Yue Zhao

CONTACT INFORMATION

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USC Faculty Directory
Google Scholar

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Powell Hall (PHE) 432
Los Angeles, CA
United States, 90089
Department of Computer Science
University of Southern California

RESEARCH SUMMARY

I build *robust*, *efficient*, and *automated* **machine learning (ML)** and **data mining (DM)** algorithms, systems, and applications. My primary areas of interest are:

1. **Robustness and Security of AI:** Enhancing the robustness and security of AI systems through out-of-distribution (OOD) detection, outlier detection, and anomaly detection.
2. **Efficient and Scalable AI:** Developing efficient and scalable ML systems and automation techniques.
3. **Applications in Security, Finance, and Healthcare:** Applying AI technologies to address complex problems in security, finance, and healthcare sectors.

(1) Robustness and Security of AI

- ❑ Out-of-distribution (OOD) Detection
- ❑ Outlier Detection
- ❑ Anomaly Detection
- ❑ Trustworthy AI

(2) Efficient and Scalable AI

- ❑ Machine Learning Systems
- ❑ Automated Machine Learning
- ❑ Decentralized Learning
- ❑ Meta-Learning
- ❑ Parallel Computing
- ❑ Quantization and Approximation

(3) Applications in Security, Finance, and Healthcare

- ❑ Healthcare AI
- ❑ AI for Security
- ❑ Financial Risk Modeling
- ❑ AI for Science

OPEN-SOURCE HIGHLIGHTS

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Open-source Contribution: I have led or contributed as a core developer to more than 10 ML open-source initiatives. Popular ones include PyOD (A Python Toolbox for Scalable Outlier Detection), ADBench (Anomaly Detection Benchmark), and TDC (An ML Data Hub for Drug Discovery).

My works receive **20,000 GitHub Stars** and 20,000,000 downloads as of July 3, 2024.

FULL-TIME PROFESSIONAL EXPERIENCE

University of Southern California
Thomas Lord Department of Computer Science
Assistant Professor (Tenure-Track) — Aug. 2023 - Present
Automation, System, and APplication (**ASAP**) Lab (Link)

PwC Canada
Consulting & Deals
Senior Consultant (Data Scientist) — Aug. 2017 - Jun. 2019
Consultant (Data Scientist) — Feb. 2017 - Jul. 2017
Research Associate (Intern) — May. 2016 - Jan. 2017

EDUCATION

Carnegie Mellon University — Pittsburgh, PA
Ph.D. in Information Systems and Management — Sep. 2019 - May. 2023

- **Affiliation**: CMU automated learning systems group (Catalyst) and Data Analytics Techniques Algorithms (DATA) Lab

- **Advisors and Mentors**: CMU: Prof. Leman Akoglu, Prof. Zhihao Jia, and Prof. George Chen. I collaborate with Prof. Jure Leskovec at Stanford, and Prof. Philip S. Yu at UIC.

University of Toronto — Toronto, ON
Master of Science in Computer Science — Sep. 2015 - Dec. 2016

University of Cincinnati — Cincinnati, OH
Bachelor of Science in Computer Engineering — Sep. 2010 - May. 2015
Minor: *Computer Science* and *Mathematics*

PUBLICATIONS
SCHOLAR
RESEARCHG

Preprints & Under Submission

41. Hao Dong, Yue Zhao, Eleni Chatzi, Olga Fink
MultiOOD: Scaling Out-of-Distribution Detection for Multiple Modalities
Under submission
arXiv preprint arXiv:2405.17419

40. Hao Dong, Gaetan Frusque, Yue Zhao, Eleni Chatzi, Olga Fink
NNG-Mix: Improving Semi-supervised Anomaly Detection with Pseudo-anomaly Generation
Under submission
arXiv preprint arXiv:2311.11961

39. Minqi Jiang, Chaochuan Hou, Ao Zheng, Xiyang Hu, Songqiao Han, Hailiang Huang, Xiangnan He, Philip S. Yu, Yue Zhao
Weakly Supervised Anomaly Detection: A Survey
Under submission
arXiv preprint arXiv:2302.04549

