

MINGKAI CHEN

Rochester, NY

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EDUCATION

Rochester Institute of Technology

Doctoral Student - Electrical and Computer Engineering

Aug 2024 – Now

Rochester, NY

Doctoral Advisor: [Prof. Dongfang Liu](#) ↗

Stony Brook University

Bachelor of Science - Computer Science

Aug 2020 – May 2024

Stony Brook, NY

Honors Research Project Advisor: [Prof. Haibin Ling](#) ↗

EXPERIENCE

Department of Computer Engineering, Rochester Institute of Technology

Jan 2024 – May 2024

Research Associate

Rochester, NY

- Conducted cutting-edge research in the field of AI for Science under the supervision of [Prof. Dongfang Liu](#) ↗.
- Completed research project of Inertial Confinement Fusion Forecasting via LLMs during this role.
- Skills: **Research · AI for Science · Python · Paper Writing**

Department of Computer Science, Stony Brook University

Dec 2022 – Dec 2023

Student Assistant

Stony Brook, NY

- Developed and maintained numerous websites and servers within the department through technology stacks including JavaScript, PHP, CSS, MySQL, etc.
- Skills: **MySQL · PHP · Cascading Style Sheets (CSS) · JavaScript**

RESEARCH

Inertial Confinement Fusion Forecasting via Large Language Models ↗

- Authors: **Mingkai Chen**, Taowen Wang, Shihui Cao, James Chenhao Liang, Chuan Liu, Chunshu Wu, Qifan Wang, Ying Nian Wu, Michael Huang, Chuang Ren, Ang Li, Tong Geng, Dongfang Liu.
- Status: Under Review by ACL 2025
- Abstract: We developed LPI-LLM, integrating Large Language Models with reservoir computing to address Laser-Plasma Instabilities (LPI) in Inertial Confinement Fusion (ICF). Our designed fusion-specific models for accurate hot electron predictions and actionable insights, achieving state-of-the-art performance in forecasting Hard X-ray (HXR) energies with a negligible computational cost compared to traditional simulation methods. In addition, we created LPI4AI, the first experimental benchmark for advancing AI-driven fusion research.

Diff-PIC: Revolutionizing Particle-In-Cell Nuclear Fusion Simulation with Diffusion Models ↗

- Authors: Chuan Liu, Chunshu Wu, Shihui Cao, **Mingkai Chen**, James Chenhao Liang, Ang Li, Michael Huang, Chuang Ren, Ying Nian Wu, Dongfang Liu, Tong Geng.
- Status: Accepted by ICLR 2025
- Abstract: We developed Diff-PIC, a paradigm using conditional diffusion models to efficiently simulate Laser-Plasma Interaction (LPI) for nuclear fusion research. Designed a distillation process to capture physical patterns from Particle-in-Cell (PIC) simulations, and addressed key challenges with a physically-informed model and rectified flow technique, enhancing efficiency and fidelity. This innovation significantly reduces computational barriers in nuclear fusion research, advancing sustainable energy solutions.

A Benchmark and CoT Prompting Strategy for LMMs with Multiple Image Inputs ↗

- Authors: Daoan Zhang¹, Junming Yang¹, Hanjia Lyu¹, Zijian Jin, Yuan Yao, **Mingkai Chen**, Jiebo Luo.
- Status: Published in *Pattern Recognition* (Conference proceedings of ICPR 2024)
- Abstract: We investigated Large Multimodal Models' (LMMs) ability to process multiple image inputs, focusing on fine-grained perception and information blending. Our research involved image-to-image matching and multi-image-to-text matching assessments, using models like GPT-4V and Gemini. We developed a Contrastive Chain-of-Thought (CoCoT) prompting method to improve LMMs' multi-image understanding, significantly enhancing model performance in our evaluations.

Aggregation of Disentanglement: Reconsidering Domain Variations in Domain Generalization [↗](#)

- Authors: Daoan Zhang¹, **Mingkai Chen**¹, Chenming Li, Lingyun Huang, Jianguo Zhang.
- Status: Under Review by IJCV
- Abstract: We proposed a new perspective to utilize class-aware domain variant features in training, and in the inference period, our model effectively maps target domains into the latent space where the known domains lie. We also designed a contrastive learning based paradigm to calculate the weights for unseen domains.

TECHNICAL SKILLS

Languages: Python, Java, C, C++, Swift, Julia, HTML, JavaScript, etc.

Developer Tools: VS Code, XCode, Github, Nginx, etc.

Technologies/Frameworks: PyTorch, OpenCV, Git, Docker, ROS, Cloudflare Workers, React, etc.

CERTIFICATIONS

- **iOS Development** - CodePath [↗](#)

¹Equal contribution.