Haolan Xu

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EDUCATION

Michigan State University — May 2025 - Present
Visiting Scholar in Computer Science and Engineering — Advisor: Prof. Xiaoming Liu

University of Illinois Urbana-Champaign — Sept. 2024 - Apr. 2025
Visiting Student in Electrical and Computer Engineering — Advisor: Prof. Narendra Ahuja

University of Florida — Sept. 2022 - May 2024
Master of Science in Computer Science — GPA: 3.83/4.00

Sichuan University — Sept. 2018 - Jun. 2022
Bachelor of Engineering in Chemical Engineering and Technology — GPA: 3.74/4.00, Top 10%

RESEARCH INTEREST

3D/4D Reconstruction and Generation, Generative Models, Differentiable Physics Simulation, Digital Humans

PUBLICATIONS

*: 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.

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

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 submitted 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.

Smooth Contour Rendering using Point Normal Triangles — May 2023 - Aug. 2023
Research Assistant at SurfLab, UF

- Proposed **PNContour**, a smooth surface approximation framework that models curved point-normal patches via cubic Bernstein–Bézier interpolation, enabling efficient and flexible contour generation seamlessly integrated into existing outline rendering pipelines.

PROJECT EXPERIENCE

Denoise in Real-Time Ray Tracing — Aug. 2023 - Sept. 2023
Precomputed Radiance Transfer with Spherical Harmonics — Jul. 2023 - Aug. 2023
Soft Shadow Using PCF & PCSS — Jun. 2023 - Jul. 2023

SKILLS SUMMARY

Programming: Python, C/C++
Tools: PyTorch(3D), NeRFStudio, Mitsuba, Warp, Blender, GIT, Huggingface, LaTeX
Language: English (fluent), Mandarin (native)