Yifan Zhang

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Research Interests

My research focuses on artificial intelligence, particularly in Neural-Symbolic AI for Software Engineering, Data-Centric AI for Systems, and Applied AI. In Neural-Symbolic AI for Software Engineering, I combine symbolic reasoning with neural networks to enhance the interpretability and effectiveness of AI in software engineering tasks. In Data-Centric AI for Systems, I focus on optimizing data to improve system performance and efficiency. My applied research aims to develop reliable AI systems that address practical challenges, advancing both technology and real-world applications.

Education

Vanderbilt University *Nashville, TN, USA*
Ph.D. in Computer Science, Specialize in AI for Software Engineering *Jun. 2022 – Apr. 2026 (Expected)*
- Advised by Prof. Kevin J. Leach & Prof. Yu Huang

Georgia Institute of Technology *Atlanta, GA, USA*
M.Sc. in Computer Science, Specialize in Machine Learning *Aug. 2022 – Jun. 2025*
- Studied courses in RL and program analysis

China University of Petroleum *Beijing, CN*
M.Eng. in Petroleum Engineering, Specialize in Industrial & System Engineering *Sep. 2012 – Jun. 2019*
- Double majored in English (TEM-8 holder) & minored in British Parliamentary debates

University of Calgary *Calgary, AB, CA*
Undergraduate Exchange Program in Petroleum Engineering *Dec. 2015 – Jun. 2016*
- Fully-funded by Chinese national fellowship for overseas studies

Publications

Refereed Journal & Conference Papers

[P1] **Yifan Zhang**, Chen Huang, Kevin Cao, Yueke Zhang, Scott Thomas Anderson, Huajie (Jay) Shao, Kevin Leach, Yu Huang: *Pre-Training Representations of Binary Code Using Contrastive Learning.* Under Major Revision at the IEEE Transactions on Software Engineering (**TSE**), 2024. JCR Q1. [arXiv]

[P2] Yichang He, **Yifan Zhang**, Yunpeng Fan, U-Xuan Tan: *Real-time Vibration Compensation with Long Short-term Memory Recurrent Neural Network and Adaptive Filter.* Under Minor Revision at the IEEE/ASME Transactions on Mechatronics (**TMech**), 2024. JCR Q1.

[P3] Zachary Karas, Aakash Bansal, **Yifan Zhang**, Jia-Jun (Toby) Li, Collin McMillan, Yu Huang: *A Tale of Two Comprehensions? Studying Human Attention during Code Summarization.* The ACM Transactions on Software Engineering and Methodology (**TOSEM**), 2024. JCR Q1. [Paper] [artifact]

[P4] **Yifan Zhang**, Jiliang (Eric) Li, Zachary Karas, Aakash Bansal, Jia-Jun (Toby) Li, Collin McMillan, Kevin Leach, Yu Huang: *EyeTrans: Merging Human and Machine Attention for Neural Code Summarization.* In Proceedings of the ACM International Conference on the Foundations of Software Engineering (**FSE'24**), July 15-19, 2024. CORE A*. [Paper] [arXiv] [artifact] [poster] [slides]

[P5] Chen Huang, Haoyang Li, **Yifan Zhang**, Wenqiang Lei, Jiancheng Lv: *Cross-Space Adaptive Filter: Integrating Graph Topology and Node Attributes for Alleviating the Over-smoothing Problem.* In Proceedings of the ACM Web Conference (**WWW'24**), May 13-17, 2024. CORE A*. [Paper] [arXiv] [poster] [slides] [video]

[P6] Jiliang (Eric) Li, **Yifan Zhang**, Zachary Karas, Collin McMillan, Kevin Leach, Yu Huang : *Do Machines and Humans Focus on Similar Code? Exploring Explainability of Large Language Models in Code Summarization.* In Proceedings of 32nd IEEE/ACM International Conference on Program Comprehension (**ICPC'24 RENE**), April 15-16, 2024. CORE A. [Paper] [arXiv] [slides]

