NAYOUNG KU

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EDUCATION

B.S. in Life Science & B.E. in AI Interdisciplinary Studies Feb 2023 – Feb 2026
Handong Global University Pohang, South Korea

B.A. in Psychology Feb 2021 – Feb 2023
National Institute for Lifelong Education Seoul, South Korea

RESEARCH EXPERIENCE

Handong Global University, *DeMUXly* Sep 2025 – present

Undergraduate Researcher under Prof. Jaeyoung Chun

- Developing a computational algorithm to demultiplex cell-hashed scRNA-seq data, accurately assigning pooled cells back to their original sample identities.
- Spearheading the design of a diffusion-based generative model to eliminate confounding artifacts, specifically aiming to rescue valid cells typically discarded by conventional thresholds due to low signal-to-noise ratios.

University of Nevada, Las Vegas, *DataX Lab* Jun 2025 – Jul 2025

Short-Term Experiential Learning Program under Prof. Mingon Kang

- Led a tumor classification project leveraging a foundational Vision Transformer (ViT) *Prov-GigaPath* on 234 Whole Slide Images (128 GB) from the TCIA Biobank.
- Designed a lightweight patch tiling and tissue-filtering algorithm for model training.
- Developed hybrid deep learning frameworks by integrating ViT embeddings with sequential and convolutional classifiers.
- Achieved nearly 0.99 of AUC, validating the efficacy of ViT in capturing complex morphological features.
- Recognized with Overseas Research Excellence Scholarship for outstanding research performance; received a follow-up research collaboration offer.

Handong Global University, *5 Billion* Mar 2025 – May 2025

Undergraduate Researcher Collaborated with Startup (Giftshed) under Prof. Jaeyoung Chun

- Worked on a computer vision project to segment Circulating Tumor Cells (CTCs) from unstained blood microscopy images.
- Processed high-resolution dataset of microscopy images, utilizing Roboflow for annotation to construct a robust training set.
- Developed a lightweight Super-Resolution (SR) framework to enable the use of downsampled images for real-time processing, significantly reducing data volume while preserving the clarity of critical features.
- Conducted extensive literature reviews on CTC morphology to ensure biological accuracy in data annotation.

Seoul National University, *Center for Convergence Approaches in Drug Development* Jan 2025 – Apr 2025

Student Researcher under Prof. Howard Lee

- Designed a Korean–English sentence-alignment algorithm for a ₩1B (≈$700K) Ministry-funded project, integrating multilingual BERT semantic scoring and length-based heuristics with dynamic programming.
- Defined metadata schema and proposed MongoDB to standardize parallel corpus management and ensure data integrity.
- Established rigorous data collection criteria and cleaning workflows to construct a gold-standard parallel corpus for developing document-level machine translation models.
- Facilitated interdisciplinary collaboration with Seoul National University SKI-ML Lab and Korea Regulatory Science Center, ensuring methodological consistency through weekly cross-functional meetings.

Handong Global University, *Nabi* Aug 2024 – Oct 2024

Undergraduate Researcher under Prof. Jaeyoung Chun

- Spearheaded a research group for the *JUMP AI 2024: Drug Discovery Competition*, developing a QSAR model to predict IC50 values of candidate compounds in SMILES representation against the IRAK4 kinase target.
- Developed traditional ML pipeline, engineered RDKit descriptors selected via PSO and trained an SVR model, tuned by Optuna employing MLflow for efficient experiment tracking.
- Placed 3rd (Daewoong Pharmaceutical President's Award) out of 990 teams, distinguishing the team as the only undergraduate-led team among the winners, and presented the methodology at the AI Pharma Korea Conference 2024.

Handong Global University, *Biodata Lab* Mar 2024 – Nov 2024

Research Intern under Prof. Taejin Ahn

- Analyzed clinical platelet RNA-seq datasets from Seoul National University Hospital to identify cancer biomarkers, addressing data sparsity and heterogeneity through rigorous statistical hypothesis testing.

