Jaegyun Im

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"Success is the sum of small efforts, repeated day in and day out"

Education

Soonchunhyang University — *Asan, S.Korea*

B.S. In Department of AI and BigData — *Mar. 2022 - Feb. 2026 (expected)*

- Total GPA of 3.54 / 4.5
- Major GPA of 3.64 / 4.5 (Credits taken: 123/130)

Research Interests

- Deep Learning
- Computer Vision
- Large Language Model
- Vision Language Model
- Multimodal Large language Model

Internships

Smart Autonomous and Infrastructure Lab (SAIL) — *Asan, S.Korea*

Undergraduate Researcher — *Mar. 2023 - Jul. 2025*

- Research in computer vision (video understanding, object detection and tracking, anomaly detection, multi-modal prediction)
- Conducted the entire research process, from setting the topic and reviewing research to devloping models, experiments, and verification
- Presented research plan, reviewed relevant literature, and reported progress during seminar sessions

Electronics and Telecommunications Research Institute (ETRI) — *Daejeon, S.Korea*

Research Intern — *Jul. 2024 - Aug. 2024*

- Developed and evaluated a real-time object detection and tracking model for de-identification purposes
- Participated in weekly mettings to analyze previous research, discuss future directions, and refine the experimental design

Project Experience

Dental Disease Detection from Panoramic X-rays using Mask R-CNN — *Asan, S.Korea*

Team Leader — *May. 2023 - Oct. 2023*

Objective: To implement Mask R-CNN for dental disease detection in panoramic X-rays, supporting clinicians

- Used Mask R-CNN to segment and label individual teeth from panoramic X-rays
- Labeled each tooth with a unique identifier and localized it precisely using the FDI notation
- Conducted pixel-level analysis to detect dental caries and periodontal disease

Multimodal Human Data Collection Using YOLOv8 on Jetson AGX Xavier and RGB-D Camera — *Asan, S.Korea*

Team Leader — *Dec. 2023 - Feb. 2024*

Objective: To construct a real-time, edge-optimized multimodal dataset for human pose estimation and spatial understanding

- Developed a data collection system on Jetson AGX Xavier using an RGB-D sensor to steam human-centered multimodal data
- Deployed YOLOv8 in ONNX format for efficient on-device person detection and keypoint estimation under edge constraints
- Collected temporally synchronized RGB, depth and skeletal keypoint data to support downstream pose and 3D spatial analysis

Designed a drone-based delivery system triggered by vehicle identification and user gestures

Asan, S.Korea

Team Member

Nov. 2023 - May. 2024

Objective: To design a drone-based delivery system triggered by vehicle identification and user gestures

- Designed a system to automatically identify target vehicles using license plate recognition and initiate operations nearby
- Implemented real-time hand gesture recognition to control drone movements with 10 commands, including Go forward, Land, Stop, and Up
- Enabled the drone to accurately land at designated locations and safely deliver items based on user hand gesture commands
- Demonstrated the feasibility of autonomous and precise drone delivery through real-time interaction with users via the developed algorithm

Development of a Real-Time Object Detection Model for de-identification

Daejeon, S.Korea

Individual Project

Jul. 2024 - Aug. 2024

Objective: To de-identify specific parts of detected objects in visual data to protect personal privacy

- Designed a privacy-preserving object detection model based on RT-DETR incorporating TensorRT for real-time inference on visual data
- Achieved 3% higher detection accuracy and over 40% reduction in inference time compared to the baseline YOLOv8
- Containerized the model using Docker to ensure portability and consistent runtime performance across environments

Temporal Inpainting of Vehicle Video Data using Video Diffusion Models

Asan, S.Korea

Individual Project

Jun. 2024 - Oct. 2024

Objective: To interpolate missing vehicle video segments via diffusion models, improving temporal coherence and perception robustness

- Designed a video reconstruction pipeline to recover missing frames in vehicle sensor footage
- Simulated missing data with Gaussian noise and masking, then reconstructed frames using reverse diffusion and a 3D U-Net
- Improved reconstruction quality by assigning higher weights to masked regions during training

Satellite Image Building Area Segmentation

Asan, S.Korea

Team Leader

Apr. 2024 - Oct. 2024

Objective: To automatically segment building regions from high-resolution satellite imagery for geospatial AI applications

- Filtered and analyzed large-scale satellite imagery by object ratio and label quality, boosting dataset reliability
- Trained and compared semantic segmentation models (U-Net, PIDNet) using multiple backbones, balancing accuracy and inference efficiency
- Refined training pipeline by addressing label noise, small object bias, and inconsistent mask quality to improve segmentation performance

Multimodal LLM-based Document Understanding and Korean Support Enhancement

Asan, S.Korea

Team Leader

Aug. 2024 - Nov. 2024

Objective: To enable structured understanding of complex documents with multimodal modeling and improved Korean language support

- Integrated Eagle multimodal experts with LLaMA 3.2 for comprehensive document understanding
- Fine-tuned the model on Korean-language corpora to improve understanding of unstructured Korean documents
- Improved multimodal understanding by preprocessing high-resolution documents and integrating visual-text features

Attention-Based Lane Change Trajectory Prediction with Traffic Context

Asan, S.Korea

Team Member

Nov. 2024 - Jan. 2025

Objective: To predict vehicle lane-change trajectories in urban traffic using Transformer-based attention

