

# Haolan Xu

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## EDUCATION

### University of Illinois Urbana-Champaign

Visiting Student in Electrical and Computer Engineering

Urbana, IL, USA

Sept. 2024 - Present

### University of Florida

Master of Science in Computer Science; GPA: 3.83/4.00

Gainesville, FL, USA

Sept. 2022 - May 2024

### Sichuan University

Bachelor of Engineering in Chemical Engineering and Technology; GPA: 3.74/4.00

Chengdu, SC, China

Sept. 2018 - Jun. 2022

## RESEARCH EXPERIENCE

### Physics-based rigging for 4D generation

Sept. 2024 - Present

- Developing a physics-based rigging framework based on Material Point Method simulations to learn driving velocity and material properties (Young's modulus, Poisson's ratio) from videos to generate physically accurate motions
- Building a 4D non-parametric animatable model that bypasses the limitations of traditional rigging-based methods like Linear Blend Skinning to create diverse and physically accurate 4D virtual assets

### Inverse rendering meets GANs for 3D object editing

Aug. 2023 - Jan. 2024

- Generated SVBRDF maps (Albedo, Normal, Roughness, Specular) using StyleGAN2-Ada from input RGB images, then introduced Mitsuba 3 to jointly recover geometry, material, and illumination properties of 3D objects
- Finetuned the unified framework through designing loss functions based on the rendering loss, resulting in the high-quality reconstruction and relighting of 3D objects

### Smooth contour rendering using point normal triangles

May. 2023 - Aug. 2023

- Employed curved point normal patches based on cubic Bernstein-Bézier interpolation for smooth approximation of surfaces to bypass more complex methods like Powell-Sabin construction
- The method's computational efficiency and adaptability allow for seamless integration into any outline rendering pipeline

## PROJECT EXPERIENCE

### 🔊 Denoise in real-time ray tracing

Aug. 2023 - Sept. 2023

- Denoised per frame using the joint bilateral filter with A-Trous wavelet for acceleration
- Implemented temporal accumulation with motion vector projection for smoother transitions

### 🔊 Precompute radiance transfer with spherical harmonics rotation

Jul. 2023 - Aug. 2023

- Implement precomputed radiance transfer (PRT) by calculating spherical harmonics (SH) in the Nori framework
- Achieved real-time rendering of the Stanford bunny across various scenes by PRT
- Further enabled dynamic light rotation leveraging the rotationally invariant properties of SH

### 🔊 Implement soft shadow using PCF & PCSS

Jun. 2023 - Jul. 2023

- Used the adaptive shadow bias algorithm to solve shadow acne to implement a robust hard shadow system
- Developed soft shadow using percentage closer filtering (PCF) and percentage closer soft shadows (PCSS)
- Extended to the multiple dynamic light sources scene

### 🔊 Tiny software path tracer

May 2023 - Jun. 2023

- Built a path tracer using Russian Roulette and light source sampling, optimized by multi-threaded acceleration
- Explored various microfacet materials with different bidirectional reflectance distribution functions like mirror reflection

## SKILLS SUMMARY

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

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

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

## HONORS AND AWARDS

Achievement Award Scholarship in University of Florida

2022

Outstanding Graduate of Sichuan University

2022

Annual Scholarship in Sichuan University

2019, 2020, 2021