

JINJIN HE

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Education

Georgia Institute of Technology

Ph.D. student in Computer Science

Aug. 2025 – Now

Atlanta, GA, U.S.

Dartmouth College

M.S in Computer Science

Sep. 2023 – May. 2025

Hanover, NH, U.S.

Huazhong University of Science and Technology

B.S. in AI and Automation

Sep. 2019 – Jun. 2023

Wuhan, Hubei, China

Research Vision

I work at the intersection of generative AI and 3D geometry to build physically grounded **world models** from images, video and language. I develop generative models and neural operators for shapes, scenes and physical fields; efficient 3D representations, including feed-forward and streaming Gaussian splatting, particle-based implicit surfaces and neural fields; and differentiable simulators that provide physical priors and training signals. I also distill Wan2.2 into a streaming video model using Fortnite game data.

Research Interests: World Models & Spatial Intelligence; Generative Models for 3D/4D Content (flow matching, diffusion, one-step generation, video-to-3D); 3D Gaussian Splatting (feed-forward, streaming); Neural Fields & Neural Operators (Instant-NGP, NeRF, neural SDF, PINNs); Differentiable Simulation & Flow Maps; Vision-Language Agents for 3D Content Creation; GPU Programming (CUDA, Taichi)

Publications

Rethinking the Roles of Diffusion and Decoding:

Predictive-State Flows for Parallel Language Generation

Jinjin He*, Xinsong Feng*, Lucheng Fu, Sinan Wang, Bo Zhu, Jiayun Wang

In submission

RetroSplat: Retroactive Revision of Streaming Gaussian Maps with Replay Evidence

Jinjin He*, Sinan Wang*, Bo Zhu

In submission

LoCoSplat: Real-Time Feed-Forward 3D Gaussian Splatting with Minimal 3D Reasoning

Sinan Wang*, Jinjin He*, Yuchen Sun, Duowen Chen, Shenyifan Lu, Bo Zhu

In submission

GPUPhysBench: Benchmarking Coding Agents for Correct and Efficient GPU Physics Simulation

Yuchen Sun, Jinjin He, Sinan Wang, Bo Zhu

In submission, [arXiv](#)

A Variational Optimal Transport Operator on Incompressible Flow

Jinjin He, Shenyifan Lu, Sinan Wang, Zhiqi Li, Duowen Chen, Bo Zhu

arXiv preprint, 2026

Neural Harmonic Measure Operator

Jinjin He, Sinan Wang, Yuchen Sun, Bo Zhu

NeurIPS 2026

Audible World Models: Spatially Aware Sound Generation for 3D Worlds

Duowen Chen, Jinjin He, Gouthaman KV, Sandeep Bangalore Venkatesh, Bo Zhu

NeurIPS 2026

Hamiltonian Two-Way Coupling of Nonlinear Waves and 3D Flows

Sinan Wang*, Ruicheng Wang*, Taiyuan Zhang, Fan Feng, Jinjin He, Yuchen Sun, Zhiqi Li, Bo Zhu

SIGGRAPH Asia 2026 (TOG)

Unified Long-Short Flow Maps for Fast Generation

Zhiqi Li, Jinjin He, Duowen Chen, Ruicheng Wang, Shenyifan Lu, Yuxuan Liao, Yuchen Sun, Sinan Wang, Bo Zhu

SIGGRAPH Asia 2026 (Conference Paper)

Two-phase Impulse Fluid on Particle Flow Map

Hui Wang, Jinjin He, Xubo Yang

TVCG 2026 (IEEE Transactions on Visualization and Computer Graphics)

Hermite-NGP: Gradient-Augmented Hash Encoding for Learning PDEs

Jinjin He, Zhiqi Li, Sinan Wang, Bo Zhu

ICML 2026

Trajectory Consistency for One-Step Generation on Euler Mean Flows

Zhiqi Li, Yuchen Sun, Duowen Chen, Jinjin He, Bo Zhu

ICML 2026

Generative Modeling with Orbit-Space Particle Flow Matching

Sinan Wang*, Jinjin He*, Shenyifan Lu, Ruicheng Wang, Greg Turk, Bo Zhu

SIGGRAPH 2026 (TOG)

A Level Set Method on Particle Flow Maps

Jinjin He, Taiyuan Zhang, Zhiqi Li, Junwei Zhou, Duowen Chen, Bo Zhu

International Journal for Numerical Methods in Engineering (accepted)

An Adjoint Method for Differentiable Fluid Simulation on Flow Maps

Zhiqi Li*, Jinjin He*, Barnabás Börcsök, Taiyuan Zhang, Duowen Chen, Tao Du, Ming Lin, Greg Turk, Bo Zhu

SIGGRAPH Asia 2025 (Conference Paper)

Fluid Simulation on Compressible Flow Maps

Duowen Chen*, Zhiqi Li*, Taiyuan Zhang, Jinjin He, Junwei Zhou, Bart G. van Bloemen Waanders, Bo Zhu

SIGGRAPH 2025 (TOG)

Multi-level Partition of Unity on Differentiable Moving Particles

Jinjin He, Taiyuan Zhang, Hiroki Kobayashi, Atsushi Kawamoto, Yuqing Zhou, Tsuyoshi Nomura, Bo Zhu

SIGGRAPH Asia 2024 (TOG)

* Equal contribution.