- Extracted traffic context from drone footage using computer vision and detected interactions among surrounding vehicles
- Developed a hybrid Transformer–LSTM architecture to model spatio-temporal dynamics for lane-change trajectory prediction
- Enhanced model interpretability through attention heatmaps, revealing key influence factors in decision-making

Federated Fall Recognition with Spatio-Temporal Attention on CCTV Networks

Asan, S.Korea

Team Member

Feb. 2024 - Mar. 2025

Objective: To develop a privacy-preserving, federated fall-detection system for distributed roadside CCTVs using spatio-temporal modeling

- Built a GAT-LSTM-Attention architecture to extract spatio-temporal features for accurate pedestrian fall recognition
- Deployed the model in a federated learning framework, enabling independent local training on edge CCTV devices without raw data sharing
- Reduced communication cost while ensuring robust performance across views on UP-FALL

Development of the DRIFT Dataset for Urban Traffic Analysis Using Drone Imagery

Asan, S.Korea

Team Member

Oct. 2024 - Mar. 2025

Objective: To build a high-resolution urban traffic dataset from aerial drone footage for fine-grained, network-wide analysis

- Utilized YOLOv11-OBB to process synchronized aerial videos of nine urban intersections, extracting over 81,000 high-resolution, direction-aware vehicle trajectories
- Provided directional trajectory data aligned with orthomaps, enabling both micro (e.g., lane-change) and macro(e.g., network flow) analysis
- Released dataset with open-source tools for detection, trajectory extraction, and traffic behavior analytics to support reproducible research

Out-of-Distribution (OoD) Image Segmentation with Structural Consistency and Boundary Accuracy

Asan, S.Korea

Team Member

Jun. 2024 - May. 2025

Objective: To improve OoD segmentation accuracy and reliability via object-level score calibration and boundary refinement

- Implemented a three-stage object-aware pipeline for score normalization and contour enhancement, reducing false positives and boundary errors
- Leveraged SAM-generated instance masks to calibrate anomaly scores within object regions, enhancing structural consistency
- Achieved state-of-the-art results on benchmark datasets (e.g., SMIYC, RoadAnomaly) with strong pixel- and component-level segmentation metrics

Context-Aware Vehicle Trajectory Prediction with Multimodal LLM

Asan, S.Korea

Team Leader

Dec. 2024 - Jul. 2025

Objective: To improve vehicle trajectory prediction by integrating visual traffic data and textual context using a multimodal LLM

- Designed a three-stage framework including trajectory encoding, scene-text fusion, and prediction using multimodal inputs
- Combined drone imagery with user-defined prompts to model complex urban traffic behavior more accurately
- Applied low-rank adaptation to fine-tune the LLM efficiently, achieving improved accuracy over existing methods on high-resolution datasets

Publications

Domestic

- **Im, J.**, Noh, B. (2023). Vision-based Turn Signal Recognition for Lane Change Prediction of Forward Vehicles
  (Accepted at the 4th Korea Artificial Intelligence Conference, Conference Paper)
- **Im, J.**, Noh, B. (2024). Loss Interpolation Method for Vehicle Video Sensor Data using Video Diffusion
  (Accepted at Korea ITS Society 2024 Fall Conference, Conference Paper)
- Hong, S., **Im, J.**, Lee, H., Ka, D., Lee, C., Noh, B. (2024) Drone Vision-based Lane Change Prediction in Urban Vehicle Driving with Transformer
  (Published at JKITS, KCI)

International

- Hong, S., **Im, J.**, Noh, B. (2025) Attention-Driven Lane Change Trajectory Prediction with Traffic Context in Urban Environments
  (Published in IEEE Access)
- Kim, B., **Im, J.**, Noh, B. (2025) Federated learning-based road surveillance system in distributed CCTV environment: Pedestrian fall recognition using spatio-temporal attention networks(publication in Applied Intelligence)
- Lee, H., Hong, S., Song, J., Cho, H., Jin, Z., Kim, B., Jin, J., **Im, J.**, Noh, B., Yeo, H. (2025) DRIFT open dataset: A drone-derived intelligence for traffic analysis in urban environment
  (Submitted to European Transport Research Review, under review)
- Song, J., Kim, S., **Im, J.**, Noh, B. (2025) Objectomaly: Objectness-Aware Refinement for OoD Segmentation with Structural Consistency and Boundary Precision (Submitted to WACV 2026, under review)
- **Im, J.**, Kim, B., Jin, J., Noh, B. (2025) Traffic Context-Augmented Vehicle Trajectory Prediction Framework using Multimodal LLM
  (Accepted at IEEE ITSC 2025, to appear)

Awards

Nov. 2023. **Excellence Award**, Big Data Analytics Competition, Soochunhyang University *Asan, S.Korea*

Nov. 2023. **Excellence Award**, 2023 Software Idea competition, Soonchunhyang University *Asan, S.Korea*

Skills

Programming. Python, R, SQL

Deep Learning. PyTorch, Keras, Tensorflow, Scikit-learn, ONNX, TensorRT

Data Analysis. Numpy, Pandas, Matplotlib, Seaborn, Tableau

Tools & Environment. Docker, Git, Linux, Wandb, Overleaf, Slack

Others

Certification

Jul. 2024. Nvidia Deep Learning Institute education