

Jin Heo

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INTRODUCTION

I have been working on **distributed serving systems for real-time and interactive multimedia use cases**, *e.g.*, extended reality (XR) and video games. My projects address key challenges (but not limited to) in:

- Scalable and efficient serving of multi-user 3D rendering and machine-learning-based perception workloads [1, 3]
- Compression and streaming of emerging data modalities for real-time applications [5, 6]
- Optimizing workload distribution for enhanced end-to-end performance [4, 7]

EDUCATION

- **Georgia Institute of Technology** Atlanta, GA, USA
Doctor of Philosophy in Computer Science; GPA: 4.0 Aug. 2019 – Aug. 2025 (Expected)
- **Ajou University** Suwon, South Korea
Bachelor of Science in Computer Engineering; Summa Cum Laude (1/213) Mar. 2016 – Aug. 2018

EXPERIENCE

- **Kernel Lab, Georgia Tech** Atlanta, GA, USA
Graduate Research Assistant, advised by Dr. Ada Gavrilovska Aug. 2019 - Present
 - Developing **an inference serving system of XR perception** [1]. It manages the ML model selection based on latency and accuracy requirements, and schedules multi-user inference requests.
 - Developed **an adaptive rendering optimization system for cloud gaming** [3]. It adaptively optimizes the game rendering quality considering the server resource usage and predicted user-side visual quality after lossy compression.
 - Developed **a distributed stream processing framework for optimal real-time workload distribution** [4, 7]. It enables flexible functionality distribution at runtime without modifying the functionality codes.
- **Dolby Laboratories** San Francisco, CA, USA
Graduate Research Intern, mentored by Jeffrey Riedmiller May. 2024 - Aug. 2024
 - Developed **a parser for the universal scene description (USD) format of 3D assets and partial query and retrieval method** for streaming modifiable 3D assets.
 - The partial query and retrieval method reduces the initial loading time of the streamed assets up to 80% by selectively loading the necessary parts of the 3D assets.
- **AT&T Labs** Austin, TX, USA
Graduate Research Intern, mentored by Dr. Thomas Novlan May. 2023 - Aug. 2023
 - Developed **a framework generating a city-scale digital twin in Unity 3D** [2] for simulating the wireless network performance of AT&T's base stations.
 - The proposed framework uses satellite images with semantic segmentation models and reduces the time to generate city-scale digital twins in an order of magnitude compared to the manual creation.
- **Ericsson Research** Santa Clara, CA, USA
Graduate Research Intern (Remote), mentored by Christopher Phillips Mar. 2021 - Dec. 2022
 - Developed **a LiDAR point cloud compression method** [5] for real-time LiDAR point cloud transmission.
 - Developed **an interpolation method** [6] to recover the lost information by lossy LiDAR point cloud compression. *Patent submission (WO2024073084A1)
- **Parallel Architectures and Systems Lab, UC Irvine** Irvine, CA, USA
Undergraduate Research Assistant (UROP), advised by Dr. Sajjad Taheri and Dr. Alex Nicolau Jul. 2017 - Jan. 2018
 - Developed **a framework for FPGA acceleration of computer vision algorithms** using OpenVX graph pipeline [8].

TECHNICAL SKILLS

- **Programming Language:** C/C++, C#, Python, Bash Script
- **Software Platforms and Tools:** Linux, Docker, PyTorch, Tensorflow, OpenCV, gRPC, ZMQ, GStreamer, Stream Processing, Distributed Systems, FFmpeg, Point Cloud Library (PCL), Unreal Engine, Unity3D, ROS, OpenGL, Makefile, CMake
- **Project Management and Documentation:** Git, Agile Method, Test-Driven Development, Doxygen, Markdown

MISCELLANEOUS (CHRONOLOGICAL ORDER)

- External reviewer - IEEE Open Journal of the Communications Society (OJ-COMS)
- Teaching (Head TA) - Advanced Operation System (CS6210/4210) at Georgia Tech, Spring 24
- Presentation (Principles and Practice of Scalable Systems (PPoSS) Workshop 23) - *Adaptive XR Serving from the Edge*
- Open-source contribution (RaftLib) - resolved the issue of the pipeline scheduler for resource efficiency
- Open-source contribution (uvgRTP) - added the build system support for Linux installation with pkg-config
- Presentation (Application Driving Architecture (ADA) Symposium 22) - *MEC-based Edge-assisted XR*
- Teaching (Head TA) - Advanced Operation System (CS6210/4210) at Georgia Tech, Spring 22
- Presentation (TECHCON of Application Driving Architecture (ADA) Center 21) - *Enabling Flexible Edge-assisted XR*

PUBLICATIONS

- [1] **Heo, Jin** and A. Gavrilovska, “Poster: Adapting xr perception serving for edge server scalability”, in *2024 IEEE/ACM 9th Symposium on Edge Computing (SEC)*, IEEE, 2024.
- [2] **Heo, Jin**, T. Novlan, S. Akoum, and A. Gavrilovska, “Gt-craft: A framework for fast prototyping geospatial-based digital twins in unity 3d”, in *2024 IEEE/ACM 9th Symposium on Edge Computing (SEC)*, IEEE, 2024.
- [3] **Jin Heo**, K. Bhardwaj, and A. Gavrilovska, *Adrenaline: Adaptive rendering optimization system for scalable cloud gaming*, 2024. arXiv: 2412.19446 [cs.DC]. [Online]. Available: <https://arxiv.org/abs/2412.19446>.
- [4] **Heo, Jin**, K. Bhardwaj, and A. Gavrilovska, “Flexr: A system enabling flexibly distributed extended reality”, in *Proceedings of the 14th Conference on ACM Multimedia Systems*, 2023, pp. 1–13.
- [5] **Heo, Jin**, C. Phillips, and A. Gavrilovska, “Flicr: A fast and lightweight lidar point cloud compression based on lossy ri”, in *2022 IEEE/ACM 7th Symposium on Edge Computing (SEC)*, IEEE, 2022, pp. 54–67.
- [6] **Heo, Jin**, G. Phillips, P.-E. Brodin, and A. Gavrilovska, “Poster: Making edge-assisted lidar perceptions robust to lossy point cloud compression”, in *2022 IEEE/ACM 7th Symposium on Edge Computing (SEC)*, IEEE, 2022, pp. 293–295.
- [7] **Heo, Jin**, K. Bhardwaj, and A. Gavrilovska, “Poster: Enabling flexible edge-assisted xr”, in *2021 IEEE/ACM Symposium on Edge Computing (SEC)*, IEEE, 2021, pp. 465–467.
- [8] S. Taheri, **Heo, Jin**, P. Behnam, J. Chen, A. Veidenbaum, and A. Nicolau, “Acceleration framework for fpga implementation of openvx graph pipelines”, in *2018 IEEE 26th Annual International Symposium on Field-Programmable Custom Computing Machines (FCCM)*, IEEE, 2018, pp. 227–227.