

# Yumeng He

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## RESEARCH INTERESTS

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My research interests are computer vision, graphics, and robotics, with a focus on physical AI, object/scene generation, articulated and kinematic asset modeling, physics-based simulation, real-to-sim pipelines, and policy learning.

## EDUCATION

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### University of California, Los Angeles

*PhD of Computer Science*

Sep 2026 – May 2030  
Los Angeles, CA, USA

- Computer Science major
- Advisor: Prof. Chenfanfu Jiang

### University of Southern California

*Master of Science with Thesis*

Aug 2024 – May 2026  
Los Angeles, CA, USA

- Cumulative GPA: 3.91/4.0
- Computer Science major
- Advisor: Prof. Jernej Barbič

### University of Toronto St. George Campus

*Honours Bachelor of Science with High Distinction*

Sep 2019 – May 2024  
Toronto, ON, Canada

- Cumulative GPA: 3.71/4.0
- Computer Science and Mathematics double major

## PUBLICATIONS AND MANUSCRIPTS

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- [1] **Fishbone: From One 3D Asset to a Million Controllable Edits**  
**Yumeng He**, Xiaoying Wang, Peihao Li, Yanjia Huang, Joe Masterjohn, Jiajun Wu, Leonidas Guibas, Yin Yang, Ying Jiang, Chenfanfu Jiang  
arXiv, 2026
- [2] **SeeClear: Reliable Transparent Object Depth Estimation via Generative Opacification**  
Xiaoying Wang\*, **Yumeng He**\*, Jingkai Shi\*, Jiayin Lu, Yin Yang, Ying Jiang, Chenfanfu Jiang  
arXiv, 2026
- [3] **VoroLight: Learning Quality Volumetric Voronoi Meshes from General Inputs**  
Jiayin Lu\*, Ying Jiang\*, **Yumeng He**\*, Yin Yang, Chenfanfu Jiang  
arXiv, 2025
- [4] **SPARK: Sim-ready Part-level Articulated Reconstruction with VLM Knowledge**  
**Yumeng He**\*, Ying Jiang\*, Jiayin Lu\*, Yin Yang, Chenfanfu Jiang  
Computer Vision and Pattern Recognition (CVPR), 2026 **Oral (top 3.45%)**
- [5] **Birth of a Painting: Differentiable Brushstroke Reconstruction**  
Ying Jiang\*, Jiayin Lu\*, Yunuo Chen\*, **Yumeng He**, Kui Wu, Yin Yang, Chenfanfu Jiang  
Conditionally Accepted by ACM Transactions on Graphics (SIGGRAPH), 2026
- [6] **Self-supervised dual-layer 2D normalizing flow method for industrial anomaly detection**  
Zhenlian Miao, Guangzhu Chen, Xiaojuan Liao, Jiu Dai, **Yumeng He**  
Applied Soft Computing (ASOC), 2024.

## RESEARCH EXPERIENCE

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### USC Graphics | Master Thesis

*Supervisor: Prof. Jernej Barbič*

Aug 2025 – present  
Los Angeles, CA, USA

- Enhancing traditional Kirchhoff–Love shell models by introducing a novel elastic energy formulation that accurately captures stretching, compression, and bending, while overcoming KL shells’ inability to reproduce Poisson effects

### UCLA AIVC Lab | Visiting student

*Supervisor: Prof. Chenfanfu Jiang*

Jun 2025 – present  
Los Angeles, CA, USA

- Leading research on end-to-end articulation-aware 3D mesh generation, designing a pipeline that synthesizes multi-part objects from text or image conditions while mitigating over-segmentation via per-part image-guided local attention
- Performing joint optimization post-generation to infer plausible URDFs, enabling deployment in embodied simulation environments and supporting per-part texturing for visual realism and downstream manipulation compatibility

**USC RESL Lab** | Research Assistant

*Supervisor: Prof. Gaurav S. Sukhatme*

Jul 2025 – present

*Los Angeles, CA, USA*

- Designed a few-shot robotic manipulation task that uses Model Predictive Control to optimize material parameters for physically accurate simulation
- Led the Real2Sim pipeline for this project, building a digital twin from a single RGB D image of a cluttered tabletop scene with object segmentation, mesh reconstruction, and pose, scale, and placement estimation, and importing the reconstructed scene into ManiSkill3 for simulation

**CDUT** | Research Assistant

*Supervisor: Prof. Guangzhu Chen*

May 2023 - Aug 2023

*Remote*

- Faced with unlabeled industrial defects on MVTec AD and tasked to raise unsupervised detection/localization accuracy, proposed SS-DualFlow: a dual-layer 2D normalizing-flow that maps features to a Gaussian base to curb information loss and inserts an Exponential Space Attention module to focus on anomaly-salient regions. Result: image-level AUROC = 99.38% and pixel-level AUROC = 98.38% on MVTec AD; co-authored the Applied Soft Computing (2024) paper.

## RELEVANT PROJECTS

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**Incompressible Fluid Simulation: A Comparison** | C++, OpenGL

Spring 2025

- Implemented and benchmarked four 2D incompressible fluid solvers, including Stable Fluids, Smoothed Particle Hydrodynamics (SPH), Particle In Cell (PIC), and Affine Particle In Cell (APIC) on identical scenarios, reporting performance-vs-accuracy trade-offs.

**Collision Detection with Penalty Method and IPC** | C++

Spring 2025

- Built a physically accurate 3D jello cube simulator using a mass-spring system with structural, shear, and bend springs to model real-world deformation under force
- Implemented penalty-based collision detection to handle interactions with static obstacles, including inclined planes and spheres, ensuring realistic response under contact

**Inverse Kinematics with Skinning** | C++

Spring 2025

- Implemented Linear Blend Skinning and Dual Quaternion Skinning for 3D character deformation with smooth, realistic joint articulation
- Built an end-to-end FK-İK pipeline, supporting forward kinematics for pose propagation and inverse kinematics under joint constraints

**Motion Capture Interpolation** | C++

Spring 2025

- Implemented four interpolation schemes (including linear & Bézier) with both Euler- and quaternion-based rotations to reconstruct and smooth optical mocap, mitigating gimbal lock and interpolation artifacts

## INDUSTRY EXPERIENCE

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**Software Developer Intern** | Full Time

*HCL Canada Inc.*

Aug 2022 – Aug 2023

*Toronto, ON, Canada*

## COMMUNITY SERVICES

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- Member of Society of Women Engineers (SWE) 2025 - 2026
- Mentor for Viterbi Graduate Mentorship Program Fall 2025
- Mentor for Women in Engineering Mentorship Fall 2025
- Mentor for Viterbi Graduate Mentorship Program Summer 2025

## INVITED TALKS

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- *MPC Is All You Need.* [Co-presented]. USC SLURM Lab, hosted by Prof. Daniel Seita Aug 2025

## AWARDS & HONORS

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- Dean's List Scholar 2020 - 2024
- Ranked in the top 25% of contestants in the Galois Contest 2017
- Ranked in the top 25% of contestants in the Cayley Contest 2017
- Ranked in the top 25% of contestants in the Canadian Intermediate Mathematics 2016

## TECHNICAL SKILLS

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- **Programming Tools:** Linux, Windows, MacOS, C++, Python, HTML, CSS, JavaScript, MySQL, R, OpenGL, GLSL, Eigen, Docker, Jenkins, Gradle, Ant, Shell, Git, Github Actions