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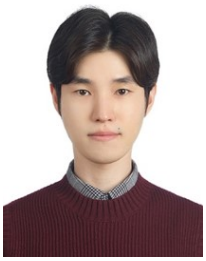

Education

Sep. 2021 – Present **Ph.D. in Artificial Intelligence**, *KAIST*, Daejeon
Advisor: Prof. Jong Chul Ye

Feb. 2012 – Feb. 2014 **M.S. in Electrical Engineering**, *KAIST*, Daejeon
Advisor: Prof. Wan Choi

Mar. 2008 – Feb. 2012 **B.S. in Media Communication Engineering**, *Hanyang University*, Seoul
Summa Cum Laude (GPA: 4.13/4.5)

Research Interests

Generative models, Trustworthy/Inclusive AI, Scientific discovery with AI

Publications

Conference Papers

[C6] Boost-and-Skip: A Simple Guidance-Free Diffusion for Minority Generation
Soobin Um*, Beomsu Kim*, Jong Chul Ye
ICML 2025

[C5] Minority-Focused Text-to-Image Generation via Prompt Optimization
Soobin Um, Jong Chul Ye
CVPR 2025 (**Oral presentation, top 0.74%**)

[C4] Physics-guided Optimization of Photonic Structures using Denoising Diffusion Probabilistic Models
Dongjin Seo*, **Soobin Um***, Sangbin Lee, Jong Chul Ye, Haejun Chung
NeurIPS 2024 Workshop (ML4PS)

[C3] Self-Guided Generation of Minority Samples Using Diffusion Models
Soobin Um, Jong Chul Ye
ECCV 2024

[C2] Don't Play Favorites: Minority Guidance for Diffusion Models
Soobin Um, Suhyeon Lee, Jong Chul Ye
ICLR 2024

[C1] A Fair Generative Model Using LeCam Divergence
Soobin Um, Changho Suh
AAAI 2023 (**Oral presentation**)

Preprints

[P1] Physics-guided and fabrication-aware inverse design of photonic devices using diffusion models
Dongjin Seo*, **Soobin Um***, Sangbin Lee, Jong Chul Ye, Haejun Chung
Submitted to ACS Photonics

Work Experience

Feb. 2014 – Aug. 2021 **Senior Researcher**, *Agency for Defense Development (ADD)*
Wireless communication and network systems for military applications

Projects

Jun. 2023 – Jun. 2024 **Development of AI-Based X-Ray Computer-Based Training Program**: Field-oriented Technology Development Project for Customs Administration, Ministry of Science & ICT (MSIT) and Korea Customs Service

Jan. 2023 – Jun. 2023 **Development of AI Technology for Personalized Plug-and-Play Explanation and Verification of Explanation** for Institute of Information & communications Technology Planning & Evaluation (IITP) and the Korea government (MSIT)

Sep. 2021 – Aug. 2022 **Development of a Framework to Analyze, Detect, and Mitigate/Remove Bias in AI Models and Training Data** for Institute of Information & communications Technology Planning & Evaluation (IITP) and the Korea government (MSIT)

Patents

Registered

[PR18] Apparatus, Method, Computer-Readable Storage Medium and Computer Program for Assigning Dynamic Frequencies in Wireless Network
Patent No. 10-2212367, Jan. 2021.

[PR17] Method and Apparatus for Satisfaction Degree based Weighted Fair Resource Allocation Optimization in Cognitive Radio Wireless Network
Patent No. 10-2204935, Jan. 2021.

[PR16] Apparatus and Method for Controlling Performance of Receiver for Sub-Device in MIMO Cognitive Radio Systems
Patent No. 10-2192564, Dec. 2020.

[PR15] Full Duplex Pair Matching Method for Improving Network Performance in Full Duplex Network Environment
Patent No. 10-2178266, Nov. 2020.

[PR14] Successive-Cancellation Fano Decoding Apparatus and Method for Decoding Using the Same
Patent No. 10-2158312, Sep. 2020.

[PR13] Apparatus and Method for Controlling Channel of Cognitive Radio
Patent No. 10-2107015, Apr. 2020.

[PR12] Data Convergence Method for Reducing Overhead of Cognitive Radio Networks
Patent No. 10-2085205, Feb. 2020.

[PR11] Method and Apparatus for Selecting Frequency Band in Cognitive Radio Network
Patent No. 10-2042260, Nov. 2019.

[PR10] Method and Apparatus for Allocating Frequency Resource in Cognitive Radio Ad-Hoc Network
Patent No. 10-2039650, Oct. 2019.

[PR9] Apparatus and Method for Scheduling Slots for Communication of Data Packets
Patent No. 10-2038051, Oct. 2019.

[PR8] Apparatus and Method for Constructing Rate-compatible Polar Code
Patent No. 10-1996026, Jun. 2019.

[PR7] Time Mirroring Method and System for Airborne Relay Communications
Patent No. 10-1901616, Sep. 2018.

[PR6] Space-Time Dynamic Spectrum Access Apparatus Combined by Multi-Beam Array Antenna and Time Division Duplexing and Frequency Division Duplexing
Patent No. 10-1873102, Jun. 2018.

[PR5] Radio Set System and Setting Channel Method for the Radio Set System
Patent No. 10-1832971, Feb. 2018.

[PR4] Phased Array Antenna System
Patent No. 10-1773481, Aug. 2017.

[PR3] Radio Apparatus for Sensing Space Frequency Spectrum
Patent No. 10-1764655, Jul. 2017.

[PR2] Polarization tracking system using dual polarization antenna with variable gain attenuator and the control method of the same
Patent No. 10-1747789, Jun. 2017.

[PR1] A Dynamic Spectrum Access Technique based on OFDM for P2P Communication
Patent No. 10-1632267, Jun. 2016.

Research Grants

Sep. 2024 – Aug. 2025 **Basic Science Research Program Grant** on Robust Generative AI
Funded by the NRF and Ministry of Education

Honors & Awards

Aug. 2020 Bronze Medal, National Defense Science Award, ADD

Aug. 2020 Achievement Award, ADD

Jun. 2018 Outstanding Paper Award, KICS Winter Conference

Feb. 2012 *Summa Cum Laude*, Excellence Award, Hanyang University

Invited Talks

Jul. 2025 *MinorityPrompt and BnS: Recent Advances in Diffusion-Based Minority Sample Generation*, Visual AI Lab, Princeton University

Jul. 2025 *Physics-Guided and Fabrication-Aware Inverse Design Using Diffusion Models*, The McMahon Lab, Cornell University (Co-presented with Dongjin Seo)

Aug. 2022 *Diffusion Probabilistic Models: A Gentle Introduction*, SpiderCore

Teaching Experience

KAIST
- AI501: Machine Learning for AI (Spring 2023)
- AI619: AI for Medical Imaging (Fall 2022, **Head TA**)
- EE424: Introduction to Optimization (Fall 2021)
- EE210: Probability and Introductory Random Processes (Fall 2013)
- EE321: Communication Engineering (Spring 2013)

Hyundai Motors Training
- Data Science: Modeling for Prediction (Feb. 2022)
- Data Science Master Program (Sep. 2021 – Nov. 2021)

Reviewer Services

Conferences CVPR 2024, ICLR 2025, CVPR 2025

References

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