Dongkun Lee

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Professional Summary

AI researcher with a **Ph.D. in Computer Science**, specializing in **Generative AI** for **XR simulations** and **anomaly detection** in **safety-critical systems**. Experienced in developing **simulation environments**, **multimodal learning techniques**, and **content generation methods**. Passionate about applying **AI** to improve **operational safety**, **immersive training**, and **scalable content creation**.

Education

KAIST - Korea Advanced Institute of Science & Technology **September 2019 - February 2025**
PhD, Computer Science *GPA: 3.82*

KAIST - Korea Advanced Institute of Science & Technology **March 2016 - September 2019**
Master's, Computer Science *GPA: 3.85*

Kyungpook National University **March 2012 - February 2016**
Bachelor's, Computer Science *GPA: 4.06*

Work Experience

KU-Center for Cyber-Physical Systems (C2PS) **Abu Dhabi, United Arab Emirates**
Visiting Researcher *March 2020 - May 2020*

- Developed explainable anomaly detection for industrial safety-critical systems using generative models.

Kyungpook National University **South Korea**
Vice-chair & Contestant, ACM-ICPC Club (Gori) *March 2013 - December 2015*

- Led competitive programming training and internal contest management.
- Participated in ACM-ICPC Daejeon Regional 2013.

Qtec **South Korea**
Undergraduate research intern *June 2014 - August 2014*

- Location control system development assistance, embedded system application development, voice call system research

Selected Projects

Development of intelligent evolutionary WiseQA platform technology for human knowledge augmentation service **South Korea**
Participant *March 2016 - August 2019*

- I conducted research to develop a deep learning-based language model for open-domain Korean natural language sentences
- Utilizing this model, I was responsible for generating vectors for Korean sentences and calculating their similarities, thus providing an auxiliary decision-making tool for AI models
- This effort was part of a larger project aimed at strengthening Korea's AI ecosystem.

Development of XAI-based Technology for Smart Energy Platform **South Korea**
Participant *January 2018 - December 2020*

- The project was undertaken by the Korea Electric Power Corporation's Power Research Institute, a national research organization in South Korea, focusing on researching artificial intelligence technologies related to energy and their practical application in Korea
- My role involved anomaly detection and explanation generation, aimed at proposing anomaly detection technology for identifying and generating explanations for abnormal situations in power system field situation images
- This represented an initial foray into incorporating explainable artificial intelligence into the power system, emphasizing the novelty of the research

- The outcome included the extraction of meaningful features for explanations through unsupervised learning, marking a significant step toward integrating AI into energy sector operations with a focus on enhancing system reliability and operational transparency.

Technology for Smart Home-Based AI Learning Assistant (AILA) Platform Based on Non-Contact English Learning Environment **South Korea**

Project Lead Student *June 2021 - May 2022*

- The project aims to develop a platform called "AILA" for a non-contact English speaking learning environment, combining multisensor technology and chatbots to immerse learners in a 24-hour English exposure and speaking setting
- Core technologies include proactive situation awareness in IoT platforms, empathetic English conversation chatbots, and customized 3D avatar creation
- As a Project Lead Student, my role encompasses integrating and managing the Unity and chatbot development environments, along with providing a personalized experience through the fusion of 3D avatar chatbot technology
- This role involves leading the project towards achieving its goal of enhancing English language learning through innovative technological integration.

XR Counter-Terrorism Education and Training Test Bed Establishment **South Korea**

Participant *April 2021 - February 2024*

- In a research program supported by the Korean National Police Agency, the objectives are to establish a virtual training platform for terrorism response and develop a system for analyzing and evaluating trainee behavior
- My role in this project involved creating an application framework for generating virtual environments based on manuals, and developing similarity-based manual analysis and simulation artificial intelligence algorithms
- I also contributed to the creation of frameworks related to behavior recognition and automatic evaluation, supporting the project's aim to enhance training effectiveness in preparing for terrorism response scenarios.

KU-Center for Cyber-Physical Systems (C2PS) **United Arab Emirates**

Visiting researcher *March 2020 - May 2020*

- The purpose of this project is to address the "black box" nature of deep learning methods in fields requiring reliability and transparency, such as the military, medical, and safety sectors
- By utilizing Explainable Artificial Intelligence (XAI) methods, the study seeks to make the decision-making processes of machine learning models more understandable and transparent
- In this research, I have worked on anomaly detection for industrial images based on generative models.

Skills

Programming: Python, Java, C/C++, MATLAB, Lua
Frameworks: Pytorch, Tensorflow, OpenCV, Unity, Unreal Engine
Tools: Git, Docker
Areas of Expertise: Natural Language Processing (NLP), Computer Vision, Generative AI, XR Simulation

Languages

Japanese, Korean, English

Interests

Generative AI for Content Creation, XR Simulation and Training, Anomaly Detection in Critical Systems, Multimodal Machine Learning

- [J1] Ahmed Y. Al Hammadi, **Dongkun Lee**, Chan Yeob Yeun, Ernesto Damiani, Song-Kyoo Kim, Paul D. Yoo, Ho-Jin Choi. *Novel EEG sensor-based risk framework for the detection of insider threats in safety critical industrial infrastructure.* IEEE Access, vol. 8, pp. 206222–206234, 2020.

