

# Haolan Xu

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## EDUCATION

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### Michigan State University

Visiting Scholar in Computer Science and Engineering

May 2025 - Present

Advisor: Prof. Xiaoming Liu

### University of Illinois Urbana-Champaign

Visiting Student in Electrical and Computer Engineering

Sept. 2024 - Apr. 2025

Advisor: Prof. Narendra Ahuja

### University of Florida

Master of Science in Computer Science

Sept. 2022 - May 2024

GPA: 3.83/4.00

### Sichuan University

Bachelor of Engineering in Chemical Engineering and Technology

Sept. 2018 - Jun. 2022

GPA: 3.74/4.00, Top 10%

## RESEARCH INTEREST

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3D/4D Vision, Generative Model, Digital Human, Differentiable Physical Simulation

## PUBLICATIONS

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\*: equal contribution

Chun Feng\*, Hao Zhang\*, **Haolan Xu**, Narendra Ahuja “Seeing is Simulating: Differentiable Physics for Interaction-Aware Material Estimation”, *TMLR*, Under Review

**Haolan Xu**, Keli Cheng, Lei Wang, Ning Bi, Xiaoming Liu “EmoTaG: Emotion-Aware Talking Head Synthesis on Gaussian Splatting with Few-Shot Personalization”, *CVPR*, 2026. [[PDF](#), [project page](#)]

Hao Zhang\*, **Haolan Xu\***, Chun Feng, Varun Jampani, Narendra Ahuja “PhysRig: Differentiable Physics-Based Skinning and Rigging Framework for Realistic Articulated Object Modeling”, *ICCV*, 2025. [[PDF](#), [project page](#)]

## RESEARCH EXPERIENCE

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### Causal Streaming Audio-Driven 3D Head Animation

Dec. 2025 - Mar. 2026

Visiting Scholar at Computer Vision Lab, MSU

- Proposed **FlowTalker**, a causal streaming framework for audio-driven 3D head animation, enabling low-latency full-head motion generation for real-time photorealistic avatar animation.
- Designed a **Draft-then-Refine** pipeline with **spatially factorized motion tokens** (pose/expression/mouth), a **kinematics-aware autoregressive transformer**, and a **selective rectified-flow refiner** to recover fine-grained lip dynamics and micro-expressions. This work is submitted to **ECCV’26**.

### Few-Shot Emotion-Aware 3D Talking Head Synthesis

May. 2025 - Nov. 2025

Visiting Scholar at Computer Vision Lab, MSU

- Proposed **EmoTaG**, a Pretrain-and-Adaptation framework based on 3D Gaussian Splatting, enabling efficient 5-second personalization for audio-driven 3D talking heads with emotion-coherent facial motion.
- Designed a **Gated Residual Motion Network (GRMN)** guided by a **Semantic Emotion Guidance (SEG)** module to disentangle linguistic and emotional cues from audio, achieving precise lip articulation and natural facial emotion. This work is accepted to **CVPR’26**.

### Differentiable Physics-Based 4D Modeling

Sept. 2024 - Mar. 2025

Visiting Student at Computer Vision and Robotics Lab, UIUC

- Proposed **PhysRig**, a differentiable physics-based rigging framework that integrates volumetric soft-body simulation with articulated skeletons for physically grounded and realistic motion synthesis.
- Designed a unified **differentiable MPM pipeline** that connects particle-level elasticity learning with high-level skeletal control, supporting end-to-end optimization for material-aware dynamic generation. This work is published in **ICCV’25**.
- Extended the framework to **PhysInteract**, which infers material properties and interaction dynamics from real-world videos for physics-grounded motion understanding. This work is under review at **TMLR**.

### Inverse Rendering Meets GANs for 3D Object Editing

Aug. 2023 - Jan. 2024

Research Assistant at SurfLab, UF

- Proposed **InvRender**, a physics-based inverse rendering framework that integrates **Mitsuba 3** with pretrained **StyleGAN2-Ada** for SVBRDF and depth priors, achieving physically accurate relighting and texture editing.
- Designed a unified end-to-end optimization pipeline that jointly refines generative latent codes and rendering parameters, enabling high-fidelity reconstruction and realistic editing.

## PROJECT EXPERIENCE

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### 🕒 Denoise in Real-Time Ray Tracing

Aug. 2023 - Sept. 2023

### 🕒 Precomputed Radiance Transfer with Spherical Harmonics

Jul. 2023 - Aug. 2023

## SKILLS SUMMARY

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**Programming:** Python, C/C++

**Tools:** PyTorch(3D), Blender, GIT, Huggingface, L<sup>A</sup>T<sub>E</sub>X

**Language:** English (fluent), Mandarin (native)