

Sangmin Woo

PH.D. CANDIDATE IN EE @ KAIST

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I am currently pursuing a Ph.D. degree in Electrical Engineering at [KAIST](#). In 2021, I completed an M.S. degree in Electrical Engineering and Computer Science at [GIST](#). Prior to that, I obtained a B.S. degree in Electrical Engineering from [KNU](#) in 2019.

I thrive on creative challenges and enjoy building strong relationships along the way. Explore my academic journey below, and contact me directly to learn more.

Research Interest

Humans are inherently **multi-modal** learners, with **vision** playing a pivotal role in shaping our understanding of the world. I am passionate about bridging the gap between machine perception and human-level understanding by harnessing the potential of **multi-modal learning**.

My work explores the following, but not limited to:

- **Multi-modal**: Vision + X
 - > *High-level*: $X \in \{\text{Language, Audio, Sketch, etc.}\}$ [C4, C7, J1, J3, P1]
 - > *Low-level*: $X \in \{\text{Depth, IR, Flow, etc.}\}$ [C2, C3, C5, C6, J5, J6]
- **Video/Image Understanding** [C1, C2, C3, C4, C5, C6, C7, J2, J4, J5, J6, P1]
- **Generation & Diffusion Models** [C8, C9,]

Publication

(C: conference, J: journal, P: preprint)

2024

[C9] HarmonyView: Harmonizing Consistency and Diversity in One-Image-to-3D

2024

IEEE / CVF COMPUTER VISION AND PATTERN RECOGNITION CONFERENCE (CVPR)

[Paper](#) | [Code](#) | [Project](#) | [Demo](#)

Sangmin Woo^{*}, Byeongjun Park^{*}, Hyojun Go, Jinyoung Kim, Changick Kim (^{*}: Equal Contribution)

[C8] Denoising Task Routing for Diffusion Models

2024

INTERNATIONAL CONFERENCE OF LEARNING REPRESENTATION (ICLR)

[Paper](#) | [Code](#) | [Project](#)

Byeongjun Park^{*}, Sangmin Woo^{*}, Hyojun Go^{*}, Jinyoung Kim^{*}, Changick Kim (^{*}: Equal Contribution)

[C7] Sketch-based Video Object Localization

2024

IEEE WINTER CONFERENCE ON APPLICATIONS OF COMPUTER VISION (WACV)

[Paper](#) | [Code](#)

Sangmin Woo, Soyeong Jeon, Jinyoung Park, Minji Son, Sumin Lee, Changick Kim

2023

[C6] AHFu-Net: Align, Hallucinate, and Fuse Network for Missing Multimodal Action Recognition

2023

IEEE INTERNATIONAL CONFERENCE ON VISUAL COMMUNICATIONS AND IMAGE PROCESSING (VCIP) (ORAL PRESENTATION)

Muhammad Adi Nugroho, Sangmin Woo, Sumin Lee, Changick Kim

[C5] Multi-modal Social Group Activity Recognition in Panoramic Scene

2023

IEEE INTERNATIONAL CONFERENCE ON VISUAL COMMUNICATIONS AND IMAGE PROCESSING (VCIP)

Donguk Kim, Sumin Lee, Sangmin Woo, Jinyoung Park, Muhammad Adi Nugroho, Changick Kim

