Mengdi Wang

Postdoctoral Fellow, University of British Columbia

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Research Summary

My research in computer graphics focuses on physics-based simulation and Physical AI. I develop multiscale numerical methods and adaptive GPU solvers, and build on this foundation through domain-guided agents for simulation construction and models that learn physical dynamics and robot policies from simulated experience.
Research Areas: Computer Graphics, Physics-based Simulation, Multiscale and Multiphysics Simulation, Physical AI, Scientific Machine Learning

Academic Appointments

University of British Columbia, Postdoctoral Fellow 2026.9 - Present

- Department of Computer Science, PhysAI Lab, working with Prof. Peter Yichen Chen

Research funding: TiCAN (UBC–Meta, approved 2026; TTP#047): *From Simulation to the Kitchen: Closing the Sim-to-Real Gap for Soft Robotics*. Designated postdoctoral trainee.

Education

Georgia Institute of Technology, Ph.D. in Computer Science 2024.1 - 2026.5

- School of Interactive Computing, advised by Prof. Bo Zhu

Dartmouth College, Ph.D. Program in Computer Science (Transferred) 2020.9 - 2023.12

- Guarini School of Graduate and Advanced Studies, advised by Prof. Bo Zhu

Peking University, B.S. in Computer Science, *summa cum laude* 2016.9 - 2020.6

- Center on Frontiers of Computing Studies, advised by Prof. Baoquan Chen

Publications

WorldAgent: Verification-Guided Agentic Physical World Construction Submitted to ICLR 2027
Caoliwen Wang*, *Mengdi Wang*†*, Yige Chen*, Zejia Wu, Bowen Huang, Siyuan Chen, Guanxiong Chen, Lifu Wei, Heng Zhang, Qinghai Zhang, Yin Yang, Guandao Yang, Shiying Xiong, Peng Wang, Chenfanfu Jiang, Peter Yichen Chen
* Co-first authors. † Corresponding author.

WorldContact: A Contact-Centric World Model for Scalable Robot Learning Submitted to ICRA 2027
Caoliwen Wang*, *Mengdi Wang*†*, Heng Zhang, Shixun Huang, Siyuan Chen, Chao Liu, Anpei Chen, Zhendong Wang, Peter Yichen Chen†, Huamin Wang
* Co-first authors. † Corresponding authors.

WorldParticle: Unified World Simulation of Lagrangian Particle Dynamics via Transformer SIGGRAPH Asia 2026
Caoliwen Wang*, Minghao Guo*, Siyuan Chen*, Heng Zhang, *Mengdi Wang*, Xingyu Ni, Hanson Sun, Kunyi Wang, Zherong Pan, Kui Wu, Lingjie Liu, Yin Yang, Chenfanfu Jiang, Taku Komura, Wojciech Matusik, Peter Yichen Chen
* Co-first authors.

Matrix-Free Multigrid with Algebraically Consistent Coarsening on Adaptive Octrees Submitted to JCP
Mengdi Wang, Yuchen Sun, Bo Zhu

Cirrus: Adaptive Hybrid Particle-Grid Flow Maps on GPU ACM TOG (SIGGRAPH 2025)
Mengdi Wang, Fan Feng, Junlin Li, Bo Zhu (Featured in video trailer)

Real-Time Knit Deformation and Rendering ACM TOG (SIGGRAPH 2025)
Tao Huang*, Haoyang Shi*, *Mengdi Wang**, Yuxing Qiu, Yin Yang, Kui Wu
* Co-first authors.

An Interface Tracking Method with Triangle Edge Cuts JCP 2025
Mengdi Wang, Matthew Cong, Bo Zhu

Hydrophobic and Hydrophilic Solid-Fluid Interaction ACM TOG (SIGGRAPH Asia 2022)
Jinyuan Liu, *Mengdi Wang*, Fan Feng, Annie Tang, Qiqin Le, Bo Zhu

A Moving Eulerian-Lagrangian Particle Method for Thin Film and Foam Simulation ACM TOG (SIGGRAPH 2022)
Yitong Deng, *Mengdi Wang*, Xiangxin Kong, Shiying Xiong, Zangyueyang Xian, Bo Zhu

A Clebsch Method for Free-Surface Vortical Flow Simulation ACM TOG (SIGGRAPH 2022)
Shiying Xiong, Zhecheng Wang, *Mengdi Wang*, Bo Zhu (Featured in video trailer)

Thin-Film Smoothed Particle Hydrodynamics Fluid ACM TOG (SIGGRAPH 2021)
Mengdi Wang, Yitong Deng, Xiangxin Kong, Aditya H. Prasad, Shiying Xiong, Bo Zhu (Featured in video trailer)

Visual Data Analysis and Simulation Prediction for COVID-19 arXiv preprint (2020)
Baoquan Chen, Mingyi Shi, Xingyu Ni, Liangwang Ruan, Hongda Jiang, Heyuan Yao, *Mengdi Wang*, Zhenhua Song, Qiang Zhou, Tong Ge

Research Experience

Research Intern, Lightspeed Studio, Tencent IEG, 2024.5 - 2024.8 Los Angeles, CA
- Designed the real-time yarn-level knit simulation framework, combining a knot-based contact representation with energy-based optimisation; co-first author of the resulting ACM TOG (SIGGRAPH 2025) paper.

Research Intern, NVIDIA, 2022.6 - 2022.9 Santa Clara, CA
- Researched high-performance GPU two-phase flow simulation, mentored by Ken Museth and Eftychios Sifakis. This research led to *An Interface Tracking Method with Triangle Edge Cuts* (JCP, 2025).

Research Mentoring

WorldAgent – Project lead and research supervisor May–Sep 2026
Guided UBC PhD students and Zhejiang University undergraduate and PhD students through problem formulation, method design, implementation, experiments and writing for AI-assisted physical scene construction and verification.

WorldContact – Research supervisor May–Sep 2026
Guided research on contact-centric world models for robot learning at UBC.

Teaching Experience

Additional Instructor, Georgia Tech Spring 2025
CS 8803 Graphics in the AI Era.

Additional Instructor, Georgia Tech Spring and Fall 2024
CS 3451 Computer Graphics.

Head Teaching Assistant, Dartmouth College Fall 2023
COSC 277 Computer Graphics.

Instructor, Dartmouth College Fall 2021
COSC 294 Graduate Seminar.

Contributions to the Research Community

I led the development of MESO, an open-source C++/CUDA simulation framework, independently implemented the Cirrus GPU fluid simulator from scratch, and have led continued development and maintenance of SimpleX, an open-source simulation and optimisation library, since 2022. Developed in Bo Zhu's group, these codebases support our simulation research and collaborations including NeuralFluid with MIT CSAIL, and contribute reusable implementations to the computer graphics community.

Peer review: ACM Transactions on Graphics (TOG; SIGGRAPH), IEEE Transactions on Visualization and Computer Graphics (TVCG), Computer Graphics Forum (CGF), Eurographics, Journal of Computational Physics, Scientific Reports