

# Peter Yichen Chen

[peterchencyc.com](http://peterchencyc.com)

**RESEARCH VISION** The overarching objective of my cross-disciplinary research is to democratize physics simulation by improving its precision, speed, ease of use, and generalizability. This is achieved through a thoughtful fusion of cutting-edge AI methodologies and classical numerical methods. My research enhances **design/fabrication/control for engineers**, and aids **discovery for scientists**, and empowers **3D content creation for artists**, **all through next-generation physics simulations that incorporate AI while retaining the essential foundation of partial differential equations (PDEs)**.

**ACADEMIC POSITIONS** **University of British Columbia (UBC)** Assistant Professor of Computer Science **2025 - Present**

**Massachusetts Institute of Technology (MIT)** Postdoc in Computer Science and Artificial Intelligence Lab (CSAIL) **2022 - 2025**

**EDUCATION** **Columbia University** Ph.D., Computer Science **2016 - 2022**  
Dissertation: *Multiscaling and Machine Learning Approaches to Physics Simulation*

**University of California, Los Angeles (UCLA)** B.S., Applied Mathematics, *Summa Cum Laude* **2012 - 2016**  
★ Sherwood Prize in Mathematics for Outstanding Undergraduate Achievement

**INDUSTRY COLLABORATIONS** **Meta Reality Labs (AR/VR)** *Machine learning enhanced physics simulations for XR* **2020 - Present**  
**Amazon Robotics** *Differentiable physics for object manipulations* **2024 - Present**  
**Tencent Games** *GPU-accelerated, multi-physics game engine* **Summer 2021**  
**Weta Digital** *Multi-scale tissue simulation for **James Cameron's Avatar** (uncredited)* **Summer 2018**

**INITIATIVES** \*Co-first authors, + Corresponding authors  
[1] Peter Yichen Chen<sup>+</sup>, Minghao Guo<sup>+</sup>, Hanspeter Pfister, Ming Lin, William Freeman, Qixing Huang, Han-Wei Shen, and Wojciech Matusik. Graphics4Science: Computer graphics for scientific impacts. *SIGGRAPH Courses*, 2025  
[2] David I.W. Levin, Peter Yichen Chen, and Eitan Grinspun. Reduced-order modeling for physical simulation: from the classical to the neural. *SIGGRAPH Technical Workshops*, 2025  
[3] Miles Macklin, Nicolas Capens, Zeshun Zong, Pingchuan Ma, Peter Yichen Chen, and Gergely Klar. Warp: Differentiable spatial computing for python. *SIGGRAPH Courses*, 2024

**PUBLICATIONS**  
[1] Yue Chang, Otman Bencheikoun, Maurizio M Chiaramonte, Peter Yichen Chen, and Eitan Grinspun. Shape space spectra. *SIGGRAPH*, 2025a **[Best Paper Award]**  
[2] Yue Chang, Mengfei Liu, Zhecheng Wang, Peter Yichen Chen, and Eitan Grinspun. Lifting the winding number: Precise representation of complex cuts in subspace physics simulations. *SIGGRAPH*, 2025b **[Best Paper Award Honorable Mention]**  
[3] Maytee Chantharayukhonthorn, Peter Yichen Chen, Yonghao Yue, Eitan Grinspun, and Ken Kamrin. A hybrid discrete and continuum framework for multiscale modeling of granular media. *Computer Methods in Applied Mechanics and Engineering (CMAME)*, 441:117936, 2025