[P7] Haoyu Dong, **Yifan Zhang**, Hanxue Gu, Nicholas Konz, Maciej Mazurowski: *SWSSL: Sliding-Window based Self-Supervised Learning Framework for Anomaly Detection.* The IEEE Transactions on Medical Imaging (**TMI**), 2023. JCR Q1. [Paper] [artifact]

[P8] Aakash Bansal, Chia-Yi Su, Zachary Karas, **Yifan Zhang**, Yu Huang, Jia-Jun (Toby) Li, Collin McMillan: *Modeling Programmer Attention as Scanpath Prediction.* In Proceedings of the 38th IEEE/ACM International Conference on Automated Software Engineering (**ASE'23 NIER**), September 11-15, 2023. CORE A*. [Paper] [arXiv]

[P9] **Yifan Zhang**: *Leveraging Artificial Intelligence on Binary Code Comprehension.* In Proceedings of the 37th IEEE/ACM International Conference on Automated Software Engineering (**ASE'22 DS**), October 10-14, 2022. CORE A. [Paper] [arXiv] [poster] [slides]

[P10] **Yifan Zhang***, Haoyu Dong*, Nicholas Konz, Hanxue Gu, Maciej Mazurowski: *Lightweight Transformer Backbone for Medical Object Detection.* In Proceedings of the 25th International Conference on Medical Image Computing and Computer Assisted Intervention Workshops, September 22nd, 2022. (**MICCAIW'22**), 2022. [Paper] [arXiv] [poster] [slides] [video]

[P11] Jing Li, Xiangfang Li, Keliu Wu, Dong Feng, Tao Zhang, **Yifan Zhang**: *Thickness and Stability of Water Film Confined inside Nanoslits and Nanocapillaries of Shale and Clay.* The International Journal of Coal Geology (**IJCG**), 2017. JCR Q1. [Paper]

Papers In Submitting & Under Review

[R1] Jieyu Li*, **Yifan Zhang***, Kevin Leach, Yu Huang: *SynthFix: A Hybrid Neural-Compiler Framework for Code Vulnerability repair.* Under Review at the ACL Rolling Review (**ARR**), August 2025. (Graduate Student Mentorship) [Preprint]

[R2] **Yifan Zhang***, Michael Sandborn*, Stefan Larson, Daniel Moyer, Yu Huang, Kevin Leach: *Structure-Aware Adaptation of LLMs for Code Vulnerability Detection.* In Submitting to 22nd International Conference on Mining Software Repositories (**MSR'25**), April 28-29.

[R3] Jiliang (Eric) Li*, **Yifan Zhang***, Yu Huang, Kevin Leach: *MalMixer: Few-Shot Malware Classification with Retrieval-Augmented Semi-Supervised Learning.* In Submitting to the ACM International Conference on the Foundations of Software Engineering (**FSE'25**), June 23-27. (Undergraduate Student Mentorship)

[R4] Haoyu Dong, **Yifan Zhang**, Nicholas Konz, Hanxue Gu, Maciej Mazurowski: *A Dual-Stream Semi-Supervised Lesion Detection Framework for Breast Tomosynthesis Screening.* Under Review at the Computer Methods and Programs in Biomedicine (**CMPB**), 2023.

[R5] **Yifan Zhang**, Jiliang (Eric) Li, Kexin Pei, Yu Huang, Kevin Leach: *VulRAG: Code Vulnerability Repair by Retrieval-Augmented Generation.* In submitting.

