Fei Zhao

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Summary

With **14 years of multimodal machine learning expertise**, my foundation is solidly built on rigorous theoretical research from my master's and Ph.D. studies, and has been further refined through 6 years of practical engineering applications in my role as a senior engineer in the industry. My research focuses on **Foundational Vision-Language Models**, **Parameter-Efficient Fine-Tuning** (PEFT), **Cross-modal Generation** (image-to-text), and **Multimodal Fusion**, leading to 11 publications in prestigious venues.

Education

Ph.D., Computer Science *2019.08 - 2025.12 (Expected)*
The University of Alabama at Birmingham (UAB), United States
GPA: 4.00/4.00, Advisor: Prof. Chengcui Zhang

M.E., Measuring and Testing Technologies and Instruments *2010.09 - 2013.07*
North University of China, China
Exchange Graduate Student at Tsinghua University (2011.02 - 2013.07)
Advisor: Prof. Zhaoying Zhou and Prof. Jijun Xiong

B.E., Automation *2006.09 - 2010.07*
North University of China, China

Selected Projects

Handwritten Check Analysis with Cross-modal Generation *2023.09 - Present*

- Designed **multimodal prompt learning** strategies for foundational vision-language models to enhance performance across multiple tasks, including handwriting recognition (OCR) and visual question answering (VQA).
- Led a team to build **the first** image-to-text handwritten check dataset with 54,154 samples in 11 classes such as payee and amount. Designed a segmentation pipeline with vision foundation models to reduce annotation workload.

Paper Ballot Tabulation and Voter Fraud Detection *2020.10 - Present*

- Pioneered AI-based voter fraud detection by designing a **Siamese Transformer-based** neural network, the first of its kind, to analyze discrepancies between paired ballot images for improved security in mail-in voting processes.
- Played a pivotal role in securing a **$1.2 million NSF grant** by contributing significantly to the model design and proposal writing.

Projects Involving Remote Sensing and Multimodal Integration *2020.01 - Present*

- Designed a **learnable prompt generator** that provides multi-stage visual prompts guiding pre-trained **vision foundation models** for damage evaluation from remote sensing imagery, surpassing SOTA methods by 22.37%.
- Developed **Transformer-based** neural networks with a geometric-based multimodal loss, fusing satellite, elevation, and temperature data to enhance algal bloom severity assessments, surpassing existing methods by 15.65%

Selected Publications

Published

- **Fei Zhao**, Chengcui Zhang, and Baocheng Geng. Deep Multimodal Data Fusion. *ACM Computing Surveys*, February 2024. **[Impact Factor: 16.6]**
- Connor Donley, Matthew McCrosson, Sri Prahad, Collier Campbell, **Fei Zhao**, Narcy Amireddy, and Michael Johnson. High Research Productivity During Orthopaedic Surgery Residency May Be Predicted by Number of Publications as a Medical Student. *Journal of Bone and Joint Surgery*, January 30, 2024. **[Impact Factor: 5.3]**
- **Fei Zhao** and Chengcui Zhang. Deep Learning for HABs Prediction with Multimodal Fusion. *ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL 2023).* November 13-16, 2023, Hamburg, Germany.
- **Fei Zhao**, Chengcui Zhang, Nitesh Saxena, Dan Wallach, and Shahariar Rabby. Ballot Tabulation using Deep Learning. *IEEE International Conference on Information Reuse and Integration (IRI)*, August 4-6, 2023, Bellevue, WA, United States. [**Acceptance Rate of Full Papers: 29%**]
- **Fei Zhao**, Chengcui Zhang, and Sheikh Abujar. A Multimodal Approach for Evaluating Algal Bloom Severity using Deep Learning. *IEEE International Conference on Multimedia and Expo (ICME)*. July 10-14, 2023, Brisbane, Australia.
- Katherine Dudding, Allyson Sanders, Peyton Lewis, **Fei Zhao**, Chengcui Zhang, and Jane Carrington. Leveraging Clinical Experiences to Inform Optimal Neonatal Outcomes Through Technology. *Academy of Neonatal Nursing National Neonatal, Advanced Practice Conference, and Mother Baby Nurses Conferences*, September 7-10, 2022, Palm Springs, CA, United States. (Poster)
- **Fei Zhao** and Chengcui Zhang. Building Damage Evaluation from Satellite Imagery using Deep Learning. *IEEE International Conference on Information Reuse and Integration (IRI)*, August 11-13, 2020, held virtually. [**Acceptance Rate of Full Papers: 29%**]
- **Fei Zhao**, Zhaoying Zhou, Jijun Xiong, Jifeng Zhao, and Jiajin Liu. Research on MEMS-based Real-Time Measurement System for Motion Information of Vehicles. *Key Engineering Materials*, 562, 549-552, 2013.
- Xiaotang Cao, Yunbo Shi, Zhaoying Zhou, Shaopeng Liu, Qi Guo, **Fei Zhao**. MEMS-based Attitude Measurement System for Micro Aerial Vehicles. *Transducer and Microsystem Technologies*, 32(2), 122-3, 2013.