Selected Publications

- [C1] Minho Sim, YoungJun Lee, **Dongkun Lee**, Ho-Jin Choi. *A Simple Debiasing Framework for Out-of-Distribution Detection in Human Action Recognition.* Proceedings of the 26th European Conference on Artificial Intelligence (ECAI), 2023.
- [C2] **Dongkun Lee**, Han-Gyu Kim, Ho-Jin Choi. *Road anomaly segmentation based on pixel-wise logit variance with iterative background highlighting.* IEEE International Conference on Robotics and Automation (ICRA), pp. 9274–9280, 2023.
- [C3] Tae-Sung Choi, **Dongkun Lee**, Yuchae Jung, Ho-Jin Choi. *Multivariate time-series anomaly detection using seqvae-cnn hybrid model.* IEEE International Conference on Information Networking (ICOIN), pp. 250–253, 2022.
- [C4] **Dongkun Lee**, Ho-Jin Choi. *Text to game characterization: a starting point for generative adversarial video composition.* IEEE International Conference on Big Data and Smart Computing (BigComp), pp. 717–720, 2018.
- [C5] Kyo-Joong Oh, **Dongkun Lee**, Byungsoo Ko, Ho-Jin Choi. *A chatbot for psychiatric counseling in mental health-care service based on emotional dialogue analysis and sentence generation.* IEEE International Conference on Mobile Data Management (MDM), pp. 371–375, 2017.
- [C6] **Dongkun Lee**, Kyo-Joong Oh, Ho-Jin Choi. *The chatbot feels you – a counseling service using emotional response generation.* IEEE International Conference on Big Data and Smart Computing (BigComp), pp. 437–440, 2017.
- [C7] Kyo-Joong Oh, **Dongkun Lee**, Chanyong Park, Young-Seob Jeong, Sawook Hong, Sungtae Kwon, Ho-Jin Choi. *Out-of-domain detection method based on sentence distance for dialogue systems.* IEEE International Conference on Big Data and Smart Computing (BigComp), pp. 673–676, 2018.

Patents

Registered Patents

- **Method of Providing Health Care Guide Using Chatbot Having User Intention Analysis Function and Apparatus for the Same** *Inventors*: Ho-Jin Choi, Dongkun Lee, Kyojoong Oh, Hyunki Kim, Jung Heo *Registration No.*: 10-1971582 | *Registration Date*: Apr 17, 2019
- **The Apparatus for Recognizing Sentence Plagiarism Using Paraphrasing Generation Technique, and Apparatus of the Program and Computer-Readable Storage** *Inventors*: Ho-Jin Choi, Kyojoong Oh, Dongkun Lee, Jung Heo, Hyunki Kim *Registration No.*: 10-1869362 | *Registration Date*: Jun 14, 2018
- **Paraphrase Sentence Generation Method for a Korean Language Sentence** *Inventors*: Ho-Jin Choi, Kyojoong Oh, Dongkun Lee *Registration No.*: 10-1757222 | *Registration Date*: Jul 6, 2017

Patent Applications

- **Method for Providing Guidance Information for Abnormal Circumstance of Utility Pole and Electronic Device Thereof** *Inventors*: Ho-Jin Choi, Dongkun Lee *Application No.*: 10-2020-0052123 | *Filing Date*: Apr 29, 2020
- **Method and Apparatus for Recommending PowerPoint** *Inventors*: Ho-Jin Choi, Dongkun Lee *Application No.*: 10-2020-0018720 | *Filing Date*: Feb 17, 2020
- **Video Generation Apparatus and Method** *Inventors*: Ho-Jin Choi, Dongkun Lee *Application No.*- : 10-2019-0023651 | *Filing Date*: Feb 28, 2019
- **Domain Specific Dialogue Acts Classification for Customer Counseling of Banking Services Using RNN Sentence Embedding and ELM Algorithm** *Inventors*: Ho-Jin Choi, Kyojoong Oh, Dongkun Lee *Application No.*: 10-2017-0173901 | *Filing Date*: Dec 18, 2017

International Patent Applications (PCT)

- **Method and Apparatus for Recommending PowerPoint** *Inventors*: Ho-Jin Choi, Dongkun Lee *PCT Application No.*: PCT/KR2021/001010 | *Filing Date*: Jan 26, 2021
- **Video Generation Method from Natural Language** *Inventors*: Ho-Jin Choi, Dongkun Lee *PCT Application No.*: PCT/KR2020/017276 | *Filing Date*: Nov 30, 2020