Book Sections & Non-Archival Papers

[N1] **Yifan Zhang**: Federated Feature Engineering in *Federated Learning: Technology and Practice.* Electronic Industry Press, 2021. ISBN: 9787121405976. [Book]

[N2] **Yifan Zhang**, Junwen Yang, Haoyu Dong, Qingchen Wang, Huajie (Jay) Shao, Kevin Leach, Yu Huang: *ASTRO: An AST-Assisted Approach for Generalizable Neural Clone Detection.* The 45th International Conference on Software Engineering Workshops (**ICSEW'23**), May 14th, 2023. [arXiv]

[N3] **Yifan Zhang**, Haoyu Dong, Nicholas Konz, Hanxue Gu, Maciej Mazurowski: *REPLICA: Enhanced Feature Pyramid Network by Local Image Translation and Conjunct Attention for High-Resolution Breast Tumor Detection.* Preprint. [arXiv]

Academic Experience

Duke University *Jul. 2021 – Jun. 2022*

Research Associate, Advisor: Prof. Maciej A. Mazurowski *Durham, NC, USA*

- **Medical Object Detection**: Designed a feature interpolation pipeline for injecting tumors into healthy images as an augmented dataset, and conjuncted a ViT on the outputs of a ResNet as inputs to a FPN in Faster R-CNN for tumor detection. The model mitigates the data-hungry problem of attention and achieves 13.1% improvement in AP50 for detecting tumors.
- **Domain Generalization**: Introduced a method for detecting anomalies in high-resolution medical images by sliding patches, and a domain generalization method by imposing constraints on the feature space and its projection space. Both of the two model achieve state-of-the-art in anomaly detection and domain generalization accuracy.

University of Hong Kong *Mar. 2021 – Sep. 2021*

Senior Research Assistant, Advisor: Prof. Qingchen Wang *Hong Kong SAR*

- **Financial Decision Making**: Built an entire intelligent debt collection system using data-driven deep reinforcement learning models. The model utilizes Transformer as the feature extractor and attaches a offline policy gradient model trained on the embedded sequential-aware hidden features to propose long-term dependent decisions.

Industry Experience

Intel Corporation *Jun. 2024 – Dec. 2024*

Generative AI Research Intern, Supervisor: Dr. Sharon Xue Yang *Santa Clara, CA, USA*

- **Construction Schedule Automation**: Developed and implemented a LLM-based system to automate and enhance construction scheduling for Intel's semiconductor fabrication projects. Integrated rule-based knowledge construction and in-context learning to predict and adjust schedules, leading to improved 2.8x efficiency compared with GPT-4o and reduced manual intervention.

ByteDance *May. 2023 – Aug. 2023*

Research Scientist Intern, Supervisor: Dr. Zhibing Zhao & Dr. Tieying Zhang *San Jose, CA, USA*

- **SQL Hint Recommendation**: Enhancing the SQL Pipeline through a Hint Recommendation System Based on Representation Learning: The model leverages two Transformer models in a pipeline and pretrains a generalizable model for reranking SQL plans across diverse table spaces and schemas.
- **Research Collaboration**: Participated in group research activities, including giving technical talk at TikTok InfraLab and working with other team members in LLM literature review and conference paper review.

JD.com *Dec. 2018 – Mar. 2021*

Machine Learning Engineer, Supervisors: Dr. Hu Wang & Mr. Chen Huang *Beijing, CN*

- **Action Model**: Built Bi-GRU and DeepFM models on user behavior features to predict the credit use rate and overall profit of every user in cash loan and consumer debt. The model can propose decisions to increase their credit limit for maximizing income, and achieved 21.4% overall profit increase.
- **Credit Score Propagation**: Built a heterogeneous graph on different types of user connections, and applied GNN models to propagate the credit score and improve risk prediction. The model can improve the overall accuracy of the XGB model by 5% in user classification.
- **Privacy-Preserving Collaboration**: Invented one kind of GAN-styled model using differential privacy to improve the efficiency and security of federated learning. Applied for 10 CN patents based on the research outputs, and was listed as 1st or 2nd inventor in 8 of them. One of the patents was awarded as 1st Runner-up in the 3rd JD Discovery Cup Patent Competition.

