Xiaoyu Liu

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EDUCATION

Huazhong University of Science and Technology **Wuhan, CHN**
M.Sc. in Control Science and Engineering *Sep. 2022 - June 2025 (expected)*
- Grade: 91.35 / 100

Central South University **Changsha, CHN**
B.E. in Intelligent Science and Technology *Sep. 2018 - June 2022*
- Grade: 90.91 / 100

PUBLICATIONS

- **Xiaoyu Liu**, Beitong Zhou, and Cheng Cheng. "PLReMix: Combating Noisy Labels with Pseudo-Label Relaxed Contrastive Representation Learning." *arXiv preprint arXiv:2402.17589* (2024).
- Cheng Cheng, **Xiaoyu Liu**, Beitong Zhou, and Ye Yuan. "Intelligent fault diagnosis with noisy labels via semi-supervised learning on industrial time series." *IEEE Transactions on Industrial Informatics* (2023).
- Yinuo Jiang, Beitong Zhou, **Xiaoyu Liu**, Qingyi Li, and Cheng Cheng. "GTINet: Global Topology-aware Interactions for Unsupervised Point Cloud Registration." *IEEE Transactions on Circuits and Systems for Video Technology* (2024).
- Longjianjie Zhang, **Xiaoyu Liu**, Ziheng Zhou, Zhihui Wang, Feng Hua, and Cheng Cheng. "Surface roughness prediction in boring of TC4-DT with multi-sensor data and machining parameters." *2024 IEEE International Conference on Prognostics and Health Management* (Accepted).

RESEARCH INTREST

Multi-modal Learning, Large Language Model, Weakly-supervised Learning, Vision Language Pre-training

RESEARCH EXPERIENCE

Pulmonary Embolism Diagnosis With Multimodal Large Language Model *Feb. 2024 - Now*
- Utilize multimodal large language model to analyze patients' conditions and predict their mortality on a self-collected unstructured multimodal pulmonary embolism medical consultation dataset (containing CT, ultrasonography, radiography, ECG, examination reports, etc.).
- Cooperate with Department of Internal Medicine, Tongji Hospital. (In progress)

Improve Multimodal Large Language Model *Dec. 2023 - Now*
- Propose LLaVA$^{\alpha}$ which utilizes Alpha-CLIP to decide where to focus, alleviating the LLaVA image encoder information bottleneck and multimodal model hallucination. (In progress)

Improve Learning With Noisy Labels Through Data Correlation Mining *Sep. 2022 - Nov. 2023*
- Analyze the conflict between supervised learning and contrastive learning when learning with noisy labels, and propose a pluggable PLR loss to address the issue.
- Utilize the two-dimensional Gaussian Mixture Model to filter out noisy samples, considering the loss values and intrinsic data correlation.

Learning With Noisy Labeled Fault Diagnosis Time Series Data *June 2022 - Nov. 2023*
- Introduce a semi-supervised co-learning method into an industrial dataset of rolling element bearings for fault diagnosis, which is robust to noisy annotated labels. The paper has been published in IEEE Transactions on Industrial Informatics.

ACADEMIC PROJECTS

Blade Knife Automatic Selection with LLM *Jan. 2024 - Now*
Project Leader
- In the process of aero-engine blade machining, use CatBoost to predict a reasonable initial value of the knife size, then use LLM to automate the tool screening process until it passes the system simulation test, avoiding the tedious steps of manual trial and error.
- Design and develop a natural language interactive agent-based machining process control system, which operates serialized process objects through an LLM and realizes the fine adjustment of process flow and parameters.
- Cooperate with JITRI - Jiangsu Industrial Technology Research Institute.

LLM Agent Anime Characters Chatbot *Nov. 2023 - Dec. 2023*
Independent Developer

- Build an LLM chatbot based on ModelScope, LangChain and Gradio, use prompts and document retrieval to give characters different personalities and memories. Demo
- Won the best popularity award in Tongyi Qianwen Agent Builder Creative Challenge Track. (20/654)

Intelligent Anti-epidemic Disinfection Vehicle *Sep. 2020 - May 2021*
Project Leader

- Develop an SSD-based mask-wearing detection algorithm for the anti-epidemic disinfection vehicle, which is deployed on Raspberry Pi 4b, with recognition accuracy reaching 89% and the speed up to 5 f/s.
- Develop the website backend based on Flask, which controls and monitors the vehicle through MQTT and RTMP.
- Collect one first-class national prize and two third-class national prizes.

MIT-BIH ECG Arrhythmia Diagnosis *Mar. 2020 - June 2022*
Project Leader

- Propose an ECG arrhythmia diagnosis algorithm based on time-series Transformer autoencoder and GWO-SVM Optimizer.
- Develop a knowledge graph-based consultation system for cardiovascular diseases with Scrapy crawling the data and Neo4j building the graph database. Code
- Be selected as the excellent project in the National Undergraduate Innovation and Entrepreneurship Project by Central South University. (10%)

INTERNSHIP

Baidu, Inc. *June. 2024 - Now*
Large Language Model Algorithm Intern

- Responsible for the content production pipeline of Baidu Zhidao, collecting relevant materials from the entire internet based on user query data, fine-tuning LLMs to generate answers, and deploying a low-cost content production line with a daily output of hundreds of thousands.
- Develop a multimodal agent routing-based response generation scheme to tackle issues arising from crucial information concealed in images. This enables the model to autonomously choose a response generation scheme based on plain text/+OCR/+original images according to the amount of information and relevance, achieving a 29% improvement in content usability.

AWARDS & HONORS

First-class Scholarship for Postgraduates, Huazhong University of Science and Technology *2022*
Outstanding Graduates, Central South University *2022*
Excellent Student (10%), Central South University *2019&2020&2021*
Third-class National Prize (Top-20 in China) *2021*
National College Student Software Innovation Competition
First-class National Prize (Top-5 in China) *2020*
China Robotics and Artificial Intelligence Competition
Third-class National Prize (15% in China) *2020*
Undergraduate Electronic Design Contest - 2020 Embedded System Design Invitational Contest
Third-class National Prize (20% in China) *2020*
Chinese Collegiate Computing Competition

OPEN SOURCE COMMUNITY CONTRIBUTIONS

- **Bug Fix in Spijkervet/SimCLR** Fix the bug in Distributed Data Parallel implementation of Pytorch SimCLR. Link
- **ECG Classification Baseline** Build baseline and tutorial for MIT-BIH ECG classification and earn 100+ stars. Link

SKILLS

Programming Languages: Python, Java, JavaScript, C++, Matlab
Machine Learning Tools: PyTorch, HuggingFace Transformers, DeepSpeed, LangChain, Sklearn, Conda, Gradio
Development Tools: Flask, Vue.js, MySQL, Docker, Git, Linux
Algorithm: PAT Computer Ability Test - Programming - Level A - 97/100
Languages: English (CET-4: 580, CET-6: 524, IELTS: 7.0), Mandarin (Mother Tongue)