HUNMIN YANG

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RESEARCH AREA

My research aims to develop trustworthy visual intelligence which assists 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, domain generalization/adaptation, and adversarial robustness.
** Keywords: Computer Vision, Machine Learning, Trustworthy AI*

WORK EXPERIENCE

Korea National Agency for Defense Development (ADD) Jan 2020 - Present
Senior AI Researcher

· Synthetic data generation framework for training DL models (D-GEN)
· Small & occluded object detection with CG-based synthetic training images
· Adversarial attack & defense for robust AI

Korea National Agency for Defense Development (ADD) May 2017 - Dec 2019
AI Researcher

· Big data platform 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) Feb 2014 - May 2017
Specialized Research Staff (Military Service)

EDUCATION

Korea Advanced Institute of Science and Technology (KAIST) Sep 2021 - Present
PhD, Mechanical Engineering (Advisor: Kuk-Jin Yoon)
- Research Area: Computer Vision & Machine Learning

Korea Advanced Institute of Science and Technology (KAIST) Feb 2012 - Feb 2014
MS, Mechanical Engineering (Advisor: Youngjin Park)
- Research Area: 3D Sound Perception

Royal Melbourne Institute of Technology (RMIT) Feb 2011 - Aug 2011
Exchange Student in Melbourne, Australia (*High Distinction*)

Korea Advanced Institute of Science and Technology (KAIST) Feb 2007 - Feb 2012
BS, Mechanical Engineering (*Magna Cum Laude*)

RESEARCH PROJECTS

D-CAM: Adversarial AI based Neural Nets Attack and Defense Oct 2020 - Sep 2024
Senior AI Researcher *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 Small Target Objects Oct 2020 - Sep 2023
Senior AI Researcher *ADD project funded by DAPA*

· The project is on a novel method of training deep object detectors for small ground objects. Designed and implemented a synthetic 2D image dataset generation S/W using Unity 3D game engine for training object detection model for small ground vehicles. Developed a technique for generating synthetic images utilizing real-time ray tracing and specialized techniques.

AI-based Object Detection for Partially Occluded Objects Jun 2019 - May 2022
Senior AI Researcher *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 distractors, utilizing domain randomization.

Data Science Competition for Satellite Imagery Recognition Nov 2019 - Mar 2020
AI Researcher *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 DACON online competition platform (a.k.a. Korea Kaggle Platform) and worked with SIA for developing and managing satellite image datasets and baseline models.

D-GEN: Synthetic Data Generation Framework for AI Jul 2017 - Jun 2020
AI Researcher *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
AI Researcher *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
Graduate Student Researcher *KAIST project funded by SAMSUNG*

· The project is on a novel method for reproducing 3D virtual sound source with linear array loud-speakers. 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.

PUBLICATIONS

International Conference

1. Hunmin Yang*, Jongoh Jeong*, Kuk-Jin Yoon. FACL-Attack: Frequency-Aware Contrastive Learning for Transferable Adversarial Attacks. In *Association for the Advancement of Artificial Intelligence (AAAI)*, 2024.

2. Junhyeong Cho, Gilhyun Nam, Sungyeon Kim, Hunmin Yang, Suha Kwak. PromptStyler: Prompt-driven Style Generation for Source-free Domain Generalization. In *IEEE/CVF International Conference on Computer Vision (ICCV)*, 2023.

3. Naufal Suryanto, Yongsu Kim, Harashta Tatimma Larasati, Hyoeun Kang, Thi-Thu-Huong Le, Yoonyoung Hong, Hunmin Yang, Se-Yoon Oh, Howon Kim. ACTIVE: Towards Highly Transferable 3D Physical Camouflage for Universal and Robust Vehicle Evasion. In *IEEE/CVF International Conference on Computer Vision (ICCV)*, 2023.

