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
- ***B.S.***, Electronic and Electrical Engineering **02/2011-02/2018**
  GPA: 3.89 / 4.5
  ** Major: 4.08 / 4.5, Upper-Division: 4.26 / 4.5
  ** 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.

[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 AI 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 the company's first internal-use diffusion-based text-to-music generation service, building a proprietary model from internal copyrighted data across data curation, training, sampling, and evaluation, resulting in three patent applications.
- Spearheaded research on alignment-preserving diversity control in text-to-music generation, designing PADS-TAL to preserve text semantics while expanding sampling diversity in a text-aware latent space; led the full pipeline from problem formulation to manuscript writing; improved overall diversity by 15.4% and within-condition diversity by 71.6%, leading to an *ICML* 2026 paper.
- Adapted personalized text-to-image generation models to create webtoon sub-characters that reflect artist-specific visual styles and production requirements.

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 using internal autonomous-driving datasets, achieving the then-best internal performance and preparing the model for production-level deployment; contributed to two registered patents.
- Designed a cross-attention-based camera-LiDAR fusion architecture to address calibration-sensitive cases, narrowing the mAP gap for long-range and small objects with sparse LiDAR points and extrinsic misalignment.
- 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 converts curb-related cues from monocular images into usable representations 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 83.5% of model parameters while maintaining approximately 90% accuracy and resulting in a registered patent.
- Benchmarked and accelerated object detection models for ADAS on ODROID XU3, achieving 78.8 mAP with SqueezeDet and reducing inference time by 61.4% through half-precision GPU computation.
- Served as a teaching assistant for undergraduate courses, supporting labs, assignments, and student guidance.

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 to optimize trim operations in the Linux filesystem–SSD block interface, reducing file-deletion latency by up to 63% through EXT4 and FTL-layer modifications.

PATENTS

[1] **T. K. Yoo**, W. K. Jung, K. H. Kim, "Method and System for Generating Audio Source Incorporating User-Specified Melody Using a Diffusion Model," Korean Patent Application, 2025.
[2] K. H. Kim, **T. K. Yoo**, "Method and System for Generating Music Using Diffusion Model Based on BPM Measurement," Korean Patent Application, 2025.
[3] **T. K. Yoo**, K. H. Kim, "Method and System for Generating Music Using Diffusion Model Based on Genre-Style Structured Information," Korean Patent Application, 2025.
[4] J. H. Lim, H. C. Choi, J. H. Kim, and **T. K. Yoo**, "Object Recognition Apparatus and Vehicle Having the Same," US Patent Publication: US20240046658A1, 2024.
[5] J. H. Kim, H. C. Choi, J. H. Lim, and **T. K. Yoo**, "Apparatus and Method for Object Recognition," US Patent Publication: US20240104935A1, 2024.
[6] J. T. Kim, **T. K. Yoo**, and D. Y. Kim, "Neural Network Accelerator Using Double-Stage Weight Sharing," Korean Patent Publication: KR10-2519210, 2023.

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) National Science and Engineering Scholarship'16 (Korea Student Aid Foundation)

LEADERSHIP EXPERIENCE

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