Experience

Epic Games (Unreal Engine)

May. 2026 – Present

World Model Research Intern

Cary, NC

- Building a VLM agent harness that turns a single image into a 3D world via procedural content generation (PCG).
- Developing 3D Gaussian splatting segmentation for scene layout extraction and understanding.
- Distilling Wan2.2 into a streaming model using Fortnite game data.

Georgia Tech Computer Graphics Lab

Jun. 2023 – Present

Research Assistant. Advisor: Prof. Bo Zhu

Atlanta, GA

- Generative models for shapes and physics (orbit-space particle flow matching, one-step generation on mean flows) and feed-forward / streaming 3D Gaussian splatting (LoCoSplat, RetroSplat).
- Neural fields and operators for geometry and PDEs: Hermite-NGP (ICML 2026), the neural harmonic measure operator (NeurIPS 2026), and a differentiable moving-particle implicit surface with Toyota Research Institute (SIGGRAPH Asia 2024).
- Differentiable physics as a learning signal: adjoint differentiable fluids with rigid-body coupling, level sets and compressible flows on flow maps.

IIIS, Tsinghua/Shanghai Qi Zhi Institute

Jun. 2024 – Sep. 2024

Research Intern, Advisor: Prof. Tao Du

Shanghai, China

- Developing a learning method integrating the Particle in Cell method to solve PINNs problem efficiently and accurately.
- Investigated a numerical method integrating the Material Point Method and Spacetime Finite Element Method to mitigate CFL limitations and enhance simulation speed.
- Investigated the application of higher-order curves in time integrals to optimize vortex particle systems.

TikTok

May 2022 – Sep. 2022

Software Development Intern

Shanghai, China

- Optimized dynamic effects and result display time (30–80ms faster) for TikTok’s image search, and improved animations in the UX infrastructure library. (*Metal*, *C++*, *Objective-C*)
- Implemented image preloading on search result pages, significantly reducing lag and increasing user scrolling engagement.

Institute of Software, Chinese Academy of Sciences

Jan. 2022 – Mar. 2022

System Development Intern

Nanjing, China

- Ported mainline Linux kernel features to OpenEuler OS; built a Go-based toolchain compiling C++/Java/Rust to OS-independent WebAssembly. (*Golang*, *C++*, *Linux*)

Netease Game

Jun. 2021 – Sep. 2021

Game Development Intern

Hangzhou, China

- Developed character skill animations and gameplay, the live module’s Lua–C# SDK communication system, and parachute animation systems for battlefield mode. (*C#*, *Unity*, *Lua*, *GLSL*)

Projects

Check videos and more projects on my website: <https://jinjinhe2001.github.io/projects/>

- **(Simulation)** Real-time C++ rigid-body and cloth physics engine with octree collision detection; fluid and sand solvers.
- **(Renderer)** C++ ray tracer (Lambertian, dielectric, metal materials) and C++ rasterizer with a full graphics pipeline.
- **(Game Dev & AR)** Unity games (2D, 3D, simulation) and ARnote, an AR object-tagging app on Android/iOS.
- **(ML)** Implemented several ML algorithms and reproduced recent papers related to neural SDF etc.
- **(Compiler)** Implemented a fully functional compiler which consists of a Lexer, Parser, Abstract Syntax Tree, Semantic Analysis, and Code Generation to x86 Assembly.
- **(TCP)** Implemented TCP network protocol together with a TCP sender, receiver, finite state machine of TCP in C++.
- **(Server)** Developed a gRPC based server and a server client in Golang.

Teaching Experience

Teaching Assistant | *cosc70 Foundations of Applied CS* | *Dartmouth College*

Spring 2024/Winter 2025

Teaching Assistant | *CS3451 Computer Graphics* | *Georgia Tech*

Fall 2025

Skills

Languages: C++, Python, Taichi, C, C#, Objective-C, Lua, GLSL

Technologies/Frameworks: Unity, Unreal Engine, Matlab, Blender, Linux, Metal, OpenGL, QT, CUDA, Pytorch, OpenCV

Honors and Awards

2023-2025 Dartmouth Master Merit-based Scholarship

2023 HUST International Exchange Scholarship

2022 The Mathematical Contest in Modeling(MCM/ICM) **Outstanding Winner(0.12% Globally)**

2021 HUST Intelligent Base Scholarship

2021 The Mathematical Contest in Modeling(MCM/ICM) **Finalist Winner**

2018 National(China) Mathematical Olympiad in Senior **First Prize**