

Longxi Zhou | Curriculum Vitae

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Research Interests

I aim to redefine what AI can detect, infer, and verify in medicine, focusing on tasks beyond current diagnostic paradigms and grounded in clinical reality.

My long-term interest lies in human-AI collaboration, including shared decision-making in high-stakes domains and the development of verifiable standards for safety and accountability.

- Clinically Deployable AI; Redefining Diagnostic Workflows; Beyond Benchmarks
- Trustworthy AI; Human-AI Interaction; Clinical Integration
- Deep-learning; Medical Imaging; Multi-modal Representation

Education

King Abdullah University of Science and Technology (KAUST)

Computational Bioscience Research Center, Supervised by Professor [Xin Gao](#)

- Ph.D. Student in *Computer Science* 2021.3-present
- Master's Degree in *Computer Science* 2019.8-2021.3

University of Science and Technology of China (USTC)

School of the Gifted Young

- Bachelor's Degree in *Applied Physics* 2014.9-2019.6
- Bachelor's Degree in *Computer Science* 2014.9-2019.6

Selected Publications

Scalable, clinically applied COVID-19 AI

Longxi Zhou et al., “A Rapid, Accurate and Machine-Agnostic Segmentation and Quantification Method for CT-Based COVID-19 Diagnosis”. *IEEE Transactions on Medical Imaging*, 2020.

- Among world's earliest deployed clinical AI for COVID-19.
- Cited 216 times · Special Issue on COVID-19 Imaging (acceptance rate: 7%).

Interpretable AI for pathology discovery

Longxi Zhou et al., “An interpretable deep learning workflow for discovering subvisual abnormalities in CT scans of COVID-19 inpatients and survivors”. *Nature Machine Intelligence*, 2022.

- Identified subvisual post-COVID fibrosis as a key culprit for long-term respiratory symptoms.
- First clinically applicable tool to enable radiologists to detect previously invisible lung lesions on CT.
- Online attention ([Altmetric](#)): Ranked #1 among *Nature Machine Intelligence* and 99th percentile among all articles of similar age.

AI trust in time-pressured, life-critical clinical settings

Longxi Zhou et al., “AI trust beyond perceptual limits: pulmonary embolism diagnosis on non-contrast CT”. *Nature Cardiovascular Research* (Under Review – Invited Submission with Guaranteed External Review, [GitHub Link](#)).

- First AI system to diagnose pulmonary embolism directly from non-contrast CT scans.
- New AI trust paradigm that enables verifiable, biomarker-like AI outputs without post hoc justification.
- **Prospectively validated** on 1,004 emergency patients in time-pressured, life-critical diagnostic conditions.

Foundation AI for safe, low-dose, generalizable tomography

Yuetan Chu[#], **Longxi Zhou[#] et al.**, “HorusEye: A self-supervised foundation model for generalizable X-ray tomography restoration”. *Nature Computational Science* (Under Review, [GitHub Link](#)). [#]Co-first authorship.

- First foundation model for X-ray tomography restoration, outperforming task-specific SOTA methods across diverse tasks.
- Achieves comparable image quality using only ~4% of standard X-ray dose in medical CT.

Research Experience

AI System Development & Commercial Deployment | 2019–2023

I led the development of state-of-the-art medical AI systems for multi-organ imaging tasks, enabling the first-line commercial deployment of diagnostic solutions **used by 100+ hospitals**.

- Built AI systems for segmentation (lung lobe, heart, airway, vessels, pulmonary lesions, breast tumor) and classification (lung diseases, breast lesions, pulmonary abnormalities).
- Designed pre- and post-processing modules, including image restoration (denoising, super-resolution, thickness reconstruction, metal artifact removal and motion correction), and landmark-based lesion analysis.
- Developed cross-modal registration algorithms between: non-contrast CT and contrast CT; CT and MRI.
- Delivered vendor-robust models that now power a widely adopted commercial product in Heilongjiang TuoMeng Technology Co., leading to four associated patents.

Pathology Discovery via Interpretable AI | 2020–2022

I designed an interpretable AI framework (DLPE) to analyze lung parenchyma lesions beyond human perceptual limits.

- Revealed a blind spot where mild fibrosis and other subtle lesions often go undetected due to CT value similarity with normal tissue.
- Proposed a deep-learning workflow to uncover previously invisible lesions, by suppressing irrelevant structures and optimizing CT windows.
- Enabled radiologists to discover new subvisual parenchymal abnormalities strongly associated with clinical outcomes in both COVID-19 inpatient (n=1,193) and survivor (n=219) cohorts.
- Published in *Nature Machine Intelligence*; **ranked #1** in online impact for its cohort ([Altmetric](#)).

