Hangxin Liu

Email: liuhx@bigai.ai Website: liuhx111.github.io

EDUCATION

University of California, Los Angeles **Los Angeles, CA**
Ph.D. in Computer Science, Computer Vision concentration 04/2018 – 06/2021
M.S. in Mechanical Engineering, Robotics concentration 09/2016 – 03/2018

Virginia Polytechnic Institute & State University (Virginia Tech) **Blacksburg, VA**
B. S. in Mechanical Engineering, Robotics concentration 08/2012 – 05/2016
B. S. in Computer Science, Scientific Computing concentration
Magna Cum Laude, Honors Scholar

Shanghai Jiao Tong University (University of Michigan-SJTU Joint Institute**)** **Shanghai, China**
Exchange Student (Mechanical Engineering) 05/2014 – 08/2014

APPOINTMENTS

Peking University
Tenure-Track Assistant Professor, School of Intelligence Science and Technology 03/2026 – present

Beijing Institute for General Artificial Intelligence
Adjunct Research Scientist in Robotics 03/2026 – present
Research Scientist in Robotics 04/2021 – 02/2026
- Leading the Robotics lab (PhD and MS level)

Center for Vision, Cognition, Learning, and Autonomy **UCLA**
Graduate Student Researcher, Advisor: Dr. Song-Chun Zhu 09/2016 – 03/2021
- ONR N00014-19-1-2153: Scene Understanding for Robot Autonomy & DURIP N00014-20-1-2812: A Cognitive Robot Platform for Scene Understanding and Expeditionary Maneuver
- DARPA XAI N66001-17-2-4029: Learning and Communicating Explainable Representations for Analytics and Autonomy
- ONR MURI N00014-16-1-2007: Understanding Scenes and Events through Joint Parsing, Cognitive Reasoning and Lifelong Learning
- DARPA SIMPLEX N66001-15-C-4035: Learning Homogeneous Knowledge Representation from Heterogeneous Data for Quantitative and Qualitative Reasoning in Autonomy

Computational Multi-physics Systems (CMS) Laboratory **Virginia Tech**
Undergraduate/Graduate Research Assistant, Advisor: Dr. Tomonari Furukawa 01/2015 – 09/2016
- Worked on a probabilistic approach for Non-Line-Of-Sight visual/ acoustical target estimation and tested on human and mobile sensor platform (NSF-EAGER-1554961).
- Worked on motion tracking and feature detection using non-stationary camera that enabled UAV to locate, track and land on a moving ground vehicle for the Mohamed Bin Zayed International Robotics Challenge (MBZIRC 2017).

PUBLICATIONS

Journal Paper (* indicates joint first authors, ✉ indicates corresponding authors, selected papers are labeled in **RED**)

[J20] X. Chen*, Y. Gao*, **H. Liu**, F. Yang, A. Ghadirzadeh, J. Yang, B. Liang, C. Zhang, T. L. Lam, S.-C. Zhu, "Cross-Robot Behavior Adaptation through Intention Alignment," Science Robotics, 2026, DOI: 10.1126/scirobotics.adv2250

[J19] W. Huang, J. Zhang, J. Li, S. Zhang, J. Wu, J. Wang, **H. Liu**, Y. Yang, Y. Su, "ECO: Energy-Constrained Optimization with Reinforcement Learning for Humanoid Walking," IEEE Transactions on Automation Science and Engineering, 2026, DOI: 10.1109/TASE.2026.3662755

[J18] K. Zhou, Z. Li, H. Gao, Y. Su, **H. Liu**, J. Yu, C. Liu, "ReSPIRe: Informative and Reusable Belief Tree Search for Robot

Probabilistic Search and Tracking in Unknown Environments," IEEE Transactions on Systems, Man and Cybernetics: Systems, 2025, DOI: 10.1109/TSMC.2025.3636589

[J17] Z. Jiao, Y. Niu, Z. Zhang, Y. Wu, Y. Su, Y. Zhu, **H. Liu**✉, S.-C. Zhu, "Integration of Robot and Scene Kinematics for Sequential Mobile Manipulation Planning," IEEE Transactions on Robotics, 2025, DOI: 10.1109/TRO.2025.3605261

[J16] Z. Zhao*, W. Li*, Y. Li*, T. Liu*, B. Li, M. Wang, K. Du, **H. Liu**✉, Y. Zhu✉, Q. Wang, K. Althoefer✉, S.-C. Zhu, "Embedding High-resolution Touch across Robotic Hands Enables Adaptive Human-like Grasping," Nature Machine Intelligence, 2025, DOI: 10.1038/s42256-025-01053-3
[Featured by Science Robotics Editors' Choice: Adaptive humanlike grasping]

