

Donghyuk Lee

Undergraduate Student
School of Electrical Engineering

Korea Advanced Institute of Science and Technology(KAIST)
291 Daehakro, Yuseonggu, Daejeon 34141, Korea
dhlee4832@kaist.ac.kr



Executive Summary

I have a strong interdisciplinary focus developed through research in neurobiology and bioengineering. My early work involved applying artificial neural network algorithms to biological data, specifically addressing challenges in genotype prediction and developing methods to mitigate data bias for enhanced model reliability.

My current intellectual pursuits lie at the critical intersection of advanced technology and biological systems. I am deeply invested in statistical inference models, information theory, and leveraging artificial intelligence for scientific discovery. A core element of this interest is the development of next-generation experimental platforms, focusing on lab-on-a-chip microfluidics integrated with cutting-edge optics and photonics. I aim to create closed-loop systems that use light-based sensing to generate high-fidelity biological data, which, in turn, informs and validates robust, interpretable AI models. I am enthusiastic about applying this integrative approach to complex challenges in neuroscience and high-throughput diagnostics.

Research Interest

- Optics & Photonics
- Signal Processing
- Lab on a Chip
- Machine Learning

Education

B.S. in Electrical Engineering Expected in 2029
Korea Advanced Institute of Science and Technology (KAIST)

Gyeonggi Buk Science High School January 2025

Awards & Certificates

2021

- Korea Middle School Physics Competition (KMPPhC) **Silver Medal**
- Korea Middle School Chemistry Competition(KMChC) **Silver Medal**
- Korean Mathematical Olympiad (KMO) **Encouragement Award**

2022

- Korea Brain Camp **Certificate (with Honors)**

2023

- Nationwide Science High School/Gifted School Creative Foundation Outstanding Research Presentation Contest **Bronze Medal (3rd place)**
- Nationwide Science Exhibition **Excellence Award (4th place)**
- KAIST pre–URP (Yoon Lab) **Certificate**

Research History

- [1] 2022 Creative Individual Research: Production of 1202T mutant mCherry–pBHA transformed *E. coli* via SDM and evaluation of its pH responsiveness as a bio–compatible micro pH–meter
- [2] 2023 Spring Semester Creative Individual Research: Epigenetic prediction of Alzheimer's disease induction mechanisms through genetic network learning
- [3] 2023 Fall Semester Creative Individual Research: Development of a Non–invasive Comprehensive Diabetes Complication Diagnosis Model Using Liquid Biopsy and Explainable AI
- [4] 2024 Spring Semester Creative Individual Research: Study on the Correlation between Gene Expression Data Transformation and Prediction via Adversarial Generative Neural Networks and Enhanced Epigenetic Aging Profiling Performance
- [5] 2022–2023 (First Half) RnE: Study on Cancer Cell–Specific Chemotaxis of *Pseudomonas fluorescens*–Powered Bio–Microbots
- [6] 2023 Second Half RnE: Study on the Correlation between Biofilm Formation and *R. palustris* Cell Efficiency Based on 3D Electrode Pretreatment Processes
- [7] 2023 KAIST Collaborative Research: Elucidation of Cell–Specific Transcriptome Dynamics During Human Cerebral Organoid Development
- [8] 2023–2024 DGIST Joint Research (Individual Research Activity): Computational Elucidation of Alzheimer's Disease Onset Mechanisms According to ApoE Isoforms and Epigenetic Normalization of ApoE4 Genotype Effects

Studies & Seminars

- [1] AD Biology Abstract & System Biology seminar
- [2] Build GNN models with PyG3
- [3] AI–driven drug discovery "Attention architecture"
- [4] KAIST lab meeting – Changes in Cholesterol Due to Lysosomal Alkalization in ApoE4 Astrocytes
- [5] Paper review seminar – Network Inference Analysis Identifies SETDB1 as a Key Regulator Colorectal Cells into DifferentiatedNormal–Like Cells
- [6] Verification methods seminar – Shapiro Wilk Test & Levene's Test
- [7] The Nitroplast: A Nitrogen–fixing Organelle
- [8] PSI Blast, protein 3D folding structure simulation seminar

Last Update : October 2025