open Journal of Control Systems 2 (2023): 63-69	<b>Aug 2023</b>
<b>POSTECH SIAM Student Chapter</b> Title : What is the chemical master equation, and how to solve it?	<b>May 2023</b>
<b>Journal Club for stochastic analysis of biochemical systems, POSTECH</b> 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)	<b>Mar 2023</b>

## Talks/Poster

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### Poster

<b>Robust Perfect Adaption of Reaction Fluxes Ensured by Network topology</b> ICIAM 2023 Satellite Workshop : Stochastic Modeling and Data Analysis for Biological Systems	<b>Aug 2023</b>
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## Teaching/Mentoring

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<b>Student Mentoring Program, POSTECH</b> Tutoring undergraduate students taking the course 'Applied Linear Algebra'	<b>Sep 2023 – Dec 2023</b>
<b>Student Advisor, POSTECH</b> Running programs and providing counseling for the university freshmen	<b>Mar 2023 – Dec 2023</b>
<b>Educational Outreach Organization, POSTECH</b> Visited local children's center weekly and taught math and science	<b>Mar 2023 – Dec 2023</b>
<b>1st Pohang Academy of AI and Mathematics, POSTECH MINDS</b> Worked as TA to help students using Python to practice mathematical knowledge	<b>Jan 2021 – Feb 2021</b>
<b>Student Mentoring Program, POSTECH</b> Tutoring undergraduate students taking the course 'Applied Linear Algebra'	<b>Mar 2020 – Jun 2020</b>
<b>Educational Outreach Organization, POSTECH</b> Visited local middle school weekly and help learning math and science	<b>Sep 2019 – Dec 2019</b>
<b>2019 Summer Educational Outreach Science Camp, POSTECH</b> Invited middle school students, teaching scientific program and lead the students	<b>Jul 2019 – Aug 2019</b>

## Scholarship/Award

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<b>Exchange Program Scholarship, POSTECH</b>	<i>Mar 2024</i>
<b>Academic Excellence Award, POSTECH Mathematics</b>	<i>Sep 2023</i>
<b>National Scholarship of Excellence (Science &amp; Engineering)</b>	<i>Feb 2023 – Continued</i>
<b>Jigok Scholarship</b>	<i>Feb 2019 – Jan 2023</i>

## Skills/Languages

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Korean, English, C, Python, MATLAB,  $\text{\LaTeX}$ , Julia