- Implemented feature selection strategies using Particle Swarm Optimization (PSO) and hierarchical clustering to reduce dimensionality while preserving critical signals for classification models.
- Conducted wet-lab protocols with graduate researchers, including platelet isolation and PCR, and curated literature on Tumor-Educated Platelets (TEP) to bridge the gap between biological experiments and computational analysis.
- Developed a novel sequence-based RNA-seq preprocessing framework as an independent capstone project: tokenizing raw nucleotide sequences by ORFs, translating them to amino acid sequences, and encoding them with ProtBERT.
- Classified embeddings of TEP RNA-seq data from ovarian cancer patients and normal individuals, achieving AUC=0.7067.

Honors and Awards

Overseas Research Excellence Scholarship Summer 2025
Awarded by the Big Data Consortium for outstanding participation at University of Nevada, Las Vegas

3rd place, Daewoong Pharmaceutical President's Award Oct 2024
Ranked 3rd out of 990 teams in *JUMP AI 2024: AI Drug Discovery Competition*; Sole undergraduate-led team among winners

Big Data Seagull Scholarship Spring 2024, Fall 2024
Merit-based scholarship for outstanding academic performance in the curriculum certified by Handong Global University School of Applied Artificial Intelligence

Conferences and Presentations

6. **No Cell Left Behind: Recovering Discarded Cells via Self-Supervised Diffusion Denoising** Dec 2025
   Handong Global University Bio-AI Capstone Design Fair — Oral Presentation
5. **Diagnosing Cancer with Genomic Context** Nov 2024
   Handong Global University Capstone Design in Life Science Fair — Oral Presentation
4. **IRAK4 IC50 Inhibition Prediction** Oct 2024
   AI Pharma Korea Conference 2024 — Poster Presentation
3. **Impact of Prenatal IL-6 Elevation on Synaptic Development and Hippocampal Connectivity** Apr 2024
   Handong Global University Life Science Seminar — Internal Seminar
2. **Epigenetic Mechanisms Linking Maternal Microbiota to Offspring Neurodevelopment** Nov 2023
   Handong Global University Life Science Seminar — Internal Seminar
1. **Antioxidant Defense of Plant-Rhizosphere Microbial Interaction Against Necrotrophic Fungi** Aug 2023
   62nd National Undergraduate Symposium on Biology, Seoul National University — Oral Presentation

Teaching Experience

Introduction to AI and Machine Learning, *Teaching Assistant* Aug 2025
Addis Ababa Science and Technology University (Handong UNESCO-UNITWIN Program) — Addis Ababa, Ethiopia
Instructor: Prof. Dai Yon Cho

Big Data Modeling and Platforms, *Teaching Assistant* Mar 2025 – Jun 2025
Handong Global University, School of Applied Artificial Intelligence — Pohang, South Korea
Instructor: Prof. Jaeyoung Chun

AI Application Programming, *Teaching Assistant* Mar 2025 – Jun 2025
Handong Global University, School of Mechanical and Control Engineering — Pohang, South Korea
Instructor: Prof. Sangsan Lee

Community Involvement

R Programming Camp at Handong Global University, *Teaching Assistant* Jan 2026 (Upcoming)
Selected to mentor high school students in fundamental data analysis and visualization using R — Pohang, South Korea

Handong Office of International Affairs, *Exchange Student Mentor* Aug 2024 – Dec 2024
Assisted exchange students with adaptation to Korean culture and Residential College (RC) life — Pohang, South Korea

62nd National Undergraduate Symposium on Biology, *Participant, Presenter* Jul 2023 – Aug 2023
Engaged in weekly literature review seminars and delivered a presentation on recent bioengineering trends — Seoul, South Korea

Incheon Beauty and Art High School Python Programming Camp, *Teaching Assistant* Aug 2023
Provided assistance for elementary to high school students through hands-on Python programming — Incheon, South Korea