AI as Independent Diagnostic Test in Emergency PE Detection | 2022–2025

I proposed a paradigm for medical AI trust beyond post hoc justification, and developed SPEA as its first realization—an AI system that diagnoses pulmonary embolism (PE) from non-contrast CT. SPEA was **prospectively** validated as an independent diagnostic test in emergency care.

- Defined a new diagnostic paradigm, overturning the longstanding belief that non-contrast CT lacks value for PE—a leading cause of cardiovascular death within hours of onset.
- Proposed a generalizable verification framework (HSS) that enforces pathology-grounded constraints during training and generates interpretable, biomarker-like outputs—enabling medical trust without post hoc explanation.
- Trained on 43,000+ CT scans and validated on 5,500+ retrospective and 1,004 prospective emergency cases, with real-time predictions aligning closely with the clinical gold standard (CTPA).
- Under review (invited submission with guaranteed external review, [GitHub Link](#)) in *Nature Cardiovascular Research*.

Foundation model for X-ray tomography restoration | 2023–2025

I developed the core self-supervised learning algorithm that powers HorusEye—a foundation model for restoring diverse X-ray tomography modalities from noisy or degraded inputs.

- Designed a contrastive learning scheme to disentangle structure from noise, enabling realistic degradation modeling from unpaired real-world data.
- Supported cross-modality generalization across 7+ tomography types (e.g., CT, spectral CT, ptychography) from millimeter to nanometer resolution.
- Trained on 100M+ images; Demonstrated substantial improvements over task-specific SOTA methods; Enhanced radiologist interpretation and CAD performance across multiple downstream tasks.
- Under review ([GitHub Link](#)) in *Nature Computational Science*.

Undergraduate research experience in cognitive neuroscience | 2017–2019

Completed a two-year research assistantship in cognitive neuroscience labs under Prof. Xiaochu Zhang (University of Science and Technology of China) and Prof. Matt Walker (University of California, Berkeley).

- Received formal training in research ethics, human subject recruitment, and experimental methodology.
- Studied algorithmic foundations for fMRI, EEG, and medical imaging, including k-space sampling, spectral analysis and inverse modeling.
- Recruited over 500 participants and collected multimodal brain data (fMRI/EEG) from more than 200 subjects.
- Assisted with experimental design, stimulus programming, and behavioral data analysis.
- Gained foundational experience in empirical research and developed long-term interest in human-AI interaction.

Other Publications

Journal (#equal contribution; *corresponding author)

1. Juexiao Zhou[#]; **Longxi Zhou[#]**; Di Wang; Xiaopeng Xu; Haoyang Li; Yuetan Chu; Wenkai Han; Xin Gao^{*}. Personalized and privacy-preserving federated heterogeneous medical image analysis with PPPML-HMI. *Computers in Biology and Medicine* (IF=7.0). DOI: 10.1038/s41467-024-50043-3.
2. Yuetan Chu[#]; Gongning Luo[#]; **Longxi Zhou**; Shaocong Cao; Guolin Ma; Xianglin Meng; Juexiao Zhou; ...; Xin Gao^{*}. Deep learning-driven pulmonary artery and vein segmentation reveals demography-associated vasculature anatomical differences. *Nature Communications* (IF=14.7). DOI: 10.1038/s41467-025-56505-6.
3. Juexiao Zhou; Bin Zhang; Haoyang Li; **Longxi Zhou**; Zhongxiao Li; Yongkang Long; Wenkai Han; ...; Xin Gao^{*}. Annotating TSSs in Multiple Cell Types Based on DNA Sequence and RNA-Seq Data via DeeReCT-TSS. *Genomics, Proteomics & Bioinformatics* (IF=8.85). DOI: 10.1016/j.gpb.2022.11.010.
4. Zhengde Wei[#]; Ying Chen[#]; Qian Zhao; Pengyu Zhang; **Longxi Zhou**; Jiecheng Ren; Yi Piao; ...; Xiaochu Zhang^{*}. Implicit Perception of Differences between NLP-Produced and Human-Produced Language in the Mentalizing Network. *Advanced Science* (IF=14.3). DOI: 10.1002/adv.202203990.
5. Yuetan Chu; Yilan Zhang; Zhongyi Han; Changchun Yang; **Longxi Zhou**; Gongning Luo; Chao Huang; Xin Gao^{*}. Improving Representation of High-frequency Components for Medical Visual Foundation Models. *IEEE Transactions on Medical Imaging* (IF=10.0). DOI: 10.1109/TMI.2025.3559402.
6. Juexiao Zhou[#]; Xiaonan He[#]; Liyuan Sun[#]; Jiannan Xu; Xiuying Chen; Yuetan Chu; **Longxi Zhou**; Xingyu Liao; ...; Xin Gao^{*}. Pre-trained multimodal large language model enhances dermatological diagnosis using SkinGPT-4. *Nature Communications* (IF=14.7). DOI: 10.1038/s41467-024-50043-3.
7. Juexiao Zhou[#]; Siyuan Chen[#]; Yulian Wu[#]; Haoyang Li; Bin Zhang; **Longxi Zhou**; Yan Hu; Zihang Xiang; ...; Xin Gao^{*}. PPML-Omics: A privacy-preserving federated machine learning method protects patients' privacy in omic data. *Science Advances* (IF=11.7). DOI: 10.1126/sciadv.adh8601.
8. Juexiao Zhou[#]; Haoyang Li[#]; Xingyu Liao; Bin Zhang; Wenjia He; Zhongxiao Li; **Longxi Zhou**; Xin Gao^{*}. A unified method to revoke the private data of patients in intelligent healthcare with audit to forget. *Nature Communications* (IF=14.7). DOI: 10.1038/s41467-023-41703-x.

