

Sanghyun Byun

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| U.S. Citizen

EDUCATION

Ph.D. University of Cambridge <i>Ph.D. Candidate</i> , Computer Science	Oct. 2026 – 2030 Supervisor: Rafal Mantiuk
M.S. University of Southern California Computer Science (Artificial Intelligence)	2023 – 2025
B.S. University of California, Irvine Computer Science and Engineering	2019 – 2023

PROFESSIONAL EXPERIENCE

Emerging Technology Lab, LG Electronics Silicon Valley AI Research Scientist	May 2024 – Present Supervisor: Dr. Nikhil Chavan-Daffe, Dr. Woo Seong Chung, Jacob Song
<ul style="list-style-type: none">Conduct spatial-affordance prediction research for robot grasping to improve success rates of language-conditioned robotic tasks (CoRL '26 Submission, 1 Patent Pending).Lead project collaborations with MIT and Cornell on efficient inference and training of large language models for edge-deployed models (2 NIPS-W '25, PMLR '25). Develop hardware-agnostic post-training compression and inference pipeline for embedding matrix of large language model (EMNLP '25, 2 Patents Pending).Lead joint project with MIT CSAIL on training methodology for adaptive tokenizer for images (NIPS '25).Work on RetailVerse: AI-assisted, glasses-free AR retail platform (ESWA '26, 5 Patents Pending).	
University of Southern California Research Assistant	Feb. 2024 – Apr. 2024
<ul style="list-style-type: none">Work on 2D-to-3D label propagation for non-synchronized scene-scale image-point-cloud pairs captured on drone.	
University of California, Irvine Undergraduate Researcher	Nov. 2021 – Jul. 2023 Advisor: Dr. Aditi Majumder
<ul style="list-style-type: none">Work on image pre-processing for accurate prediction of landmarks of cleft surgeries (AIVR '23).	
OptumRX Software Development Intern	Jun. 2021 – Aug. 2022
<ul style="list-style-type: none">Work on portable VM benchmark for networking evaluation for efficient server selection and deployment.Launch new CRM platform to handle frequent regional legal and practical policy changes on medicine.	
Foodpool Co-founder	Nov. 2021 – Jun. 2022
<ul style="list-style-type: none">Found low-fee carpool-based food delivery service for college communities. Manage legal, finance, and backend.	

RESEARCH FOCUS

My research focuses on **efficient perception** across robotics, graphics, and machine vision. I build methods that retain the capability of large-scale vision and language models while running within the memory, compute, and latency budgets of real deployment. My work ranges from post-training compression and efficient inference to model architectures and representation learning. Specifically, my research covers three areas:

Efficient machine vision. My work makes core perception tasks practical under real hardware limits, including detection, recognition, and visual reasoning. Representative directions include extreme quantization, efficient decoding, context-adaptive inference, and compact architectures that carry across domains, from autonomous vehicles to language-conditioned robotic manipulation.

Neural rendering. A growing focus of mine is the photorealistic synthesis of 3D scenes on consumer hardware. Areas of interest include frame generation, neural super-resolution, and learned lighting for real-time rendering.

Human and machine vision. This thread studies how models of biological sight inform machine perception, from visual reasoning to learned representations. Treating the human visual system as a source of priors points toward perception that is both more efficient and more robust.

PUBLICATIONS

Conference Proceedings

- [C.1] **Single-pass Adaptive Image Tokenization for Minimum Program Search.** Shivam Duggal, Sanghyun Byun, William T. Freeman, Antonio Torralba, and Phillip Isola. *Conference on Neural Information Processing Systems.* NIPS '25
- [C.2] **Unifying Vision-Language Latents for Zero-label Image Caption Enhancement.** Sanghyun Byun*, Jung Ick Guack*, Mohanad Odema, Baisub Lee, Jacob Song, and Woo Seong Chung. *Conference on Neural Information Processing Systems - UniReps Workshop.* NIPS-W '25
- [C.3] **3-Model Speculative Decoding.** Sanghyun Byun, Mohanad Odema, Jung Ick Guack, Baisub Lee, Jacob Song, and Woo Seong Chung. *Conference on Neural Information Processing Systems - SPIGM Workshop.* NIPS-W '25
- [C.4] **APCE: Adaptive Progressive Context Expansion for Long Context Processing.** Baisub Lee, Sanghyun Byun, Mohanad Odema, Jung Ick Guack, Jacob Song, and Woo Seong Chung. *Conference on Neural Information Processing Systems - MLforSys Workshop.* NIPS-W '25
- [C.5] **CARVQ: Corrective Adaptor with Group Residual Vector Quantization for LLM Embedding Compression.** Dayin Gou*, Sanghyun Byun*, Nilesh Malpeddi, Gabrielle De Micheli, Prathamesh Vaste, Jacob Song, and Woo Seong Chung. *Conference on Empirical Methods in Natural Language Processing.* EMNLP '25
- [C.6] **Channel-Wise 1D Convolutional U-Net.** Sanghyun Byun, Kayvan Shah, Ayushi Gang, Christopher Apton, Jacob Song, and Woo Seong Chung. *IEEE International Conference on Image Processing Theory, Tools and Applications.* IPTA '25
- [C.7] **Automated Landmark Detection for AR Based Craniofacial Surgical Assistance System.** Sanghyun Byun, Muhammad T. Ibrahim, Gopi Meenakshisundaram, Aditi Majumder, Ross Sayadi, Usama S. Hamdan, and Raj M. Vyas. *International Conference on Artificial Intelligence and Virtual Reality.* AIVR '23