Academic Services

Program Committee (PC) Member

- 2025 International Conference on Learning Representations (ICLR'25)
- 2024 Annual Conference on Neural Information Processing Systems (NeurIPS'24) Datasets & Benchmarks Track
- 2024 Annual Conference on Neural Information Processing Systems (NeurIPS'24)
- 2024 ACM Conference on Computer and Communications Security (CCS'24) Artifact Evaluation Track
- 2024 International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI'24)
- 2024 Data-Centric Machine Learning Research Workshop at ICLR (DMLR@ICLR'24) with **Exceptional Reviewer Award** (Top 9.43% venue-wide) [reviewers]
- 2024 AAAI Conference on Artificial Intelligence (AAAI'24)
- 2023 Annual Conference on Machine Learning and Systems (MLSys'23) Artifact Evaluation Track
- 2023 International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI'23)
- 2023 AAAI Workshop on DL-Hardware Co-Design for AI Acceleration (DCAA@AAAI'23)
- 2023 International Conference on Mining Software Repositories (MSR'23)
- 2023 AAAI Conference on Artificial Intelligence (AAAI'23)
- 2022 MICCAI Workshop on Cancer Prevention through Early Detection (CaPTion@MICCAI'22)

External Conference Reviewer

- 2024 International Conference on Very Large Data Bases (VLDB'24) Scalable Data Science Track
- 2023 USENIX Security Symposium (USENIX Security'23)
- 2022 IEEE/CVF Computer Vision and Pattern Recognition Conference (CVPR'22)

Teaching and Supervision

Teaching Assistant (TA) Experience

- CS3892: Projects in Computing for Sustainability at Vanderbilt University, *Undergraduate Capstone Project*, 2023 Fall. Instructor: Prof. Douglas H. Fisher.
- CS3276/CS5276: Compiler Design at Vanderbilt University, 2023 Fall. Instructor: Prof. Kevin J. Leach.

Supervision of Research Students

- Manish Acharya, Bachelor of Math & CS at Vanderbilt University. *Vanderbilt Chancellor's Scholar*. From 2024 Spring to Present. Research Topic: Software Patch Representation Learning
- Jieyu Li, Bachelor of EEE at Shanghai Jiaotong University (SJTU), Master student of ECE at Vanderbilt University. From 2023 Fall to Present. Research Topic: AI Agent for Automated Program Repair
- Luka Mushkudiani, Bachelor of Math & CS at Vanderbilt University. *Former Intern at Meta's PyTorch Compiler Team*. From 2023 Fall to Present. Research Topic: Neural Type Systems for Python/Javascript
- Jiliang (Eric) Li, Bachelor of Math & CS at Vanderbilt University. From 2022 Summer to Present. Research Topic: Few-Shot Malware Classification. First Placement: Master of Science in Computer Science (MSCS) at Stanford University

Funds and Awards

Fellowships

- 2022 Research Fellowship from Defense Advanced Research Projects Agency (DARPA) (32500$/year)
- 2021 Research Fellowship from National Institutes of Health (NIH) ($36000/year)
- 2017 Roberto Roca Education Fellowship (Top 10 nationwide)
- 2015 Chinese National Fellowship for Overseas Studies (Full tuition fees & CA$6000/4 months)
- 2015 & 2016 & 2017 & 2018 First-class Scholarship at China University of Petroleum (CUP)
- 2014 Schlumberger Engineering Fellowship (Top 8 university-wide)
- 2013 Chinese National Scholarship for Outstanding Merits (Top 0.2% nationwide)

Honors and Awards

- 2020 First Runner-up in the 3rd JD.com Discovery Cup Patent Competition (Top 0.1% company-wide)
- 2020 Silver Medal Award of Distinguished Technical Recruiter at JD.com (Top 5% company-wide)
- 2020 Bronze Medal Award of Certified Technical Instructor at JD.com
- 2019 Beijing Outstanding Graduate Award (Top 0.1% nationwide)
- 2015 & 2017 Meritorious Winner of American Mathematical Contest in Modeling (Top 5% worldwide)
- 2015 *Summa Cum Laude* for the Best Undergraduate Students at CUP (Top 1% university-wide)
- 2013 & 2015 Third Prizes of Chinese National Petroleum Engineering Design Competition (Top 5% nationwide)