[J6] Cross-Modal Alignment and Translation for Missing Modality Action Recognition COMPUTER VISION AND IMAGE UNDERSTANDING (CVIU) Paper Yeonju Park, <u>Sangmin Woo</u> , Sumin Lee, Muhammad Adi Nugroho, Changick Kim	2023
[J5] Modality Mixer Exploiting Complementary Information for Multi-modal Action Recognition IEEE TRANSACTIONS ON IMAGE PROCESSING (TIP) Paper Sumin Lee, <u>Sangmin Woo</u> , Yeonju Park, Muhammad Adi Nugroho, Changick Kim	2023 Major Revision
[C4] Audio-Visual Glance Network for Efficient Video Recognition IEEE INTERNATIONAL CONFERENCE ON COMPUTER VISION (ICCV) Paper Muhammad Adi Nugroho, <u>Sangmin Woo</u> , Sumin Lee, Changick Kim	2023
[C3] Towards Good Practices for Missing Modality Robust Action Recognition AAAI CONFERENCE ON ARTIFICIAL INTELLIGENCE (AAAI) (ORAL PRESENTATION) Paper Code <u>Sangmin Woo</u> , Sumin Lee, Yeonju Park, Muhammad Adi Nugroho, Changick Kim	2023
[C2] Modality Mixer for Multi-modal Action Recognition IEEE WINTER CONFERENCE ON APPLICATIONS OF COMPUTER VISION (WACV) Paper Sumin Lee, <u>Sangmin Woo</u> , Yeonju Park, Muhammad Adi Nugroho, Changick Kim	2023
~2022	
[P1] Explore-And-Match: Bridging Proposal-Based and Proposal-Free with Transformer for Sentence Grounding in Videos ARXIV Paper Code <u>Sangmin Woo</u> , Jinyoung Park, Inyong Koo, Sumin Lee, Minki Jeong, Changick Kim	2022
[J4] Tackling the Challenges in Scene Graph Generation with Local-to-Global Interactions IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS (TNNLS) Paper Code <u>Sangmin Woo</u> , Junhyug Noh, Kangil Kim	2022
[C1] Temporal Flow Mask Attention for Open-Set Long-Tailed Recognition of Wild Animals in Camera-Trap Images IEEE INTERNATIONAL CONFERENCE ON IMAGE PROCESSING (ICIP) Paper Jeongsoo Kim, <u>Sangmin Woo</u> , Byeongjun Park, Changick Kim	2022
[J3] Impact of Sentence Representation Matching in Neural Machine Translation APPLIED SCIENCES Paper Heeseung Jung, Kangil Kim, Jong-Hun Shin, Seung-Hoon Na, SangKeun Jung, <u>Sangmin Woo</u>	2022
[J2] What and When to Look?: Temporal Span Proposal Network for Video Relation Detection EXPERT SYSTEMS WITH APPLICATIONS (ESWA) Paper Code <u>Sangmin Woo</u> , Junhyug Noh, Kangil Kim	2021 Major Revision

[J1] Revisiting Dropout: Escaping Pressure for Training Neural Networks with Multiple Costs

2021

ELECTRONICS

[Paper](#) | [Code](#)

Sangmin Woo, Kangil Kim, Junhyug Noh, Jong-Hun Shin, Seung-Hoon Na

DOMESTIC

Light-Weighted Korean Speech Recognition System for Edge Devices

2023

INSTITUTE OF ELECTRONICS AND INFORMATION ENGINEERS (IEIE)

Yooseung Wang, Sangmin Woo, Changick Kim

On Learning Relations between Objects in Images

2022

KOREA INSTITUTE OF MILITARY SERVICE AND TECHNOLOGY (KIMST)

Sangmin Woo, Changick Kim

Effective Trash Classification using Attentional Learning

2018

KOREA SOFTWARE CONGRESS (KSC)

Sangmin Woo, Soon Ki Jung

Honors & Awards

Oct, 2023	Invited Paper Talk (\$ 100) , Center for Applied Research in Artificial Intelligence (CARAI) Workshop
Dec, 2022	Finalist , 29th HumanTech Paper Award @ Samsung Electronics Co., Ltd.
Dec, 2021	Top Award (\$ 10,000) , LG Electronics Robot Contest @ LG Electronics Co., Ltd.
Nov, 2019	Excellence Award (\$ 500) , Creative Space G A.I&IoT Makerthon @ GIST