4. Hunmin Yang, Se-Yoon Oh, Junhyeong Jo. Synthetic Image Generation for Deep Neural Networks. In *NVIDIA GPU Technology Conference (GTC)*, 2023. (**Spotlight Presentation**)

5. 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.

6. 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.

7. 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)*, 2020.

8. 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.

9. 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.

10. 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.

11. 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.

12. 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)*, 2019. (**Oral Talk - 50min**)

13. 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)*, 2019.

14. Se-Yoon Oh, Hunmin Yang, Ki-Jung Ryu. Optimal Distributed Inference on Multi-GPU Processing System. In *NVIDIA GPU Technology Conference (GTC)*, 2019.

15. 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.

16. 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

Synthetic Data Generation

1. Hunmin Yang, Se-Yoon Oh. Training data generation method and apparatus for deep learning model. kr 10-2613781, 2023.

2. 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.

3. Hunmin Yang, Ki-Jung Ryu, Se-Yoon Oh. Apparatus and method for learning machine learning models based on virtual data. kr 10-2086351, 2020.

4. Hunmin Yang, Se-Yoon Oh, Seongbaek Jo. Apparatus and method for enhancing learning capability for machine learning. kr 10-2053202, 2019.

5. Hunmin Yang, Ki-Jung Ryu, Se-Yoon Oh. Method and apparatus of improving self-supervised learning performance utilizing synthesized data. kr 10-2032519, 2019.

6. 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.

7. Hunmin Yang, Se-Yoon Oh, Seongbaek Jo. Apparatus and method for generating learning image in game engine-based machine learning. kr 10-1947650, 2019.

Physical Adversarial Attack

1. Se-Yoon Oh, Hunmin Yang, Hyeongkeun Lee, Kyungmin Lee, Jeonghun Kim. Method and Apparatus for optimizing adversarial patch, computer-readable storage medium and computer program. kr 10-2445215, 2022.

2. Hyeongkeun Lee, Jeonghun Kim, Kyungmin Lee, Hunmin Yang, Se-Yoon Oh. Method and Apparatus for optimizing adversarial patch, computer-readable storage medium and computer program. kr 10-2414146, 2022.

3. Jeonghun Kim, Se-Yoon Oh, Hyeongkeun Lee, Kyungmin Lee, Hunmin Yang. Apparatus and method for optimizing adversarial patch based on natural pattern for stealthiness against human vision system. kr 10-2380154, 2022.

4. Hyeongkeun Lee, Hunmin Yang, Jeonghun Kim, Kyungmin Lee, Se-Yoon Oh. Method, apparatus computer-readable storage medium and computer program for determining adversarial patch position. kr 10-2360070, 2022.

Big Data

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.

PROFESSIONAL SERVICE

Academic Reviewer

· IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**), 2023, 2024
· IEEE/CVF International Conference on Computer Vision (**ICCV**), 2023
· European Conference on Computer Vision (**ECCV**), 2024

Technology Transfer

· Synthetic Data Generation Techniques for Training DL models (**SI Analytics**, **JEIOS**, **Xiilab**), 2020, 2021, 2022, 2023
· Camouflage Pattern Generation Techniques for Attacking DL models (**SmartM2M**), 2022
· Big Data Platform Techniques for Real-time Video Recognition (**Xiilab**), 2019

HONORS & AWARDS

National Grant for Defense Research and Development Dec 2021
From the Chief Director of DAPA

· Synthetic Data Generation for Defense AI

Defense Science Award - Bronze medal Aug 2019
From the Chief Research Director of ADD

· Improving Distributed Multi-GPU Computing for Large-scale Intelligent Video Analytics

High Achievement Award Aug 2018
From the Chief Research Director of ADD

· Big Data Platform Development

Excellent Paper Award Mar 2013
From the Korea Society for Noise and Vibration Engineering (KSNVE)

· 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

· Outstanding academic performance & good conduct

Scholarship for Academic Excellence 2007-2014
From the Korean Government

· Tuition free for all semesters in KAIST (BS & MS)