[J15] Z. Zhang*, S. Yan*, M. Han, Z. Wang, X. Wang, S.-C. Zhu, **H. Liu**✉, "M3Bench: Benchmarking Whole-body Motion Generation for Mobile Manipulation in 3D Scenes," IEEE Robotics and Automation Letters (RA-L), 2025, DOI: 10.1109/LRA.2025.3575013

[J14] **H. Liu**, Q. Xie, Z. Zhang, T. Yuan, S. Wang, Z. Wang, X. Leng, L. Sun, J. Zhang, Z. He, Y. Su, "PR2: A Physics- and Photo-realistic Humanoid Testbed with Pilot Study in Competition," Journal of Field Robotics, 2025, DOI: 10.1002/rob.22588

[J13] S. Yan, Z. Zhang, M. Han, Z. Wang, Q. Xie, Z. Li, Z. Li, **H. Liu**✉, X. Wang✉, S.-C. Zhu, "M^2Diffuser: Diffusion-based Trajectory Optimization for Mobile Manipulation in 3D Scenes," IEEE Transactions on Pattern Analysis and Machine Intelligence, 2025, DOI: 10.1109/TPAMI.2025.3553454

[J12] W. Li*, Z. Zhao*, L. Cui*, W. Zhang*, **H. Liu**, L.-A. Li, Y. Zhu, "MiniTac: An Ultra-Compact 8 mm Vision-Based Tactile Sensor for Enhanced Palpation in Robot-Assisted Minimally Invasive Surgery," IEEE Robotics and Automation Letters (RA-L), 2024, DOI: 10.1109/LRA.2024.3487516

[J11] Z. He, J. Wu, J. Zhang, S. Zhang, Y. Shi, **H Liu**, L. Sun, Y. Su, X. Leng, "CDM-MPC: An Integrated Dynamic Planning and Control Framework for Bipedal Robots Jumping," IEEE Robotics and Automation Letters (RA-L), 2024, DOI: 10.1109/LRA.2024.3408487

[J10] S. Zhao*, Z. Yu*, Z. Wang*, **H. Liu**, Z. Zhou, L. Ruan, Q. Wang, "A Learning-Free Method for Locomotion Mode Prediction by Terrain Reconstruction and Visual-Inertial Odometry," IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2023, DOI: 10.1109/TNSRE.2023.3321077

[J9] W. Li*, M. Wang*, J. Li, Y. Su✉, D. K. Jha, X. Qian, K. Althoefer, **H. Liu**✉, "L^3 F-TOUCH: A Wireless GelSight with Decoupled Tactile and Three-axis Force Sensing," IEEE Robotics and Automation Letters (RA-L), 2023, DOI: 10.1109/LRA.2023.3292575

[J8] **H. Liu***✉, Z. Zhang*, Z. Jiao*, Z. Zhang, M. Li, C. Jiang, Y. Zhu✉, S.-C. Zhu, "A Reconfigurable Data Glove for Reconstructing Physical and Virtual Grasps," Engineering, 2023, DOI: 10.1016/j.eng.2023.01.009

[J7] M. Han*, Z. Zhang*, Z. Jiao, X. Xie, Y. Zhu✉, S.-C. Zhu, **H. Liu**✉, "Scene Reconstruction with Functional Objects for Robot Autonomy," International Journal of Computer Vision, 2022, DOI: 10.1007/s11263-022-01670-0

[J6] Z. Zhang*, Z. Jiao*, W. Wang, Y. Zhu, S.-C. Zhu, **H. Liu**✉, "Understanding Physical Effects for Effective Tool-use," IEEE Robotics and Automation Letters (RA-L), 2022, DOI: 10.1109/LRA.2022.3191793

[J5] Y. Su, Y. Jiang, Y. Zhu, **H. Liu**✉, "Objects Gathering with Tethered Robot Duo," IEEE Robotics and Automation Letters (RA-L), 2022, DOI: 10.1109/LRA.2022.3141828

[J4] **H. Liu**, Y. Zhu, S.-C. Zhu, "Patching Interpretable And-Or Graph Knowledge Representation using Augmented Reality," Applied AI Letters, 2021, DOI: 10.1002/ail2.43 [DARPA XAI Special Issue]

