

# Minji Lee

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I specialize in computer vision, particularly in the semantic segmentation of agricultural images, focusing on the detection and classification of Eastern Red Cedar trees. My research bridges the gap between theoretical models and practical applications by utilizing Meta's Segment Anything Model as a ViT foundation model. I have evaluated its effectiveness compared to traditional approaches and developed multi-modal architectures that integrate image and text data, including environmental and contextual information, to enhance detection accuracy and robustness in real-world scenarios.

## EDUCATION

- **Ph.D. (Candidate)**, Technology, Purdue University, West Lafayette, IN. May 2021 - May 2025 (expected).  
Dissertation: *UAV-Based Eastern Red Cedar Semantic Segmentation with Custom SAM Model in MLOps*
- **M.S.**, Computer and Information Technology, Purdue University, West Lafayette, IN. August 2019 – May 2021.  
Thesis: *Intelligent Self-Adapting Robot Apparel to Adapt Comfort*
- **B.F.A. and B.S.**, Sejong University, Seoul, South Korea. March 2012 – February 2017
- **Visiting Scholar**, Purdue University, West Lafayette, IN, USA. June 2016 – August 2016

## PROFESSIONAL EXPERIENCE

### 1. MLOps Researcher, LG Innotek June 2023 - August 2023, Seoul, South Korea

Designed and implemented a pilot project to evaluate the impact of transitioning from sequential to parallel processing in manufacturing workflows; a hybrid ML model combining parallel and sequential processing to leverage the advantages of both approaches while maintaining system stability.

Benchmarked a real-time monitoring system in Amazon EC2 to optimize resource utilization and track the status of parallel operations efficiently.

Developed a model utilizing Kullback–Leibler divergence to minimize discrepancies between process data and operational data, ensuring improved alignment and system performance.

### 2. Research Aide, Argonne National Laboratory May 2022 - August 2022, Lemont, IL

Designed and implemented an Ansible script for the NVIDIA Nano platform, reducing system setup time by 12%, enabling scalable deployment of edge-to-cloud pipelines for the SAGE Project.

Contributed to creating educational materials to help students with no prior background learn how to deploy and manage edge-to-cloud pipelines for the SAGE Project.

### 3. Research Aide, Argonne National Laboratory May 2021 - August 2021, Lemont, IL (Virtual)

Integrated Node-RED into the IBM Cloud platform and web portal, deployed within Docker containers managed by Kubernetes, streamlining the deployment of edge-to-cloud pipelines for environmental monitoring.

Collected weather and camera sensor data through distributed sensor systems utilizing edge computing and real-time data analytics via Apache Kafka, applying machine learning techniques for environmental and geographical research.

## WORK EXPERIENCE

### • Teaching Assistant, Purdue University August 2024 - Current, West Lafayette, IN

Mentored undergraduate students in advanced C programming, focusing on algorithm design, memory management, and time-complexity analysis to enhance their problem-solving and programming skills.

Enhanced students' analytical skills through interactive lab sessions, fostering a deeper understanding of complex computational problems such as recursive function.

- **Research Advisor, Purdue University**

June 2020 - May 2021, West Lafayette, IN

Advised international students on navigating their research projects and career paths, offering guidance on academic planning, research methodologies, and professional development.

Provided hands-on instruction in data analysis techniques, equipping students with the skills needed to effectively analyze and interpret complex data sets.

Taught programming skills and concepts such as C during lab sessions, facilitating students' understanding of key topics and enhancing their practical coding abilities.

- **IITP Program Coordinator, Purdue University**

August 2019 - May 2020, West Lafayette, IN

Collaborated with IITP Korean Government mentors to manage, tutor, and instruct Korean and Purdue undergraduate students in research classes and lab sessions.

Developed and delivered curriculum content that was tailored to the needs of international students, fostering an inclusive and supportive learning environment.

## PROJECT EXPERIENCE

- **Research Assistant, Purdue University**

August 2021 - July 2024, West Lafayette, IN

Primarily assisted undergraduate/graduate visiting students with all stages of their research, including setting up the research environment, defining problem statements, identifying gaps in literature, structuring papers, providing insights on academic writing and publication standards, offering feedback to improve clarity and coherence. The project details are as follows:

