

HUNMIN YANG

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RESEARCH INTERESTS

“Visual Intelligence for assisting decision-making processes regarding real-world problems.”

To do this, I research in the interdisciplinary fields of computer vision and machine learning. My major interests currently lie in robust model training with few or large-scale data, domain generalization/adaptation, and adversarial robustness. The applications are mostly on visual recognition tasks such as image classification, object detection, segmentation, etc.

* *Keywords: Computer Vision, Machine Learning, Robust AI*

TECHNICAL SKILLS

ML & DL	PyTorch, Scikit-learn
Computer Vision	OpenCV, Scikit-image
Data Analytics	NumPy, Pandas, SciPy, Matplotlib, Seaborn
Big Data	Hadoop, Spark, Kafka, HBase
Programming	Python, Linux, Docker, MATLAB, Simulink

EDUCATION

Korea Advanced Institute of Science and Technology (KAIST) PhD, Mechanical Engineering (Advisor: Dr. Kuk-Jin Yoon) - Research Area: Computer Vision & Machine Learning	Sep 2021 - Present
Korea Advanced Institute of Science and Technology (KAIST) MS, Mechanical Engineering (Advisor: Dr. Youngjin Park) - Research Area: 3D Sound	Feb 2012 - Feb 2014
Royal Melbourne Institute of Technology (RMIT) Exchange Student in Melbourne, Australia	Feb 2011 - Aug 2011
Korea Advanced Institute of Science and Technology (KAIST) BS, Mechanical Engineering (<i>Magna Cum Laude</i>)	Feb 2007 - Feb 2012

WORK EXPERIENCE

Korea National Agency for Defense Development (ADD) <i>Senior Researcher</i> · Team: Defense AI Technology Center (DAIC) · Key Contributions: <ul style="list-style-type: none">- Synthetic data generation framework for data-scarce deep learning (D-GEN)- Training neural nets with synthetic data for small/occluded object detection- Adversarial attack and defense for robust AI:	Jan 2020 - Present
Korea National Agency for Defense Development (ADD) <i>Researcher</i> · Team: Institute of Defense Advanced Research (IDAR)	May 2017 - Dec 2019

- Key Contributions:
 - Big data platform development for large-scale intelligent video analytics (D-NET)
 - Accelerating the distributed deep learning inference on multi-GPU with Hadoop-Spark
 - Hosting a data science competition for satellite image recognition with AI

Korea National Agency for Defense Development (ADD)
Specialized Research Staff (Military Service)

Feb 2014 - May 2017

- Team: The 1st R&D Department
- Key Contributions:
 - Control and instrumentation for the experimentation
 - Data acquisition and signal processing for various sensors

RESEARCH PROJECTS

D-CAM: Adversarial AI based Neural Net Attack and Defense Oct 2020 - Sep 2024
Research Scientist *ADD project funded by DAPA*

- The project is on the development of adversarial attack/defense techniques for deep learning model, especially in real-world situations. This is an ongoing project and participating as a main researcher.

AI-Based Object Detection for Partially Occluded Objects Jun 2019 - May 2022
Research Scientist *ADD project funded by DAPA*

- The project is on a novel method of training deep object detectors for partially occluded objects. Designed and implemented a synthetic 2D image dataset generation S/W using Unreal 3D game engine for training robust deep detectors against visually occluded situations. Developed a technique for generating synthetic images containing occluded objects with artificial distractors, utilizing domain randomization.

Data Science Competition for Satellite Imagery Recognition Nov 2019 - Mar 2020
Competition Host & Manager *ADD project funded by DAPA*

- Designed and managed a Korea data science competition for satellite imagery recognition with AI algorithm. The competition has been held online from Nov 2019 to March 2020. Utilized the DAICON online competition platform (a.k.a. Korea Kaggle Platform) and worked with SIA for developing and managing satellite image datasets and baseline models.

* Website: <https://dacon.io/competitions/official/235492/overview/description/>

D-GEN: Deep Learning Synthetic Data Generation Framework Jul 2017 - Jun 2020
Research Scientist *ADD project funded by DAPA*

- The project is on the development of a synthetic image dataset (image + cost-free label) generation framework for data-scarce deep learning. Designed and implemented a synthetic 2D image generation S/W with Unity 3D game engine with XIILAB. Thorough theoretical review and experimental study on GANs based image generation & enhancement, image super-resolution, domain adaptation, transfer learning, object detection, data augmentation, domain randomization, etc. Developed techniques have been technology-transferred to several Korean companies such as XIILAB, SIA, etc.

