Cao, Ge                    +1-(217) 841-8609                    gecao2@illinois.edu

# Curriculum Vitae

## PERSONAL DETAILS

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| Name: | *Cao, Ge* |
| Nationality: | *China* |
| Birthday | *01/07/1998* |

## EDUCATION

*08/2023 - present*
**University of Illinois Urbana-Champaign, USA**
***PhD. Electrical and Computer Engineering***
*Advisor: Prof. Dr. Zhen Peng.*

*09/2020 - 04/2023*
**ETH Zurich, Switzerland**
***MSc. Computational Science and Engineering***
*Advisor: Prof. Dr. Markus Gross.*

*09/2016 - 07/2020*
**University of Science and Technology of China (USTC), Hefei, China**
***BSc. Theoretical and applied Mechanics***
***BEng. Computer science and Technology (dual major)***
*Advisor: Prof. Dr. Fengchao Wang, Prof. Dr. Yun Xu*

## RESEARCH EXPERIENCES

**2024/10 – present**
**ECE,**
**UIUC**

**Photon Splatting: Real-Time Neural Representation for Predicting 3D Indoor Radio Channels**
*Advisor: Prof. Dr. Zhen Peng.*
Designed a novel neural surrogate inspired by photon mapping and Gaussian splatting, delivering accurate predictions of channel impulse responses (CIRs) with millisecond-level latency. The framework efficiently handles dynamic changes in antenna patterns and user mobility without retraining.

**2023/09 – 2024/09**
**ECE,**
**UIUC**

**RayProNet: A Neural Point Field Framework for Radio Propagation Modeling**
*Advisor: Prof. Dr. Zhen Peng.*
Developed a scalable neural framework for 3D radio propagation modeling that leverages point clouds and spherical harmonics to predict path loss maps in wireless environments. RayProNet integrates electromagnetic wave physics with neural representations, enabling rapid and accurate predictions adaptable to dynamic transmitter and receiver configurations.

*2022/10 - 2023/02*
*Applied Mathematics,*
*ETH Zurich*

**Augmented BEM for Acoustic Transmission**
*Advisor: Prof. Dr. Ralf Hiptmair.*
We investigated the spurious quasi-resonance problem, where, for certain geometries, the norms of the inverses of the boundary integral operators grow dramatically as the wave number increases. Our research focused on both analytical and numerical aspects of this phenomenon.

*2022/01 - 2022/07*
*Computer Science,*
*ETH Zurich*

**Differentiable Ferrofluid Simulations and Optimizations (Master Thesis)**
*Advisor: Prof. Dr. Markus Gross.*
We proposed a differentiable grid-based ferrofluid approach to optimize the magnetic field for controlling ferrofluid with keyframes, enabling greater flexibility for artistic design purposes.

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| *2020/01 - 2022/07*<br>*Modern Mechanics,*<br>*USTC* | **Molecular Dynamics Simulation of the Interaction Between Petroleum Component of Rock (Bachelor Thesis)**<br>*Advisor: Prof. Dr. Fengchao Wang.*<br>Characterizing the surface morphology of rocks in crude oil environments using atomic force microscopy (AFM) is a critically important subject. We employed molecular dynamics to simulate, track and analyze this process. |
| *2019/07 - 2019/09*<br>*Applied Physics,*<br>*University of Twente* | **Wicking fluid in micropillared surfaces**<br>*Advisor: Prof. Dr. Detlef Lohse.*<br>With the potential applications of superhydrophobic materials, the wicking of fluid on porous materials has gained significant attention. In this project, I investigated this phenomenon and validated its behavior through both experiments and numerical simulations using computational fluid dynamics. |

## ACADEMIC EXPERIENCES

Excellence Fellowship from UIUC (2023-2024);

Hsue-Shen Tsien Talent Program in Mechanics (2016-2020 in USTC);

## PROFESSIONAL EXPERIENCE

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| *2021/11 - 2023/05* | ***Internship: Taichi Graphics, Remote***<br>I interned at Taichi Graphics as a Graphics Engineer, where I contributed to the development of Taitopia, their proprietary web renderer. My work involved implementing advanced computer graphics techniques into the product, including skeleton animation, texture systems, ray tracing, depth of field, and geometry systems, etc. |
| *2020/07 - 2020/09* | ***Internship: NetEase Games, Guangzhou, China***<br>I was working as an intern on Game engine developing with Zen-group, NetEase Games. I was devoted on fundamental implementation of their self-developed Game Engine: Messiah. |

## SKILLS

**Programming**: C/C++, Python, R, CUDA;

**Algorithms**: Computational Fluid Dynamics (FVM, LBM, BEM, SPH), Computational Soft/Rigid Body (FEM, PD), Rendering (Real-time Rasterizer, Ray-Tracing & Photon Mapping), Molecular Dynamics, Machine Learning (Computer Vision & 3D Graphics), High Performance Computing.

## RESEARCH INTERESTS

*Computational Science, Machine Learning and Multi-Physics Simulation.*

## PUBLICATIONS

[1] **Ge Cao**, Qi Jian Lim, Gabriele Gradoni, and Zhen Peng, "Photon Splatting: Real-Time Neural Representation for Predicting 3D Indoor Radio Channels", European Conference on Antennas and Propagation (EuCAP), Stockholm, Sweden, 2025 (Accepted)

[2] Peisen Qian, **Ge Cao**, et al., "Scanning Electrochemical Microscopy for Kinetic Investigations in Viscous Media: Identifying Practical Approach Curves and Deviations from the Butler-Volmer and Marcus-Hush-Chidsey Formalisms", Submitted to Analytical Chemistry Journal.

[3] **G. Cao** and Z. Peng, "RayProNet: A Neural Point Field Framework for Radio Propagation Modeling in 3D Environments," in IEEE Journal on Multiscale and Multiphysics Computational Techniques, vol. 9, pp. 330-340, 2024, doi: 10.1109/JMMCT.2024.3464373.

[4] **G. Cao** and Z. Peng, "A Novel Neural Point Field Framework for End-to-End Wireless Channel Modeling," 2024 International Applied Computational Electromagnetics Society Symposium (ACES), Orlando, FL, USA, 2024, pp. 1-2.

[5] **G. Cao** and Z. Peng, "A Scalable Multi-Physics Simulation of Dancing Ferrofluid," 2024 International Applied Computational Electromagnetics Society Symposium (ACES), Orlando, FL, USA, 2024, pp. 1-2.