- **Political Compass Evaluation of ChatGPT: Assessing Consistency Bias in Generated Responses**  
Collected datasets to analyze ChatGPT's political bias using the Political Compass plugin.  
Found a higher bias in the economic left-right dimension than in the social libertarian-authoritarian axis.  
Published in IEEE AIMHC 2024 conference proceedings.
- **Resolution Free Human Image Generation and Control**  
Utilized publicly available COCO datasets to perform generative facial generation, enhancing image quality and diversity through advanced algorithms such as Variational Autoencoders (VAEs).  
Developed a Diffusion Transformer (DiT) model combined with Patch n' Pack to create high-resolution images of people, trained on a vast dataset comprising real-world images containing individuals.
- **Deploying a Sustainable Deep Learning Pipeline for Poison Ivy Image Classification**  
Collected seasonal Poison Ivy datasets to address the lack of public data.  
Used SAM for segmentation, followed by pre-processing, augmentation, and classification, and built a pipeline with Kubeflow for automation.  
Published in IEEE MCSI 2024 conference proceedings.
- **Safe Route Recommendation based on Crime Risk Prediction with Urban and Crime Data**  
Developed a model with Gaussian KDE for crime density estimation and Dijkstra's algorithm for safe route optimization.  
Published in IEEE BigDataService 2023 conference proceedings.

## PUBLICATIONS

1. *Political Compass Evaluation of ChatGPT: Assessing Consistency Bias in Generated Responses* presented at IEEE 9th International Conference on Mathematics and Computers in Sciences and Industry (MCSI)

Coauthors: Eric T. Matson

2. *Deploying a Sustainable Deep Learning Pipeline for Poison Ivy Image Classification* presented at the 2024 IEEE First International Conference on Artificial Intelligence for Medicine, Health and Care (AIMHC)

**Coauthors:** Wonjun Park, Sumin Cho, Subin Kim, Jiyeon Lee, Jack Mahedy, and Nebey Gebresalssie

3. *Prediction based Auto-Pilot Interface for Drone to Object Chasing using Historical TSPI Data* presented at the 2023 23rd International Conference on Control, Automation and Systems (ICCAS)

**Coauthors:** Shinhyoung Jang, Byeonghwi Park, Juheon Jeong, Jack Mahedy, Nebey Gebreslassie, and Eric T. Matson

4. *Safe Route Recommendation based on Crime Risk Prediction with Urban and Crime Data* presented at the IEEE 9th International Conference on Big Data Computing Service and Applications

**Coauthors:** Daye Kim, Juwon Baek, Jihu Yang, Hyun Roh, Heewon Jeong, Bryanna Ruiz, and Eric T. Matson

5. *Ehdnet: Enhanced human detection network for search and rescue* presented at the 2022 IEEE 46th Annual Computers, Software, and Applications Conference (COMPSAC)

**Coauthors:** Seungoh Han, Ah-Young Nho, Wei Teng Kwan, Benjamin Paglia, Jacob Visniski, Eric T. Matson, and Minsun Lee

6. *Feasibility of Measuring Shot Group Using LoRa Technology and YOLO V5* presented at the 2022 IEEE Sensors Applications Symposium (SAS)

**Coauthors:** Sanghyun Park, Dongheon Lee, Jisoo Choi, Dohyeon Ko, Zack Murphy, Nowf Binhowidy, and Anthony Smith

7. *Cost-Effective Solution for Fallen Tree Recognition Using YOLOX Object Detection* presented at the 2022 Sixth IEEE International Conference on Robotic Computing (IRC)

**Coauthors:** Hearim Moon, Eunsik Park, Junghyun Moon, Juyeong Lee, Doyoon Kim, Minsun Lee, and Eric T. Matson

## Certifications

- The Recreational UAS Safety Test (TRUST, 2024)
- Neural Networks and Deep Learning (Coursera, 2024)
- EBEC Programming in Python (Purdue, 2022)

## INVITED KEYNOTES, TALKS, AND PRESENTATIONS

- Graduate Women in Business Session of AI October 24, 2024 in West Lafayette, IN
- PMRI Workshop of Machine Learning Application June 25-26, 2024 in West Lafayette, IN
- IITP Career Talk Workshop December 15-16, 2023 in Seoul, South Korea

## SKILLS

- **Programming:** Python3 (NumPy, Pandas, Matplotlib), C, Bash scripting
- **Frameworks:** PyTorch, Docker, Kubernetes
- **High-Performance Computing:** GPU acceleration, CUDA
- **Mathematics:** Algebra, calculus, statistics, linear algebra, optimization, probability theory

## LANGUAGE PROFICIENCY

- **Korean:** Native proficiency. Extensive academic and professional use.
- **English:** Fluent. Professional working proficiency with academic publications and conference presentations.
- **Japanese:** Intermediate proficiency. Practical conversational and business communication.

[CV compiled on January 12, 2025]