# Jerry Hsu

University of Utah, PhD Candidate

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## Education

### Computer Science, PhD Student

University of Utah, GPA 4.00
Advisor: Prof. Cem Yuksel, Utah Graphics Group
Focus on computer graphics and simulations
2020 ~ current

### Computer Science, B.S.
### Mathematics, B.S.

Purdue University, GPA 3.81
2017 ~ 2020

## Research & Publications

### *ACM SIGGRAPH 2023*: Real-Time Physically Guided Hair Interpolation

University of Utah, 2023 - 2024

- Jerry Hsu, Tongtong Wang, Zherong Pan, Xifeng Gao, Cem Yuksel, and Kui Wu. 2024. Real-time Physically Guided Hair Interpolation. ACM Trans. Graph. 43, 4, Article 95 (July 2024), 11 pages. https://doi.org/10.1145/3658176
- Hair interpolation enables fast real-time simulations but frequently leads to various artifacts during runtime. As the skinning weights are often pre-computed, substantial variations between the initial and deformed shapes of the hair can cause severe deviations in fine hair geometry
- This work introduces a novel physical-driven hair interpolation scheme that utilizes existing simulated guide hair data. Instead of directly operating on positions, we interpolate the internal forces from the guide hairs before efficiently reconstructing the rendered hairs based on their material model.

### *ACM SIGGRAPH 2022*: Sag Free Initialization for Complex Hair Simulations

Tencent Lightspeed & Quantum Studios, 2022 - 2023

- A continuation of sag-free initializations below with the goal of addressing sag on complex hair simulations with full collision, friction, and many thousands of individual guide hairs.
- Uses a novel 4 stage optimization to address the extra inclusion of quaternions with bending.
- Hair simulation using XPBD Cosserat Rods coupled to a MPM continuum friction model.

### *ACM SIGGRAPH 2021*: A general two-stage initialization for sag-free deformable simulations

University of Utah, 2020 - 2022

- Jerry Hsu, Nghia Truong, Cem Yuksel, and Kui Wu. 2022. A general two-stage initialization for sag-free deformable simulations. ACM Trans. Graph. 41, 4, Article 64 (July 2022)
- Physically based simulations often suffer from sagging on initialization due to naïve assumptions on rest state and material parameters. This often requires artists to compensate manually and perform costly warmup simulations.
- This is a general framework to efficiently solve for sag free initializations applicable to cloth, FEM, MPM, and PBD based simulations.

### Intelligent Adaptive Splitting for Vector Representations

Adobe, 2021 – 2022

- Discrete parameters like the number of nodes in a Bezier curve are often optimized through handcrafted heuristics.
- This provides a theoretically sound and generalizable framework to intelligently perform discrete node additions (or splitting) on vector representations like splines, diffusion curves, or gradient meshes.
- Applications include curve fitting, image fitting, and adaptive simulations.

### Yarn-Level Cloth Simulation

University of Utah, 2020 - Present

- Continuing researching into real-time yarn level simulations.
- Massively parallel solver for super stable Cosserat rods at large time steps using a new bending formulation.
- Working on publication for a novel collision handling method which combines stability with guarantees on penetration free states on thin structures.

## Work Experience

**Research Intern**
**Tencent Lightspeed & Quantum Studios**

2023 Summer

- Performed research, implementation, and experimentation on state-of-the-art hair simulation methods.
- **Real-Time Physically Guided Hair Interpolation** extends simulation quantities to interpolation for robust, efficient, and responsive hair animations.

**Research Intern**
**Tencent Lightspeed & Quantum Studios**

2022 Summer

- Performed research, implementation, and experimentation on state-of-the-art hair simulation methods.
- **Sag-free initialization** of said simulation performed by the inverse solve of hair rest configurations to counter sagging due to gravity.

**Research Intern**
**Adobe Computational Artistry Team (CAT)**

2021 Summer

- Performed research through mathematical derivation to implementation and experimentation.
- ***Intelligent adaptive splitting***: A representation independent way of optimizing over discrete parameters in vector graphics.
- Currently working on publishing.

**Software Engineering Intern**
**Amazon Commerce Platform**

2019 Summer

- Implemented diagnostic data processing on cloud systems for bill computation.
- Designed data chunking systems that reduced network transfer usage by 70% when accessed.

## Technical

- Languages: C & C++, CUDA, GLSL/HLSL, C#, Mathematica, Matlab
- Familiar with: OpenGL, eigen3, SCS, ipopt, Intel MKL/Pardiso