

Jingyu Shi

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Summary & Objective

Ph.D. Candidate in Computer Engineering with a focus on applied **Machine Learning (ML)** / **Deep Learning (DL)** methodologies to solving **Computer Vision (CV)** challenges in real-world applications, including videos, **Augmented Reality (AR)**, and **Virtual Reality (VR)**, with hands-on experience with **diffusion models**, **Neural Radiance Field (NeRF)**, **action recognition**, **object/hand tracking** etc.

Education

Ph.D. in Computer Engineering <i>Purdue University</i>	Jan. 2021 – Dec. 2025 West Lafayette, IN
M.S. in Computer Engineering <i>Georgia Institute of Technology</i>	Sept. 2019 – Dec. 2020 Atlanta, GA
B.Eng. in Instrument Science and Technology <i>Beihang University</i>	Sept. 2015 – Jun. 2019 Beijing, China

Selected Projects

Occlusion-Aware NeRF Inpainting via Score Distillation Sampling from Diffusion Models 2024

- Designed and implemented collaborative **score distillation sampling** workflow to inpaint NeRF scenes with occlusion awareness and applied a Grid-based denoising pattern to enhance the distillation consistency.
- Collected a challenging dataset for NeRF inpainting with consistently annotated RGB, Depth, and mask images.
- Applied **LoRA to fine-tune Stable Diffusion 2** for more realistic per-scene inpainting.
- Achieved the best performance in consistency and faithfulness on common datasets, compared against SOTA baselines

Diverse Text-to-Image Generation via Bimodal Classifier-Free Guidance 2024

- Implemented **Bimodal Classifier-Free Guidance for diffusion models** to incorporate the (demographic and aesthetic) diversity of the generated images without compromising fidelity.
- Adapted Decoupled Cross-Attention and applied LoRA to **fine-tune bimodal-conditioned diffusion models**
- On human image generation tasks in MSCOCO and OpenImages-v6, achieved the best diversity and image quality performance while maintaining good fidelity and alignment compared with SOTA baselines.

Context-Aware Motion Generation for AR Instructions using Diffusion Models 2023

- Designed and developed CARING-AI, a system that leverages **Motion Diffusion Model (MDM)** to create context-aware humanoid avatar animations for AR instructions.
- Modified MDM to enable conditioning on trajectory data and incorporated a temporal smoothing algorithm to ensure continuous transitions among generated animations.
- Finetuned and evaluated the models on a subset of the HumanML3D dataset, achieving 0.12m less transition error and 0.01m less average distance between generated avatars and keypoint conditions.

Consistent Hand-Object Interaction Rendering in AR 2023

- Designed and developed Ubi-TOUCH, a system that enables real-time rendering of hand-object interaction (HOI) in AR to transfer real-world HOIs into virtual rendering with proxy objects.
- Set up a five-camera system to **collect real-world HOI data** with hand-tracking and object pose estimation annotations.
- Fine-tuned and deployed pretrained **hand-tracking** and **object pose estimation** models for real-time inference in AR.
- Implemented a joint HOI optimization algorithm to render the virtual hands and objects plausibly in AR.

Object-Object Interaction for richer dynamic scene representations in videos 2022

- Collected and annotated a novel video dataset for object-object interactions (OOI), and **benchmarked the dataset** for tasks including OOI classification, Scene-Graph generation, and human-object interaction classification.
- Developed a web-based UI for video data annotation, and recruited and trained annotators for high-quality annotation of the collected video data.
- Using the I3D backbone, **Vision-Transformer**, and **Segment-Anything-Model**, extracted and engineered the features into descriptors of motion relations, location relations, and contacted relations for the OOI-based downstream tasks.

Professional Experience

Research Intern May 2024 – Dec. 2024 *Futurewei Technologies Inc.* Santa Clara, CA

- Conducted research on SOTA generative AI algorithms such as diffusion models for CV and CG tasks, such as text-to-image generation and 3D scene rendering.
- Led a research team of three to conduct independent research and contributed to multiple research projects.

Software Engineer Intern Jan. 2018 – Mar. 2018 *Hikvision Digital Technology Co., Ltd.* Hangzhou, China

- Independently developed and maintained a QT-based front-end software for editing, viewing, and annotating videos

Technical Skills

Programming Languages: **Python**, **C++**, **C#**, Objective C, Shell Scripting

ML/DL Platforms & Libraries: **Pytorch**, TensorFlow, Keras, **Diffusers**, **Transformers**, OpenCV, Scikit-learn

AR/VR & Graphics Development Tools: **Unity3D**, Blender, MeshLab, **Oculus**, **HoloLens**

Publications & Preprints

An HCI-Centric Survey and Taxonomy of Human-Generative-AI Interactions

Jingyu Shi*, Rahul Jain*, Hyungjun Doh, Ryo Suzuki, Karthik Ramani

CSUR (Major Revision): *ACM Computing Surveys*

Visualizing Causality in Mixed Reality for Manual Task Learning: An Exploratory Study