[J3] Y. Zhu, T. Gao, L. Fan, S. Huang, M. Edmonds, **H. Liu**, F. Gao, C. Zhang, S. Qi, Y.N. Wu, J.B. Tenenbaum, S.-C. Zhu, "Dark, Beyond Deep: A Paradigm Shift to Cognitive AI with Human-like Commonsense," Engineering, 2020, DOI: 10.1016/j.eng.2020.01.011

[J2] M. Edmonds*, F. Gao*, **H. Liu***, X. Xie*, S. Qi, B. Rothrock, Y. Zhu, Y.N. Wu, H. Lu, S.-C. Zhu, "A Tale of Two Explanations: Enhancing Human Trust by Explaining Robot Behavior," Science Robotics, 2019, DOI: 10.1126/scirobotics.aay4663

[J1] Y. Tian, **H. Liu.** and T. Furukawa, "Reliable Infrastructural Urban Traffic Monitoring Via Lidar and Camera Fusion," SAE International Journal of Passenger Cars-Electronic and Electrical Systems, 10(2017-01-0083), pp.173-180, 2017, DOI: 10.4271/2017-01-0083

Conference Paper (* indicates joint first authors)

[C40] M. Wang*, W. Li*, Q. Chen, Y. Huang, H. Li, K. Althoefer, Z. Jiao, Y. Su, **H. Liu**, "TacTape: Real-time High-accuracy Tactile Fiducial System with Structured 3D Texture for Vision-based Tactile Sensors," IEEE International Conference on Robotics and Automation (*ICRA*), 2026

[C39] H. Yang, Z. Jiao, S. Wang, Y. Niu, S. Liu, **H. Liu**, "Integrated Exploration and Sequential Manipulation on the Graph-Based Representation with Situated Replanning," IEEE International Conference on Robotics and Automation (*ICRA*), 2026

[C38] W. Huang, Z. Li, **H. Liu**, B. Hou, Y. Su, J. Zhang, "Towards Bridging the Gap between Large-Scale Pretraining and Efficient Finetuning for Humanoid Control," International Conference on Learning Representations (ICLR), 2026

[C37] W. Li*, P. Lin*, M. Wang, C. Xiao, K. Althoefer, Y. Su, Z. Jiao, **H. Liu**, "R-FTact0: A Rounded High-Frequency Transferable Monochrome Vision-based Tactile Sensor for Shape Reconstruction," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2025

[C36] H. Li, Z. Jiao, X. Liu, **H. Liu**, Z. Zheng, "In-situ Value-aligned Human-Robot Interactions with Physical Constraints," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2025

[C35] P. Hou*, D. Sun*, M. Wang, Y. Huang, Z. Zhang, **H. Liu**, W. Li, Z. Jiao, "SuperMag: High-resolution Tactile Shape Reconstruction for Magnetic-based Tactile Sensors with Vision-based Tactile Sensors Data," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2025

[C34] M. Wang*, W. Li*, H. Liang, B. Li, K. Althoefer, Y. Su, **H. Liu**, "Large-scale Deployment of Vision-based Tactile Sensors on Multi-fingered Grippers," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2024

[C33] B. Li*, H. Li*, **H. Liu**, "Driving Animatronic Robot Facial Expression from Speech," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2024

[C32] S. Wang*, M. Han*, Z. Jiao*, Z. Zhang, Y.N. Wu, S.-C. Zhu, **H. Liu**, "Large Language Model-based Task and Motion Planning with Motion Failure Reasoning," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2024

[C31] Y. Su, Z. Jiao, Z. Zhang, J. Zhang, H. Li, M. Wang, **H. Liu**, "Flight Structure Optimization of Modular Reconfigurable UAVs," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2024

[C30] Z Li*, Y Niu*, Y Su, **H Liu**, Z Jiao, "Dynamic Planning for Sequential Whole-body Mobile Manipulation," IEEE Conference on Industrial Electronics and Applications (ICIEA), 2024

[C29] K. Zhou, P. Wu, Y. Su, H. Gao, J. Ma, **H. Liu**, C. Liu, "ASPIRe: An Informative Trajectory Planner with Mutual Information Approximation for Target Search and Tracking," IEEE International Conference on Robotics and Automation (*ICRA*), 2024

[C28] Y. Su*, J. Zhang*, H. Li, M. Wang, **H. Liu**, "Real-time Dynamic-Consistent Motion Planning for Over-actuated UAV," IEEE International Conference on Robotics and Automation (*ICRA*), 2024