Peer-reviewed Journal Papers

38. Ling Yang*, Zhilong Zhang*, Yang Song, Shenda Hong, Runsheng Xu, Yue Zhao, Wentao Zhang, Bin Cui, Ming-Hsuan Yang
Diffusion Models: A Comprehensive Survey of Methods and Applications
*ACM Computing Surveys (**CSUR**)*, 2023
(*equal contribution)

37. Yue Zhao*, Martin Q. Ma*, Xiaorong Zhang, Leman Akoglu
The Need for Unsupervised Outlier Model Selection: A Review and Evaluation of Internal Evaluation Strategies
*ACM SIGKDD Explorations Newsletter (**SIGKDD Explor.**)*, 2023
(*equal contribution)

36. Kexin Huang*, Tianfan Fu*, Wenhao Gao*, Yue Zhao, Yusuf Roohani, Jure Leskovec, Connor W. Coley, Cao Xiao, Jimeng Sun, Marinka Zitnik
Artificial Intelligence Foundation for Therapeutic Science
*Nature Chemical Biology (**NCHEMB**)*, 2022
(*equal contribution)

35. Yue Zhao*, Zheng Li*, Xiyang Hu, Nicola Botta, Cezar Ionescu, George H. Chen
ECOD: Unsupervised Outlier Detection Using Empirical Cumulative Distribution Functions
*IEEE Transactions on Knowledge and Data Engineering (**TKDE**)*, 2022.
(*equal contribution)

34. Yue Zhao, Zain Nasrullah, Zheng Li
PyOD: A Python Toolbox for Scalable Outlier Detection
Journal of Machine Learning Research (**JMLR**), 2019.

Peer-reviewed Conference & Workshop Papers (with proceedings)

33. Xueying Ding, Yue Zhao, Leman Akoglu
Fast Unsupervised Deep Outlier Model Selection with Hypernetworks
*ACM SIGKDD Conference on Knowledge Discovery and Data Mining (**KDD**), 2024*

32. Lichao Sun, Yue Huang, Haoran Wang, Siyuan Wu, Qihui Zhang, Chujie Gao, Yixin Huang, Wenhan Lyu, Yixuan Zhang, Xiner Li, Zhengliang Liu, Yixin Liu, Yijue Wang, Zhikun Zhang, 50+ collaborative authors, Yue Zhao
TrustLLM: Trustworthiness in Large Language Models
*International Conference on Machine Learning (**ICML**)*, 2024

31. Songtao Liu, Hanjun Dai, Yue Zhao, Peng Liu
Preference Optimization for Molecule Synthesis with Conditional Residual Energy-based Models
*International Conference on Machine Learning (**ICML**)*, **Oral**, 2024

30. Yue Zhao, Leman Akoglu
Hyperparameter Optimization for Unsupervised Outlier Detection
*International Conference on Automated Machine Learning (**AutoML**)*, 2024

29. Yue Zhao
Towards Reproducible, Automated, and Scalable Anomaly Detection
*AAAI Conference on Artificial Intelligence (**AAAI**), New Faculty Highlights*, 2024

28. Minqi Jiang*, Chaochuan Hou*, Ao Zheng*, Songqiao Han, Hailiang Huang†, Qingsong Wen, Xiyang Hu†, Yue Zhao†
ADGym: Design Choices for Deep Anomaly Detection.
*Advances in Neural Information Processing Systems (**NeurIPS**)*, 2023
(†Corresponding author)

27. Jaemin Yoo, Yue Zhao, Lingxiao Zhao, Leman Akoglu
DSV: An Alignment Validation Loss for Self-supervised Outlier Model Selection
*European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (**ECML/PKDD**)*, 2023

26. Peng Xu, Lin Zhang, Xuanzhou Liu, Jiaqi Sun, Yue Zhao, Haiqin Yang, Bei Yu
Do Not Train It: A Linear Neural Architecture Search of Graph Neural Networks
*International Conference on Machine Learning (**ICML**)*, 2023

25. Yue Zhao, Guoqing Zheng, Subhabrata Mukherjee, Robert McCann, Ahmed Awadallah
ADMoE: Anomaly Detection with Mixture-of-Experts from Noisy Labels
*Thirty-Seventh AAAI Conference on Artificial Intelligence (**AAAI**)*, 2023

