Jin Heo

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Research Focus and Objective

My research bridges distributed systems and immersive multimedia to address the increasing computational demands of real-time services, especially in resource-constrained settings. I design and develop efficient system architectures and optimization techniques that enhance resource efficiency, scalability, and user experience for high-load multimedia use cases, including XR and cloud gaming.

Professional Experience

Dolby Laboratories — Atlanta, GA
Senior Researcher — Aug 2025 - Present

- Contributing to advanced content adaptation methods driven by user engagement metrics to enhance personalized viewing experiences and retention on streaming platforms.
- Leading the design and implementation of a scalable, cloud-based data pipeline for collecting and processing multi-source data (QoS, user interaction, ML-derived content insights), enabling personalized content adaptation strategies.

Georgia Institute of Technology — Atlanta, GA
Graduate Research Assistant — Aug 2019 - Aug 2025

- Designed an adaptive resource management system to dynamically balance server-side rendering cost against user-perceived quality in demanding cloud gaming workloads [1].
- Architected and implemented a low-latency, soft real-time inference serving system for XR perception models, serving more users with the same resource footprint on the resource-constrained server [2].
- Developed a distributed pipeline processing system for flexible distribution of XR workloads, significantly improving throughput and reducing pipeline latency [4, 7].

Dolby Laboratories — San Francisco, CA
Research Intern — May 2024 - Aug 2024

- Developed a parser for the Universal Scene Description (USD) standard of 3D assets to facilitate real-time content handling.
- Designed a partial query and retrieval method to enable efficient streaming of interactable 3D assets following the USD standard.

AT&T Labs — Austin, TX
Research Intern — May 2023 - Aug 2023

- Developed a fast-prototyping framework for a city-scale digital twin in Unity 3D to simulate wireless network performance of AT&T's base stations.
- Published the resulting research on the digital-twin framework [3].

Ericsson Research — Santa Clara, CA
Research Intern (remote) — Mar 2021 - Dec 2022

- Developed a LiDAR point cloud compression method to enable real-time LiDAR data processing on servers
- Developed an interpolation method to recover the lost information by lossy compression, resulting in an international patent application (WO2024073084A1).
- Published the resulting research findings [5, 6].

University of California, Irvine — Irvine, CA
Research Assistant (Undergraduate Research Opportunities Program) — Jul 2017 - Jan 2018

- Contributed to the design and implementation of a framework for FPGA acceleration of computer vision algorithms.
- Focused on implementing the framework using the OpenVX graph pipeline, resulting in a publication [8].

Commonwealth Scientific and Industrial Research Organization (CSIRO) — Brisbane, Australia
Research Assistant (Undergraduate Research Opportunities Program) — Sep 2016 - Feb 2017

- Engineered and implemented an optimized network flooding algorithm for efficient broadcasting in Wireless Sensor Networks (WSNs).
- Validated performance by deploying the implementation onto battery-constrained sensor devices in an Australian field area.

Military Service, Republic of Korea Army — Busan, South Korea
IT Specialist (System Administration) — Nov 2011 - Aug 2013

- Managed and maintained the hospital's on-premise IT infrastructure and medical data platform, ensuring 24/7 operation and data integrity.
- Developed and deployed a monitoring tool to track the status and usage of 400+ PC/IT assets across the hospital.

Publication

1. **Heo, J.**, Wang, V., Bhardwaj, K. and Gavrilovska, A., 2026, May. *Stimpack: An Adaptive Rendering Optimization System for Scalable Cloud Gaming*. -- To appear in The 23rd USENIX Symposium on Networked Systems Design and Implementation (NSDI '26).
2. **Heo, J.** and Gavrilovska, A., 2024, December. Poster: *Adapting XR Perception Serving for Edge Server Scalability*. In 2024 IEEE/ACM Symposium on Edge Computing (SEC) (pp. 518-520). IEEE.
3. **Heo, J.**, Novlan, T., Akoum, S. and Gavrilovska, A., 2024, December. *GT-Craft: A Framework for Fast Prototyping Geospatial-Based Digital Twins in Unity 3D*. In 2024 IEEE/ACM Symposium on Edge Computing (SEC) (pp. 395-401). IEEE.
4. **Heo, J.**, Bhardwaj, K. and Gavrilovska, A., 2023, June. *FleXR: A system enabling flexibly distributed extended reality*. In Proceedings of the 14th Conference on ACM Multimedia Systems (pp. 1-13).
5. **Heo, J.**, Phillips, C. and Gavrilovska, A., 2022, December. *FLiCR: A fast and lightweight lidar point cloud compression based on lossy RI*. In 2022 IEEE/ACM 7th Symposium on Edge Computing (SEC) (pp. 54-67). IEEE.
6. **Heo, J.**, Phillips, G., Brodin, P.E. and Gavrilovska, A., 2022, December. Poster: *Making Edge-assisted LiDAR Perceptions Robust to Lossy Point Cloud Compression*. In 2022 IEEE/ACM 7th Symposium on Edge Computing (SEC) (pp. 293-295). IEEE.
7. **Heo, J.**, Bhardwaj, K. and Gavrilovska, A., 2021, December. Poster: *Enabling flexible edge-assisted XR*. In 2021 IEEE/ACM Symposium on Edge Computing (SEC) (pp. 465-467). IEEE.
8. Taheri, S., **Heo, J.**, Behnam, P., Chen, J., Veidenbaum, A. and Nicolau, A., 2018, April. *Acceleration framework for FPGA implementation of OpenVX graph pipelines*. In 2018 IEEE 26th Annual International Symposium on Field-Programmable Custom Computing Machines (FCCM) (pp. 227-227). IEEE.

Education

Georgia Institute of Technology — Atlanta, GA
Doctor of Philosophy in Computer Science; GPA: 4.0 — 2019 - 2025

- PhD Thesis: "Adaptively Serving XR Workloads from Resource-constrained Edge"

Ajou University — Suwon, South Korea
Bachelor of Science in Computer Engineering; Summa Cum Laude — 2016 - 2018

Technical Skills

- Programming Languages & Core Systems: C, C++, Python, Linux, Git
- Distributed Systems & Infrastructure: AWS, GCP, Docker, gRPC, Apache Spark, Apache Kafka, ZMQ, Databricks, CMake, Makefiles
- Multimedia, ML & Scientific Computing: Unity, Unreal Engine, FFmpeg, GStreamer, OpenCV, OpenGL, PyTorch, Scikit-learn, Point Cloud Library

Additional Activities

- Academic Service & Teaching
  - External Reviewer for IEEE Open Journal of the Communications Society (OJ-COMS), 2024.
  - Head Teaching Assistant for Advanced Operating Systems (CS6210/4210) at Georgia Tech (Spring 2024, Spring 2022).
- Open-Source Contributions
  - RaftLib: Resolved a pipeline scheduler issue to enhance resource efficiency in the streaming library.
  - uvgRTP: Added build system support for Linux installation using pkg-config.
- Selected Presentations/Talks
  - Adaptive XR Serving from the Edge (Principles and Practice of Scalable Systems (PPoSS) Workshop 2023)
  - MEC-based Edge-assisted XR" (Application Driving Architecture (ADA) Symposium 2022)
  - Enabling Flexible Edge-assisted XR" (TECHCON of Application Driving Architecture (ADA) Center 2021)