

Prospective PhD student

HYUNJAE WOO

Computational & Systems Biology, Machine Learning

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scholar.google.com/citations?user=l_uaRlwAAAAJ&hl

EDUCATION

Mar 2023 – Aug 2024

M.S. in Bioscience and Biotechnology | Konkuk University (Seoul, Korea)

Graduated as the **Valedictorian** (Representing 733 graduate students)

Cumulative GPA: **4.43 / 4.5** (Total of 24 credits)

Mar 2017 – Feb 2023

(Military service: Apr 2019 – Nov 2020)

B.S. in Systems Biotechnology | Konkuk University (Seoul, Korea)

Minor track in **Bioinformatics**

Cumulative GPA: **4.34 / 4.5** (Total of 145 credits)

MEDIA RECOGNITION

Feb, Aug 2024

News Coverage | South Korean News Media (Featured in over 15 press outlets)

Artificial Intelligence Reveals Hidden Metabolic Mechanism [\[link 1\]](#), [\[link 2\]](#), [\[link 3\]](#), [\[link 4\]](#), [\[link 5\]](#)

Artificial Intelligence Reveals Hidden Metabolic Mechanism (**English version**) [\[link\]](#)

2024 Konkuk University Commencement (awarded the President's Award) [\[link1\]](#), [\[link 2\]](#)

Feb 2024

Scientist Interview | Biological Research Information Center (Korea)

Interview for the nomination of "Leading Scientists of Korea (Hanbitsa)" [\[link\]](#)

AWARDS & HONORS

Feb 2024

Outstanding Researcher of Korea | The National Research Foundation of Korea

Presented to Korean researchers with publications in high-impact journals (JCR < 10%) [\[link\]](#)

Aug 2024

President's Award | Konkuk University, Seoul Campus

Honored to the top graduating student from each of the B.S., M.S., and Ph.D. programs for outstanding scholarly achievements and notable contributions to the university community

Oct 2023

Outstanding Oral Presentation Prize | The American Society for Microbiology

The **American Society for Microbiology** sponsored Graduate Student Research Forum at the 2023 Annual International Meeting of Microbial Society of Korea, Yeosu, South Korea [\[link\]](#)

Nov 2022

Gold Prize for Integrative Software Competition | Konkuk University, Seoul Campus

Mar 2023

Full-funded scholarship for a Master's Program | Konkuk University, Seoul Campus

2022, 2021, 2017

Best Honors Scholarship | Konkuk University, Seoul Campus

2018, 2017

PRIME-sponsored Scholarship | Ministry of Education, Korea Republic

2018

Department Representative Recognition Honor | Konkuk University, Seoul Campus

PUBLICATIONS

Journal Articles

Jan 2024

Woo H, Kim Y, Kim D, and Yoon SH. (2024) Machine learning identifies key metabolic reactions in bacterial growth on different carbon sources. *Molecular Systems Biology* (IF: 12.7) [PMID: 38291231] [\[link\]](#), [\[github\]](#)

Kim Y, Kim D, **Woo H**, and Yoon SH. Transcriptome structure of the probiotic *Escherichia coli* Nissle 1917 and its global responses to specific culture conditions and growth stage (in preparation)

International Conference Presentations

Oct 2023

Oral presentation: "Machine Learning and Deep Learning Approaches to Identify Metabolic Reactions Significantly Affecting Bacterial Growth" at the International

Jan 2023

Meeting of the Microbiological Society of Korea (MSK), Yeosu, Republic of Korea

Poster Presentation: "Artificial intelligence approaches to identify metabolic reactions important for bacterial growth" at the international Symposium of the Korean Society for Microbiology and Biotechnology, Yongpyeong, Republic of Korea

RESEARCH EXPERIENCE

Dec 2020 – Aug 2024

Systems Biotechnology Research Group | Konkuk University, Seoul Campus [\[link\]](#)
Research Intern, MSc Researcher (Advisor: Prof. Sung Ho Yoon)

- Led a project and published a paper on developing machine learning (ML) models to identify key metabolic steps influential to bacterial growth in various carbon sources.

Metabolic Modeling: Reconstructed *E. coli* K12 MG1655 genome scaled metabolic model to enable assimilation of previously unused carbon sources. Simulated model across 30 distinct carbon conditions in the context of 1,422 genetic mutations for preparation of training data.

Machine Learning: Developed explainable ML models (elastic net regression, multilayer perceptron + SHAP interpretation) to predict growth-influential metabolic reactions.

Wet lab Experiments: Validated key model predictions by performing genetic knockouts and growth experiments on the corresponding *E. coli* gene-deletion mutants

- Led a project on metabolic engineering of synthetic pathways for heterogenous butanol production in *Pseudomonas putida* S12 through *in silico* modeling approaches

TECHNICAL SKILLS

In silico & In vitro

Computational Skills

Programming languages: Python, R

Machine Learning: Tensorflow (Keras), Scikit-learn

Others: Adobe Illustrator, Microsoft Office, Linux (Ubuntu)

Experimental Skills

Basic Experiments: Isolation of genomic/plasmid DNA, PCR, PAGE, Transformation

Genetic Deletion: Recombination-based gene knockout of *E. coli*

Strain Cultivation: Stirred tank microbial bioreactor, High-throughput microplate reader

LEADERSHIP and EXTRACURRICULAR

Mar 2018 – Feb 2019

Student Representative | Konkuk University

Elected as a student representative for the Department of Systems Biotechnology
Led department social events, and resolved academic issues (e.g. class enrollment)

Mar 2017 – Feb 2018

University Student Council | Konkuk University

Worked for the public relations of Konkuk University

Apr 2019 – Nov 2020

Military Service | Republic of Korea Army

Stationed in the 3rd (White Skull) Division, near the Korean Demilitarized Zone
Received the "Exemplary Soldier Award"

Sep 2017 – Dec 2017

Mentoring for Students with Special Needs | Shinyang Middle School

Volunteered to teach basic algebra to students with intellectual disabilities

Apr 2017 – Feb 2019

Baseball Club | Konkuk University

Participated in ball games as an outfielder / 1st baseman

LANGUAGE PROFICIENCY

TOEFL : 110 | TOEIC : 980