Journal Articles

- [J.1] **AI Automation for Material Consistency in Industrial 3D Assets.** Sanghyun Byun, Eric Sterner, Joshua Milburn, Keunhae Ushiroda, Eric Boise, David Olsen, Jacob Song, and Woo Seong Chung. *Expert Systems with Applications.* ESWA '26
- [J.2] **Multidepth: Multi-sample priors for refining monocular metric depth estimations in indoor scenes.** Sanghyun Byun, Jacob Song, and Woo Seong Chung. *International Journal of Intelligent Systems.* IJIS '26
- [J.3] **Unifying Vision-Language Latents for Zero-label Image Caption Enhancement.** Sanghyun Byun, Jung Ick Guack, Mohanad Odema, Baisub Lee, Jacob Song, and Woo Seong Chung. *Proceedings of Machine Learning Research.* PMLR '25

Submissions and Preprints

- [S.1] **Dense Vision-Language Alignment for Fine-Grained Task Affordances.** Sanghyun Byun, Nikhil Chavan-Dafle, and Jacob Song. CoRL 2026 Submission.
- [S.2] **Native Mixed-Precision and Quantization Support on RISC-V GPU Tensor Cores.** Xilai Dai, Yuzong Chen, Sanghyun Byun, Mohanad Odema, Jacob Song, and Mohammed Abdelfattah. ISPASS 2026 Submission.

PATENT SUBMISSIONS

- [P.1] **Unified Methods and Systems for Automation of Customized Retail Experience.** Woo Seong Chung, Jacob Song, and Sanghyun Byun. 2025 (Provisional). US63/814,905
- [P.2] **Multi-Expert Hybrid AI Agent for On-Demand Customer Service.** Woo Seong Chung, Hyun Chul Lee, Jacob Song, and Sanghyun Byun. 2025 (Provisional). US63/730,945

- [P.3] **Corrective Adaptor with Group Residual Vector Quantization for LLM Embedding Compression.** Woo Seong Chung, **Sanghyun Byun**, Nilesch Malpeddi, Jimmy Gou, Gabrielle De Micheli, Prathamesh Vaste, Jacob Song, and Bahattin Yildiz. 2025 (Provisional). US63/806,992
- [P.4] **Efficient Large Language Models with Low-Rank Tensor Decomposition and Transformer Block Pruning.** Woo Seong Chung, **Sanghyun Byun**, Nilesch Malpeddi, Jimmy Gou, Gabrielle De Micheli, Prathamesh Vaste, Jacob Song, and Bahattin Yildiz. 2025 (Provisional). US63/730,939
- [P.5] **Privacy-Centric Universal Multi-Modal AI Home Agent.** Woo Seong Chung, Hyun Chul Lee, Jacob Song, and **Sanghyun Byun**. 2025 (Provisional). US63/735,911
- [P.6] **Device and spatial reconstruction method thereof.** Woo Seong Chung, Hyun Chul Lee, Jacob Song, and **Sanghyun Byun**. 2024 (Pending). US19/368,967
- [P.7] **AI based Auto Dubbed Lip Synchronizations Generation.** Woo Seong Chung, Hyun Chul Lee, Jacob Song, and **Sanghyun Byun**. 2024 (Pending). US19/368,987

AWARDS

Butterworth Design Competition, 2nd Place	2022
UCI Dean's List	2019 – 2023

SERVICES

Reviewer, <i>Conference on Robot Learning, CoRL</i>	2026
Reviewer, <i>Conference on Neural Information Processing Systems, NeurIPS</i>	2025

MEDIA

UCI News. <i>Award-Winning Startup Foodpool Brings Affordable Food Delivery to UCI</i>	2022
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LANGUAGES

English (Native), Korean (Native), Japanese (Amateur)