[C27] H. Gao, P. Wu, Y. Su, K. Zhou, J. Ma, **H. Liu**, C. Liu, "Probabilistic Visibility-Aware Trajectory Planning for Target Tracking in Cluttered Environments," American Control Conference (ACC), 2024

[C26] Z. Zhang, Z. Zhang, Z. Jiao, Y. Su, **H. Liu**, W. Wang, S.-C. Zhu, "On the Emergence of Symmetrical Reality," IEEE Conference on Virtual Reality and 3D User Interfaces (VR), 2024

[C25] Z. Zhang*, L. Zhang*, Z. Wang, Z. Jiao, M. Han, Y. Zhu, S.-C. Zhu, **H. Liu**, "Part-Level Scene Reconstruction Affords Robot Interaction," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2023

[C24] Z. Zhang*, M. Han*, B. Jia, Z. Jiao, Y. Zhu, S.-C. Zhu, **H. Liu**, "Learning a Causal Transition Model for Object Cutting," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2023

[C23] Y. Su*, J. Li*, Z. Jiao*, M. Wang, C. Chu, H. Li, Y. Zhu, **H. Liu**, "Sequential Manipulation Planning for Over-Actuated Unmanned Aerial Manipulators," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2023 [Finalist-IROS Best Paper Award on Mobile Manipulation]

[C22] M. Wang*, Y. Su*, H. Li, J. Li, J. Liang, **H. Liu**, "Aggregating Single-wheeled Mobile Robots for Omnidirectional Movements," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2023

[C21] W. Wang*, Z. Zhao*, Z. Jiao*, Y. Zhu, S.-C. Zhu, **H. Liu**, "Rearrange Indoor Scenes for Human-Robot Co-Activity," IEEE International Conference on Robotics and Automation (*ICRA*), 2023

[C20] Z. Jiao, Y. Niu, Z. Zhang, S.-C. Zhu, Y. Zhu, **H. Liu**, "Sequential Manipulation Planning on Scene Graph," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2022

[C19] Y. Su*, C. Chu*, M. Wang, J. Li, L. Yang, Y. Zhu, **H. Liu**, "Downwash-aware Control Allocation for Over-actuated UAV Platforms," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2022

[C18] Z. Jiao*, Z. Zhang*, W. Wang, D. Han, S.-C. Zhu, Y. Zhu, **H. Liu**, "Efficient Task Planning for Mobile Manipulation: a Virtual Kinematic Chain Perspective," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2021

[C17] Z. Jiao*, Z. Zhang*, X. Jiang, D. Han, S.-C. Zhu, Y. Zhu, **H. Liu**, "Consolidating Kinematic Models to Promote Coordinated Mobile Manipulations," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2021

[C16] M. Han*, Z. Zhang*, Z. Jiao, X. Xie, Y. Zhu, S.-C. Zhu, **H. Liu**, "Reconstructing Interactive Scenes by Panoptic Mapping and CAD Model Alignments," IEEE International Conference on Robotics and Automation (*ICRA*), 2021

[C15] S. Qiu*, **H. Liu***, Z. Zhang, Y. Zhu, S.-C. Zhu, "Human-Robot Interaction in a Shared Augmented Reality Workspace," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2020

[C14] M. Wang, Y. Su, **H. Liu**, Y. Xu, "WalkingBot: Modular Interactive Legged Robot with Automated Structure Interpretation and Motion Planning," IEEE International Conference on Robot and Human Interactive Communication (*RO-MAN*), 2020

[C13] Z. Zhang, **H. Liu**, Z. Jiao, Y. Zhu, S.-C. Zhu, "Congestion-aware Evacuation Routing using Augmented Reality Devices," IEEE International Conference on Robotics and Automation (*ICRA*), 2020

[C12] T. Yuan, **H. Liu**, L. Fan, Z. Zheng, T. Gao, Y. Zhu, S.-C. Zhu, "Joint Inference of States, Robot Knowledge, and Human (False-)Beliefs," IEEE International Conference on Robotics and Automation (*ICRA*), 2020

[C11] X. Xie, **H. Liu**, Z. Zhang, Y. Qiu, F. Gao, S. Qi, Y. Zhu, S.-C. Zhu, "VRGym: A Virtual Testbed for Physical and Interactive AI," 2nd ACM Turing Celebration Conference - China (ACM TURC), 2019

[C10] **H. Liu***, Z. Zhang*, Xu Xie, Y. Zhu, Y. Liu, Y. Wang, S.-C. Zhu, "High-Fidelity Grasping in Virtual Reality using a Glove-based System," IEEE International Conference on Robotics and Automation (*ICRA*), 2019

