

Che Liu

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Research Interest: My research focuses on multimodal learning, integrating diverse modalities such as 2D and 3D visual data, video, audio, natural language, and time-series signals. I am particularly interested in multimodal understanding and the development of unified models that support both perception and generation. My work combines large-scale pretraining with reinforcement learning to enable structured cross-modal reasoning, aiming to build scalable and generalizable systems for complex real-world tasks.

Education

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| Feb 2022 – 2026 (expected) | 📖 Ph.D. Imperial College London
Research Topic: Multimodal Learning.
Supervisors: Dr Rossella Arcucci, Dr Wenjia Bai |
| Apr 2024 – Jun 2024 | 📖 Visiting PhD. Technical University of Munich
Research Topic: Multimodal Learning.
Supervisor: Prof. Dr. Daniel Rückert |
| Sep 2019 – Sep 2021 | 📖 M.Sc. with Distinction, Swansea University.
Major in Computational Mechanics.
(Formerly Erasmus Mundus Program) |
| Sep 2016 – Jul 2018 | 📖 B.Sc. Shanghai University of Engineering and Science
Major in Automotive Engineering. |

Experience

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| April 2025 – Present | 📖 Visiting Researcher – Embodied VLM, X-humanoid, Remote. <ul style="list-style-type: none">· Leading the VLM post-training team, leveraging SFT and self-evolving RL across 3B to 72B parameter models on large-scale video datasets (30k+ hours) to advance reasoning capabilities for natural and embodied tasks. |
| May 2025 – Present | 📖 Visiting Researcher – OmniLLM, StepFun, Remote. <ul style="list-style-type: none">· Advancing OmniLLM post-training via joint audio-visual-language SFT and RL, developing specialized data curation pipelines and omni-capability benchmarks to drive state-of-the-art Omni reasoning. |
| Nov 2024 – Apr 2025 | 📖 Research Intern – Unified Multimodal Vision Pretraining, DAMO Academy, Beijing, China. <ul style="list-style-type: none">· Developed a unified vision pretraining framework using a single framework capable of processing 2D images, 3D volumetric data, and video across modalities. |
| Jul 2024 – Sep 2024 | 📖 Research Intern – Vision-Language Models, AstraZeneca, Cambridge, UK. <ul style="list-style-type: none">· Investigated multimodal learning using purely synthetic data (image-text pairs) generated by diffusion models and large language models.· Demonstrated that synthetic pretraining outperforms state-of-the-art models trained on real-world data. |

Selected Publications

- Pelican-VL 1.0: A Foundation Brain Model for Embodied Intelligence
C. Liu, X-Humanoid, Technical Report
- Nexus-O: An Omni-Perceptive And -Interactive Model for Language, Audio, And Vision
C. Liu, *et al.* ACM Multimedia 2025
- Unified Visual Self-Supervised Pre-training Across Video, 2D, and 3D Vision
C. Liu, Alibaba Inc, DAMO Academy. Technical Report
- Step-Audio 2 Technical Report
StepFun Audio Team. Technical Report
- Beyond Distillation: Pushing the Limits of Medical LLM Reasoning with Minimalist Rule-Based RL
C. Liu, *et al.* Technical Report
- Investigating Vision-Language Model Architectures for 3D Volume Understanding
C. Liu, *et al.* ACL 2025 Findings
- Succeeding in Vision-Language Pretraining with Purely Synthetic Data
C. Liu, *et al.* ACL 2025 Findings
- Multimodal Time-Series Learning with Test-Time Enhancement
C. Liu, *et al.* ICML 2024
- Vision-Language Pretraining for Dense Visual Representation Learning
C. Liu, *et al.* NeurIPS 2024
- Learning Textual Hierarchies through Vision-Language Pretraining
C. Liu, *et al.* IEEE Transactions on Medical Imaging 2024

Collaboration and Supervision († - Equal contribution, ‡ - Supervision)

- Ariadne: A Controllable Framework for Probing and Extending VLM Reasoning Boundaries
Minghe Shen, Zhengzhong Tu, Che Liu[†], *et al.* Under Review
- Emergent Hierarchical Reasoning in LLMs through Reinforcement Learning
Haozhe Wang, Che Liu, Wenhui Chen, *et al.* Under Review
- SuPreME: A Supervised Pre-training Framework for Multimodal Representation Learning
Mingsheng Cai, Che Liu[†], *et al.* EMNLP 2025 Findings
- NOVA: Benchmark for Anomaly Localization and Clinical Reasoning
Cosmin I. Bercea, Che Liu, *et al.* NeurIPS Dataset and Benchmark Track 2025 (Oral)
- SRPO: Enhancing Multimodal LLM Reasoning via Reflection-Aware Reinforcement Learning
Zhongwei Wan, Che Liu, Shen Yan, *et al.* NeurIPS 2025
- Unifying Cross-Lingual Vision-Language Pre-Training by Diminishing Bias
Zhongwei Wan[†], Che Liu[†], *et al.* NeurIPS 2023

Invited Talks

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| 2025 | ■ Incentivizing Medical LLM Reasoning Without Distillation | King's College London. |
| 2024 | ■ ECG Multimodal Learning | Peking University. |
| | ■ Synthetic Data for Medical Multimodal Learning | AstraZeneca, Cambridge. |
| | ■ Multimodal Medical AI | Stanford MedAI. |
| 2023 | ■ Language Bias in Medical Vision-Language Pretraining | Imperial College London. |
| | ■ Cross-lingual Medical Vision-Language Pretraining | Peking University. |
| | ■ Latent Geometry Optimization in Medical Vision-Language Pretraining | King's College London. |

Awards and Achievements

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| 2024 | ■ Top Reviewer Award (Top 10%). | NeurIPS 2024. |
| | ■ Turing Scheme Funding. | Imperial College London. |
| 2022 | ■ Google Research Grant. | Google Cloud Platform. |
| | ■ Engineering School Dean's Fund. | Imperial College London. |