TAE KOAN YOO

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RESEARCH INTERESTS

My research interests lie in understanding **the fundamental principles underlying relationships across visual and other modalities**. I am particularly interested in **representation-level alignment** beyond explicit cross-modal matching, and in using such aligned representations to build controllable generative models toward multimodal world foundation models.

EDUCATION

SUNGKYUNKWAN UNIVERSITY, Seoul, Republic of Korea

- ***M.S.***, Electrical and Computer Engineering **02/2018-02/2020**
  GPA: 4.04 / 4.5 (95.4%)
- ***B.S.***, Electronic and Electrical Engineering **02/2011-02/2018**
  GPA: 3.89 / 4.5 (93.9%)
  * Major: 4.08/ 4.5, Upper-Division: 4.26 / 4.5 (97.6%)
  * Exchange Student Program, The University of Texas at Austin, USA 01/2017-08/2017

PUBLICATIONS

[1] **T. K. Yoo**, W. K. Jung, K. H. Kim, and K. B. Kong, "PADS-TAL: Padding Annealed Diffusion Sampling in Text-Aware Latent Space for Robust and Diverse Text-to-Music Generation," *International Conference on Machine Learning (ICML)* (2026)
* Led the project by formulating the core problem, proposing PADS and TAL, implementing the experimental pipeline, conducting the main experiments, and writing the manuscript.

[2] **T. K. Yoo**, "Minimizing Required Data in a Neural Network Accelerator Using Double-Stage Weight Sharing," *Master's Thesis, Sungkyunkwan University* (2020)

[3] **T. K. Yoo**, J. K. Park, and J. T. Kim, "VLSI Implementation of Area-Efficient Parallelized Neural Network Accelerator Using Hashing Trick," *International SoC Design Conference (ISOCC)* (2019)

[4] **T. K. Yoo**, G. H. Hong, and D. K. Shin, "Analysis on Accelerating Object Detection in Edge Device with Half-Precision Floating Point," *Korea Computer Congress (KCC)* (2018)
* Best Paper Award

[5] **T. K. Yoo**, K. H. Han, and D. K. Shin, "Optimizing Trim Operations by In-Storage Processing," *Korea Computer Congress (KCC)* (2017)
* Best Undergraduate/Junior Paper Award

EXPERIENCE

NHN CORPORATION, Seongnam, Republic of Korea

Senior Research Engineer, Multi-modal Development Team, AI Tech Lab. **09/2023-Present**
Role: Generative AI research and service development for multimodal content creation

- Led end-to-end research and development of diffusion-based text-to-music generation models for a production-level generative AI service, covering data curation, model training, sampling strategies, and evaluation protocols, resulting in three patent applications.
- Proposed PADS-TAL for alignment-preserving diversity control in text-to-music generation; achieved a 15.4% gain in overall diversity and a 71.6% gain in within-condition diversity, leading to an ICML 2026 paper.
- Developed personalized text-to-image generation models for webtoon sub-character creation.

Senior Research Engineer, Voice AI Team, AI Tech Lab. **11/2023-02/2024**
Role: Automatic Speech Recognition (ASR) model research and system optimization

- Optimized ASR inference and streaming pipelines for real-time speech recognition services by reimplementing beam search and improving TensorRT inference, CUDA memory management, IPC, multi-threading, and gRPC-based streaming, reducing memory usage by 65% and processing time by 40%.

HYUNDAI MOTOR COMPANY, Seoul, Republic of Korea

Research Engineer, Camera-LiDAR Fusion Group, Autonomous Driving SW Team **09/2021-09/2023**
Role: Camera–LiDAR fusion and multimodal perception for autonomous driving

- Established the company's first camera-LiDAR fusion-based perception method for 3D object detection and road information recognition using internal autonomous-driving datasets, prepared it for production-level deployment, and contributed to two registered patents.
- Designed a cross-attention-based fusion architecture to dynamically capture correlations between image and LiDAR modalities, improving mAP for long-range and small objects.
- Built multimodal data pipelines for camera–LiDAR perception, covering sensor calibration, cross-sensor transformation, data collection, annotation management, and dataset quality control.

Research Engineer, Road Information Detection Group, Autonomous Driving SW Team **01/2020-09/2021**
Role: Real-time computer vision and embedded inference for autonomous driving

- Implemented a production-deployed road boundary recognition pipeline that extracts road information from monocular camera images and converts curb-related visual cues into a usable representation for autonomous-driving systems.
- Accelerated the inference pipeline using TensorRT, CUDA, Nsight, TensorBoard, and multi-stream/asynchronous processing, achieving a 28.2% reduction in per-process latency from 43.694 ms.

SUNGKYUNKWAN UNIVERSITY, Seoul, Republic of Korea

Graduate Researcher, Deep Learning Optimization for Embedded Models **02/2018-02/2020**
Advisor: Prof. Jong Tae Kim (College of Information and Communication Engineering)

- Conducted thesis research on Double-Stage Weight Sharing, reducing over 80% of model parameters while maintaining approximately 90% accuracy and resulting in a registered patent.
- Benchmarked and accelerated edge-device object detection models for ADAS on ODROID XU3, evaluating YOLOv2, SSD, and SqueezeDet, achieving 78.8 mAP with SqueezeDet, and reducing inference time by 61.4% through half-precision GPU computation.

Undergraduate Research Student, System-level OS–Storage Optimization **08/2017-02/2018**
Advisor: Prof. Dong Kun Shin (College of Information and Communication Engineering)

- Introduced fTrim/vTrim schemes for the EXT4–SSD FTL interface, reducing file-deletion latency by up to 63%.

SKILLS AND ACHIEVEMENTS

Programming	Python; C/C++; CUDA; Golang; JavaScript; Verilog
Deep Learning	PyTorch; PyTorch Lightning; TensorFlow; Diffusers; DeepSpeed; AWS SageMaker
Infrastructure	Linux; Docker; Kubernetes; FastAPI; gRPC
DL Optimization	TensorRT; CUDA, OpenCL; ACL; Nsight Profiler
Awards	Technical Report Award'20 (Hyundai Motor Company), Best Paper Award'18 (Korea Computer Congress), Best Undergraduate/Junior Paper Award'18 (Korea Software Congress), Dean's List'16 (Sungkyunkwan University), National Science and Engineering Scholarship'16 (Korea Student Aid Foundation)

ADDITIONAL ACTIVITIES

- *Exchange Student*, The University of Texas at Austin, USA 01/2017-08/2017
- *Working Holiday Program*, Australia 08/2014-09/2015
- *Official University Ambassador*, Sungkyunkwan University, Republic of Korea 02/2011-11/2012

LEADERSHIP EXPERIENCE

- *Sergeant*, Republic of Korea Army, Republic of Korea 11/2012-08/2014