D-NET: Big Data Platform For Real-time Video Recognition May 2017 - Nov 2018
Research Scientist *ADD project funded by DAPA*

- The project is on the development of a big data platform for large-scale real-time (1000Ch live CCTV) intelligent video analytics (IVA). Designed and implemented a real-time big data processing pipeline with open source frameworks such as Hadoop, Spark, Kafka, etc. Developed a technique for accelerating the distributed DL inference on multi-GPU multi-node cluster (30 servers, 60 GPUs) with Hadoop-Spark. Developed techniques have been technology-transferred to XIILAB.

HWFS: Hybrid Wave Field Synthesis for 3D Virtual Sound Play Jun 2012 - Dec 2012
Research Engineer *KAIST project funded by SAMSUNG*

- The project is on a novel method for reproducing 3D virtual sound source with linear array loudspeakers. Designed and implemented a technique named Hybrid Wave Field Synthesis (HWFS) which provided a virtual azimuth and elevation impression to multi-user in large listening area but needed less than ten ear-level loud-speaker.

INTERNATIONAL CO-WORK & ACTIVITIES

NeurIPS 2022 Nov 28 - Dec 9, 2022
In USA with Conference Participants

- Business trip to USA and participated the 36th Conference on Neural Information Processing Systems (NeurIPS) in New Orleans, LA.

CVPR 2022 June 19-26, 2022
In USA with Conference Participants

- Business trip to USA and participated the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) in New Orleans, LA. Presented a poster titled “DTA: Physical Camouflage Attacks using Differentiable Transformation Network”

Intel Data Center Mar 22, 2019
In USA with Intel Data Center Group

- Business trip to USA and visited a Intel data center in Santa Clara, CA. Attended a technical meeting about next generation Intel solutions (CPU, FPGA, etc.) and toured the data center guided by Intel engineers.

NVIDIA GTC Silicon Valley 2019 Mar 17-21, 2019
In USA with Conference Participants

- Business trip to USA and participated the NVIDIA GPU Technology Conference (GTC) in Silicon Valley, San Jose, CA. Presented a talk (50min) about accelerating the distributed deep learning inference on multi-GPU clusters with Hadoop-Spark. Also presented two posters about AI application deployment/inference and intelligent video analytics.

NVIDIA GTC Silicon Valley 2018 Mar 25-29, 2018
In USA with Conference Participants

- Business trip to USA and participated the NVIDIA GPU Technology Conference (GTC) in Silicon Valley, San Jose, CA.

NeurIPS 2017 Dec 4-9, 2017
In USA with Conference Participants

- Business trip to USA and participated the 31st Conference on Neural Information Processing Systems (NeurIPS) in Long Beach, CA.

3D Sound Workshop Feb 18, 2013
In KAIST with University of Sydney

- Organized and participated the 3D sound workshop in KAIST with the 3D sound working group of University of Sydney (Prof. William L. Martens). Presented the works related to the HWFS project and shared some technical insights about three dimensional audio spatilization.

HONORS & AWARDS

National Grant for Defense Research and Development

Dec 2021

From the Chief Director of DAPA

- Title: Synthetic training data generation for defense AI

Defense Science Award - Bronze medal

Aug 2019

From the Chief Research Director of ADD

- Title: Enhancement of distributed deep learning inference on multi-GPU with Hadoop-Spark

High Achievement Award

Aug 2018

From the Chief Research Director of ADD

- Title: Development of big data platform & synthetic data generation framework

Excellent Paper Award

Mar 2013

From the Korea Society for Noise and Vibration Engineering (KSNVE)

- Title: Sweet spot analysis of linear array system with a large number of loudspeakers by geometrical approach method

Scholarship for Academic Excellence

Jun 2007

From the Korea Human Resource Development Scholarship Association

- Title: Outstanding academic performance & good conduct

Scholarship for Academic Excellence

2007-2014

From the Korean Government

- Title: Tuition free for all semesters in KAIST (BS & MS)