Patent

Method for group activity recognition using RGB videos and LiDAR data

2023

KR PATENT APPLICATION

In Progress

Changick Kim, Jinyoung Park, Donguk Kim, Sumin Lee, Muhammad Adi Nugroho, Sangmin Woo, Yooseung Wang

Method and Apparatus for Human Activity Recognition using Accelerometer and Gyroscope Sensors

2022

KR PATENT APPLICATION: 10-2022-0094911

Changick Kim, Inyong Koo, Yeonju Park, Minki Jeong, Sumin Lee, Sangmin Woo

Method and Device for Inferring Dynamic Relationship between Objects in Video

2021

KR PATENT APPLICATION: 10-2021-0125704

Sangmin Woo, Kangil Kim

Scene Graph Generation Apparatus

2021

KR PATENT 10-2254-7680000

Sangmin Woo, Kangil Kim

Research Experience

Computational Intelligence Lab @ KAIST

Daejeon, Korea

PH.D. (ADVISOR: PROF. CHANGICK KIM)

Sep. 2021 - present

Robot Vision Team @ NAVER LABS

Suwon, Korea

RESEARCH INTERN (ADVISOR: PH.D. SOONYONG PARK)

Apr. 2023 - Aug. 2023

- My primary focus involved pushing the boundaries of **multi-modal multi-task learning**, aiming to tackle a complex challenge: given inputs in the form of RGB imagery, partially captured depth information, and incomplete semantic segmentation, the objective was to create a model that could simultaneously refine the depth perception and complete the missing segments in the semantic segmentation.

Intelligence Representation and Reasoning Lab @ GIST

M.S. (ADVISOR: PROF. KANGIL KIM)

Gwangju, Korea

Sep. 2019 - Aug. 2021

Virtual Reality Lab @ Kyungpook National University

UNDERGRADUATE RESEARCH INTERN (ADVISOR: PROF. SOON KI JUNG)

Daegu, Korea

Jan. 2018 - Aug. 2019

Academic Activity

I serve as a reviewer in the following journals and conferences.

IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) 2024 ~
AAAI Conference on Artificial Intelligence (AAAI) 2023 ~
IEEE International Conference on Image Processing (ICIP) 2022 ~
IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)
IEEE Access

Education

Korea Advanced Institute of Science and Technology (KAIST)

PH.D. IN ELECTRICAL ENGINEERING

Daejeon, Korea

Aug. 2021 - Present

Coursework: Computer Vision, Machine Learning, Graph Mining, Explainable AI

Gwangju Institute of Science and Technology (GIST)

M.S. IN ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Gwangju, Korea

Sep. 2019 - Aug. 2021

Coursework: Machine Learning and Deep Learning, Computer Vision, Natural Language Processing, Visual Recognition and Reasoning, Evolutionary AI, Algorithm

Kyungpook National University

B.S. IN ELECTRICAL ENGINEERING (MINOR IN COMPUTER SCIENCE AND ENGINEERING)

Daegu, Korea

Mar. 2013 - Aug. 2019

Coursework: Data Mining, Multimedia Systems, Internet of Things, Data Structure, Algorithm, C Programming, Python Programming, JAVA Programming, Signal Processing, Random Process, Linear Algebra

Project

Scene Text Recognition with Visual Contexts

CENTER FOR SECURITY TECHNOLOGY RESEARCH, KAIST

2024.02 present

Multi-modal Group Activity Recognition

CENTER FOR APPLIED RESEARCH IN ARTIFICIAL INTELLIGENCE (CARAI)

2023.02 present

Sketch-based Video Object Localization

CENTER FOR SECURITY TECHNOLOGY RESEARCH, KAIST

2023.02 2023.11

Multi-modal Action Recognition

CENTER FOR APPLIED RESEARCH IN ARTIFICIAL INTELLIGENCE (CARAI)

2021.09 2022.12

Development of Precise Content Identification Technology based on Relationship Analysis for Maritime Vessels/Structure

MINISTRY OF SCIENCE AND ICT (MSIT)

2021.09 2021.12