

Xiao Liu

SENIOR RESEARCH SCIENTIST · ROBOTICS & AI · US PERMANENT RESIDENT · HE/HIM/HIS

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Summary

I am currently a Senior Research Scientist in the Robot Intelligence Lab at **Samsung Research America**, we are developing humanoid AI systems along with Foundation models. My research focuses on Agentic Robotics, Robot Learning, Representation Learning, and Long-horizon task reasoning, especially how to enable robots to understand task and scene in long-horizon scope. My work has been presented at conferences such as **CoRL**, **ICRA**, and **IROS**. I earned my Ph.D. in Computer Science from the School of Computing and Augmented Intelligence at Arizona State University, supervised by **Prof. Heni Ben Amor**, and completed my Master's degree in Mechanical Engineering at Case Western Reserve University under the guidance of **Prof. Kiju Lee**.

Experience

Samsung Research America (SRA)

Mountain View, California

SENIOR SCIENTIST - MANAGER: KRIS HAUSER

Jan. 2026 - present

- Agentic Robotics: Developed agent harness with standard operating procedure (SOP) guidance for long-horizon tasks in home environments. **[S1]**
- Built full-stack humanoid robot AI infrastructure: perception (SAM3, DA), planning (Qwen3.5), localization, navigation, manipulation (Pi0.5).

Honda Research Institute USA, Inc.

San Jose, California

POSTDOC SCIENTIST - MANAGER: SOSHI IBA

Sep. 2024 - Dec. 2025

- System I & II: Create Intelligent Context Reasoning via Large Vision Model and LLM, where system II provides contexts for Long-horizon dexterous action policy (System I) for arm + multifinger hands.
- Developed a scene graph-based assistant generation framework for a teleoperated avatar robot. This framework facilitates task understanding, encodes spatial relationships during rearrangement tasks, and constructs planning-capable graphs using graph edit distance. **[C9] [C10]**
- Improved human intention estimation and action recognition by leveraging attention-based dynamic scene graphs for dexterous teleoperation.

Interactive Robtoics Lab, ASU

Tempe, Arizona

RESEARCH ASSOCIATE - LEAD: HENI BEN AMOR

June. 2020 - Aug. 2024

- Embodied AI: Proposed Diff-Control, an Action diffusion policy incorporating ControlNet from the domain of image generation to robot actions. **[C7]**
- Created a multimodal learning framework (α -MDF) using attention mechanism and differentiable filtering, which conducts state estimation in latent space with multiple modalities. **[C5]**
- Developed differentiable Ensemble Kalman Filters (DEnKF) framework incorporating algorithmic priors for robot learning, i.e., learning system dynamics from observations, and learning representations from high-dimensional space. **[C4]**
- Deployed the differentiable filtering framework with smartwatch for ubiquitous robot control tasks, i.e., teleoperation, drone piloting. **[C6]**

RadiusAI, Inc.

Tempe, Arizona

COMPUTER VISION DATA SCIENTIST (PART-TIME) - MANAGER: AYKUT DENGİ

Sep. 2020 - Dec 2023

- Refined Multi-object tracking (MOT) algorithms using Bayes Filter for Video Analytics for indoor and outdoor cameras, improved $\sim 9\%$ accuracy.
- Developed multi-objective optimization technique base on Frank-Wolfe algorithm for monocular depth prediction model across multiple datasets.
- Researched on monocular depth prediction models with varied advanced architecture, Vision Transformer and multi-scale local planar guidance blocks, achieved depth estimation with 0.117, 0.416 on abs REL and RMS error metrics and 0.868 on d1 metric on NYU depth testset.

Case Western Reserve University

Cleveland, Ohio

RESEARCH ASSISTANT - LEAD: KIJU LEE

Aug. 2017 - Aug. 2019

- Led social robot project "Woody and Philos" project, developed advanced algorithms in Computer Vision for social robots.
- Real-time Human Facial Emotion Expression Recognition for Human-robot Interaction using deep learning and machine learning technique. (featured on Case Western Daily) **[J1]**
- Human-Robot Interaction: Developed social robots-"Philos" & "Woody" platform and investigated the potential of social robots as cognitive assessment applications for older adults. (featured on ideastream)

CWRU & ASU

Cleveland, Ohio & Tempe, Arizona

TEACHING ASSISTENT

2018 - 2019, 2023 - 2024

- Served as the teaching assistant for EMAE250 (Computers in Mechanical Engineering), instructing students on numerical problem-solving using Matlab and providing guidance throughout the learning process.
- TA for CSE205 (Object Oriented Programming), instructing students on condng with varied data structure and OOP tasks in Java.

Uber Technologies, Inc.

Xi'an, China

DATA ANALYST

Jan. 2016 - Aug. 2016

- Coordinated data analysis and fraud detection with the operation team. Conducted competitor tracking and advising on driver incentives.

