

# Jaewon Kim

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## EDUCATION

### Korea University

2022.03 – Present

*B.E. Semiconductor Engineering*

*Seoul, Korea*

- **GPA:** 4.35/4.5 (3.93/4.0)
- SK Hynix-KU Partnership Fellowship (Full tuition + monthly stipend)
- Leave of absence for mandatory military service (2025.03 – 2026.12)

## RESEARCH INTEREST

- Generative Models
- Stochastic Partial Differential Equations
- Deep Reinforcement Learning
- Physics-Informed Machine Learning

## RESEARCH EXPERIENCE

### Complex Data Analytics Lab (CDAL)

2024.02 – Present

*Undergraduate Researcher (Advisor: Prof. Seok Junhee)*

*Seoul, Korea*

- **High-Dimensional Conditional Generation.** Extended continuous conditional diffusion models from scalar to multi-dimensional regression labels using Hutchinson-based random projections and prioritized sampling, achieving state-of-the-art performance on nanophotonic device inverse design.
- **Reinforcement Learning for Super Resolution.** Developed a novel RL-based approach for image super resolution that overcomes diffusion model limitations by formulating the task as a Markov decision process, enabling flexible optimization of multiple quality metrics (PSNR, SSIM, LPIPS) through reward design.
- **Physics-Informed Policy Learning.** Proposed Fokker-Planck Soft Actor-Critic (FP-SAC) that reformulates policy improvement as solving partial differential equations, enabling capture of multi-modal distributions beyond traditional Gaussian-constrained approaches.

## PUBLICATIONS

(P: Preprint, J: Journal, C: Conference, W: Workshop & Demos, \*: Equal contribution, †: Equal senior role)

### [P3] EMF3D: Physics-Informed Diffusion Modeling of Electromagnetic Fields for 3D Nanophotonic Design

Insoo Kim, Jaewon Kim, Jangwon Seo, Junhee Seok<sup>†</sup>, Bohyung Han<sup>†</sup>

*Under Review, 2025*

### [P2] Scalable Continuous Conditional Diffusion via Random Projections and Prioritized Sampling

Jaewon Kim<sup>\*</sup>, Hyo-Seok Hwang<sup>\*</sup>, Junhee Seok

*Under Review, 2025*

### [P1] Fokker-Planck Soft Actor-Critic

Hyo-Seok Hwang, Jaewon Kim, Junhee Seok

*Under Review, 2025*

## HONORS & AWARDS

### SK Hynix-KU Partnership Fellowship

2022.02 – Present

- Full tuition and stipend awarded upon admission to the highly selective SK Hynix-KU Fellowship program.

### KU Alumni Scholarship, Korea University

2022.02 – Present

- Merit-based scholarship funded by the KU alumni association, granted to high-achieving students.

### Semester High Honors, Korea University

2022.03 – Present

- Awarded for achieving top academic performance each semester.

### Outstanding Poster Award, 12th SK Hynix Academic Conference

2024

- Recognized for excellence in research presentation among selected poster submissions.

### Dean's List, Korea University

2022

- Granted for achieving a perfect GPA (4.5/4.5) in the 1st semester of 2022.

EXTRACURRICULAR ACTIVITIES

<b>Young Engineers' Honor Society (YEHS)</b> <ul style="list-style-type: none"><li>Honor Society sponsored by the National Academy of Engineering of Korea (NAEK).</li></ul>	2024.03 – Present
<b>BITAmin</b> <ul style="list-style-type: none"><li>Intercollegiate offline study group focusing on ML/DL research and projects</li></ul>	2023.08 – 2024.08
<b>Korea University International Student Assistant (KUISA)</b> <ul style="list-style-type: none"><li>Voluntary student organization under Global Services Center, Korea University.</li></ul>	2023.02 – 2024.02

SKILLS & INTERESTS

**Language Skills:** Korean(Native), English(Fluent)  
**Computer Skills:** Python (Pytorch, Tensorflow), Matlab, C, C++  
**Interests:** Music, Basketball, Badminton, Cooking, Traveling, Math

SELECTED COURSEWORKS

**Statistics & Mathematics:** Engineering Mathematics I, Engineering Mathematics II, Probability and Random Process, Introduction to Linear Algebra, Fundamentals of Data Science, Data Learning and Intelligence

**Electrical and Computer Engineering:** Introduction to Computers, Object-Oriented Programming, Microprocessor, Computer System, System Software, Signal and Systems, Digital Image Processing, Digital Signal Processing, Deep Signal Processing