Under Review

- **Fei Zhao**, Chengcui Zhang and Nitesh Saxen. BubbleSig: Same-Hand Ballot Stuffing Detection. *The 33rd USENIX Security Symposium.*
- **Fei Zhao**, Chengcui Zhang, and Katherine Dudding. Neonatal Pain Detection using Deep Learning. *Journal of Healthcare Informatics Research.*

Pre-prints

- **Fei Zhao** and Chengcui Zhang. Visual Prompt Learning of Foundation Models for Post-disaster Damage Assessment. (Manuscript ready for submission)
- **Fei Zhao** and Chengcui Zhang. Parameter-Efficient Adaptation of Vision Foundation Models for Building Damage Evaluation. (Manuscript ready for submission)
- **Fei Zhao** and Chengcui Zhang. Multimodal Algal Bloom Severity Evaluation Using Deep Learning: Leveraging Satellite Imagery, Elevation, Temperature, and Geolocation Data. (Manuscript ready for submission)
- Augmented Communication Tools (ACTs): Pain Assessment Support Algorithm for the Individual Infant (PASAFii) for the neonatal pain algorithm. *Provisional Patent.*

Professional and Research Experience

The University of Alabama at Birmingham *Birmingham, USA*
Graduate Research/Teaching Assistant, Department of Computer Science *2019.08 - Present*

- **Graduate Research Assistant**: Designed novel deep neural networks and loss functions for multimodal fusion, cross-modal generation, object detection and segmentation tasks, leading to publications in top-tier conferences.
- **Graduate Teaching Assistant**: Led TA teams, taught lab sections, held office hours, and created/graded assignments. Selected Courses: System Programming, Database App Dev, Computer Vision, and Deep Learning.

Shanxi Auto Transport Group Co., Ltd (Shanxi Auto Trans) *Taiyuan, China*
Principal Engineer, Investment & Development Department, Headquarters *2017.01 - 2019.04*
Vice President, Maintenance Plant, Shanxi Auto Trans Logistics Co., Ltd *2014.09 - 2015.05*
Deputy Division Director, Department of Tech & Security, Shanxi Auto Trans Logistics Co., Ltd *2014.05 - 2014.08*
Senior Engineer (incl. concurrent roles), Tech Department, Headquarters *2013.10 - 2016.12*

- Led a team of engineers to leverage deep technical knowledge, advising leadership on emerging technologies and their industrial applications. Provided technical guidance during a $1.39 million investment in a ridesharing startup.
- Led a team to integrate machine learning models (e.g., SVM) with database, developing a system to evaluate driver behaviors. This initiative not only enhanced safety but also resulted in a 7.3% improvement in MPG.
- In concurrent managerial roles, oversaw and coordinated the deployment of the system across company subsidiaries.

Tsinghua University *Beijing, China*
Research Assistant, Department of Precision Instrument, Supervisor: Prof. Zhaoying Zhou *2011.02 - 2013.07*

- Led a team to develop a real-time multimodal data fusion system. This system efficiently extracts air vehicle's attitude features from accelerometers, gyroscopes, and magnetometers, enhancing autopilot capabilities.

Grants, Awards, and Others

Grants

- Chengcui Zhang (PI), Nitesh Saxena (PI), Dan Wallach (PI), NSF SaTC-2154589, "Bubble Aid: Assistive AI to Improve the Robustness and Security of Reading Hand-Marked Ballots,"$1,200,000, 10/01/2022-09/30/2025. (Main contributor to preliminary work and part of the grant writing)
- Chengcui Zhang (PI), NSF DCL 22-087, "Funding for AWS, Azure, and GCP cloud access through CloudBank," $23,139, 04/26/2023-05/01/2024. (Contributed to grant writing)

Awards

- Graduate Research/Teaching Assistantship, Department of Computer Science, UAB, 2019-Present.
- Student Travel Grant to IEEE IRI 2023, IEEE TCMC, 2023.
- Professional Development and Travel Award, UAB Graduate Student Government, 2023.
- Barrett R. and Oceana A. Bryant Endowed Awards, Department of Computer Science, UAB, 2020, 2023.
- Tuition Scholarship, Department of Computer Science, UAB, 2019-2022.
- Outstanding Student Volunteer Award, IEEE IRI, 2020-2021.
- Graduate Admission Scholarship, North University of China, 2010.

Panels

- Panelist, "Global Awareness: International Student Insights on the Experience of Studying in the United States," UAB, 2023.

- Panelist, "Orientation for International Graduate Students," UAB, Summer Semester, 2023.
- Panelist, "Orientation for International Graduate Students," UAB, Fall Semester, 2023.

Reviewer

- Frequent Reviewer for **13** Prestigious Journals, including ACM Computing Surveys, IEEE TGRS, IEEE TDSC, IEEE/ACM TCBB, IEEE GRSL, Knowledge-based Systems, and Expert Systems with Applications, among others.

- Reviewer for Top-tier Conferences: ICME (2020-2024), ACM Multimedia (2021-2024), ICASSP (2023, 2024)

Volunteer

- IT Support and Web Development: The World Games (2022), IEEE IRI (2020-2021), Birmingham Chinese Professor Association (2020-present)
- Others: United States Anti-Doping Agency (2022)

Skills

- Programming Languages: Python, C, MATLAB, SQL, Bash, TeX, JavaScript, CSS
- Development Tools: Pytorch, TensorFlow, Numpy, OpenCV, Scikit-learn, Pandas, D3.js, MPI, Git, Conda