PUBLICATIONS

International Conference

1. Hunmin Yang, Se-Yoon Oh, Junhyeong Jo. Synthetic Image Generation for Deep Neural Networks. In *NVIDIA GPU Technology Conference (GTC)*, 2023.
2. Naufal Suryanto, Yongsu Kim, Hyoeun Kang, Harashta Tatimma Larasati, Youngyeo Yun, Thi-Thu-Huong Le, Hunmin Yang, Se-Yoon Oh, Howon Kim. DTA: Physical Camouflage Attacks using Differentiable Transformation Network. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2022.
3. Jeonghun Kim, Kyungmin Lee, Hyeongkeun Lee, Hunmin Yang, Se-Yoon Oh. Camouflaged Adversarial Attack on Object Detector . In *21th International Conference on Control, Automation and Systems (ICCAS)*, 2021.
4. Hunmin Yang, Se-Yoon Oh, Taewon Kim, Ki-Jung Ryu. D-GEN: A Deep Learning Data Generation Framework For Artificial Intelligence. In *NVIDIA GPU Technology Conference (GTC) Silicon Valley*, 2020.
5. Kyungmin Lee, Hunmin Yang, Se-Yoon Oh. Adversarial Training on Joint Energy Based Model for Robust Classification and Out-of-Distribution Detection. In *20th International Conference on Control, Automation and Systems (ICCAS)*, 2020.
6. Eunchong Kim, Kanghyun Park, Hunmin Yang, Se-Yoon Oh. Training Deep Neural Networks with Synthetic Data for Off-Road Vehicle Detection. In *20th International Conference on Control, Automation and Systems (ICCAS)*, 2020.

7. Hyeongkeun Lee, Kyungmin Lee, Hunmin Yang, Se-Yoon Oh. Applying FastPhotoStyle to Synthetic Data for Military Vehicle Detection. In *20th International Conference on Control, Automation and Systems (ICCAS)*, 2020.
8. Kanghyun Park, Hyeongkeun Lee, Hunmin Yang, Se-Yoon Oh. Improving Instance Segmentation using Synthetic Data with Artificial Distractors. In *20th International Conference on Control, Automation and Systems (ICCAS)*, 2020.
9. Hunmin Yang, Se-Yoon Oh, Ki-Jung Ryu. Accelerating Distributed Deep Learning Inference on multi-GPU with Hadoop-Spark. In *NVIDIA GPU Technology Conference (GTC) Silicon Valley*, 2019. (Oral-50min)
10. Hunmin Yang, Se-Yoon Oh, Ki-Jung Ryu. Scalable Distributed Deep Learning Inference on Multi-GPU with Hadoop-Spark. In *NVIDIA GPU Technology Conference (GTC) Silicon Valley*, 2019.
11. Se-Yoon Oh, Hunmin Yang, Ki-Jung Ryu. Optimal Distributed Inference on Multi-GPU Processing System. In *NVIDIA GPU Technology Conference (GTC) Silicon Valley*, 2019.
12. Se-Yoon Oh, Hunmin Yang, Ki-Jung Ryu. Optimal Experimental Design Approach for Machine Learning Process. In *17th International Conference on Control, Automation and Systems (ICCAS)*, 2017.
13. Hunmin Yang, Youngjin Park, Youn-Sik Park. Sweet spot analysis of sound field reproduced by ear-level linear arrays of loudspeakers using inter-aural time difference cue. In *15th Asia Pacific Vibration Conference (APVC)*, 2013.

PATENTS

Machine Learning & Deep Learning

1. Hunmin Yang, Ki-Jung Ryu, Se-Yoon Oh. Apparatus and method for deep learning based on mixing virtual and real data. kr 10-2198088, 2020.
2. Hunmin Yang, Ki-Jung Ryu, Se-Yoon Oh. Apparatus and method for learning machine learning models based on virtual data. kr 10-2086351, 2020.
3. Hunmin Yang, Se-Yoon Oh, Seongbaek Jo. Apparatus and method for enhancing learning capability for machine learning. kr 10-2053202, 2019.
4. Hunmin Yang, Ki-Jung Ryu, Se-Yoon Oh. Method and apparatus of improving self-supervised learning performance utilizing synthesized data. kr 10-2032519, 2019.
5. Hunmin Yang, Se-Yoon Oh, Seongbaek Jo. Apparatus and method for generating learning image in game engine-based machine learning. kr 10-1947650, 2019.

Computer Vision

1. Hunmin Yang, Ki-Jung Ryu, Se-Yoon Oh. Method and Apparatus of adding artificial object for improving performance in detecting object. kr 10-1972095, 2019.

Big Data & Database

1. Hunmin Yang, Ki-Jung Ryu, Se-Yoon Oh. Method and apparatus of building NoSQL database for signal processing. kr 10-2002360, 2019.
2. Hunmin Yang, Ki-Jung Ryu, Se-Yoon Oh. Method and apparatus of building inverse index DB for high speed searching of moving picture object. kr 10-2014267, 2019.

TALKS

Invited Talk

1. “Development of Big Data Platform (D-NET) for Real-time Video Recognition”
- Defense Science Grand Expo / Coex in Seoul, Korea / July 11, 2019

Lecture

1. “Big Data Analytics (Advanced)”
- Professional Skill Education / ADD in Daejeon, Korea / Sep 24, 2019