# 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, specifically in 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

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| **Ph.D. in Computer Engineering** | Jan. 2021 – expt. Dec. 2025 |
| *Purdue University* | West Lafayette, IN |
| **M.S. in Computer Engineering** | Sept. 2019 – Dec. 2020 |
| *Georgia Institute of Technology* | Atlanta, GA |
| **B.Eng. in Instrument Science and Technology** | Sept. 2015 – Jun. 2019 |
| *Beihang University* | 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 80% less transition error and 11% 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* model with 6% reduced MPJPE and *object pose estimation* model with 3% reduced rotation error and 29% reduced translation error 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

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| **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
- Spearheaded a research team of three to conduct independent research, contributed to multiple research projects, and delivered *3 CVPR submissions* and *1 patent application*.

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

- Developed and maintained a QT-based front-end software for editing, viewing, and annotating videos in C++

## 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**

# Selected Publications & Preprints

**An Exploratory Study on Multi-modal Generative AI in AR Storytelling**
Hyungjun Doh*, *Jingyu Shi**, Rahul Jain*, Heesoo Kim, Karthik Ramani
*DIS '25 (Under Review): the ACM Designing Interactive Systems Conference 2025*

**DesignFromX: Empowering Consumer-Driven Product Design by Facilitating Feature Composition of Existing Products**
Runlin Duan, Chenfei Zhu, Yuzhao Chen, Yichen Hu, *Jingyu Shi*, Karthik Ramani
*DIS '25 (Under Review): the ACM Designing Interactive Systems Conference 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
*DIS '25 (Under Review): the ACM Designing Interactive Systems Conference 2025*

**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 (Accepted): 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 (Accepted): the 2025 CHI Conference on Human Factors in Computing Systems*

**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 (Accepted): 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 TensoRF: 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*

**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)*