

Jinhee Paeng

Homepage: <https://jhpaeng306.github.io>
Email Address: jhpaeng306@gmail.com

Last Updated : November 30, 2023

EDUCATION

Seoul National University (SNU), Seoul, Korea

Left for Mandatory Military Service May 2022 - Feb 2024

- o B.S. in Mathematics (Major)
- o B.S. in Statistics (Double Major)

Mar 2018 - Jun 2024 (Expected)

Overall GPA: 4.01/4.3

Mathematics Major GPA: 4.08/4.3

Statistics Major GPA: 4.01/4.3

Gyeonggi Science High School for the Gifted, Suwon, Korea

- o High school for the gifted in science and mathematics

Mar 2015 - Feb 2018

RESEARCH INTEREST

Neural Networks, Convex Optimization, Deep Learning, PDE, Stochastic Process, Data Analysis, Mathematical Biology

PUBLICATIONS

†: 1st author, *: corresponding author

- [1] **J. Paeng**[†], J. Park, and E. K. Ryu*, “*Coordinate-Update Algorithms can Efficiently Detect Infeasible Optimization Problems*”, Preprint, Submitted to JMAA, [arXiv:2305.12211](https://arxiv.org/abs/2305.12211), [\[Overview Video\]](#)
- [2] **J. Paeng**[†], K. Myoung, S. Lee, S. Ha*, and J. Yoon, “*Applications of Renormalization group method for generalized Kuramoto type models*”, Preprint, [\[PDF\]](#), [\[Poster\]](#)

SELECTED AWARDS & HONORS

SCHOLARSHIPS/FELLOWSHIPS:

The National Presidential Science Scholarship, Korea Student Aid Foundation

(8 semesters) 2018 - 2021

- o Full tuition plus \$5,000 each year for honorable undergraduates from the Korean government

Work-Study Scholarship (Type 1), Seoul National University

Mar 2020 - Aug 2020

- o Financial support of \$1,800 for the work on the student society

HONORS:

Dean’s List, SNU College of Natural Sciences

2018 - 2021

SNU CNS Model Student Awards, SNU College of Natural Sciences

2021

SELECTED AWARDS:

Undergraduate’s Research Program: Participation Prize(Top 8), SNU Faculty of Liberal Education

2022

- o “Applications of Renormalization group method for generalized Kuramoto type models” [2], with [\[Poster\]](#)

University Students Contest of Mathematics: Silver Medal, Korean Mathematics Society

2018

- o Awarded in division of Mathematics major

International Mathematical Modeling Challenge (IMMC), COMAP with NeoUnion ESC Organization

- o Meritorious Prize (2nd Prize), Invited to Awards Ceremony(Top 4) [\[Link\]](#)

2017

- o Meritorious Prize (2nd Prize)

2016

- o Selected and participated as the Representative of South Korea in both years

QHack 2023 - Quantum computing coding challenge: Third Place, Xanadu

2023

Education Outreach for Free Semester Classes: Top Prize, Korean Ministry of Education

2018

TEACHING EXPERIENCES

Teaching Assistant: Mathematical Foundations of Deep Neural Networks

Fall 2021

- o Lecture(M1407.001200 001) by professor *Ernest K. Ryu*, Opened office hours in English once a week

SNU

Python basics and Mathematical modeling

Summer 2021

- o Open a class in Major Tutor School for Undergraduate, 10 week course

SNU CNS

TALKS & SEMINARS

ACADEMIC TALKS:

Peer Mathematics Seminar, Speaker of following topics:

Fall 2023

- o Convex Optimization and First Order Methods [\[Note\]](#)
- o Personal Research: Asymptotic behavior of Inconsistent case RC-FPI [1] [\[Slides\]](#) [\[Overview Video\]](#)
- o Automata Theory and Halting Problem [\[Slides 1, 2, 3\]](#)
- o Deep Learning Theory: Approximation Guarantees of Neural Networks [\[Slides 1, 2\]](#)

Quantum teleportation with Quantum Information Theory

- o In Professor Sunghoon Jung's group seminar [\[Slides\]](#)

May 2023

Application of Renormalization Group Method on Lohe Sphere Model [2]

- o Poster session on the Undergraduate's Research Program [\[Poster\]](#)

Dec 2021

Maximum entropy and Spectrum estimation

- o Professor Seung-Yeal Ha's HYKE group seminar

Spring 2021

PUBLIC LECTURES:

Basics of Natural Language Processing and how computers read emotion

- o Natural Science Concert (GLEAP's Public Lecture for High school), about 250 audiences

Aug 2020

Mathematical modeling and Prediction of disease infection via SIR model

- o Natural Science Concert (GLEAP's Public Lecture for High school), about 250 audiences

Aug 2019

ACADEMIC EXCHANGES:

Why is it hard to predict: Incompleteness theorems and Halting problem

- o The Night of GLEAP (GLEAP's Alumni event)

Nov 2023

Explanation of Hallucination patterns in vision using mathematics

- o GLEAP Academic Exchange with STEM(Academic students club of Engineering)

Nov 2020

P vs NP problem and Turing machine: How computers think

- o In GLEAP's monthly academic seminar

May 2020

RESEARCH EXPERIENCES

Ryu Optimization Group

Department of Mathematics, SNU

Advisor: Ernest K. Ryu

Jan 2022 - Present

- Topic: Asymptotic behavior of Randomized Coordinate FPI without any fixed points [1]

- o Proved L^2 and almost sure convergence of the normalized iterate x_k/k to the infimal displacement vector.
- o Discovered the tight upper bound for $\limsup_{k \rightarrow \infty} k \text{Var}(x_k/k)$.
- o Developed an infeasibility detection for randomized FPI-type methods.
- o Extended the result to general M -norm, allowing applications to solvers such as the decentralized optimization method.
- o This work is currently under review of *Journal of Mathematical Analysis and Applications*.

