Sunghwan Kim

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Research Interests

My research interests lie in machine learning and computer vision, especially algorithms for visual perception. Currently, I'm exploring effective algorithms and model structures to leverage pre-trained large models in vision for a variety of perception tasks.

Keywords: Domain Generalization, Knowledge Distillation, Efficient Fine-tuning

Education

Korea Advanced Institute of Science and Technology (KAIST) Feb 2017-Feb 2021
B.S. in Electrical Engineering and Mathematics (double major) Advisor: Steven E. Whang
GPA: overall 3.61/4.00; major 3.66/4.00

Korea Science Academy of KAIST Mar 2014-Feb 2017
High school for gifted students in mathematics and science

Publications

2. Texture Learning Domain Randomization for Domain Generalized Segmentation [paper]
Sunghwan Kim, Dae-hwan Kim, and Hoseong Kim
International Conference on Computer Vision (ICCV), 2023

1. Data Gathering Trials for the Development of Military Imaging Systems [paper]
Maria Niebla, Duncan L. Hickman, Eunjin Koh, Chanyong Lee, Hoseong Kim, Chaehyoen Lim, **Sunghwan Kim**
SPIE Sensors+Imaging, 2023

Patent

1. Method and System for Detecting Target Using Time Series Images
Chaehyeon Lim, **Sunghwan Kim**, Hoseong Kim, and Eunjin Koh
KR Patent, 2023 (Reg. Num. 10-2023-0031087)

Work Experience

Agency for Defense Development (ADD) Jun 2021-Present
First Lieutenant and Machine Learning Research Engineer Daejeon, Republic of Korea

- Selected as one of the exclusive 20 military officers in Korea who conduct military service as research engineer at the ADD, Korea's counterpart to U.S. DARPA.
- **Object detection in infrared imagery**: Developed real-time object detection algorithms for defense systems. Generated synthetic infrared imagery for training data and constructed the entire learning pipeline.
- **Model acceleration on edge devices**: Implemented network compression techniques such as knowledge distillation, network pruning, and model quantization to accelerate models on edge devices like NPU.
- **Deep learning-based application software for UAVs**: Developed application software that seamlessly integrates resource optimization by multi-threading, and I/O interfacing with flight control system.

Bluepoint Partners Aug 2020-Mar 2021
Research Assistant Seoul, Republic of Korea

- Bluepoint Partners is an early stage venture capital firm targeting tech sector, such as AI and robotics.
- Supported investments in tech-based startups and conducted market research for these investments.

Paple Jun 2019-May 2020
Co-founder and Software Engineer Seoul, Republic of Korea

- Paple is a software platform with a community feature that allowing the meta-review of AI papers.
- Developed the backend using Django and built the database system with MySQL.

Neosapience Dec 2017-Feb 2018
Machine Learning Engineer Seoul, Republic of Korea

- Neosapience is a Series B startup that operates deep learning-based audio and video synthesis technology and has launched an AI-powered virtual actor service.
- Conducted data processing for the development of a Korean text-to-speech system.

Research Experience

Agency for Defense Development (ADD) Jun 2022-Present
Researcher in missile IR seeker team Daejeon, Republic of Korea

- **Domain generalization in object recognition**: Explored methods for training robust models that learn from synthetically generated source images and perform effectively on diverse real-world images.
- **Foundation models for enhancing downstream tasks**: Exploring methods to leverage pre-trained foundation models in vision (e.g., SAM) to improve the efficiency and efficacy of segmentation tasks.

Korea Advanced Institute of Science and Technology (KAIST) Oct 2018-Apr 2019
Undergraduate researcher in Intelligent Network Architecture (INA) lab Daejeon, Republic of Korea

- **Super-resolution on edge devices**: Implemented an algorithm that combines neural super resolution with traditional video codecs to enhance streaming quality on edge devices.

Korea Advanced Institute of Science and Technology (KAIST) Jun 2016-Aug 2016
Invited researcher in Center for Axion and Precision Physics Center Daejeon, Republic of Korea

- Researched on the detection of axion using resonant frequency measurements in a cylindrical cavity.

Honor

Korea Army Startup Challenge Gold Prize ($3000)
Korea Student Aid Foundation (KOSAF) Scholarship ($1500)
Korea National Scholarship of Science and Technology ($10000)
KAIST scholarship ($5000)

Community Involvement

KAIST Freshman Coach Senior	Feb 2020-Feb 2021
Samsung Semicoductor Education Program and Scholarship	Jun 2019-Present
Research Officiers for National Defense (ROND) cadat	Dec 2018-May 2021
KAIST Electrical Engineering Department Student Council	Mar 2018-Feb 2019
KAIST Cyber Tutoring Program	Feb 2018-Jun 2018
KAIST Foreign Buddy Program	Sep 2017-Dec 2017
KAIST Automobile Maker Club	Mar 2017-Aug 2018

Selected Coursework

Electrical Engineering: Deep Learning, Database and Bigdata System, Signal Processing, Computer Architecture, Operating System, Computer Network, Digital System, Electrical Circuits, Electromagnetics

Mathematics: Linear Algebra, Mathematical Analysis, Probability theory, Statistics, Convex optimization, Numerical Analysis, Discrete Mathematics, Mathematical Modeling, Differential Geometry, Modern Algebra

Skills

Programming Languages: Python, C/C++, JavaScript, MATLAB

Frameworks & Tools: Pytorch, Tensorflow, NumPy, OpenCV, Docker, Git

References

Dr. Steven E. Whang, Associate Professor at KAIST **Email:** swhang@kaist.ac.kr

Dr. Hoseong Kim, Senior Reseacher at ADD **Email:** hoseongkim@add.re.kr

Dr. Dae-hwan Kim, Senior Reseacher at ADD **Email:** dhkim7@add.re.kr