Sanghyun Son, PhD

Contact Information

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Google scholar:	link

Personal Statement

I earned my Ph.D. in Electrical and Computer Engineering from Seoul National University. My research has focused on deep learning and low-level image restoration, particularly image super-resolution with an emphasis on enhancing the visual quality of in-the-wild images.

Currently, I am with the AI Center at Samsung Electronics. I have been fascinated by the immense potential of large language models (LLMs) and am actively exploring their applications, particularly on manufacturing process optimization using large-scale in-house datasets.

Outside of my primary research, I have a strong passion for analyzing open-source libraries and frameworks and understanding how complex systems operate efficiently at scale. I also enjoy developing side projects that integrate AI into everyday life. One such project I am particularly proud of is a fully automated Discord bot that summarizes daily voice chats among my friends.

Work Experience

Staff Research Engineer at Samsung Electronics
Core Algorithm Lab, AI Development, AI Center Dec. 2024 – Present

(Dec. 2024 – Present) LRM and Agentic Workflow for Manufacturing Process Automation
- Implemented a distributed RL system (>128 GPUs) for training in-house reasoning models.
- *Tech Stack: Ray, FSDP, vLLM, SGLang*

Computer Vision TU, AI Research Center, SAIT Sep. 2023 – Nov. 2024

(Aug. 2024 – Dec. 2024) LLM-based Safeguard System for in-house AI Models.
- Led model orchestration and supervised fine-tuning for in-house LLM infrastructure.
- Organized a development team of ∼10 researchers and engineers for in-house model development.
- Officially released a Korean-specialized safety model for internal systems.
- *Tech Stack: FastAPI, vLLM, Transformers, DeepSpeed*

(Apr. 2024 – Nov. 2024) Domain-Specific LLMs for Manufacturing Process Automation.
- Fine-tuned domain-specific LLMs using in-house data and achieved ∼10x speedup compared to the larger general-purpose model.
- Partnered with manufacturing engineers to deliver the best user experience.
- Officially released the domain-specific model for internal engineers.
- Led a TF team of 7 researchers for multi-modal data curation.
- *Tech Stack: vLLM, Transformers, DeepSpeed, Whisper*

(Sep. 2023 – Mar. 2024) AI-based ISP Solution for Low-light Environments.
- Led a team of 3 researchers and developed low-light machine vision systems for automotive.
- *Tech Stack: Hardware ISP, PyTorch*

Internship

Student Research Intern — Jan. 2019 - Jun. 2019
Research Topic: Real-World Single Image Super-Resolution
Google Cloud, Sunnyvale, CA, USA
Mentor: Ming-Hsuan Yang

Education

Ph.D. in Department of ECE — Mar. 2017 – Aug. 2023
Integrated Ph.D. program in Seoul National University (SNU), Seoul, Korea
Thesis: Generalized Resampling Model for Practical Image Super-Resolution
Advisor: Kyoung Mu Lee

B.S. in Department of ECE, *Summa Cum Laude* (Rank: 9/174) — Mar. 2013 – Feb. 2017
Seoul National University (SNU), Seoul, Korea

International Publications (Selected)

• Bee Lim, **Sanghyun Son**, Heewon Kim, Seungjun Nah, and Kyoung Mu Lee, "Enhanced Deep Residual Networks for Single Image Super-Resolution," **NTIRE 2017** workshop in conjunction with **CVPR**, 2017. (**Challenge winners, Workshop best paper, Over 8,000 citations on Google Scholar, over 2,500 Github stars**)

• Reyhaneh Neshatavar*, Mohsen Yavartanoo*, **Sanghyun Son**, and Kyoung Mu Lee, "ICF-SRSR: Invertible scale-Conditional Function for Self-Supervised Real-world Single Image Super-Resolution," In **WACV**, 2024.

• Joonkyu Park, **Sanghyun Son**, and Kyoung Mu Lee, "Content-Aware Local GAN for Photo-Realistic Super-Resolution," In **ICCV**, 2023.

• Wooseok Lee, **Sanghyun Son**, and Kyoung Mu Lee, "AP-BSN: Self-Supervised Denoising for Real-World Images via Asymmetric PD and Blind-Spot Network," In **CVPR**, 2022.

• Seungjun Nah, **Sanghyun Son**, Jaerin Lee, and Kyoung Mu Lee, "Clean Images are Hard to Reblur: Exploiting the Ill-Posed Inverse Task for Dynamic Scene Deblurring," In **ICLR**, 2022.

• Geonwoon Jang, Wooseok Lee, **Sanghyun Son**, and Kyoung Mu Lee, "C2N: Practical Generative Noise Modeling for Real-World Denoising," In **ICCV**, 2021.

• **Sanghyun Son** and Kyoung Mu Lee, "SRWarp: Generalized Image Super-Resolution under Arbitrary Transformation," In **CVPR**, 2021.

• **Sanghyun Son**, Jaeha Kim, Wei-Sheng Lai, Ming-Hsuan Yang, and Kyoung Mu Lee, "Toward Real-World Super-Resolution via Adaptive Downsampling Models,' IEEE Trans. on Pattern Analysis and Machine Intelligence (**TPAMI**), vol. 44, no. 11, pp. 8567-8670, 2022.
https://doi.org/10.1109/TPAMI.2021.3106790

• **Sanghyun Son** and Kyoung Mu Lee, "Image Super-Resolution," in Ikeuchi K. (eds) Computer Vision. Springer, Cham, 2021. https://doi.org/10.1007/978-3-030-03243-2_838-1

• Seungjun Nah, **Sanghyun Son**, and Kyoung Mu Lee, "Recurrent Neural Networks with Intra-Frame Iterations for Video Deblurring," In **CVPR**, 2019.

