

# Soobin Um

202, KMU Law Building, Seoul  
02707, South Korea  
+82-2-910-4808  
✉ soobin.um@kookmin.ac.kr  
🌐 soobin-um.github.io  
🔗 soobin-um  
👤 soobin-um



## 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 (2025)*
- 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)*

## Projects

- Oct. 2025 – **AI-Driven Long-Range EO/IR/SWIR Sensor Fusion System** for Future Defense Innovative Technology Program (Ministry of Science & ICT, Republic of Korea). Awarded ~KRW 400M (~USD 300K). Role: Principal Investigator
- Mar. 2028
- Aug. 2024 – **Basic Science Research Program** on Robust Generative AI (NRF and Ministry of Education, Republic of Korea). Role: Principal Investigator
- Aug. 2025
- Sep. 2024 – **Basic Science Research Program Grant** on Robust Generative AI
- Aug. 2025 Funded by the NRF and Ministry of Education, Republic of Korea
- Role: Principal Investigator
- 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

## 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

- Oct. 2025 – **Future Defense Innovative Technology Program:** AI-Driven Long-Range EO/IR/SWIR Sensor Fusion System  
Mar. 2028 Funded by the Ministry of Science & ICT (MSIT), Republic of Korea  
Role: Principal Investigator
- Sep. 2024 – **Basic Science Research Program Grant** on Robust Generative AI  
Aug. 2025 Funded by the NRF and Ministry of Education, Republic of Korea  
Role: Principal Investigator

## 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

- 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

## 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)

## Reviewer Services

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