24. Yue Zhao, George H. Chen, Zhihao Jia
TOD: GPU-accelerated Outlier Detection via Tensor Operations
*International Conference on Very Large Data Bases (**VLDB**)*, 2023

23. Songqiao Han*, Xiyang Hu*, Hailiang Huang*, Minqi Jiang*, Yue Zhao*
ADBench: Anomaly Detection Benchmark
*Advances in Neural Information Processing Systems (**NeurIPS**)*, 2022
(*equal contribution & the corresponding author)

22. Yue Zhao*, Kay Liu*, Yingtong Dou*, et al.
Benchmarking Node Outlier Detection on Graphs
*Advances in Neural Information Processing Systems (**NeurIPS**)*, 2022
(*equal contribution)

21. Yue Zhao, Xiaorong Zhang, Leman Akoglu
ELECT: Toward Unsupervised Outlier Model Selection
*IEEE International Conference on Data Mining (**ICDM**)*, 2022.
Regular paper. Acceptance rate 9.77% (85/870); overall acceptance 20% (174/870).

20. Zhiming Xu, Xiao Huang, Yue Zhao, Yushun Dong, Jundong Li
Contrastive Attributed Network Anomaly Detection with Data Augmentation

*Pacific-Asia Conference on Knowledge Discovery and Data Mining (**PAKDD**)*, 2022
Acceptance rate 19%.

19. Yue Zhao, Ryan A. Rossi, Leman Akoglu
Automatic Unsupervised Outlier Model Selection
*Advances in Neural Information Processing Systems (**NeurIPS**)*, 2021
Acceptance rate 26%.

18. Kwei-Herng Lai, Daochen Zha, Junjie Xu, Yue Zhao, Guanchu Wang, Xia Hu
Revisiting Time Series Outlier Detection: Definitions and Benchmarks
*Advances in Neural Information Processing Systems (**NeurIPS**)*, 2021

17. Kexin Huang*, Tianfan Fu*, Wenhao Gao*, Yue Zhao, Yusuf Roohani, Jure Leskovec, Connor W. Coley, Cao Xiao, Jimeng Sun, Marinka Zitnik
Therapeutics Data Commons: Machine Learning Datasets and Tasks for Drug Discovery and Development
*Advances in Neural Information Processing Systems (**NeurIPS**)*, 2021
(*equal contribution)

16. Yue Zhao*, Xiyang Hu*, Cheng Cheng, Cong Wang, Changlin Wan, Wen Wang, Jianing Yang, Haoping Bai, Zheng Li, Cao Xiao, Yunlong Wang, Zhi Qiao, Jimeng Sun, Leman Akoglu
SUOD: Accelerating Large-scale Unsupervised Heterogeneous Outlier Detection
*Conference on Machine and Learning Systems (**MLSys**)*, 2021.
Acceptance rate 23.5% (52/221). (*equal contribution)

15. Kwei-Herng Lai*, Daochen Zha*, Guanchu Wang, Junjie Xu, Yue Zhao, Devesh Kumar, Yile Chen, Purav Zumkhawaka, Minyang Wan, Diego Martinez and Xia Ben Hu
TODS: An Automated Time Series Outlier Detection System (Demo paper)
*Thirty-Fifth AAAI Conference on Artificial Intelligence (**AAAI**)*, 2021.
(*equal contribution)

14. Meng-Chieh Lee, Yue Zhao, Aluna Wang, Pierre Jinghong Liang, Leman Akoglu, Vincent S. Tseng, Christos Faloutsos
AutoAudit: Mining Accounting and Time-Evolving Graphs
*IEEE International Conference on Big Data (**Big Data**)*, 2020

13. Changlin Wan, Dongya Jia, Yue Zhao, Wennan Chang, Sha Cao, Xiao Wang, and Chi Zhang
A Data Denoising Approach to Optimize Functional Clustering of Single Cell RNA-sequencing Data
*IEEE International Conference on Bioinformatics and Biomedicine (**BIBM**)*, 2020

12. Zheng Li, Yue Zhao, Nicola Botta, Cezar Ionescu, Xiyang Hu
COPOD: Copula-Based Outlier Detection
*IEEE International Conference on Data Mining (**ICDM**)*, 2020.