HYKE Research Group

Department of Mathematics, SNU

Advisor: Seung-Yeal Ha

Mar 2021 - Dec 2021

- Topic: Applications of Renormalization Group Method on Lohe Sphere Model [2]

- o Proved that Complete synchronized state among particles with identical natural frequencies forms a stable manifold of the Lohe Sphere model, using the Renormalization Group method.
- o Developed lemmas on the integration of matrix exponential by using Jordan form for the calculation of RG method.
- o 2021 Undergraduate's Research Program (Research Fund of \$6,000 per Team) by *SNU Faculty of Liberal Education*.

- Topic: Estimation of Spectrum Density function using Maximum Entropy Rate

- o Reviewed p -th order Markov process $AR(p)$ and its spectrum density function.
- o Using the notion of maximum entropy, Burg's theorem and its application on the method of estimation on the spectrum density function were reviewed.
- o Spring 2021 Undergraduate's Research Internship (Research Fund of \$700) by *SNU CNS*.

Numerical Computing & Image Analysis Research Group

Department of Mathematics, SNU

Advisor: Myungjoo Kang

Nov 2020 - Mar 2021

- Topic: Comparison between Chan-Vase and Normalized cut for Image Segmentation

- o Reviewed methods for the image segmentation. Compared the performance of Chan-Vase model and the normalized cut method in various image settings.
- o Winter 2020 Undergraduate's Research Internship (Research Fund of \$500) by *SNU CNS*.

SNU Quantum Research Team

Advisor: Sunghoon Jung

Department of Physics, SNU

Sep 2022 - May 2023

- Topic: Quantum teleportation with Quantum Information Theory

- o Described necessary condition of generalized quantum teleportation using the language of the quantum Entropy. Prior works on Fidelity estimation and quantum teleportation with non-maximally entangled qubits were reviewed.
- o Project of SNU Quantum Research Team, members selected by Professor S.Jung.

Software Maestro

Korean Ministry of Science and ICT

- Project Topic: AI on Facial expression using web camera

Apr 2020 - Dec 2020

- o Developed an AI to quantify the user's concentration via recognizing the facial expression.
- o Implemented with the WebRTC and developed an AI coach to adjust break sessions in the online study/work groups.
- o Program for selected 150 students, among 2000 or more applicants.
- o Financial support of \$1000 per month with additional \$6000 project grant.

EDUCATIONAL OUTREACHES

Talk-Talk Science Mentoring

2019 - 2021

- o Tutored local high school students about topics in Natural Sciences, once in a two week
- o Tutored in both theoretical and experimental topics, including laboratory experiment sessions

GLEAP

Natural Science Camp

Summer 2019

- o Mentored high school students about careers in Natural Sciences

GLEAP

Education Outreach for Free Semester Classes

Fall 2018

- o Lectured in middle school about topics in mathematics, once a week for whole semester
- o Topics ranging from Euclidean Construction and Quadratic Curves to Cryptography

Ministry of Education

Science Outreach Volunteers

Summer 2018

- o Tutored students in rural area(Yeongdeok-gun, Korea) for 5 consecutive days

SNU CNS

EXTRACURRICULAR ACTIVITIES

Student President of SNU Department of Mathematical Sciences

2019 - 2020

Student Council of SNU Department of Mathematical Sciences

2018 - 2020

- o Head of *Mathematical Encountering* Task Force(Department's largest event involving professors and students)

Student Council of SNU College of Natural Sciences

2018

GLEAP (Recognized undergraduate student organization at SNU CNS) [\[Link\]](#)

2019 - 2021

- o Academic activities: GLEAP Monthly Seminar, Academic Exchange with STEM, KPF, National Taiwan University
- o Educational Outreach: Talk-Talk Mentoring, Natural Science Camp
- o Public Lectures: Natural Science Concert, Monthly Science column & Science Card-news
- o Leader of Design and Publicity Task Force, Designer of current GLEAP logo

2020 - 2021

SQRT (SNU Quantum Research Team)

2022 - 2023

- o Students club with the interests in Quantum computing, one of the starting member

IBM Quantum Spring Challenge 2022

2022

IBM Qubit by Qubit

2020 - 2021

- o Quantum Computing online course by IBM Quantum

MASTA: Math & Stats student's dance club

2018 - 2019

- o Leader of the club

2019

SKILLS

Skilled in R, Python, C, C++, Matlab

LANGUAGES

- o **English:** Fluent
- o **Korean:** Native