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# Soobin Um

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## Education

- Aug. 2021 – **Ph.D. in Artificial Intelligence**, KAIST, Daejeon  
Aug. 2025 Advisor: Prof. Jong Chul Ye
- Feb. 2012 – **M.S. in Electrical Engineering**, KAIST, Daejeon  
Feb. 2014 Advisor: Prof. Wan Choi
- Mar. 2008 – **B.S. in Media Communication Engineering**, Hanyang University, Seoul  
Feb. 2012 *Summa Cum Laude* (GPA: 4.13/4.5)

## Work Experience

- Sep. 2025 – **Assistant Professor**, Kookmin University, Seoul  
Present Department of Artificial Intelligence
- Feb. 2014 – **Senior Researcher**, Agency for Defense Development (ADD)  
Aug. 2021 Wireless communication and network systems for military applications

## Research Interests

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

## Publications

- Journal Papers [J1] Physics-guided and fabrication-aware inverse design of photonic devices using diffusion models  
Dongjin Seo\*, **Soobin Um**\*, Sangbin Lee, Jong Chul Ye, Haejun Chung  
*ACS Photonics* (2026)
- Conference Papers [C7] DPAIL: Training Diffusion Policy for Adversarial Imitation Learning without Policy Optimization  
Yunseon Choi, Minchan Jeong, **Soobin Um**, Kee-Eung Kim  
*NeurIPS 2025*
- [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)*

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## Projects

- Jun. 2023 – **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  
Jun. 2024
- Jan. 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)  
Jun. 2023
- Sep. 2021 – **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)  
Aug. 2022

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## 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.

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## Research Grants

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

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## 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

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## Invited Talks

Aug. 2025 *MinorityPrompt*, Korean AI Association - KAIA Summer Conference  
Aug. 2025 *MinorityPrompt*, Poster Session at KCCV 2025  
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

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## Teaching Experience

**Instructor** ○ 1623802: Generative AI (Fall 2025, KMU)  
○ 1568703: Data Science (Fall 2025, KMU)

**TA** ○ AI501: Machine Learning for AI (Spring 2023, KAIST)  
○ AI619: AI for Medical Imaging (Fall 2022, KAIST, **Head TA**)  
○ EE424: Introduction to Optimization (Fall 2021, KAIST)  
○ EE210: Probability and Introductory Random Processes (Fall 2013, KAIST)  
○ EE321: Communication Engineering (Spring 2013, KAIST)  
○ Data Science: Modeling for Prediction (Feb. 2022, Hyundai Motors)  
○ Data Science Master Program (Sep. 2021 – Nov. 2021, Hyundai Motors)

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## Reviewer Services

Conferences CVPR (2024–2026), ICLR (2025–2026), WACV (2026)  
Journals IEEE Transactions on Image Processing (TIP)