Changhun Lee

PH.D. · POST-DOCTORAL RESEARCHER · UNIST AIGS

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Education

PH.D. INDUSTRIAL ENGINEERING   *2016.03 - 2023.02*
- Institution: Ulsan National Institute of Science and Technology (UNIST)
- Advisor: Dr. Chiehyeon Lim
- Dissertation Title:
  "Tackling Three Problems in Controlled Sequence Generations: Bridging Reinforcement Learning with Language Models"

BSc. ECONOMICS   *2011.03 - 2015.02*
- Institution: Ajou University

Competency

TECHNICAL & RESEARCH CAPABILITIES
- Proficient in Python, R, TensorFlow, and Keras, intermediate in PyTorch and Spark
- Expertise in sequential decision-making models (i.e., language modeling, reinforcement learning, etc.)
- Adept at translating real-world problems described in everyday language into generalized abstract logic that is mathematically formulated.

COMMUNICATION SKILLS
- Advanced level of English writing
- Intermediate level of English speaking

Research Interest

GENERAL REMARKS
- With the increasing reliance on artificial intelligence (AI) in various fields, I believe that unprincipled, or rule-of-thumb, use of AI will greatly increase the risk of out-of-control situations. In this regard, the goal of my research is to analyze the nature of controllability and use it to improve the controllability of AI.
- Specifically, my research focuses on the interplay between generative models and reinforcement learning (RL) algorithms for developing controllable AI with a theoretical guarantee for its usage — especially in the context of large language models (LLMs).

SPECIFIC REMARKS
- **Optimality:** Control over AI must be considered with guaranteed results. We need to understand the optimality of the objective function or training algorithm and thereby provide guarantees about the results.
- **Dynamics:** Control over AI must be considered in dynamic situations. We need to recognize and reflect that AI is subject to many uncertainties (e.g., interaction with users or other AIs, long-term distribution shifts in training datasets, adversarial attacks on AI from the outside, etc.).
- **Equilibrium:** Control over AI must be considered at the equilibrium. We need to seek an equilibrium of AI control that achieves long-term optimality under any dynamic situation.
- **Gamification, Simulation & Mechanism Design:** Control over AI must be tested from the perspective of whether what was intended has been followed. To test all possible intended scenarios, it is best for researchers to be able to arbitrarily design and manipulate experimental settings at will.

Professional Experience

2023.03-Present	**Postdoctoral Researcher**, Graduate School of Artificial Intelligence, UNIST
2019-2022	**Principal Investigator**, Granted Research Program, Daewoong Pharmaceutics Foundation
2021.11-2021.12	**Research Advisor**, Project-based Learning Program, LG Electronics
2018-2019	**Co-founder**, Data Team, Smart Ship Venture Tech
2017.07-2017.12	**Data Analyst**, Business Planning Department, Hyundai Mipo Dockyard
2016-2017	**Graduate Teaching Assistant**, Department of Industrial Engineering, UNIST

Awards, Fellowships, & Grants

2023	**UNIST Best Research Award**, Ulsan National Institute of Science and Technology
2022	**Prominent Presentation Award**, The Korean Nutrition Society
	Best Oral Presentation Award, Korean Academy of Pediatric Allergy and Respiratory Disease
2020	**Best Poster Presentation Award**, The Korean Nutrition Society
2018	**Minister of Science and ICT Award**, Korea Institute of Science and Technology
	Daewoong Research Scholarship Grant, Daewoong Pharmaceutics Foundations
2013	**Student Best Paper Award**, Korean Association for Policy Sciences

Publications

CONFERENCE PAPERS

Changhun, Lee., Chiehyeon Lim. (2024). "Levenshtein Agent: Reinforced Editing Process for Text Style Transfer," *To be submitted to ACL'24*

Changhun, Lee., Chiehyeon Lim. (2024). "A Bi-objective Perspective on Controllable Language Models: Reward Dropout Improves Off-policy Control Performance," *Under Review in ICLR'24*

Jongkyung Shin.*, **Changhun, Lee.***, Chiehyeon Lim., Yunmo Shin., Junseok Lim. (2022). "Recommendation in Offline Stores: A Gamification Approach for Learning the Spatiotemporal Representation of Indoor Shopping," *In Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (pp. 3878-3888).*

Changhun, Lee., Soohyeok Kim., Sehwa Jeong., Chiehyeon Lim., Jayun Kim., Yeji Kim., Minyoung Jung. (2021). "MIND dataset for diet planning and dietary healthcare with machine learning: Dataset creation using combinatorial optimization and controllable generation with domain experts," *In Thirty-fifth Conference on Neural Information Processing Systems (NeurIPS) Datasets and Benchmarks Track (Round 2).*

