KUN XIANG

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INTRODUCTION

I am currently a research assistant at the HCP-I2 Lab of Sun Yat-sen University under the supervision of Prof. Xiaodan Liang. I have obtained a Bachelor's and Master's degree in Engineering from Sun Yat-sen University under the supervision of Prof. Shancheng Jiang. My research interests include:

- **Multimodal Large Language Model:** Visual Language Model, Slow Thinking and Higher-Order Reasoning.
- **Trustworthy Machine Learning:** Adversarial Robustness, the Worst Case Learning, Out-of-Distribution generalization and interpretability.
- **Computer Aided Diagnosis System:** Medical imaging analysis, Diagnostic Report Generation.

EDUCATION

SUN YAT-SEN UNIVERSITY

M.E. Mechanical Engineering (Electronic Information) GPA:3.8/4.0 *2021.09 - 2024.06*

B.E. Automation GPA:3.2/4.0 *2017.09 - 2021.06*

PUBLICATION & MANUSCRIPT

- **K Xiang***, Z Liu*, et al. *AtomThink: A Slow Thinking Framework for Multimodal Mathematical Reasoning* (**CVPR 2025 Submitted**).
- K Chen, Y Gou, et al. *Emova: Empowering Language Models to See, Listen and Talk With Vibrant Emotions* (**CVPR 2025 Submitted**).
- **K Xiang***, X Zhang*, et al. *Toward Robust Diagnosis: A Contour Attention Preserving Adversarial Defense for COVID-19 Detection* AAAI 2023 (**Accepted**).
- **K Xiang***, L Peng*, et al. *A novel weight pruning strategy for light weight neural networks with application to the diagnosis of skin disease* Applied Soft Computing (**Accepted**).
- S Jiang, Z Wu, H Yan, **K Xiang***, et al. *A Prior Knowledge-guided Distributionally Robust Optimization based Adversarial Training Strategy for Medical Image Classification*, Information Sciences (**Accepted**).
- **K Xiang**, S Jiang. *Rethink the Worst-case Training: Learning Label Distribution with Human-aligned Prototype* (**In Progress**).
- **K Xiang***, S Jiang, L Wu. *An optimization method, apparatus, and medium for a predictive model of resource industry information.* **Published Patent**(202111201525.8).

EXPERIENCE

Human Cyber Physical Inteligence Integration Lab Shenzhen, CN

Research Assistant *2024.09 - Present*

- We introduced AtomThink, a comprehensive framework that guides MLLMs to **focus on atomic step reasoning**, which obtains consistent performance improvements across multiple baseline MLLMs.
- By designing **an atomic capability evaluation** based on outcome supervision, we reveal the capability distribution of MLLMs in generating each type of atomic step.
- A **multimodal long CoT dataset** specifically focused on multimodal mathematical tasks, AtomMATH, is developed.

National Natural Science Foundation of China Shenzhen, CN
Principal researcher *2021.09 - 2024.06*

- Based on nationality and ethnicity, we constructed the first COVID-19 CT imaging database with different distribution shifts, aimed at evaluating the vulnerability of computer-aided diagnosis systems in scenarios of **adversarial perturbations** and **Out-of-Distribution conditions**.
- We developed an **attention parameter regularization technique** that implicitly injects lung contour prior knowledge into the Vision Transformer model and employs a composite distance metric to optimize the "min-max" problem.
- We proposed **a transferable adversarial training framework** to resist the impacts of unseen noise and data distribution shifts, achieving the highest model robustness under various metrics. A paper on this research was published in **AAAI 2023**.
- Recently, we are also conducting a research on the unifying theory of worst-case learning and adversarial learning.

Guangdong Province Science and Technology Innovation Fund Guangzhou, CN
Principal *2019.11 - 2022.06*

- Led the development of a **lightweight auxiliary diagnostic software** aimed at patients with dermatological conditions and small to medium-sized clinics, incorporating autoencoders to realize a workflow for classification-diagnostic report generation.
- Collected and preprocessed dermatoscopic medical images from the past decade of a top-tier dermatology hospital.
- Analyzed the weight distribution of different modules within various neural networks and proposed a **hierarchical adaptive network pruning algorithm** suitable for dermatological auxiliary diagnosis, significantly enhancing the diagnostic accuracy of smaller models. A paper on this research was published in **Applied Soft Computing**.

Intelligent Loading Project in China COSCO Shipping Corporation Limited Guangzhou, CN
Main Developer *2023.01 - 2023.12*

- Developed an optimization method for the rectangular packing problem based on the greedy algorithm. It simultaneously satisfies requirements for regional obstacle avoidance, limits on the number of wall contacts, restrictions on the shape of rectangles and adaptability to irregular containers.
- The packing efficiency has been achieved to over 98% and exceeded the existing optimization algorithm of the department in all indicators.

Sangfor Technologies Inc. Shenzhen, CN
Development Intern *2021.04 - 2021.08*

- Participated in the "Data Warehouse Intelligent Index Evaluation Engine" project, responsible for designing a SQL lexical parsing algorithm based on Calcite prior to executing intelligent recommendation aggregation groups.
- Designed a **Cardinality Estimation Pruning algorithm** that reduces the cardinality information required for computation in dimension and fact tables based on overlap rates and substitution relationships, achieving a computational speed increase of up to 75 times.
- Wrote an automatic SQL generator for different data connection modes.

AWARDS

- **Outstanding Graduate of Sun Yat-sen University (Top 0.5%)** *2024.06*
- Intelligent Healthcare Scholarship of SYSU (Top 1%) *2024.02*
- First and Second-Class Scholarship of SYSU (Three times) *2021.10-2024.02*
- **National Scholarship (Top 0.5%)** *2022.11*

· Graduate Studies Advancement Scholarship of SYSU (Top 2%) *2021.10*

· **Provincial First Prize** of the 16th "Challenge Cup" Competition *2021.07*

· **National Third Prize** of the 17th "Challenge Cup" Competition *2021.09*

· **Provincial Silver Prize** of the 7th "Internet+" Competition *2021.09*

· Academic Progress Scholarship Awardee of SYSU *2019.10*

COMMUNITY CONTRIBUTION

Journal Reviewer:

· Applied Soft Computing (ASOC)

· IEEE Transactions on Neural Networks and Learning Systems (TNNLS)

· IEEE Journal of Biomedical and Health Informatics (JBHI)

· Information Sciences (IS).

Campus Position:

· Minister of the Life Department of the Student Union, SYSU.

Teaching Assistant Experiences:

· Operations Research, ISE311, Autumn 2021-2022.

· Data Structure and Algorithm, ISE229, Autumn 2022-2023.

SKILLS

· **Programming:** Python, C, Shell, SQL, Pytorch, Tensorflow, Keras, OpenCV etc.

· **Office Software**: Latex, Markdown, Word, Excel, PowerPoint, Visio etc.

· **Language Proficiency**: CET-4, CET-6.