# Haolan Xu

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## EDUCATION

**University of Florida** — Gainesville, FL, USA
Master of Science in Computer Science; GPA: 3.81/4.00 — Sept. 2022 - May 2024

**Sichuan University** — Chengdu, SC, China
Bachelor of Engineering in Chemical Engineering and Technology; GPA: 3.74/4.00 — Sept. 2018 - Jun. 2022

## RESEARCH EXPERIENCE

**Unified Reconstruction of Shape and Spatially-Varying Reflectance** — Aug. 2023 - Jan. 2024
Advisor: Prof. Jorg Peters, University of Florida and Dr. Kaleb Smith, Nvidia
- Generated SVBRDF maps using StyleGAN2-Ada, followed by integrating with the SOTA physics-based differentiable renderer, Mitsuba 3, to recover geometry, material, and illumination
- Finetuned the unified framework through the meticulous design of loss functions and regularization strategies, enabling the high-quality reconstruction of 3D objects

**Smooth contour rendering using point normal triangles** — Jun. 2023 - Oct. 2023
Advisor: Prof. Jorg Peters, University of Florida
- Employed curved point normal patches for smooth approximation of surfaces to bypass more complex methods like Powell-Sabin construction
- Developed a contour detection algorithm by evaluating the orthogonality between shading normals and viewing directions, and implemented cubic Bernstein-Bézier interpolation for rendering smooth curves
- The method's computational efficiency and adaptability allow for seamless integration into any outline rendering pipeline

**Parametric modeling of smooth biological cells** — Jan. 2023 - May 2023
Advisor: Prof. Jorg Peters, University of Florida
- Modeled the parametric surface of axisymmetric spread cell using the cubic Bézier curve
- Simulated the flattening process by adjusting the control polygon of curves
- Devised heuristics based on constant mean curvature to extend the method to general cells

## 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) using 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)
- Adapted to more complex multiple dynamic light sources

**⍉ A 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 such as perfect mirror reflection

## SKILLS SUMMARY

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

**Tools**: PyTorch(3D), Mitsuba, Optix7, Open(Web)GL, Blender, Cmake, LaTeX, GIT

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

## HONORS AND AWARDS

Achievement Award Scholarship in University of Florida (4500$) — 2022

Outstanding Graduate of Sichuan University — 2022

Annual Scholarship in Sichuan University — 2019, 2020, 2021