- [4] **Peter Yichen Chen**, Chao Liu, Pingchuan Ma, John Eastman, Daniela Rus, Dylan Randle, Yuri Ivanov, and Wojciech Matusik. Learning object properties using robot proprioception via differentiable robot-object interaction. *International Conference on Robotics and Automation (ICRA)*, 2025
- [5] **Peter Yichen Chen\***, Pingchuan Ma\*, Niklas Hagemann\*, John Romanishin, Wei Wang, Daniela Rus, and Wojciech Matusik. AI-enhanced automatic design of efficient underwater gliders. *International Conference on Robotics and Automation (ICRA)*, 2025
- [6] Pranav Jain, Ziyin Qu, **Peter Yichen Chen**, and Oded Stein. Neural monte carlo fluid simulation. In *SIGGRAPH 2024*
- [7] Liane Makatura, Michael Foshey, Bohan Wang, Felix Hähnlein, Pingchuan Ma, Bolei Deng, Megan Tjandrasuwita, Andrew Spielberg, Crystal Elaine Owens, **Peter Yichen Chen**, Allan Zhao, Amy Zhu, Wil J Norton, Edward Gu, Joshua Jacob, Yifei Li, Adriana Schulz, and Wojciech Matusik. How can large language models help humans in design and manufacturing? *Harvard Data Science Review (HDSR)*, 2024
- [8] Zeshun Zong, Xuan Li, Minchen Li, Wojciech Matusik, Eitan Grinspun, Maurizio Chiaramonte, Kevin Carlberg, Chenfanfu Jiang, and **Peter Yichen Chen**. Neural stress fields for reduced-order elastoplasticity and fracture. *SIGGRAPH ASIA 2023*
- [9] Chang Yue, **Peter Yichen Chen**\*, Maurizio Chiaramonte, Kevin Carlberg, and Eitan Grinspun\*. LiCROM: Linear-subspace continuous reduced order modeling with neural fields. *SIGGRAPH ASIA 2023*
- [10] Pingchuan Ma\*, **Peter Yichen Chen**\*, Bolei Deng, Joshua B. Tenenbaum, Tao Du, Chuang Gan, and Wojciech Matusik. Learning neural constitutive laws from motion observations for generalizable PDE dynamics. In *International Conference on Machine Learning (ICML)*, 2023
- [11] Yichen Li, **Peter Yichen Chen**, Tao Du, and Wojciech Matusik. Learning preconditioner for conjugate gradient PDE solvers. In *International Conference on Machine Learning (ICML)*, 2023b
- [12] Honglin Chen\*, Rundi Wu\*, Eitan Grinspun, Changxi Zheng, and **Peter Yichen Chen**. Implicit neural spatial representations for time-dependent PDEs. In *International Conference on Machine Learning (ICML)*, 2023
- [13] **Peter Yichen Chen**, Jinxu Xiang, Dong Heon Cho, Yue Chang, G A Pershing, Henrique Teles Maia, Maurizio M Chiaramonte, Kevin Thomas Carlberg, and Eitan Grinspun. CROM: Continuous reduced-order modeling of PDEs using implicit neural representations. In *International Conference on Learning Representations (ICLR)*, 2023 **[notable-top-25%]** **[Best Paper Award @ Neural Fields Workshop]**
- [14] **Peter Yichen Chen**, Maurizio Chiaramonte, Eitan Grinspun, and Kevin Carlberg. Model reduction for the material point method via an implicit neural representation of the deformation map. *Journal of Computational Physics (JCP)*, 2023
- [15] Xuan Li, Yi-Ling Qiao, **Peter Yichen Chen**, Krishna Murthy Jatavallabhula, Ming Lin, Chenfanfu Jiang, and Chuang Gan. PAC-NeRF: Physics augmented continuum neural radiance fields for geometry-agnostic system identification. In *International Conference on Learning Representations (ICLR)*, 2023a **[notable-top-25%]**
- [16] **Peter Yichen Chen**, Maytee Chantharayukhonthorn, Yonghao Yue, Eitan Grinspun, and Ken Kamrin. Hybrid discrete-continuum modeling of shear localization in granular media. *Journal of the Mechanics and Physics of Solids (JMPS)*, 2021
- [17] Yonghao Yue\*, Breannan Smith\*, **Peter Yichen Chen**\*, Maytee Chantharayukhonthorn\*, Ken Kamrin, and Eitan Grinspun. Hybrid grains: adaptive coupling of discrete and continuum simulations of granular media. *ACM Transactions on Graphics (TOG), Presented at SIGGRAPH ASIA 2018*
- [18] **Peter Yichen Chen**, Jonathan David Blutinger, Yorán Meijers, Changxi Zheng, Eitan Grinspun, and Hod Lipson. Visual modeling of laser-induced dough browning. *Journal of food engineering*, 2019

[19] Jonathan David Blutinger, Yorán Meijers, **Peter Yichen Chen**, Changxi Zheng, Eitan Grinspun, and Hod Lipson. Characterization of CO<sub>2</sub> laser browning of dough. *Innovative Food Science & Emerging Technologies*, 2019

[20] Jonathan David Blutinger, Yorán Meijers, **Peter Yichen Chen**, Changxi Zheng, Eitan Grinspun, and Hod Lipson. Characterization of dough baked via blue laser. *Journal of food engineering*, 2018

#### PREPRINTS

[21] Hrishikesh Viswanath, Yue Chang, Julius Berner, **Peter Yichen Chen**, and Aniket Bera. Reduced-order neural operators: Learning lagrangian dynamics on highly sparse graphs. *arXiv preprint arXiv:2407.03925*, 2024

#### AWARDS AND FELLOWSHIPS

★ **Best Paper Award**, SIGGRAPH, 2025

★ **Best Paper Award Honorable Mention**, SIGGRAPH, 2025

★ **Best Paper Award**, Neural Fields Workshop at ICLR, 2023

★ **Best Poster Award**, New England Mechanics Workshop, 2017

MMLDT-CSET Conference Fellowship, National Science Foundation, 2021

#### UNDERGRADUATE HONORS

Sherwood Prize in Mathematics for Outstanding Undergraduate Achievement, UCLA, 2016