11. Zheng Li, Yue Zhao, Jialin Fu
SYNC: A Copula based Framework for Generating Synthetic Data from Aggregated Sources
*IEEE International Conference on Data Mining Workshops (**ICDMW**)*, 2020.

10. Yiqun Mei, Yue Zhao, Wei Liang
DSR: An Accurate Single Image Super Resolution Approach for Various Degradations
*IEEE International Conference on Multimedia and Expo (**ICME**)*, 2020, London, UK.

9. Yue Zhao, Xuejian Wang*, Cheng Cheng*, Xueying Ding*
Combining Machine Learning Models and Scores using combo Library (Demo paper)
*Thirty-Fourth AAAI Conference on Artificial Intelligence (**AAAI**)*, 2020.
(*equal contribution)

8. Zain Nasrullah, Yue Zhao
Music Artist Classification with Convolutional Recurrent Neural Networks
IEEE International Joint Conference on Neural Networks (***IJCNN***), 2019, Hungary.

7. Yue Zhao, Zain Nasrullah, Maciej K. Hryniewicki, Zheng Li
LSCP: Locally Selective Combination in Parallel Outlier Ensembles
SIAM International Conference on Data Mining (***SDM***), 2019, Calgary, Canada.
Acceptance rate 22.7% (90/397).

6. Yue Zhao, Maciej K. Hryniewicki
XGBOD: Improving Supervised Outlier Detection with Unsupervised Representation Learning
IEEE International Joint Conference on Neural Networks (***IJCNN***), 2018, Rio, Brazil.

5. Yue Zhao, Maciej K. Hryniewicki, Francesca Cheng, Boyang Fu, Xiaoyu Zhu
Employee Turnover Prediction with Machine Learning: A Reliable Approach
Intelligent System Conference (***Intellisys***), 2018, London, UK.
Acceptance rate 34% (194/568).

4. Yue Zhao*, Zhongtian Qiu*, Yiqing Yang*, Weiwei Li*, Mingming Fan
An Empirical Study of Touch-based Authentication Methods on Smartwatches
ACM International Symposium on Wearable Computers (***ISWC***), 2017, Maui, USA.
Acceptance rate 25.6% (23/90). (*equal contribution)

Peer-reviewed Workshop Papers (without proceedings)

3. Yue Zhao, Xueying Ding, Jianing Yang, and Haoping Bai.
SUOD: Toward Scalable Unsupervised Outlier Detection
Workshops *at the Thirty-Fourth* ***AAAI*** *Conference on Artificial Intelligence*, 2020.
Extended version published in *MLSys 2021*.

2. Colin Wan, Zheng Li, Alicia Guo, Yue Zhao
SynC: A Unified Framework for Generating Synthetic Population with Gaussian Copula
Workshops *at the Thirty-Fourth* ***AAAI*** *Conference on Artificial Intelligence*, 2020.
Extended version published in *ICDMW 2020*.

1. Yue Zhao, Maciej K. Hryniewicki
DCSO: Dynamic Combination of Detector Scores for Outlier Ensembles
ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (***KDD Workshop*** *on Outlier Detection De-constructed*), 2018, London, UK.
Extended version published in *SDM 2019*, renamed to LSCP.

Awards, Grants, and Funding

NSF POSE	Jun. 2024
Google Cloud Research Innovators	Mar. 2024
AAAI New Faculty Highlights	Feb. 2024
Meta 2022 AI4AI Research Award (co-PI)	Oct. 2022
The Norton Labs Graduate Fellowship	Mar. 2022
CMU Presidential Fellowship	2019
Mitacs-Accelerate Research and Development Funding	2016-2017
University Global Award and Scholarship	2010-2015
Mantei/Mae Award & Scholar	2012-2015
Engineer of the Month (University of Cincinnati)	Jun. 2014

Internship Experience

NortonLifeLock Research Group
Machine Learning Research Intern — 2022
- Supervised by Dr. Acar Tamersoy and Dr. Kevin Roundy.

