

Education

- 2022-Present **PhD Computer Science**, *Tokyo Institute of Technology*, Tokyo, Japan
- Advisor: Dr. Naoaki Okazaki
 - MEXT Scholar (文部科学省奨学金)
- 2016-2018 **MS Computer Science**, *Yonsei University*, Seoul, South Korea
- Advisor: Dr. Yo-Sub Han
 - Thesis: *Efficient Algorithms for Two Parsing Problems on Probabilistic Finite Automata*
 - Outstanding International Student Scholarship Recipient
- 2011-2015 **BS Discrete Mathematics**, *Georgia Institute of Technology*, Atlanta, GA
- Minor in Korean
 - Advisor: Dr. Anton Leykin
 - Thesis: *Straight Line Programs and Automatic Differentiation in Python*

Work Experience

- 05/22-Present **PhD Student Researcher**, *Google*, Tokyo, Japan
- Researcher focusing on language modeling and federated analytics on the Gboard team.
- 08/19-04/22 **Software Engineer**, *Google*, Mountain View, CA
- Software engineer on the Gboard team.
 - Developed compressed statistical language models for mobile keyboard input.
 - Developed TensorFlow Federated infrastructure and compressed sketching models for privacy-preserving federated analytics.
 - TA for Google Tech Exchange Applied Data Structures and Algorithms (2020 and 2021).
- 02/19-05/19 **Software Engineering Intern**, *Google*, New York City, NY
- Software engineering intern in the Speech and Language Algorithms research group.
 - Developed a compression scheme for finite-state transducers used in keyboard language models which led to a first-author publication.
 - Compression algorithm reduced the space requirements of the Gboard keyboard lexicon data structure by 90% compared to the uncompressed version and 58% compared to the previous production compression scheme.
- 09/16-12/18 **Graduate Teaching Assistant**, *Yonsei University*, Seoul, South Korea
- TA for CSI2103 Data Structures, CSI 3108 Algorithm Analysis, CSI3109 Automata and Formal Languages, and CSI6512 Graduate Analysis of Algorithms.
- 01/16-05/16 **Upper School Computer Science Teacher**, *Maclay School*, Tallahassee, FL
- Faculty sponsor of the Computer Science Club.
- 05/15-08/15 **Data Science Intern**, *AirSage Inc.*, Atlanta, GA
- Used Python and QGIS to track, analyze, and display population movement patterns.
- 05/12-08/12 **Software Development Intern**, *AirSage Inc.*, Atlanta, GA
- Used Python and psycpg2 to construct and store geometric representations of cell towers' effective areas in a spatial database.

Publications (* denotes primary authorship)

- Parameter-Efficient Korean Character-Level Language Modeling**
 - Marco Cognition*, Sangwhan Moon, Lawrence Wolf-Sonkin, Naoaki Okazaki. EACL 2023
- SoftRegex: Generating Regex from Natural Language Descriptions using Softened Regex Equivalence**
 - Jun-U Park, Sang-Ki Ko, Marco Cognition, Yo-Sub Han. EMNLP 2019
- On the Compression of Lexicon Transducers.**
 - Marco Cognition*, Cyril Allauzen, Michael Riley. FSMNLP 2019
- Online Infix Probability Computation for Probabilistic Finite Automata**
 - Marco Cognition*, Yo-Sub Han, Soon Chan Kwon. ACL 2019
- Incremental Computation of Infix Probabilities for Probabilistic Finite Automata**
 - Marco Cognition*, Yo-Sub Han, Soon Chan Kwon. EMNLP 2018
- Online Stochastic Pattern Matching**
 - Marco Cognition*, Yo-Sub Han. CIAA 2018

Service

- **Workshop for Natural Language Processing Open Source Software (NLP-OSS 2023)** - Programme Committee
- **ACM International Collegiate Programming Contest (Korea Regional)** - Question Writer (2017, 2018)
- **FSU ACM Programming Contest** - Question Writer (2020, 2021^(x2), 2022)
- **Hackbright Academy** - Volunteer Mentor (2020^(x2), 2021)
- **Seminars on Formal Languages and Neural Networks (FLaNN)** (<https://flann.super.site/>) - Organizer (2022 - Present)
- **The Gradient** (<https://thegradient.pub/>) - Editorial Board (2021 - Present)

Advising

1. **Junyoung Lee** (2023) - *Comparing Jamo-Level BPE Variants for Korean Machine Translation*
 - Nanyang Technological University (NTU Singapore) Bachelor's Thesis
2. **Emil Hukic** (2022) - *FST Tokenization for NLP*
 - Young Science and Engineering Researchers Program (YSEP) Final Project
3. **Kosuke Endo** (2022) - 画像キャプション生成におけるJPEG圧縮への頑健性の改善
 - English Title: *Improved Robustness to JPEG Compression in Image Caption Generation*
 - Tokyo Institute of Technology Bachelor's Thesis (co-advised with Zhishen Yang)
 - Presented at the Japanese Association for Natural Language Processing conference (NLP2023)
4. **Haksu Kim, Yumin Lim, Myeongjang Pyeon** (2018) *Solving k -MPS using Probabilistic Finite-State Automata*
 - Yonsei University Capstone Project

Talks

1. **LotteryTickets.jl: Sparsify Your Flux Models**
 - Presented at JuliaCon 2023

Skills

- **Programming Languages:** Python, C++, Julia
- **Human Languages:** English, Korean, Esperanto