College and Departmental Honors, UCLA, 2016

Jeffrey George Wilson Research Award, UCLA, 2015

Irving and Jean Stone Research Award, UCLA, 2015

Meritorious Winner in Mathematical Contest in Modeling (MCM), COMAP, 2015

Caltech SURF Fellowship, California Institute of Technology, 2014

The Rose Gilbert in Memory of Maggie Gilbert Scholarship, UCLA, 2014

Honorable Mention in Mathematical Contest in Modeling (MCM), COMAP, 2014

#### INVITED TALKS

##### Neural PDE: AI-enhanced Physics Simulation

Los Alamos National Laboratory

June 2025

UT Austin

May 2025

Stanford University

May 2025

Autodesk Research

November 2024

Toyota Research Institute

September 2024

University of Virginia

April 2024

University of British Columbia

April 2024

Brown University

March 2024

Duke University

February 2024

University of Waterloo

January 2024

University of North Carolina, Chapel Hill

January 2024

University of California, Davis

January 2024

Arizona State University

January 2024

University of Hong Kong

January 2024

Boston University

October 2023

Georgia Tech

October 2023

##### Accurate and Fast PDE Solvers via Neural Fields

Caltech

August 2023

Peking University

May 2023

Tsinghua University

April 2023

University of Stuttgart and NEC Labs

March 2023

Extrality

January 2023

##### Towards a Physical Metaverse

ETH Zurich

February 2022

MIT

February 2022

UCLA

February 2022

	NVIDIA AI Multiscaling and Machine Learning Approaches to Physics Simulation NVIDIA Omniverse Hybrid Grains: Adaptive Coupling of Discrete and Continuum Simulations of Granular Media DreamWorks Animation	January 2022 November 2021 Hybrid Grains: Adaptive Coupling of Discrete and Continuum Simulations of Granular Media June 2019
TEACHING EXPERIENCES	MIT Kaufman Teaching Certificate Program MIT 6.837 Computer Graphics - Particle Simulations Substitute lecturer Topics: <i>Numerical ODEs, Time Integration, Lennard-Jones Forces, and Collision</i> Columbia University COMS 4167 Physics-based Computer Animation Teaching assistant Topics: <i>Time Integration, Collision Detection, Rigid Bodies, Elasticity, Incompressible Viscous Fluid, Finite Element Method, Finite Difference Method, Computational Fluid Dynamics, Control</i> Columbia University COMS W4160 Computer Graphics Teaching assistant Topics: <i>OpenGL, Graphics Pipeline, Shaders, Texture Mapping, Ray Tracing, Rendering Equation, Monte Carlo Integration, Triangle Meshes, Mesh Manipulation, Character Animation, Forward/Backward Kinematics, Spline Curves</i> New Jersey Institute of Technology IT 360 Computer Graphics Guest lecturer	Spring 2024 Fall 2023 Fall 2017 Spring 2018 Spring 2020, Fall 2021
JUNIOR STUDENT MENTORSHIP	Instituto de Matemática Pura e Aplicada Daniel Perazzo, master student Federal University of Paraíba João P. V. Teixeira, undergrad student → PhD student at UofT MIT John Eastman, undergrad student → master student at MIT Marcel Roed, master student → PhD student at Stanford Columbia University Jinxu Xiang, master student → Graphics Researcher at Tencent Pixel Lab Dong Heon Cho, master student → PhD student at Duke G Pershing, undergrad student Mingxuan Li, master student → Intern at Treyarch Logan Wang, master student → Intern at Meta Reality Labs	2023 - 2024 2023 - 2024 2022 - 2023 2022 - 2023 2021 - 2023 2021 - 2023 Spring 2022 Spring 2022 Fall 2021
SERVICES	Group Leader, Queer in Computational and Applied Mathematics (QCAM) Workshop Organizer, AI4PDE Meetup at ICLR Mentor, Summer Geometry Initiative Mentor, RCDC@SIGGRAPH Undergraduate Mentorship Program	2024 2023 2023 2021
REVIEWING	International Conference on Learning Representations (ICLR) Neural Information Processing Systems (NeurIPS) Association for the Advancement of Artificial Intelligence (AAAI) ACM SIGGRAPH North America ACM SIGGRAPH Asia ACM Transactions on Graphics (TOG) Eurographics Pacific Graphics Symposium on Computer Animation (SCA) International Conference on Robotics and Automation (ICRA) Journal of Food Engineering ACM Computing Surveys Proceedings of the National Academy of Sciences of the United States of America (PNAS)	

PROGRAM COMMITTEE	ACM SIGGRAPH North America ACM SIGGRAPH Asia ACM SIGGRAPH / EUROGRAPHICS Symposium on Computer Animation (SCA) International Conference on 3D Vision (3DV)	2025 2024 2024 2026
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GRANT PANELIST	U.S. National Science Foundation (NSF)	2025
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