[C9] **H. Liu***, Z. Zhang*, Y. Zhu, S.-C. Zhu, "Self-Supervised Incremental Learning for Sound Source Localization in Complex Indoor Environment," IEEE International Conference on Robotics and Automation (*ICRA*), 2019

[C8] **H. Liu**, C. Zhang, Y. Zhu, C. Jiang, S.-C. Zhu, "Mirroring without Overimitation: Learning Functionally Equivalent Manipulation Actions," 33rd AAAI Conference on Artificial Intelligence (*AAAI*), 2019

[C7] **H. Liu***, Y. Zhang*, W. Si, X. Xie, Y. Zhu, S.-C. Zhu, "Interactive Robot Knowledge Patching using Augmented Reality," IEEE International Conference on Robotics and Automation (*ICRA*), 2018

[C6] X. Xie*, **H. Liu***, M. Edmonds, F. Gao, S. Qi, Y. Zhu, B. Rothrock, S.-C. Zhu, "Unsupervised Learning of Hierarchical Models for Hand-Object Interactions," IEEE International Conference on Robotics and Automation (*ICRA*), 2018

[C5] M. Edmonds*, F.Gao*, X. Xie, **H. Liu**, S. Qi, Y. Zhu, B. Rothrock, S.-C. Zhu, "Feeling the Force: Integrating Force and

Pose for Fluent Discovery through Imitation Learning to Open Medicine Bottles ," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2017

[C4] **H. Liu***, X. Xie*, M. Millar*, M. Edmonds, F.Gao, Y. Zhu, V. Santos, B. Rothrock, S.-C. Zhu, "A Glove-based System for Studying Hand-Object Manipulation via Joint Pose and Force Sensing," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2017

[C3] K. Takami**, H. Liu**, T. Furukawa, M. Kumon, G. Dissanayake, "Non-Field-of-View Sound Source Localization Using Diffraction and Reflection Signal," IEEE/RSJ International Conference on Intelligent Robots and Systems (*IROS*), 2016

[C2] **H. Liu**, Y. Tian, T. Furukawa, "Design of Highly Reliable Infrastructural Traffic Monitoring Using Laser and Vision Sensors," ASME IDETC/CIE, 2016

[C1] K. Takami, **H. Liu**, T. Furukawa, M. Kumon, G. Dissanayake, "Recursive Bayesian Estimation of NFOV Target Using Diffraction and Reflection Signals," ISIF International Conference on Information Fusion, 2016

HONORS & AWARDS

- Finalist - IROS Best Paper Award on Mobile Manipulation 2023
- ACM TURC Conference Best Paper Award 2019
- ICRA 2019 Conference Travel Award 2019
- ICRA 2018 Conference Travel Award 2018
- Pratt Engineering Scholarship ($5000 each academic year) from Collage of Engineering 2013 – 2016
- Dean's Scholarship ($3000) from Collage of Engineering Spring 2013
- 6 × Dean's List with Distinction, 2 × Dean's List 2012 – 2016
- University Honor Student at Virginia Tech. Summer 2014 – Spring 2016

TEACHING

Robot Dynamics and Control, Fall 2023, Fall 2024, Fall 2025, Peking University
Embodied and Generalist Agents, Fall 2025, Peking University

PROFESSIONAL SERVICE

Workshop Organization: The Art of Robustness: Surviving Failures in Robotics in IROS 2025, Workshop on Open-World Agents in NeurIPS 2024
Journal Reviewer: Nature Communications, Artificial Intelligence Review, IEEE RA-L, Applied AI Letters, IEEE TCSVT, Robotics and Autonomous Systems
Conference Reviewer: ICRA (2024, 2023, 2022, 2020, 2019), IROS (2023, 2022, 2020, 2019), RO-MAN (2020)

LANGUAGES & SKILLS

Language: Chinese Mandarin and Cantonese: Native
English: Full professional proficiency

Skills: Computer Languages: Java, C/C++, Python Software: Robot Operating System (ROS), MATLAB, Eclipse
Operating Systems: Windows, Linux CAD: AutoDesk Inventor, Solidworks

MEMBERSHIPS & AFFILIATION

- Student Member of IEEE and RAS. 06/2017
- Member of **Phi Beta Kappa** Honor Society. 04/2016
- Student Member of ASME. 01/2016
- Member of **Tau Beta Pi** National Engineering Honor Society. 04/2014