

Sanghyeok Lee

(Sean Lee)

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Summary

Research Scientist on Team Pegasus at TwelveLabs. I earned my Ph.D. in Computer Science at Korea University under the supervision of Prof. Hyunwoo J. Kim and subsequently served as an InnoCORE-funded postdoctoral research fellow at KAIST's Machine Learning & Vision Lab. My research focuses on reliable and efficient AI systems for multimodal understanding over extremely long contexts, including videos spanning months or years.

Research Interests: Multimodal LLMs, Agentic AI, Long-context Understanding, Efficient Deep Learning, Efficient Adaptation, Computer Vision, and 3D Vision

Education

- Sep 2020 - Aug 2025** **Ph.D. in Computer Science and Engineering**
Korea University | GPA: 4.24 / 4.50 (97.0 / 100)
- Advisor: Prof. Hyunwoo J. Kim
 - Dissertation: Token Compression for Accelerating and Improving Modern Vision Architectures
- Mar 2016 - Sep 2020** **B.S. in Computer Science and Engineering**
Korea University | GPA: 4.02 / 4.50 (94.5 / 100)

Teaching Experience

- 2020** **Teaching Fellow**
COSE474: Deep Learning, Korea University
- 2021 - 2022** **Teaching Assistant**
COSE361: Artificial Intelligence, Korea University

Publications

* Equal contribution. C: Conference, J: Journal, P: Preprint, U: Under review.

- C12** **DocPrune: Efficient Document Question Answering via Background, Question, and Comprehension-aware Token Pruning**
Joonmyung Choi, Sanghyeok Lee, Jongha Kim, Sehyung Kim, Dohwan Ko, Jihyung Kil, Hyunwoo J. Kim
IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2026 w/ Adobe Research
- C11** **MoE-GRPO: Optimizing Mixture-of-Experts via Reinforcement Learning in Vision-Language Models**
Dohwan Ko, Jinyoung Park, Seoung Choi, Sanghyeok Lee, Seohyun Lee, Hyunwoo J. Kim
IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2026
- C10** **Transferable Model-agnostic Adaptation for Enhancing Vision-Language Models without Backpropagation**
Jihwan Park, Taehoon Song, Sanghyeok Lee, Miso Choi, Hyunwoo J. Kim
AAAI Conference on Artificial Intelligence (AAAI), 2026 **Oral Presentation**
- C9** **TabFlash: Efficient Table Understanding with Progressive Question Conditioning and Token Focusing**
Jongha Kim, Minseong Bae, Sanghyeok Lee, Jinsung Yoon, Hyunwoo J. Kim
AAAI Conference on Artificial Intelligence (AAAI), 2026 w/ Google Cloud AI
- J1** **Parameter-Efficient Fine-Tuning via Meta-Regularizer**
Jinyoung Park, Juyeon Ko, Sanghyeok Lee, Joonmyung Choi, Hyunwoo J. Kim
International Journal of Computer Vision (IJCV), 2026
- C8** **Representation Shift: Unifying Token Compression with FlashAttention**
Joonmyung Choi*, Sanghyeok Lee*, Byungoh Ko, Eunseo Kim, Jihyung Kil, Hyunwoo J. Kim
IEEE/CVF International Conference on Computer Vision (ICCV), 2025 w/ Adobe Research
- C7** **EfficientViM: Efficient Vision Mamba with Hidden State Mixer based State Space Duality**
Sanghyeok Lee, Joonmyung Choi, Hyunwoo J. Kim
IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2025
- C6** **vid-TLDR: Training Free Token Merging for Light-weight Video Transformer**
Joonmyung Choi*, Sanghyeok Lee*, Jaewon Chu, Minhyuk Choi, Hyunwoo J. Kim
IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2024
- C5** **Multi-criteria Token Fusion with One-step-ahead Attention for Efficient Vision Transformers**
Sanghyeok Lee*, Joonmyung Choi*, Hyunwoo J. Kim
IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2024