• **Sanghyun Son**, Seungjun Nah, and Kyoung Mu Lee, "Clustering Convolutional Kernels to Compress Deep Neural Networks," In **ECCV**, 2018.

International Collaborations and Reports (Selected)

• **Sanghyun Son**, Suyoung Lee, Seungjun Nah, Radu Timofte, and Kyoung Mu Lee, "NTIRE 2021 Challenge on Video Super-Resolution," **NTIRE 2021** workshop in conjunction with **CVPR**, 2021.

• **Sanghyun Son**, Jaerin Lee, Seungjun Nah, Radu Timofte, and Kyoung Mu Lee, "AIM 2020 Challenge on Video Temporal Super-Resolution," **AIM 2020** workshop in conjunction with **ICCV**, 2020.

• Seungjun Nah, **Sanghyun Son**, Radu Timofte, and Kyoung Mu Lee, "NTIRE 2020 Challenge on Image and Video Deblurring," **NTIRE 2020** workshop in conjunction with **CVPR**, 2020.

• Seungjun Nah, **Sanghyun Son**, Radu Timofte, and Kyoung Mu Lee, "AIM 2019 Challenge on Video Temporal Super-Resolution: Methods and Results," **AIM 2019** workshop in conjunction with **ICCV**, 2019.

• Seungjun Nah, Sungyong Baik, Seokil Hong, Gyeongsik Moon, **Sanghyun Son**, Radu Timofte, and Kyoung Mu Lee, "NTIRE 2019 Challenge on Video Deblurring and Super-Resolution: Dataset and Study," **NTIRE 2019** workshop in conjunction with **CVPR**, 2019.

Academic Experience & Service

Workshop Challenge Co-organizer

NTIRE 2021 Challenge on Video Super-Resolution, Video Deblurring — Jun. 2021
NTIRE 2021 workshop in conjunction with CVPR, 2021

AIM 2020 Challenge on Video Temporal Super-Resolution — Aug. 2020
AIM 2020 workshop in conjunction with ECCV, 2020

AIM 2019 Challenge on Video Temporal Super-Resolution — Sep. 2019
AIM 2019 workshop in conjunction with ICCV, 2019

Conference Reviewer

CVPR, ECCV, ICCV, and the corresponding Workshops on Image Restoration

Journal Reviewer

IEEE TPAMI, TIP, TCI
Springer IJCV
Elsevier CVIU

Teaching Assistant

EE729.003: Advanced Trends in Computer Vision (ATCV) — Sep. 2020 – Dec. 2020
Seoul National University, Seoul, Korea

Neural Processing Expert (NPEX): Image Restoration Lab. — Sep. 2020
Samsung Electronics SNU R&D Center, Seoul, Korea

EE729.001: Topics in Control and Automation — Sep. 2019 – Dec. 2019
Seoul National University, Seoul, Korea

Neural Processing Expert (NPEX): Image Restoration Lab. — Jul. 2019
Samsung Electronics SNU R&D Center, Seoul, Korea

EE306: Signal and Systems — Mar. 2017 – Jun. 2017
Seoul National University, Seoul, Korea

Research Projects

MLPerf Mobile AI Benchmark: Super-Resolution Track — Apr. 2022 – Mar. 2023
in conjunction with **MLCommons**
Invited talk: Mobile Super-Resolution on the MLPerf App - Benchmarking and Challenges
Efficient Deep Learning Workshop for Computer Vision, in conjunction with **CVPR**, 2023.

Pixel-wise Adaptive Weighting for Perceptual Image Super-Resolution — May 2022 – May 2023
with **Naver**

Efficient Vision Transformer for Image Super-Resolution — May 2021 – May 2022
with **Naver**

Raw Food Image Generation by Domain Adaptation — Dec. 2020 – Dec. 2021
with **Samsung Research**

Awards and Honors

- **The Best Collaboration Award** from the AI Research Center, Samsung Electronics, 2024.
- **The KCCV Sang-Uk Lee Prize** (Test of Time award) from KCCV 2022.
- Winner of **Qualcomm Innovation Fellowship Korea** 2021.
- **Highly Cited Paper Award** from Department of ECE, SNU, 2018.
- **1st Place Award** in NTIRE 2017 Challenge on Single Image Super-Resolution.
- **Best Paper Award** of NTIRE 2017 Workshop: Challenge Track.

Scholarships

- **Youlchon AI Stars Scholarship**, Youlchon Foundation — 2022
- **Kwanjeong Scholarship**, Kwanjeong Educational Foundation — 2017 – 2018
- **National Scholarship for Science & Engineering**, Korea Student Aid Foundation — 2015 – 2016
- **Scholarship of Academic Excellence**, Seoul National University — 2013 – 2014

Skills

- **Programming languages**
  Expert: Python
  Intermediate: C++, MATLAB
  Novice: CUDA (can write a custom kernel), Javascript (especially for my side projects)
- **Software stacks (selected)**
  General Deep Learning: PyTorch (8+ years of experience), TensorFlow (mobile deployment)
  Distributed Computing: DeepSpeed, FSDP (distributed training with >128 GPUs)
  Applications: FastAPI (especially for my side projects), LangChain, vLLM, SGLang
- **Others**: Korean (Native), English (Working proficiency), Japanese (Novice), LaTeX

References

Advisor	Kyoung Mu Lee Professor Seoul National University kyoungmu(at)snu.ac.kr https://cv.snu.ac.kr/index.php/kmlee
Mentor	Ming-Hsuan Yang Professor UC Merced, Google mhyang(at)ucmerced.edu http://faculty.ucmerced.edu/mhyang