Gelei Xu

Curriculum Vitae

Department of Computer Science and Engineering
College of Engineering
University of Notre Dame
Notre Dame, IN 46556 USA

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Research Interests

On-device AI, AI for Healthcare, Fairness in AI.

Education

University of Notre Dame 2023 – Present
Ph.D. Student in Computer Science and Engineering *Notre Dame, IN, USA*
Advisor: Yiyu Shi
GPA: 4.0/4.0

Southern University of Science and Technology 2019 – 2023
B.E. in Computer Science and Engineering *Shenzhen, Guangdong, China*
Advisor: Jiang Liu
GPA: 3.73/4.0

Selected Honors and Awards

Graduate School Professional Development Awards, Notre Dame ($3750 in total)	2024, 2025
DAC Young Fellow	2024
Lyman Taylor & W Stuart Travel Award ($1500)	2024
Excellent Graduate in the SUSTech (Top 10%)	2023
Enterprise Intelligence Base Scholarship (¥5000)	2022

Major Refereed Conference and Journal Papers

[1] **The Cost of Local and Global Fairness in Federated Learning**
Yuying Duan, Gelei Xu, Yiyu Shi, and Michael Lemmon
Proceedings of the 2025 International Conference on Artificial Intelligence and Statistics (AISTATS 2025)

[2] **Enabling On-Device Learning via Experience Replay with Efficient Dataset Condensation**
Gelei Xu, Ningzhi Tang, Jun Xia, Ruiyang Qin, Wei Jin, and Yiyu Shi
Proceedings of the 2024 Design, Automation & Test in Europe Conference & Exhibition (DATE 2024)

[3] **Automatic Cortical Cataract Classification Framework Based on AS-OCT Images**
Gelei Xu*, Xiaoqing Zhang*, Zunjie Xiao, Risa Higashita, Wan Chen, Jin Yuan, and Jiang Liu
Computer Systems & Applications (CSA), 2022, 31(12).

[4] **A Novel Local-Global Spatial Attention Network for Cortical Cataract Classification in AS-OCT**
Zunjie Xiao, Xiaoqing Zhang, Qingyang Sun, Zhuofei Wei, Gelei Xu, Yuan Jin, Risa Higashita, and Jiang Liu
Proceedings of the Pattern Recognition and Computer Vision: 5th Chinese Conference (PRCV 2022).

[5] **Channel-Wise and Spatial Feature Recalibration Network for Nuclear Cataract Classification**
Xiaoqing Zhang, Gelei Xu, Junyong Shen, Zunjie Xiao, Qiuyang Yan, Jin Yuan, Risa Higashita, Jiang Liu
Proceedings of the 2022 IEEE International Conference on Multimedia and Expo (ICME 2022)

[6] **CCA-Net: Clinical-awareness Attention Network for Nuclear Cataract Classification in AS-OCT**
Xiaoqing Zhang, Zunjie Xiao, Lingxi Hu, Gelei Xu, Risa Higashita, Wan Chen, Jin Yuan, Jiang Liu
Knowledge-Based Systems (KBS), 2022, 250.

Lightly Reviewed Posters, Extended Abstracts, and Workshop Papers

[1] **An Adaptive System for Wearable Devices to Detect Stress Using Physiological Signals**
Gelei Xu, Ruiyang Qin, Zhi Zheng, and Yiyu Shi
Proceedings of the 2024 Workshop on Conference on Human Factors in Computing Systems (CHI)

Papers Under Review

[1] **Achieving Fairness in Dermatological Disease Diagnosis through Automatic Weight Adjusting Federated Learning and Personalization**
Gelei Xu, Yawen Wu, Jingtong Hu, and Yiyu Shi
arXiv preprint arXiv:2208.11187

Research Experience

Ensuring Fair AI in Medical Image Processing Without Sacrificing Accuracy 2024 – Present
Lead Researcher *University of Notre Dame*

- Propose that current fair AI methods for medical image processing cannot be practically implemented because they sacrifice accuracy and consistently fail to maximize the performance of certain groups.
- Designed an algorithm to train a personalized model for each group to maximize their performance. Specifically, each group will select the subset that is most helpful to them from the other groups.

On-Device Efficient Data Condensation 2023 – 2024
Lead Researcher, Paper Accepted at DATE 2025 *University of Notre Dame*

- Proposed a summarizing method to integrate the knowledge of original images into a more informative memory for on-device learning.
- Efficiently match the training gradients between real samples and synthetic samples, and optimize the samples to better represent the entire data stream distribution in a self-supervised fashion.

Fair Federated Learning for Dermatological Disease Diagnosis 2022 – 2023
Lead Researcher *University of Notre Dame*
- Proposed a framework with in-FL and post-FL to solve the fairness problem systematically and achieve fairness without sacrificing overall classification performance.
- Designed an automatic weight adjuster in our in-FL stage that assigns the weight of each client with the exponential loss value times the scaling factor, which is flexible and efficient to achieve fairness in the extremely imbalanced dataset.

Cataract Intelligent Diagnosis and Screening System 2021 – 2022
Lead Researcher, Paper Accepted at Computer Systems & Applications *SUSTech*
- Proposed an automatic cortical cataract classification framework based on AS-OCT images, utilizing texture features such as gray-level co-occurrence matrix (GLCM), gray-level size zone matrix (GLSZM), and neighborhood gray-tone difference matrix (NGTDM).
- Developed a multimodal-based automatic method for nuclear cataract classification.
- Participated in The Ministry of Education's National College Students' Innovative Entrepreneurial Training Program, where we built an intelligent diagnosis and screening platform for cataracts.

Professional Experience

Research Assistant 2023
The First Affiliated Hospital, Sun Yat-sen University *Guangzhou, China*
- Designed a neural network with doctors for predicting liver tumor prognosis using sequential CT images.

Teaching Experience

Teaching Assistant, *CSE 20221 Logic Design* Spring 2024
Department of Computer Science and Engineering, University of Notre Dame
Teaching Assistant, *CSE 40535 Computer Vision* Fall 2023
Department of Computer Science and Engineering, University of Notre Dame

Service

Committee Member, College of Engineering Grad Student Leadership Committee, 2024 – 2025
Reviewer, TOIS, TECS, RO-MAN, Scientific Reports

Languages

English – Proficient, **Chinese (Mandarin)** – Native