Sunghyun **Park**

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"AI for Understanding the World, bridging science and technology to explore the unknown."

Education

Yonsei University
B.S. in Biochemistry and Computer Science (Double Major)
Seoul, South Korea
Mar. 2020 – Present (Expected Aug. 2026)

- GPA : 3.91/4.3 (Cumulative), 3.94/4.3 (CS Major)
- Oct. 2022- Jul. 2024 : Compulsory Military Service, Served as a sergent in R.O.K Air Force.

Research Interest

My research interest is **AI for Science**, especially the development of computational and machine learning methods for modeling and analyzing complex scientific systems. Recently, I emphasize two directions - **(1) World Modeling** that combines data-driven approaches with established domain models to build more accurate and robust simulators, and **(2) Scientific reasoning in LLMs as practical tools for science**, paired with alignment techniques to improve faithfulness and safe decision support in scientific workflows.

AI For Science | Machine Learning | LLM Alignment | Tool-Use LLMs

Experience

Undergraduate Research, Mechanobiology Lab (Prof. Hyunkyu Choi)
Seoul, South Korea
Research Intern
Dec. 2024 - Feb. 2025

- Conducted high-resolution microscopy (TIRF, RICM) analysis of bioloical samples and gained hands-on experience with biophysical experimental techniques.
- Applied Unsupervised Machine Learning techniques to classify cells on their orientation.

Extracurricular Activity

PoolC (Yonsei Programming Club)
Member
South Korea
Mar. 2024 - PRESENT

- Participated in AI-related paper studying groups.
- Organized seminars on the mathematical foundations of deep Learning - including information theory, maximum likelihood estimation(MLE), maximum a posterior(MAP), and convex optimization.

Seoul-Learn (Mentoring Program)
Mentor
South Korea
Mar. 2024 - PRESENT

- Guided middle and high school students in mathematics learning and academic planning.
- Provided guidance on choosing a major-overview of CS/AI and any science major curricula, prerequisites and study habits.

Biochemistry Student Academic Club
Member
South Korea
Mar. 2020 - Mar. 2022

- Participated in collaborative study groups on core biochemistry subjects.
- Engaged in systematic study of Organic Chemistry, focusing on reaction mechanisms through problem-solving sessions.
- Conducted group discussions on Immunology, deepening understanding of immune system functions and disease mechanisms.

Projects

Prompt Optimization with OPRO and Evolutionary algorithm
Yonsei University, South Korea
LLM Course project
Jul. 2025

- Implemented a prompt optimization loop combining **OPRO with an evolutionary algorithm** (selection, crossover, mutation)
- Used an LLM scorer to evaluate candidates and drive self-rewriting and selection
- Evaluated on `GSM8K` with `Llama-3.1-8B-Instruct` and `Mistral-7B-Instruct`.

LLM Application | Prompt Engineering

Reducing WebOS Boot Latency through Build and Boot-Time Optimization *Yonsei University, South Korea*

YONSEI CAPSTONE DESIGN *Jun. 2025*

- Analyzed **function call traces** using `ftrace` to identify critical bottlenecks in WebOS boot process.
- Distinguished kernel-level and user-level execution delays, contributing to optimization of binary layout and page fault handling.

Operating System | Embedded System | Booting Optimization

Force-Driven Mechano-Typing of B Cells: Multi-Channel Image Analysis of CD40-CD40L Interactions Using autoencoder *Yonsei University, South Korea*

UNDERGRADUATE RESEARCH INTERN *Dec. 2024 - Feb. 2025*

- Built a dataset with multi-threshold molecular tension probe sensors and microscopy for CD40-CD40L mechanics in B cells and automated single-cell segmentation.
- Compressed each cell into a low dimension and estimated local intrinsic dimension for each cell data.
- Visualized the global landscape with `UMAP` and conditional-wise trajectories.

AI For Science | Immunology | Computer Vision

Honors & Awards

DOMESTIC

Fall, 2021 **Honors Award,** Yonsei University *Seoul, South Korea*

Fall, 2025 **Honors Award,** Yonsei University *Seoul, South Korea*

"Honors Award" is granted to students with outstanding academic achievement, typically ranking in the top 10%.

Relevant Coursework

CS/AI	Discrete Mathematics, Data Structures, Introduction of Computer science, Computer Architecture, Linear Algebra, **Machine Learning**, Algorithm Analysis, Computer Network, **Computer Vision**, Operating System, **Large Language Model**, Cloud Computing ,Introduction of Deep Learning, **Mathematics for Deep Learning**, **Distributed Learning and inference**
Biochemistry	Biochemistry, Organic Chemistry, Neuroscience, **Biophysical chemistry**, Biological Statistics

** Courses in **bold** indicate areas of particular interest.*

Skills

DevOps	AWS, Docker
Programming	Python, JAVA, C/C++, MATLAB, LaTeX
Framework	Pytorch, OpenCV, PyMOL
Languages	Korean (Native) , English (Intermediate / TEPS : 340)
Video Editing	Adobe Premiere Pro
Lab Techniques	PCR, Western blot, Gel electrophoresis, Single Cell RNA sequencing