C4	<u>Read-only Prompt Optimization for Vision-Language Few-shot Learning</u> DongJun Lee*, Seokwon Song*, Jihee Suh, Joonmyung Choi, Sanghyeok Lee, Hyunwoo J. Kim IEEE/CVF International Conference on Computer Vision (ICCV), 2023
C3	<u>Self-positioning Point-based Transformer for Point Cloud Understanding</u> Jinyoung Park*, Sanghyeok Lee*, Sihyeon Kim, Yonyang Xiong, Hyunwoo J. Kim IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2023 w/ Meta Reality Labs
C2	<u>SageMix: Saliency-Guided Mixup for Point Clouds</u> Sanghyeok Lee*, Minkyu Jeon*, Injae Kim, Yonyang Xiong, Hyunwoo J. Kim Conference on Neural Information Processing Systems (NeurIPS), 2022 w/ Meta Reality Labs
C1	<u>PointWOLF: Point Cloud Augmentation with Weighted Local Transformations</u> Sihyeon Kim*, Sanghyeok Lee*, Dasol Hwang, Jaewon Lee, Seong Jae Hwang, Hyunwoo J. Kim IEEE/CVF International Conference on Computer Vision (ICCV), 2021 w/ University of Pittsburgh
P	<u>Robust Multimodal 3D Object Detection via Modality-Agnostic Decoding and Proximity-based Modality Ensemble</u> Juhan Cha*, Minseok Joo*, Jihwan Park, Sanghyeok Lee, Injae Kim, Hyunwoo J. Kim arXiv preprint, 2024
U	SuperClip Pyramid for Video Temporal Grounding Sanghyeok Lee, Juyeon Ko, Joonmyung Choi, Jongha Kim, Dohwan Ko, Ji Soo Lee, Hyunwoo J. Kim Under review w/ KT Gen AI Lab
U	<u>HyperGraphPro: Progress-Aware Reinforcement Learning for Structure-Guided Hypergraph RAG</u> Jinyoung Park, Sanghyeok Lee, Omar Zia Khan, Hyunwoo J. Kim, Joo-Kyung Kim Under review w/ Amazon Alexa AI
U	Fate: A Faithful Audio-Visual Question Answering Benchmark Through Modality-Specific Temporal Grounding Jun Hyung Park*, Seungmin Yun*, Sanghyeok Lee, Injae Kim, Joonmyung Choi, Hyunwoo J. Kim Under review w/ KT Gen AI Lab
U	Hysteresis Parallel Decoding for Diffusion Large Language Models Sehyung Kim, Mujin Shin, Sanghyeok Lee, Jihwan Park, Sungsik Cho, Sungwook Choi, Hyunwoo J. Kim Under review w/ Hyundai Mobis
U	VideoGPS: Navigating an Agent-Readable Video Map for Long-Video QA Seohyun Lee, Joonmyung Choi, Seoung Choi, Jonathan Minh Chung, Chaehyeon Kim, Sanghyeok Lee, Noori Kim, Heera Kim, Hyunwoo J. Kim Under review w/ Hanwha Vision

Experience

Sep 2026 - Present	Research Scientist TwelveLabs Team Pegasus
Sep 2025 - Aug 2026	Postdoctoral Researcher KAIST Machine Learning & Vision Lab Hosted by Prof. Hyunwoo J. Kim - InnoCORE LLM Innovation Research Center (Sep 2025 - Aug 2026). MSIT-funded fellowship; developed efficient video MLLMs for long-video understanding. - Media Content Summarization through Video Understanding (Oct 2025 - Aug 2026). Project lead; funded by KT with KT Gen AI Lab, Vision AI Team; developed an audio-guided video temporal grounding model. - Learning Strategies and Data Augmentation to Mitigate Dataset Bias (Sep 2025 - Aug 2026). Funded by ETRI; developed lightweight video LLMs for egocentric video understanding. - Training and Compression of MoE-Based Large Multimodal Models for Tiered and Personalized Services (Sep 2025 - Aug 2026). Funded by Samsung Device Solutions; developed robust training and acceleration methods for MoE-based large multimodal models.
Sep 2020 - Aug 2025	Graduate Student Researcher Korea University Machine Learning & Vision Lab - Media Content Summarization through Video Understanding (Aug 2024 - Jul 2025). Project lead; funded by KT; developed temporal grounding and LLM-based end-to-end video summarization models. - Blood Image Analysis for Infectious Diseases and Blood Cancers (Jul 2022 - Dec 2024). Project lead; funded by KHIDI; developed models for bright-field, Giemsa-stained, fluorescence, and LAMP-MS assay images. - Deep Learning Program for Tooth Axis Identification and Automated Orthodontic Set-Ups (Feb 2020 - Nov 2021). Project lead; funded by TIPAA; developed 3D classification, detection, and automated alignment systems.

