

# Sangmin Woo

## PH.D. CANDIDATE IN EE @ KAIST

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

[✉ smwoo95@kaist.ac.kr](mailto:smwoo95@kaist.ac.kr) | [🏠 sangminwoo.github.io](https://sangminwoo.github.io) | [🐙 sangminwoo](https://github.com/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 +  $X \in \{\text{Language, Audio, Sketch, Graph, etc.}\}$ .
- Video Understanding
- Diffusion Models

## Publication

### INTERNATIONAL

#### A paper on "Single-Image 3D Generation"

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

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

2024

Under Review

#### A paper on "Group Activity Recognition"

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

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

2024

Under Review

#### Denoising Task Routing for Diffusion Models

INTERNATIONAL CONFERENCE OF LEARNING REPRESENTATION (ICLR)

[Paper](#)

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

2024

Under Review

#### Sketch-based Video Object Localization

IEEE WINTER CONFERENCE ON APPLICATIONS OF COMPUTER VISION (WACV)

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

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

2024

#### AHFu-Net: Align, Hallucinate, and Fuse Network for Missing Multimodal Action Recognition

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

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

2023

#### Multi-modal Social Group Activity Recognition in Panoramic Scene

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

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

2023

#### Cross-Modal Alignment and Translation for Missing Modality Action Recognition

COMPUTER VISION AND IMAGE UNDERSTANDING (CVIU)

[Paper](#)

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

2023

## Modality Mixer Exploiting Complementary Information for Multi-modal Action Recognition

2023

IEEE TRANSACTIONS ON IMAGE PROCESSING (TIP)

Under Review

[Paper](#)

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

## Audio-Visual Glance Network for Efficient Video Recognition

2023

IEEE INTERNATIONAL CONFERENCE ON COMPUTER VISION (ICCV)

[Paper](#)

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

## Towards Good Practices for Missing Modality Robust Action Recognition

2023

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

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

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

## Modality Mixer for Multi-modal Action Recognition

2023

IEEE WINTER CONFERENCE ON APPLICATIONS OF COMPUTER VISION (WACV)

[Paper](#)

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

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

2023

MULTIMEDIA TOOLS AND APPLICATIONS (MTA)

Under Review

[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

2022

IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS (TNNLS)

[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

2022

IEEE INTERNATIONAL CONFERENCE ON IMAGE PROCESSING (ICIP)

[Paper](#)

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

## Impact of Sentence Representation Matching in Neural Machine Translation

2022

APPLIED SCIENCES

[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

2023

EXPERT SYSTEMS WITH APPLICATIONS (ESWA)

Under Review

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

**Sangmin Woo**, Junhyug Noh, Kangil Kim

## 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

KOREA INSTITUTE OF MILITARY SERVICE AND TECHNOLOGY (KIMST)

Sangmin Woo, Changick Kim

2022

## Effective Trash Classification using Attentional Learning

KOREA SOFTWARE CONGRESS (KSC)

Sangmin Woo, Soon Ki Jung

2018

## Honors & Awards

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

## Patent

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

KR PATENT APPLICATION: 10-2022-0094911

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

2022

### Method and Device for Inferring Dynamic Relationship between Objects in Video

KR PATENT APPLICATION: 10-2021-0125704

**Sangmin Woo**, Kangil Kim

2021

### Scene Graph Generation Apparatus

KR PATENT 10-2254-7680000

**Sangmin Woo**, Kangil Kim

2021

## Research Experience

### Computational Intelligence Lab @ KAIST

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

*Daejeon, Korea*

*Sep. 2021 - present*

### Robot Vision Team @ NAVER LABS

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

*Suwon, Korea*

*Apr. 2023 - Aug. 2023*

### 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.

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

## Education

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### 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

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### Sketch Query-based Video Object Localization

*2023.02 present*

CENTER FOR SECURITY TECHNOLOGY RESEARCH, KAIST

### Center for Applied Research in Artificial Intelligence (CARAI), Phase 1

*2021.09 present*

AGENCY FOR DEFENSE DEVELOPMENT (ADD)

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

*2021.09 2021.12*

MINISTRY OF SCIENCE AND ICT (MSIT)