Conference (#equal contribution; *corresponding author)

9. Yuetan Chu; **Longxi Zhou**; Gongning Luo; Zhaowen Qiu; Xin Gao^{*}. Topology-Preserving Computed Tomography Super-Resolution Based on Dual-Stream Diffusion Model. *Medical Image Computing and Computer Assisted Interventions (MICCAI) 2023*. DOI: 10.1007/978-3-031-43999-5_25.

Patents and Patent Applications

1. [CN114820571B](#) (Granted Patent) — "A Quantitative Analysis Method for Pulmonary Fibrosis Based on the DLPE Algorithm"; **Inventor**; China National Intellectual Property Administration; publication date: May 30, 2023
2. [U.S. Patent Application No. 17/917,036](#) (Substantive Examination) — "A Pulmonary Embolism Detection Method Based on Non-contrast CT"; **Inventor**; published as US 2023/0154006 A1
3. [CN115984300A](#) (Substantive Examination) — "A Pulmonary Embolism Detection Method Based on Non-contrast CT"; **Inventor**; China National Intellectual Property Administration; publication date: April 18, 2023
4. [CN115797308A](#) (Substantive Examination) — "A Segmentation Method for Breast Tumor in DCE-MRI"; **Inventor**; China National Intellectual Property Administration; publication date: March 14, 2023

Teaching Experience & Mentorship & Outreach

Teaching Assistant — CS220, Data Analytics | KAUST | Fall 2021–2023

- Supported course delivery under Prof. Xin Gao for three consecutive years.

Teaching & Technical Training

- Delivered hands-on tutorials to technicians at Heilongjiang TuoMeng Technology Co. (2020-2023).
- Authored a comprehensive user manual for my medical AI system, including setup, deployment, site-specific fine-tuning, and maintenance instructions (2022-2023).

Research & Writing Mentorship

- As the **first** Ph.D. student in medical imaging in Prof. Xin Gao's group, I mentored junior Ph.D. students and research interns (2021–2024), providing guidance on experimental design, manuscript writing and troubleshooting.
- My research article published in [Nature Machine Intelligence](#) was selected as exemplary material for graduate course “Advanced English Language Communication” (ENG 100), KAUST.

Honors

King Abdullah University of Science and Technology, KAUST

- CEMSE Dean's List Award, 2023
- CEMSE Dean's List Award, 2022
- Excellent Research Award, CEMSE, 2022
- CEMSE Dean's List Award, 2021

Badminton:

- Men's Singles Runner Up: The Badminton Championship at King Abdullah University of Science and Technology (KAUST), 2024.
- Men's Doubles Champion: The Badminton Championship at King Abdullah University of Science and Technology (KAUST), 2021.
- Men's Singles Runner Up: The Champion Cup at University of Science and Technology of China (USTC), 2017.