

Seunghwan Choi

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RESEARCH INTERESTS

To investigate the impact of genetic variants on protein-protein interactions and post-translational modifications, particularly phosphorylation, in disease mechanisms.

EDUCATION

Korea University, Seoul | B.Sc. in Biosystems and Biomedical Sciences | Mar 2017 – Feb 2025 (Expected)
GPA: 3.94/4.5 (94.4/100)

RESEARCH EXPERIENCE

Undergraduate Researcher | Jan 2022 – Dec 2022, May 2024 – Present

Human Genomics Lab, Korea University, Seoul, Supervised by Professor Joon-Yong An

▪ **Single-cell Transcriptomics Research for Neural Behavior | May 2024 – Present**

Objective: To investigate the neural circuit mechanisms underlying fear memory formation in the cortex and cerebellum, as well as the social memory deficit caused by social isolation in the infralimbic cortex, using single-cell and spatial transcriptomics.

- Modified an existing preprocessing pipeline to detect fluorescent marker genes and in silico sort cells expressing these markers from single-cell transcriptomic data, enabling the labeling of specific neural circuits.
- Analyzed and integrated single-cell and spatial transcriptomics data from the cerebellum, interpreting the spatiotemporal interaction of inhibitory neurons in the Purkinje layer and deep cerebellar nuclei region during fear memory formation and recall.

▪ **Multi-omics Research for Non-Small Cell Lung Cancer (NSCLC) | Jan 2022 – Dec 2022**

Objective: To identify molecular subtypes of NSCLC, one of the leading causes of death, and investigate their molecular characteristics for precision medicine and potential drug targets, utilizing five types of data: whole exome sequencing, transcriptomics, proteomics, phosphoproteomics, and acetylproteomics.

- Classified NSCLC patients into five distinct molecular subtypes using Non-negative Matrix Factorization (NMF) clustering of multi-omics data.
- Performed integrative analyses with previous studies to validate the reproducibility of NSCLC subtypes proposed in this research.
- Conducted feature-wise survival analyses to identify proteins and phosphorylation sites associated with patient survival.
- Identified activated kinases and kinase-mediated signaling pathways in high-risk cancer tumors through phosphoproteomic analysis.

Undergraduate Researcher (During Mandatory Military Service in South Korea) | Oct 2023 – April 2024

Human Genomics Lab, Korea University, Seoul, Supervised by Professor Joon-Yong An

Note: Mandatory military service in South Korea, Jan 2023 – July 2024

▪ **Review on Multi-omics Clustering and Cancer Subtypes**

Objective: To compare clustering methods for multi-omics data and to review molecular subtypes of various subtypes, emphasizing the importance of multi-omics approaches in cancer research.

- Authored a first-author manuscript offering a comprehensive overview of cancer multi-omics methodologies and cancer subtyping.

PUBLICATIONS

(*co-first authors, †corresponding authors)

1. Song KJ*, Choi S*, Kim K*, Hwang HS*, Chang E, Park JS, Shim SB, **Choi S**, Heo YJ, An WJ, Yang DY, Cho KC, Ji W, Choi CM, Lee JC, Kim HR, Yoo J, Ahn HS, Lee GH, Hwa C, Kim S, Kim KG, Kim MS, Paek E, Na S†, Jang SJ†, An JY†, Kim KP†, Proteogenomic Analysis Reveals Non-Small Cell Lung Cancer Subtypes Predicting Chromosome Instability, and Tumor Microenvironment, *Nature Communications*, 2024. (DOI:[10.1038/s41467-024-54434-4](https://doi.org/10.1038/s41467-024-54434-4))
2. **Choi S*** & An JY†, Multiomics-Based Evaluation for Cancer Biomarker Discovery and Cancer Subtyping, *Advances in Clinical Chemistry*, 2024. (DOI:[10.1016/bs.acc.2024.10.004](https://doi.org/10.1016/bs.acc.2024.10.004))
3. Park G*, Jang WE*, Kim S*, Gonzales EL, Ji J, **Choi S**, Kim YJ, Park JH, Mohammad HB, Bang G, Kang M, Kim SB, Jeon SJ, Kim JY, Kim KP, Shin CY†, An JY†, Kim MS†, Lee YS†, Dysregulation of the Wnt/β-catenin Signaling Pathway via Rnf146 Upregulation in a VPA-Induced Mouse Model of Autism Spectrum Disorder, *Experimental and Molecular Medicine*, 2023. (DOI:[10.1038/s12276-023-01065-2](https://doi.org/10.1038/s12276-023-01065-2))
4. Ji J*, **Choi S**, Lee YS, An JY†, Identification of Cell Type-Specific Gene Regulatory Networks Responsive to Contextual Fear Conditioning in Hippocampal Excitatory Neurons, *under review*.
5. Ji J*, Baek JH*, **Choi S**, Huang KD, Junko Kasuya, Ted Abel†, An JY†, Lee YS†, Region- and cell type-specific changes in gene expression in the cerebellum after classical fear conditioning, *manuscript in preparation*.

HONORS & AWARDS

Dean's Award, Korea University, 2021

BIOINFORMATICS SKILLS

Programming Languages: Python, R, Unix

CONFERENCES, TRAINING & WORKSHOPS

- **Attendee, Annual Meeting of the American Society of Human Genetics**, Denver, Colorado, Nov 2024
- **Participant, AI Summer School for Protein-Protein Interaction Prediction**, Hanyang University, Seoul, Aug 2024

TEACHING EXPERIENCE

- **Undergraduate Intern Mentor**

Human Genomics Lab, Korea University | Aug 2024 – Present

Mentor undergraduate interns in bioinformatics analysis, guiding them through data preprocessing and analysis steps while ensuring they understand the concepts and techniques behind each process to develop their technical and research skills.

- **Mathematics Tutor**

Self-employed | Mar 2022 – Dec 2022

Provided one-on-one personalized tutoring in calculus and probability & statistics to a high school student, tailoring lessons to individual learning needs.