Jaehong Kim

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Research Interest

AI for systems, AI for video streaming, Immersive video, Systems for large-scale AI, Networked system

Work Experience

Carnegie Mellon University *Pittsburgh, PA, USA*

To join as a Postdoctoral Researcher in Computer Science Department *Sep. 2024 - Aug. 2025 (Expected)*

- Postdoctoral Fellowship Program granted by NRF. (Advisor: Srinivasan Seshan and Anthony Rowe)

Education

KAIST (Korea Advanced Institute of Science and Technology) *Daejeon, S.Korea*

Ph.D. in Electrical Engineering *Feb. 2020 - Aug. 2024 (Expected)*

- Thesis title: Enabling High-quality 2D and 3D Live Streaming at Ingest (Advisor: Prof. Dongsu Han)

KAIST (Korea Advanced Institute of Science and Technology) *Daejeon, S.Korea*

M.S. in Electrical Engineering *Sep. 2018 - Feb. 2020*

- Thesis title: Enhancing Live Video Quality at Ingest Using Online Trained DNNs (Advisor: Prof. Dongsu Han)

KAIST (Korea Advanced Institute of Science and Technology) *Daejeon, S.Korea*

B.S. in Electrical Engineering (Cum Laude) *Mar. 2014 - Aug. 2018*

University of Maryland *College Park, MD, USA*

Exchange Student Program *Jan. 2016 - May. 2016*

Publications / Preprints

Conference Proceedings (C), Workshops (W), Preprints (P) — Topics

[P-2] Pushing the Limits of Live 3D Streaming with BlenDR — **Volumetric Video**

Jaehong Kim, Junha Kim, and Dongsu Han

Under Review

[P-1] NerVast: Scaling Neural Video Representation with Enhanced Compression Efficiency — **AI for Video**

Yunheon Lee, Jaehong Kim, Juncheol Ye, and Dongsu Han

Under Review

[C-5] FlexPass: A Case for Flexible Credit-based Transport for Datacenter Networks — **Datacenter Networking**

Hwijoon Lim, Jaehong Kim, Inho Cho, Keon Jang, Wei Bai, and Dongsu Han

ACM EuroSys 2023, webpage

[C-4] OutRAN: Co-optimizing for Flow Completion Time in Radio Access Network — **5G Networks**

Jaehong Kim, Yunheon Lee, Hwijoon Lim, Youngmok Jung, Song Min Kim, and Dongsu Han

ACM CoNEXT 2022 (Best paper award nominee), webpage

[C-3] NeuroScaler: Neural Video Enhancement at Scale — **AI for Live Streaming**

Hyunho Yeo, Hwijoon Lim, Jaehong Kim, Youngmok Jung, Juncheol Ye, and Dongsu Han

ACM SIGCOMM 2022, webpage

[C-2] Neural-Enhanced Live Streaming: Improving Live Video Ingest via Online Learning — **AI for Live Streaming**

Jaehong Kim*, Youngmok Jung*, Hyunho Yeo, Juncheol Ye, and Dongsu Han

ACM SIGCOMM 2020, * Co-first authors, webpage

[C-1] Neural Adaptive Content-aware Internet Video Delivery — **AI for Video Streaming**

Hyunho Yeo, Youngmok Jung, Jaehong Kim, Jinwoo Shin, and Dongsu Han

USENIX OSDI 2018, webpage

[W-1] Neural Cloud Storage: Innovative Cloud Storage Solution for Cold Video — **AI for Cloud Storage**

Jinyeong Lim, Juncheol Ye, Jaehong Kim, Hwijoon Lim, Hyunho Yeo, and Dongsu Han

ACM HotStorage 2023, webpage

Honors and Awards

(Expected)	**NRF Postdoctoral Fellowship Program** Selected as a principal investigator of Postdoctoral Fellowship Program (Nurturing Next-generation Researchers) in 2024 granted by the National Research Foundation of Korea (NRF) with ₩60,000,000 grant for one year.	*NRF*
Feb. 2023	**29th Samsung Humantech Paper Award** Silver Prize (2nd place), Communication & Network	*Samsung Electronics*
Dec. 2022	**Google Conference Scholarship** Travel grants for students giving oral presentations at top-tier CS conferences.	*Google LLC*
Dec. 2022	**ACM CoNEXT'22 Best Paper Award Nomination & ACM Student Grant** Received the highest review score with five "4 Accept" ratings.	*NSF & ACM*
Feb. 2022	**28th Samsung Humantech Paper Award** Gold Prize (1st place), Communication & Network	*Samsung Electronics*
2021	**KAIST Breakthrough of the Year** For the top 15 most significant research achievements.	*KAIST*
2020	**Donghwa Industry Moon Daewon AI Research Scholarship** Awarded to a graduate student for outstanding AI research and collaborative spirit.	*KAIST*
2018	**USENIX OSDI Student Grant**	*USENIX*

Patents

International

US17265680	**Live video ingest system and method**	*KAIST*
US16612498	**Method and apparatus for transmitting adaptive video in real time using content-aware neural network**	*KAIST*

Domestic (South Korea)

