Shinhaeng Lee

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Education

Georgia Institute of Technology | Atlanta, GA

B.S Computer Science, GPA 3.6 / 4.0 — *Expected Dec 2025*

M.S Computer Science, Specialization in Machine Learning — *Expected Dec 2026*

Experience

UN Peacekeeper - United Nations Interim Force in Lebanon (UNIFIL) — *June 2023 - January 2024*

- Maintained, repaired, and constructed websites and servers for internal communication, and managed computer devices as part of the Signal Company, Republic of Korea Battalion.
- Engaged in civilian operations and peacekeeping initiatives to support the local community and worked with multinational forces to enhance regional stability and security.

Undergraduate Research Assistant - Saker Lab (Emory University) — *May 2025 - present*

- Architected **a modular NLP framework** (regex + lexicons + medication-tuned PLMs + LLMs) to extract and classify polysubstance-use from Reddit.
- Modeled **multi-order Markov chains** to quantify month-to-month transition probabilities between substances.
- Leveraged **Apriori** and **PrefixSpan** to mine frequent and sequential substance use patterns while preserving co-occurrence and temporal order

VIP Research Team (BTAP) - Georgia Institute of Technology — *January 2025 - present*

- **Developed an iOS application providing Augmentative and Alternative Communication (AAC) solutions** for individuals with traumatic brain injuries (TBIs), contributing to UI/UX design and core feature implementation, including Visual Scene Display, text-to-speech, and AI-driven smart suggestions.
- **Collaborated in a multidisciplinary team to research and implement accessibility-focused technology**, leveraging Swift and SwiftUI to enhance communication tools for individuals with aphasia, while addressing challenges such as data persistence and usability improvements.

Personal Projects

Real-Time YOLOv3 Object Detection Model for Gastrointestinal Endoscopy — *August 2024*

- Developed a real-time **YOLOv3** model from scratch using **PyTorch** and **OpenCV** to capture and process video frames for poly detection in gastrointestinal endoscopy.
- Fine-tuned the model on **Kvasir dataset** for polyp detection, achieving a **mAP@0.5 of 0.74**.
- Optimized model performance using **L1 and Taylor Expansion-based structured pruning**, targeting the channels of convolutional layer filters.
  - **L1-based pruning** reduced model parameters by **92%**, with only a **11% drop in mAP@0.5**.
  - **Taylor Expansion pruning** pruned **20% more parameters** than L1 pruning while maintaining comparable accuracy and mAP@0.5.
- Applied **K-Means Clustering** to predefine anchor boxes, accelerating model **convergence by 40%**.
- Implemented a custom **Greedy Pruning strategy (iterative method)**, which further maximized filter reduction, improving real-time performance without significantly affecting accuracy.
- Achieved **real-time performance at 19 FPS with 54ms latency** on a **CPU setting**, demonstrating efficient operation even on lower-performance hardware.

Fine-Tuning CoT: GRPO vs. PPO vs. Few-Shot Prompting — *March 2025*

- Implemented **GRPO, PPO, and CoT few-shot prompting from scratch** to compare fine-tuning approaches for Chain-of-Thought reasoning in **GPT-Neo** using the **GSM8K dataset.**
- Trained a **Reward Model** by fine-tuning **DistilRoBERTa-base** on a comparison dataset to provide structured feedback for reinforcement learning and analyzed performance to determine the most effective fine-tuning strategy.

CycleGAN for Face-to-Portrait Image Generation — *February 2024*

- Developed a custom **CycleGAN** model for **unsupervised transformation** of human faces into portrait images using **PyTorch**, incorporating **UNet-based encoders and decoders within PatchGAN** for enhanced architecture.
- Improved model performance by adding **Local Self-Attention** to focus on critical regions and utilizing **buffering of past generated images** to reduce training oscillation, ensuring stable and reliable convergence.

Autonomous Driving Simulation with Genetic Algorithm — *December 2023*

- Simulated real-time road environments, vehicles, and sensors via a web-based interactive interface, enabling autonomous navigation using a **feedforward neural network** built with **JavaScript, HTML, and CSS.**
- Enhanced driving performance through **Genetic Algorithm,** applying **Elitism, Roulette Wheel Selection,** and**, Two-Point Crossover** for continuous performance improvement.

Skills

Languages: Python, R, java, C/C++, C#, SQL, Javascript, HTML/CSS

Frameworks and Libraries: PyTorch, Tensorflow/Keras, Scikit-learn, Numpy, Pandas, Matplotlib, OpenCV, Next.js

Technologies: Git, Linux, Docker