DONGHYUK LEE

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EXECUTIVE SUMMARY

I am an undergraduate student in the School of Electrical Engineering at KAIST. I am studying with an interest in research on biomedical devices based on computational methodologies such as machine learning and in the field of wave optics.

During my time at science high school, I conducted various research activities combining graph theory and genetics. Specifically, I developed a screening model that rapidly predicts diabetes based on the 5hMC methylation pattern of circulating cell-free DNA (cfDNA). Additionally, under the guidance of professor Jin-Soo Seo (Yonsei university, Seo Lab), I conducted research using graph perturbation theory to elucidate the correlation between the ApoE4 genotype (a causative gene for Alzheimer's disease) and lipid rafts from a metabolic perspective. Beyond this, I have made diverse attempts to integrate various machine learning techniques, such as GANs and LLMs, into biotechnology research.

I also possess wet lab research experience. During my sophomore year of high school, I conducted research in Professor Yoon's lab at KAIST (Yoon Lab) on elucidating cell-specific transcriptomic dynamics during human brain organoid development. During this research, I had the opportunity to use confocal imaging, which sparked my interest in imaging and processing techniques. Consequently, I am currently pursuing personal studies related to optics.

EDUCATION

B.S in Electrical Engineering Feburary 2025 -
Korea Advanced Institute of Science and Technology (KAIST)

Highschool Diploma March 2022 - January 2025
Gyeonggi Buk Science High School

SKILLS AND INTERESTS

Interests	Machine Learning, Nanophotonics, Signal Processing, Plasmonics Optimization, Devices, Integrated Photonics & Silicon Photonics
Languages and Tools	Python, Javascript, HTML5, CSS3, NodeJS, React, Assembly Markdown, MATLAB

AWARDS & CERTIFICATES

Korea Middle School Physics Competition(KMPhC) Silver Medal 2021
Korea Middle School Chemistry Competition(KMChC) Silver Medal 2021
Korean Mathematical Olympiad (KMO) Encouragement Award 2021
Korea Brain Camp Certificate with Honors 2022
Nationwide Science High School/Gifted School Research Contest Bronze Medal (3rd place) 2023
Nationwide Science Exhibition Excellence Award 2023
KAIST pre-URP (Yoon Lab) Certificate with Honors 2023

RESEARCH

Production of I202T mutant mCherry-pBHA transformed E. coli via SDM and evaluation of its pH responsiveness as a bio-compatible micro pH-meter March 2022 - August 2022
Science High School Creative Individual Research for 2022 Spring

Epigenetic prediction of Alzheimer's disease induction mechanisms through genetic network learning March 2023 - July 2023
Science High School Creative Individual Research for 2023 Spring

Development of a Non-invasive Comprehensive Diabetes Complication Diagnosis Model Using Liquid Biopsy and Explainable AI September 2023 - March 2024
Science High School Creative Individual Research for 2023 Fall

Study on the Correlation between Gene Expression Data Transformation and Prediction via Adversarial Generative Neural Networks and Enhanced Epigenetic Aging Profiling Performance March 2024 - August 2024
Science High School Creative Individual Research for 2024 Spring

Study on Cancer Cell-Specific Chemotaxis of Pseudomonas fluorescens-Powered Bio-Microbots April 2022 - May 2023
Science High School First-Half RnE

Study on the Correlation between Biofilm Formation and R. palustris Cell Efficiency Based on 3D Electrode Pretreatment Processes March 2023 - January 2024
Science High School Second-Half RnE

Elucidation of Cell-Specific Transcriptome Dynamics During Human Cerebral Organoid Development 2023
Pre-URP KAIST Collaborative Research

Computational Elucidation of Alzheimer's Disease Onset Mechanisms According to ApoE Isoforms and Epigenetic Normalization of ApoE4 Genotype Effects July 2023 - May 2024
DGIST Joint Research (Individual Research)

DECLARATION

Last Update : November 2025