KR10-2338986-0000	**Method for enhancing live video delivery at ingest point utilizing content-aware neural network**	*KAIST*
KR10-2023-0164365 (Filed)	**Unified Compression Method for RGB and Depth Video in Live 3D Video Streaming**	*KAIST*
KR10-2022-0091760 (Filed)	**Acceleration method for encoding selective super-resolved video**	*KAIST*
KR10-2022-0091726 (Filed)	**Acceleration and scheduling method for video super-resolution based on codec-level information**	*KAIST*
KR10-2022-0138553 (Filed)	**Practical flow scheduling algorithm designed for 4G/5G radio access network base stations for low-latency applications**	*Samsung Electronics & KAIST*
KR10-2022-0077669 (Filed)	**Method of scheduling flow and electronic device performing the method**	*Samsung Electronics & KAIST*
KR10-2023-0181034 (Filed)	**Cloud storage system for cold video with content-aware super-resolution**	*KAIST*

Research Experience

AI-augmented Video Delivery for Immersive Media (NRF, PI) *Sep. 2024 - Aug. 2025 (Expected)*

Funded by the National Research Foundation of Korea (NRF) with ₩60,000,000 for one year as a postdoctoral researcher and PI.

Live Volumetric Video Streaming [P-2] *Nov. 2022 - Feb. 2024*

Designed a novel RGB-D representation and delivery scheme for live 3D video streaming. It reduces depth error by **8.7**× (RMSE) and improves RGB quality by **3.18 dB** (PSNR) given the same bandwidth. Compared to Google's Draco , it offers **89.6%** better compression efficiency. Demonstrated real-time performance using **Azure Kinect** Camera attached to the Jetson device.

Cross-layer Optimization for 5G Radio Access Networks [C-4] *Aug. 2020 - June. 2022*

Developed a new transport-layer scheduling in 5G Networks that delivers better latency for latency-sensitive traffic without the QoS information. Implemented the design both on **NS-3** and on top of **srsRAN** gNodeB, which runs on **USRP** Software Defined Radios (**SDR**). Reduced the webpage load time up to **34%** outperforming legacy 4G/5G MAC schedulers. Funded by Samsung Electronics Modem S/W R&D Group.

Neural-enhanced Live Video Delivery [C-2, C-3] *Nov. 2018 - July. 2020*

Designed a new live ingest framework that ensures high-quality live streaming to viewers by enhancing origin live video quality with online-trained super-resolution DNNs at ingest servers. Implemented the client and ingest server with **WebRTC**, **PyTorch**, and ffmpeg. Improved quality of experience for live stream viewers up to **69%** or saved streamer's bandwidth usage by 45.9%.

Neural-enhanced Adaptive Streaming [C-1] *Mar. 2017 - Oct. 2018*

Contributed to the development of a neural adaptive content-aware video delivery system, a first application of neural enhancement in adaptive video streaming. Implemented an end-to-end system on top of **MPEG DASH (dash.js)** and **TensorFlow**. Improved the quality of user experience by **43.08%** or saved 17.13% of network bandwidth.

Mentoring Experience

Individual Study

- Junha Kim (B.S. KAIST / Jun. 2023 - Present): Mentored research on live 3D streaming [P-2]. Read his experience here.
- Yunheon Lee (B.S. KAIST → Ph.D. Candidate KAIST / Jun. 2021 - Present): Mentoring research on 5G [C-4], and AI for video [P-1].
- Jinyeong Lim (M.S. KAIST): Mentored research on AI for cloud storage [W-1].
- Euijun Jeong (B.S. KAIST): Mentored research on an efficient cluster-wise training scheme for content-aware neural-enhancement.

Undergraduate Research Program (URP)

- Hyojin Choi (B.S. KAIST / Jan.2023 - Jun.2023): Mentored research on deep neural video compression.

Teaching Experience

Teaching Assistant

- Advanced Computer Networking and Cloud Computing (EE618) *Spring 2021*
- Network Programming (EE324) *Fall 2020, Fall 2021*
- SK Hynix ASK Program *Aug. 2020*
- Systems and Applications of Artificial Intelligence and Machine Learning (EE793) *Spring 2020*
- Programming Structures for Electrical Engineering (EE209) *Spring & Fall 2019, Spring & Fall 2022*

Presentation

Computer Science & Engineering Department Seminar/Interview at UNIST *Ulsan, S.Korea*

Presented major research accomplishments to date and future research plans. *Jun. 2024*

Conference talk at CoNEXT'22 *Rome, Italy*

Presented OutRAN: Co-optimizing for Flow Completion Time in Radio Access Network. Demo *Dec. 2022*

Conference talk at SIGCOMM'20 *Virtual*

Presented Neural-Enhanced Live Streaming: Improving Live Video Ingest via Online Learning. *Aug. 2020*

20-min talk , 10-min talk

Demo & Poster session at OSDI'18 *Carlsbad, CA, USA*

Presented demo of Neural Adaptive Content-aware Internet Video Delivery. Demo *Oct. 2018*

Academic Service

2023, 2024 **IEEE/ACM transactions on networking,** Role: Reviewer

Skills

Programming Python, C/C++, JavaScript, CUDA

AI Frameworks TensorFlow, PyTorch, TensorRT

Other Skills dash.js, ffmpeg, NS-3, srsRAN, Docker

Languages Korean (native), English (fluent, IBT TOEFL 106)

References

Available upon request.