Rahul Jain*, Jingyu Shi*, Andrew Benton, Moiz Rasheed, Hyungjun Doh, Subramanian Chidambaram, Karthik Ramani

TVCG (Minor Revision): *IEEE Transactions on Visualization and Computer Graphics*

OccludeNeRF: Handling Occlusions in 3D Scene Inpainting with Collaborative Score Distillation in NeRF

Jingyu Shi, Achleshwar Luthra, Jiazhi Li, Xiyun Song, Zongfang Lin, Heather Yu, Liang Peng

CVPR '25 (Under Review): *the IEEE/CVF Conference on Computer Vision and Pattern Recognition 2025*

Fair, Creative, and Faithful: Diverse Text-to-Image Generation via Bimodal Classifier-Free Guidance

Jiazhi Li, Mi Zhou, Mahyar Khayatkhoei, Jingyu Shi, Jiageng Zhu, Hanchen Xie, Xiyun Song, Zongfang Lin, Heather Yu, Liang Peng, Jieyu Zhao

CVPR '25 (Under Review): *the IEEE/CVF Conference on Computer Vision and Pattern Recognition 2025*

Generalized TensorRF: Efficient Multi-Scene Radiance Fields and View-Consistent 3D Editing

Achleshwar Luthra, Jingyu Shi, Xiyun Song, Zongfang Lin, Heather Yu, Liang Peng

CVPR '25 (Under Review): *the IEEE/CVF Conference on Computer Vision and Pattern Recognition 2025*

PowVRtool: A Handheld Haptic Device for Realistic Power Tool Feedback in VR-Based Manufacturing Training

Mayank Patel, Asim Unmesh, Ananya Ipsita, Levi Erickson, Priyam Maheshwari, Rahul Jain, Jingyu Shi,

Laura H Blumenschein, Karthik Ramani

CHI '25 (revision): *the 2025 CHI Conference on Human Factors in Computing Systems*

CARING-AI: Towards Authoring Context-aware Augmented Reality INstruction through Generative Artificial Intelligence

Jingyu Shi*, Rahul Jain*, Seunggeun Chi*, Hyungjun Doh, Hyung-gun Chi, Alexander J. Quinn, Karthik Ramani

CHI '25 (revision): *the 2025 CHI Conference on Human Factors in Computing Systems*

Transparent Barriers: Natural Language Access Control Policies for XR-Enhanced Everyday Objects

Kentaro Taninaka, Rahul Jain, Jingyu Shi, Kazunori Takashio, Karthik Ramani

CHI '25 (revision): *the 2025 CHI Conference on Human Factors in Computing Systems*

avaTTAR: Table Tennis Stroke Training with Embodied and Detached Visualization in AR

Dizhi Ma, Xiyun Hu, Jingyu Shi, Mayank Patel, Rahul Jain, Ziyi Liu, Zhengzhe Zhu, Karthik Ramani

UIST '24: *Proceedings of the 37th Annual ACM Symposium on User Interface Software and Technology*

Parametric: Empowering In-Situ Parametric Modeling in Augment Reality for Personal Fabrication

Runlin Duan, Xiyun Hu, Min Liu, Jingyu Shi, Karthik Ramani

ASME 2024 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference

ConceptVis: Generating and Exploring Design Concepts for Early-Stage Ideation Using Large Language Model

Runlin Duan, Nachiketh Karthik, Jingyu Shi, Rahul Jain, Maria C. Yang, Karthik Ramani

ASME 2024 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference

Interacting objects: A dataset of object-object interactions for richer dynamic scene representations

Asim Unmesh, Rahul Jain, Jingyu Shi, VK Chaithanya Manam, Hyung-Gun Chi, Subramanian Chidambaram, Alexander Quinn, Karthik Ramani

RAL: *IEEE Robotics and Automation Letters* (Volume: 9, Issue: 1, January 2024)

Ubi-TOUCH: Ubiquitous Tangible Object Utilization through Consistent Hand-object interaction in Augmented Reality

Rahul Jain*, Jingyu Shi*, Runlin Duan, Zhengzhe Zhu, Xun Qian, Karthik Ramani

UIST '23: *Proceedings of the 36th Annual ACM Symposium on User Interface Software and Technology*

Understanding Generative AI in Art: An Interview Study with Artists on G-AI from an HCI Perspective

Jingyu Shi*, Rahul Jain, Runlin Duan, Karthik Ramani

arXiv preprint arXiv:2310.13149

Ubi Edge: Authoring Edge-Based Opportunistic Tangible User Interfaces in Augmented Reality

Fengming He, Xiyun Hu, Jingyu Shi, Xun Qian, Tianyi Wang, Karthik Ramani

CHI '23: *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*

Patents

Authoring edge-based opportunistic tangible user interfaces in augmented reality

Karthik Ramani, Fengming He, Xun Qian, Jingyu Shi, Xiyun Hu

US20240312154A1 (Pending)

Visualizing Causality in Mixed Reality for Manual Task Learning

Karthik Ramani, Jingyu Shi, Rahul Jain

US20240135831A1 (Pending)