Xinran (Nicole) Han

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Education

Harvard University   *Cambridge, Massachusetts, USA*

Ph.D. candidate in Computer Science   *Sept. 2020 - 2026 (Expected)*

- Master of Science in Computer Science *en route* (2022), GPA: 4.00/4.00
- Advisor: Prof. Todd Zickler

University of Pennsylvania   *Philadelphia, Pennsylvania, USA*

Bachelor of Science in Engineering   *Sept. 2016 - May 2020*

- Double Major in Computer Science and Mathematics, *Summa Cum Laude*. GPA: 4.00/4.00

Research Interests

I'm broadly interested in **computer vision**, **generative models** and **multimodal learning**. My current research focuses on developing world models by combining data-driven learning with insights from the human visual system, aiming to build models that are perceptually aligned, robust, and capable of human-level generalization.

Selected Publications

Generative Perception of Shape and Material from Differential Motion   *2025*

Xinran Han, Ko Nishino, Todd Zickler

- Advances in Neural Information Processing Systems **(NeurIPS) 2025**.
- We show that a novel pixel-space video diffusion model trained from scratch estimates accurate shape and material from short videos, and also produces diverse shape and material samples for ambiguous input images.

Multistable Shape from Shading Emerges from Patch Diffusion   *2024*

Xinran Han, Todd Zickler, Ko Nishino

- Advances in Neural Information Processing Systems **(NeurIPS) 2024, Spotlight Paper** (Top 2 %).
- We present a bottom-up, patch-based diffusion model with test-time optimization for monocular shape from shading that produces multimodal outputs, similar to multistable perception in humans.

Transfer Learning for Bayesian Optimization on Heterogeneous Search Spaces   *2024*

Zhou Fan, Xinran Han and Zi Wang.

- Transactions on Machine Learning Research **(TMLR) 2024**. Research collaboration with Google Brain.

Curvature Fields from Shading Fields   *2023*

Xinran Han and Todd Zickler.

- Proceedings of the NeurIPS Workshop on Symmetry and Geometry in Neural Representations, **PMLR 228, 2023**.
- We present a neural distance field model for inferring curvature fields from monocular shading images that is invariant under lighting and texture variations. We also derive the symmetry and equivariance structure of the solution space to improve model efficiency.

Compositional Data and Task Augmentation for Instruction Following   *2021*

Soham Dan*, Xinran Han* and Dan Roth. (* equal contributions)

- Findings, Conference on Empirical Methods in Natural Language Processing **(EMNLP) 2021**.

ForkGAN: Seeing into the Rainy Night   *2020*

Ziqiang Zheng, Yang Wu, Xinran Han and Jianbo Shi.

- European Conference on Computer Vision **(ECCV) 2020, Oral Presentation** (Top 2 %).

Experience

Apple Inc.   *Cupertino, CA*

Research Intern   *Summer 2025*

- **Consistent Video Generation with Representation Alignment** [Project Page]
- Extended and finetuned a **5B-parameter image-to-video diffusion model** for timelapse video generation, scaling training to multi-node H100 clusters with DeepSpeed.
- Built a scalable **data curation pipeline** using VLMs to automatically filter high-quality training videos from mixed data sources.
- Introduced **derivative representation alignment (dREPA)** for image-to-video generation, demonstrating improved subject consistency over long horizon and better generalization across artistic styles.

Computer Vision Lab, Kyoto University

Kyoto, Japan

VISITING RESEARCHER

Summer 2023, 2024

- Research topics: 3D computer vision, diffusion model. Advisor: Prof. Ko Nishino.

GRASP Lab, University of Pennsylvania

Philadelphia, PA

RESEARCH ASSISTANT

2017 - 2020

- Research topics: domain adaptation, multimodal learning for vision and music. Advisor: Prof. Jianbo Shi.

Cognitive Computation Group, University of Pennsylvania

Philadelphia, PA

RESEARCH ASSISTANT

2019 - 2020

- Research topic: physically-grounded language understanding. Advisor: Prof. Dan Roth.
- Open-source software: Wikipedia processing tool for multilingual supervision data. [Code]

AQR Capital Management

Greenwich, CT

QUANTITATIVE RESEARCHER INTERN

Summer 2019

- Global Alternative Premia Team

Awards & Honors

2025-2026 **Siebel Scholar**, Class of 2026 (awarded to top graduate students in Computer Science)

2020-2021 **Mou-Shiung Lin Fellowship**, Harvard University

2020 **Hugo Otto Wolf Memorial Prize**, University of Pennsylvania (two senior students per department)

2016-2020 **Dean's List**, University of Pennsylvania

2015 **Team China Selection Team**, International Young Physicists' Tournament (IYPT)

2014 **First Prize**, Chinese Physics Olympiad (CPhO)

Invited Talks

2025.5 **Computational Models Exhibit Invariance and Multistability In Shape from Shading**, Vision Sciences Society (VSS) Annual Meeting

Tampa, FL

2025.1 **Towards Aligning Human and Computer Shape Perception**, Boston University, Artificial Intelligence Research (AIR) Seminar

Boston, MA

2024.6 **Multistable Shape from Shading Emerges from Patch Diffusion**, Kyoto University, Cognitive Informatics Lab Seminar

Kyoto, Japan

2023.12 **Curvature Fields from Shading Fields**, New England Computer Vision Workshop (NECV)

Hanover, NH

Teaching & Services

Teaching

TEACHING ASSISTANT

- **ES 143 Computer Vision**, Harvard University, Spring 2024
- **CS 283 Advanced Computer Vision**, Harvard University, Fall 2021
- **CIS 160 Mathematical Foundations of Computer Science**, University of Pennsylvania, Fall 2017 & Spring 2018

Academic service

REVIEWER

- AISTATS 2023, ECCV 2024, NeurIPS 2024 & 2025, CVPR 2025 & 2026, ICCV 2025

Skills

Programming Languages   Python, C++, C, MATLAB, GLSL, Java, Go, OCaml

Frameworks   PyTorch, Tensorflow, Wolfram Mathematica