May - Dec 2021

Initial Team Member

Drone Laps

- Early-stage startup for drone-based autonomous maintenance services.
- Sponsored by the Korea Ministry of Science and ICT (\$70,000); contributed to market research and business model design.

Patents & Copyright

- P7** **Method for Progressive Question Conditioning and Token Focusing and Apparatus for Same**
Hyunwoo J. Kim, Minseong Bae, Sanghyeok Lee, Jongha Kim
Korean Patent 10-2025-0210451, filed Dec 26, 2025.
- P6** **Method, System, and Kit for Nucleic Acid Detection Using Morphological Analysis of Magnesium Pyrophosphate Microparticles**
Chaeseung Lim, Woongsik Jang, Minkyong Choi, Seoyeon Park, Hyunwoo J. Kim, Sanghyeok Lee, Injae Kim
Korean Patent 10-2025-0176226, filed Nov 19, 2025. PCT/KR2025/019390, filed Nov 21, 2025.
- C1** **EfficientViM (Efficient Vision Mamba for Computer Vision)**
Sanghyeok Lee, Joonmyung Choi, Hyunwoo J. Kim
Korean Computer Program Copyright C-2024-055621, registered Dec 26, 2024.
- P5** **Biosensor for LAMP Product Detection in LAMP Analysis**
Chaeseung Lim, Woongsik Jang, Minkyong Choi, Seoyeon Park, Hyunwoo J. Kim, Sanghyeok Lee, Injae Kim
Korean Patent 10-2024-0168968, filed Nov 22, 2024.
- P4** **3D Data Augmentation Method Using Weighted Local Transformation and Apparatus Therefor**
Hyunwoo J. Kim, Sihyeon Kim, Sanghyeok Lee, Jinyoung Park
Korean Patent 10-2636217, registered Feb 7, 2024. U.S. Patent 18/634,813, filed Apr 12, 2024.
- P3** **Method for Generating High Quality Video with Professional Filming Techniques through Deep Learning Technology Based 3D Space Modeling and Point-of-View Synthesis**
Hyunwoo J. Kim, Sihyeon Kim, Jooyeon Kim, Sanghyeok Lee
Korean Patent 10-2593135, registered Oct 19, 2023.
- P2** **Method and Apparatus for Read-only Prompt Learning**
Hyunwoo J. Kim, Jinyoung Park, Joonmyung Choi, Sanghyeok Lee, Dongjun Lee, Seokwon Song, Jihee Suh
Korean Patent 10-2563550, registered Aug 7, 2023.
- P1** **Apparatus for Generating Videos with Enhanced Camera Movements through 3D Modeling and View Synthesis Based on Deep Learning Techniques**
Hyunwoo J. Kim, Sihyeon Kim, Sanghyeok Lee, Jooyeon Kim
Korean Patent 10-2022-006232, filed May 20, 2022.

Presentations & Talks

- Mar 2024** **Token Reductions for Efficient Vision Transformers**
Invited talk | Naver AI Lab, Naver 1784
- Feb 2023** **3D Point Cloud and Transformer**
Invited talk and SageMix tutorial | Korean Computer Vision Society Workshop

Honors & Awards

- InnoCORE Postdoctoral Fellowship, Ministry of Science and ICT (2025 - 2026)
- Travel Award, CVPR (2024)
- Research Grant, Brain Korea 21 (2021 - 2022)
- Teaching Assistantship, Korea University (2021 - 2022)
- Scholarship, Korea University (2016 - 2020)
- Outstanding Paper Award, Korea University (2024)
- Travel Award, NeurIPS (2022)
- Future Research Fellowship, Brain Korea 21 (2021 - 2022)
- Teaching Fellowship, Korea University (2020)

Academic Service

Program Committee

MICCAI 2nd-4th International Workshop on Foundation Models for General Medical AI (MedAGI), 2024 - 2026

Conference Reviewer	Journal Reviewer
CVPR, 2023 - Present NeurIPS, 2023 - Present ECCV, 2024 - Present ICCV, 2025 - Present WACV, 2025 - Present ACM MM, 2025 - Present ACL ARR, 2026 - Present	IEEE TPAMI, 2026 IEEE TNNLS, 2024 IEEE TIP, 2024 IEEE TMM, 2024 - 2025 Pattern Recognition, 2025 - 2026

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