Sangmin **Woo**

Ph.D. Candidate in EE @ KAIST

291, Daehak-ro, Yuseong-gu, Daejeon, 34141, Rep. of KOREA

✉ smwoo95@kaist.ac.kr | 🏠 sangminwoo.github.io | sangminwoo | 🎓 Sangmin Woo

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 ∈ {Language, Audio, Sketch, Graph, *etc.*}.
- Video/Image Understanding
- Generative Diffusion Models

Publication

2024

HarmonyView: Harmonizing Consistency and Diversity in One-Image-to-3D *2024*
IEEE / CVF Computer Vision and Pattern Recognition Conference (**CVPR**) *Under Review*
Paper | Code | Project
Sangmin Woo*, Byeongjun Park*, Hyojun Go, Jinyoung Kim, Changick Kim (***: Equal Contribution**)

A paper on "Group Activity Recognition" *2024*
IEEE / CVF Computer Vision and Pattern Recognition Conference (**CVPR**) *Under Review*
Muhammad Adi Nugroho, **Sangmin Woo**, Sumin Lee, Jinyoung Park, Yooseung Wang, Donguk Kim, Changick Kim

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**)

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

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

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

Cross-Modal Alignment and Translation for Missing Modality Action Recognition

COMPUTER VISION AND IMAGE UNDERSTANDING (**CVIU**)

2023

Paper

Yeonju Park, **Sangmin Woo**, Sumin Lee, Muhammad Adi Nugroho, Changick Kim

Modality Mixer Exploiting Complementary Information for Multi-modal Action Recognition

IEEE TRANSACTIONS ON IMAGE PROCESSING (**TIP**)

2023

Under Review

Paper

Sumin Lee, **Sangmin Woo**, Yeonju Park, Muhammad Adi Nugroho, Changick Kim

Audio-Visual Glance Network for Efficient Video Recognition

IEEE INTERNATIONAL CONFERENCE ON COMPUTER VISION (**ICCV**)

2023

Paper

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

Towards Good Practices for Missing Modality Robust Action Recognition

AAAI CONFERENCE ON ARTIFICIAL INTELLIGENCE (**AAAI**) (**ORAL PRESENTATION**)

2023

Paper | Code

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

Modality Mixer for Multi-modal Action Recognition

IEEE WINTER CONFERENCE ON APPLICATIONS OF COMPUTER VISION (**WACV**)

2023

Paper

Sumin Lee, **Sangmin Woo**, Yeonju Park, Muhammad Adi Nugroho, Changick Kim

~2022

Explore-And-Match: Bridging Proposal-Based and Proposal-Free with Transformer for Sentence Grounding in Videos

ARXIV

2022

Paper | Code

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

Tackling the Challenges in Scene Graph Generation with Local-to-Global Interactions

IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS (**TNNLS**)

2022

Paper | Code

Sangmin Woo, Junhyug Noh, Kangil Kim

Temporal Flow Mask Attention for Open-Set Long-Tailed Recognition of Wild Animals in Camera-Trap Images

IEEE INTERNATIONAL CONFERENCE ON IMAGE PROCESSING (**ICIP**)

2022

Paper

Jeongsoo Kim, **Sangmin Woo**, Byeongjun Park, Changick Kim

Impact of Sentence Representation Matching in Neural Machine Translation

APPLIED SCIENCES

2022

Paper

Heeseung Jung, Kangil Kim, Jong-Hun Shin, Seung-Hoon Na, SangKeun Jung, **Sangmin Woo**

What and When to Look?: Temporal Span Proposal Network for Video Relation Detection

EXPERT SYSTEMS WITH APPLICATIONS (**ESWA**)

2021

Under Review

Paper | Code

Sangmin Woo, Junhyug Noh, Kangil Kim

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

ELECTRONICS

2021

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 Appratus 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   *Gwangju, Korea*
M.S. (ADVISOR: PROF. KANGIL KIM)   *Sep. 2019 - Aug. 2021*

Virtual Reality Lab @ Kyungpook National University   *Daegu, Korea*
UNDERGRADUATE RESEARCH INTERN (ADVISOR: PROF. SOON KI JUNG)   *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) *Daejeon, Korea*
PH.D. IN ELECTRICAL ENGINEERING *Aug. 2021 - Present*
Coursework: Computer Vision, Machine Learning, Graph Mining, Explainable AI

Gwangju Institute of Science and Technology (GIST) *Gwangju, Korea*
M.S. IN ELECTRICAL ENGINEERING AND COMPUTER SCIENCE *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 *Daegu, Korea*
B.S. IN ELECTRICAL ENGINEERING (MINOR IN COMPUTER SCIENCE AND ENGINEERING) *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 *2024.02 present*
CENTER FOR SECURITY TECHNOLOGY RESEARCH, KAIST

Multi-modal Group Activity Recognition *2023.02 present*
CENTER FOR APPLIED RESEARCH IN ARTIFICIAL INTELLIGENCE (CARAI)

Sketch-based Video Object Localization *2023.02 2023.11*
CENTER FOR SECURITY TECHNOLOGY RESEARCH, KAIST

Multi-modal Action Recognition *2021.09 2022.12*
CENTER FOR APPLIED RESEARCH IN ARTIFICIAL INTELLIGENCE (CARAI)

Development of Precise Content Identification Technology based on Relationship Analysis for Maritime Vessels/Structure *2021.09 2021.12*
MINISTRY OF SCIENCE AND ICT (MSIT)