Changhun, Lee., Soohyeok Kim., Chiehyeon Lim., Jayun Kim., Yeji Kim., Minyoung Jung.. (2021). "Diet Planning with Machine Learning: Teacher-forced REINFORCE for Composition Compliance with Nutrition Enhancement," *In Proceedings of the 27th ACM SIGKDD Conference on Knowledge Discovery & Data Mining (pp. 3150-3160).*

JOURNAL PAPERS

Changhun, Lee., Soohyeok Kim., Sehwa Jeong., Jayun Kim., Yeji Kim., Chiehyeon Lim., Minyoung Jung. (2023). "Artificial intelligence generates allergy-free high-nutrition diets: A first study on the real-world solution development and its evaluation," *To be submitted to Allergy.*

Changhun, Lee., Soohyeok Kim., Jayun Kim., Chiehyeon Lim., Minyoung Jung. (2022). "Challenges of diet planning for children using artificial intelligence," *Nutrition Research and Practice, 16(6), 801-812.*

Changhun, Lee., Chiehyeon Lim. (2021). "From technological development to social advance: A review of Industry 4.0 through machine learning," *Technological Forecasting and Social Change, 167, 120653.*

Min Jung., Chiehyeon Lim., **Changhun, Lee.**, Soohyeok Kim., Jayun Kim. (2020). "Human dietitians vs. Artificial intelligence: Which diet design do you prefer for your children?," *Journal of Allergy and Clinical Immunology, 147(2), AB117.*

Presentations
* presenting author; + mentored undergraduate

Contributed Presentations

Sehwa Jeong.[+], Soohyeok Kim, **Changhun, Lee.**, Jayun Kim., Yeji Kim., Chiehyeon Lim., Minyoung Jung.* 2022. Toward the Diet Planning with Artificial Intelligence for Children with Food Allergies. Flash Talk Session: EAACI Hybrid Congress 2022, Prague, Czech Republic

Changhun, Lee.*, Soohyeok Kim., Sehwa Jeong.[+], Chiehyeon Lim., Jayun Kim., Yeji Kim., Minyoung Jung. 2021. MIND dataset for diet planning and dietary healthcare with machine learning: Dataset creation using combinatorial optimization and controllable generation with domain experts. Best Paper Sessions: Korean Artificial Intelligence Association 2021, Virtual

Changhun, Lee., Soohyeok Kim., Jayun Kim., Chiehyeon Lim., Minyoung Jung.* 2021. Human- or Artificial Intelligence-designed Diets: Which Do You Prefer for Your Children? Poster Presentation: AAAI 2021, Virtual

Research Project

DEVELOPMENT OF A CONTROLLED SEQUENCE GENERATION MODEL SOLVING THE OBJECTIVES MISMATCH PROBLEM OF DATA-DRIVEN SEQUENCE OPTIMIZATION • Funding Agency: National Research Foundation of Korea	*2023 - present*
DEVELOP AND VALIDATE A LEARNING FRAMEWORK FOR INTERACTION AND CO-EVOLUTION BETWEEN HUMANS AND AI • Funding Agency: Ministry of Education	*2021 - present*
DEVELOPING INTELLIGENT BIO-OMICS ANALYSIS TECHNOLOGY • Funding Agency: Ministry of SMEs and Startups	*2021 - 2023*
DEVELOP A METHODOLOGY FOR IDENTIFYING LATENT FACTORS EXPLAINING VARIABILITY IN SOCIAL SCIENCE BIG DATA • Funding Agency: Ministry of Education	*2020 - 2022*
DEVELOPMENT OF A NON-FACE-TO-FACE PRECISION DIETARY AI SERVICE SYSTEM TAILORED TO THE GUT FLORA OF PEDIATRIC ATOPIC DISEASES • Funding Agency: Ministry of Science and ICT	*2020-2021*
DEVELOPMENT OF A DATA REORGANIZATION AND RECOMMENDATION SYSTEM TO REDUCE THE COST OF DRUG DISCOVERY • Funding Agency: Daewoong Pharmaceutics Foundation	*2019 - 2022*
STRUCTURAL ANALYSIS OF THE PROCESS OF TECHNOLOGICAL INNOVATION IN THE FOURTH INDUSTRIAL REVOLUTION • Funding Agency: Ministry of Education	*2018 - 2021*
RESEARCH ON SERVITIZATION IN INDUSTRY 4.0 THROUGH REGIONAL INDUSTRIAL-ACADEMIC COOPERATION • Funding Agency: Ministry of Science and ICT	*2018-2019*
UNDERSTAND THE KEY RESEARCH AND APPLICATION INDUSTRIES OF THE FOURTH INDUSTRIAL REVOLUTION • Funding Agency: Ulsan National Institute of Science and Technology	*2017-2020*