

# Zhiling Chen

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## EDUCATION

- **University of Connecticut** Aug. 2023 - present  
*Ph.D. student at Mechanical Engineering, advised by [Prof. Farhad Imani](#)* Storrs, CT
- **Boston University** Sep. 2021 - Aug. 2022  
*Master of Science in Applied Data Analytics* Boston, MA
- **Waterford Institute of Technology** Sep. 2020 - June. 2021  
*Bachelor of Science (Honours) in Software Engineering Practice* Waterford, Ireland
- **Nanjing University of Information Science & Technology** Sep. 2017 - June. 2021  
*Bachelor of Engineering in Software Engineering* Nanjing, China




## SKILLS

- **Programming & Frameworks:** Python, Java, Javascript, R, HTML, SQL, Git, Linux, ROS2, PyTorch, TensorFlow
- **Machine Learning & AI:** Vision Language Models (CLIP, BLIP, Siglip), Multimodal Large Language Models (QwenVL series, LLaVA series, InternVL series, GPT series, Gemini), Retrieval-Augmented Generation, Object Detection Models (YOLO series, Grounding DINO series)
- **Robotics:** UR3 robot control, MoveIt, Isaac Sim
- **Design & 3D Modeling:** 3D printing, SolidWorks, Blender, OpenSCAD
- **Databases & Tools:** MySQL, Oracle, Docker

## RESEARCH INTERESTS

My research focuses on the intersection of machine learning and smart manufacturing, with particular emphasis on Vision-Language Models and robotics, especially in the areas of cooperative robotics and embodied robotic systems.

## SELECTED PROJECTS

- **ScanBot: Instruction-Conditioned Robotic Surface Scanning Dataset** Fed 2025 - May 2025  
*Tools: UR3 Robot Arm, Keyence LJ-X8200, RealSense D435i, GoPro, ROS2, PyTorch* 
  - Developed **ScanBot**, the first multimodal dataset for instruction-conditioned robotic surface scanning, covering 12 objects across 6 industrially relevant task types.
  - Implemented a **robotic scanning system** integrating UR3 arm, Keyence LJ-X8200, RealSense D435i, and GoPro to capture synchronized RGB-D, laser profiles, robot states, and third-person video.
  - Created a **comprehensive benchmark** by evaluating state-of-the-art MLLMs (GPT-4.1, OpenAI o3, Gemini 2.5) on perception-planning-execution loops, revealing key limitations in trajectory stability and parameter tuning.
- **MoXpert: Multi-Expert Framework for Industrial Anomaly Detection with MLLMs** Sep 2024 - Dec 2024  
*Tools: CLIP, Faiss/HNSW, PyTorch, GPT-4o, Gemini2, Qwen2-VL, LLaVA, InternVL2* 
  - Proposed **MoXpert**, a gated Mixture-of-Experts framework with four expert modules (Reference Extractor, Knowledge Guide, Reasoning Expert, Decision Maker) to enhance MLLM-based industrial anomaly detection.
  - Implemented a **multimodal RAG system** using CLIP embeddings and HNSW indexing to efficiently retrieve the most similar normal images and domain-specific knowledge for defect evaluation.
  - Achieved **state-of-the-art results** on MVTec-AD and VisA benchmarks: +7.39% in anomaly discrimination and +4.40% in defect classification compared to the baseline Qwen2-VL.
- **Clip2Safety: VLM-based Framework for Workplace Safety Compliance Detection** march 2024 - June 2024  
*Tools: CLIP, BLIP2, YOLO-World, OWLv2, Grounding DINO, GPT-4o, PyTorch, FlashAttention* 
  - Proposed **Clip2Safety**, a multi-module framework (scene recognition, visual prompt, safety gear detection, fine-grained verification) to address PPE non-compliance in dynamic workplaces.
  - Implemented a **two-stage detection pipeline**: YOLO-World for open-vocabulary object detection and CLIP-based embedding alignment for verifying fine-grained PPE attributes (color, material, functionality).
  - Achieved **72.3% accuracy** in safety gear detection and attribute verification with **21× faster inference** than baseline VQA models (e.g., LLaVA-1.6-7B), enabling real-time deployment.

## PUBLICATIONS GOOGLE SCHOLAR

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- [1] Zhiling Chen\*, Danny Hoang, Ruimin Chen, Farhad Imani. **Distributed Hyperdimensional Computing for Real-Time Data Aggregation and Interpretable Quality Monitoring in Manufacturing.** *IMECE 2024.*
- [2] Zhiling Chen\*, Danny Hoang, Fardin Jalil Piran, Ruimin Chen, Farhad Imani. **Federated Hyperdimensional Computing for Hierarchical and Distributed Quality Monitoring in Smart Manufacturing.** *Internet of Things.*
- [3] Zhiling Chen\*, Hanning Chen, Moshen Imani, Ruimin Chen, Farhad Imani. **Vision Language Model for Interpretable and Fine-grained Detection of Safety Compliance in Diverse Workplaces.** *Expert Systems with Applications.*
- [4] Fardin Jalil Piran\*, Zhiling Chen, Moshen Imani, Farhad Imani. **Privacy-preserving Federated Learning with Differentially Private Hyperdimensional Computing.** *Computers and Electrical Engineering.*
- [5] Zhiling Chen\*, Hanning Chen, Moshen Imani, Farhad Imani. **Can Multimodal Language Model be Guided to Improve Industrial Anomaly Detection?** *Arxiv [Under Review].*
- [6] Kiarash Naghavi Khanghah\*, Zhiling Chen, Lela Romeo, Qian Yang, Rajiv Malhotra, Farhad Imani, Hongyi Xu. **Multimodal RAG-driven Anomaly Detection and Classification in Laser Powder Bed Fusion using Large Language Models.** *2025 DFMLC Best Paper Award.*
- [7] Zhiling Chen\*, Yang Zhang, Fardin Jalil Piran, Qianyu Zhou, Jiong Tang, Farhad Imani. **ScanBot: Towards Intelligent Surface Scanning in Embodied Robotic Systems.** *Arxiv [Submitted to ICRA].*
- [8] Zhiling Chen\*, Farhad Imani. **A Multi-Expert Framework for Enhancing Multimodal Large Language Models in Industrial Anomaly Detection.** *[Under Review].*
- [9] Kiarash Naghavi Khanghah\*, Zhiling Chen, Lela Romeo, Qian Yang, Rajiv Malhotra, Farhad Imani, Hongyi Xu. **Zero-Shot Anomaly Detection in Laser Powder Bed Fusion Using Multimodal RAG and Large Language Models.** *[Under Review].*

## EXPERIENCE

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### • UCONN ISCL Lab

Research Assistant

Aug. 2023 - Present

Storrs, CT

- Application of Vision-Language Models for Industrial Anomaly Detection
- Collected and implemented VLA datasets using UR3 robot and laser profiler for robotic learning tasks.

## ADDITIONAL INFORMATION

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**Languages:** English (Proficiency level), Mandarin (Native Speaker)

**Interests:** Snowboarding, boxing, climbing