Education

Arizona State University

PH.D. IN COMPUTER SCIENCE, ADVISOR: PROF. HENI BEN AMOR
• Thesis Focus: Robot Learning via Deep State-Space Model GPA: 4.0/4.0

Tempe, Arizona
Aug. 2019 - Aug. 2024

Case Western Reserve University

M.S. IN MECHANICAL ENGINEERING, ADVISOR: PROF. KIJU LEE
• Thesis Focus: Automated Facial Emotion Recognition for Human-Robot Interaction GPA: 3.8/4.0

Cleveland, Ohio
Aug. 2016 - May. 2019

Southwest Jiaotong University

B.S. IN MECHANICAL ENGINEERING
• Project: Roller bearing fault diagnosis based on wavelet analysis GPA: 3.6/4.0

Chengdu, China
Aug. 2011 - May. 2015

Publications

2027	[S1] , Liu, X , Dinkel, H, Hauser, K, et al. “C-SOP: Continuous Standard Operating Procedure-Guided In-Home Agentic Mobile Manipulaiton” <i>IEEE International Conference on Robotics and Automation (ICRA) (submitted)</i>	ICRA 2027
2026	[C11] , Gramopadhye, M, Baskaran, P, Liu, X , Li, S & Iba, S. “STEP: State-Aware Task Estimation and Planning with Multi-Modal LLMs for Human-Robot Collaboration” <i>35th IEEE RO-MAN</i>	RO-MAN 2026
2026	[C10] , Liu, X , Baskaran, P, Li, S & Iba, S. “SUBTA: A Framework for Supported User-Guided Bimanual Teleoperation in Structured Assembly” <i>IEEE International Conference on Robotics and Automation (ICRA)</i>	ICRA 2026
2025	[C9] , Baskaran, P, Liu, X , Li, S & Iba, S. “eXplainable Intention Estimation in Teleoperated Manipulation using Dynamic Graph Neural Networks” <i>IEEE/RSJ IROS</i>	IROS 2025
2025	[C8] , Zhou, Y, Liu, X , Vuong, Q & Ben Amor, H. “AutoMA: Automated Modular Attention enables Context-Rich Imitation Learning using Foundation Models” <i>IEEE International Conference on Robotics and Automation (ICRA)</i>	ICRA 2025
2024	[C7] , Liu, X , Zhou, Y, Weigend, F, Sonawani, S, Ikemoto, S & Ben Amor, H. “Diff-Control: A Stateful Diffusion-based Policy for Imitation Learning” <i>IEEE/RSJ IROS</i>	IROS 2024
2024	[W2] , Liu, X , Weigend, F, Zhou, Y & Ben Amor, H. “Enabling Stateful Behaviors for Diffusion-based Policy Learning” <i>ICRA 2024 Workshop - Back to the Future: Robot Learning Going Probabilistic</i>	ICRA 2024
2024	[C6] , Weigend, F, Liu, X , Sonawani, S & Ben Amor, H. “iRoCo: Intuitive Robot Control from Anywhere using a Smartwatch” <i>IEEE International Conference on Robotics and Automation (ICRA)</i>	ICRA 2024
2023	[C5] , Liu, X , Zhou, Y, Ikemoto, S & Ben Amor, H. “ α -MDF: An Attention-based Multimodal Differentiable Filter for Robot State Estimation” <i>7th Conference on Robot Learning</i>	CoRL 2023
2023	[W1] , Weigend, F, Liu, X , & Ben Amor, H. “Probabilistic Differentiable Filters Enable Ubiquitous Robot Control with Smartwatches” <i>IROS 2023 Workshop on Differentiable Probabilistic Robotics</i>	IROS 2023
2023	[C4] , Liu, X , Clark, G, Campbell, J, Zhou, Y & Ben Amor, H. “Enhancing State Estimation in Robots: A Data-Driven Approach with Differentiable Ensemble Kalman Filters” <i>IEEE/RSJ IROS</i>	IROS 2023
2023	[C3] , Liu, X , Ikemoto, S, Yoshimitsu, Y & Ben Amor, H. “Learning Soft Robot Dynamics using Differentiable Kalman Filters and Spatio-Temporal Embeddings” <i>IEEE/RSJ IROS</i>	IROS 2023
2021	[J1] , Liu, X , Cheng, X & Lee, K. “GA and SVM based Facial Emotion Recognition using Geometric Features” <i>IEEE sensors Journal on Machine Vision and automated systems</i>	IEEE sensors 2021

Skills

• **Programming:** Python, C/C++, Java; **Tools & Library:** PyTorch, ROS2, vLLM, LangChain, huggingface, MuJoCo, Unity, Docker, Git, Kubernetes;

References

Heni Ben Amor

ASSOCIATE PROFESSOR, PH.D. ADVISOR
• School of Computing and Augmented Intelligence | Google DeepMind Researcher Tel: 480.965.2253, Email: hbenamor@asu.edu

Tempe, Arizona
Arizona State University

Kiju Lee

ASSOCIATE PROFESSOR, M.S. ADVISOR
• Engineering Technology and Industrial Distribution and Mechanical Engineering Tel: 979.458.6479, Email: kiju.lee@tamu.edu

College Station, Texas
Texas A&M University