Microsoft Research
Machine Learning Research Intern — 2022
- Designed weakly supervised anomaly detection algorithms
- Supervised by Dr. Guoqing Zheng and Dr. Subhabrata (Subho) Mukherjee.

Stanford University, Computer Science Department
Visiting Student Researcher — 2021

- Designed new GNN systems.
- Supervised by Prof. Jure Leskovec.

IQVIA, Analytics Center of Excellence
Machine Learning Research Intern 2020
- Designed new machine learning models in healthcare.
- Supervised by Dr. Cao (Danica) Xiao (IQVIA) and Prof. Jimeng Sun (UIUC).

Siemens PLM Software USA
Software Engineer (Intern & Contract) Mar. 2012 - Dec. 2014
- Managed a Java project to transition the LabManager system to vCloud Director.
- Refactored outdated automation code and added new modules and JUnit test cases.
- Led a C++ Code Coverage project on Teamcenter platform to strengthen its stability.

Teaching Experience

University of Southern California Los Angeles, CA
Instructor Spring 2025 (scheduled)
CSCI 566 Deep Learning and Its Applications
Instructor Spring 2024
CSCI 566 Deep Learning and Its Applications

Carnegie Mellon University Pittsburgh, PA
Teaching Assistant Fall 2022
Managing Digital Business (Prof. David Riel)

Teaching Assistant & co-Instructor (lectures on AutoML and MLSys) Spring 2022
Teaching Assistant & co-Instructor (lectures on AutoML and MLSys) Fall 2021
Teaching Assistant & co-Instructor (lectures on AutoML) Spring 2021
Teaching Assistant & co-Instructor (lectures on AutoML) Fall 2020
Intro to Artificial Intelligence (Prof. David Steier)

Teaching Assistant Spring 2022
Digital Transformation (Prof. David Riel)

Teaching Assistant (helping on course topics) Fall 2021
Statistics for IT Managers (Prof. Daniel Nagin)

University of Toronto Toronto, ON
Teaching Assistant & Lab Session Instructor Fall 2015
Embedded Systems (Prof. Philip Anderson)

University of Cincinnati Cincinnati, OH
Teaching Assistant & Lab Session Instructor Fall 2014
Intro to Programming (Prof. George Purdy)

Ph.D. Students

- Haoyan Xu (USC, ECE Ph.D., 2024 Spring-)
- Tiankai Yang (USC, CS Ph.D., 2024 Fall-)
- Li Li (USC, CS Ph.D., 2024 Fall-)

Qualification & Thesis Committee

- Gengyu Rao (USC, CS Ph.D.)
- Mehrdad Kiamari (USC, ECE Ph.D.)
- Haonan Wang (USC, ECE Ph.D.)
- Yuan Meng (USC, ECE Ph.D.)
- Hassan Hamad (USC, ECE Ph.D.)
- Yizhou Zhang (USC, CS Ph.D.)
- Haoming Li (USC, CS Ph.D.)

- Arash Hajisafi (USC, CS Ph.D.)
- Yi Chien Lin (USC, ECE Ph.D.)
- Yuke Zhang (USC, ECE Ph.D.)

Services

Conference Organizing Committee
- Workflow Co-Chair for KDD 2023

External Reviewer for Funding Proposals
- Dutch Research Council (NWO)

Journal Editor
- Associate Editor, IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
- Action Editor, Journal of Data-centric Machine Learning Research (DMLR)

Program Committee and/or Area Chair for Conferences and Workshops
- ICML 2024 (Area Chair)
- AISTATS 2024 (Area Chair)
- MLSys 2024
- KDD 2020, 2021, 2022, 2023
- IJCAI 2022, 2023
- NeurIPS 2021, 2022, 2023
- AAAI 2021, 2022, 2023
- AAAI Demonstrations 2021, 2022
- MICCAI 2020, 2021, 2022
- ICDM 2020
- KDD Workshop on Outlier Detection and Description (ODD), 2021
- KDD Workshop on Anomaly and Novelty Detection (ANDEA), 2021, 2022
- IJCAI Workshop on Artificial Intelligence for Anomalies and Novelties (AI4AN), 2020, 2021
- INFORMS Workshop on Data Science 2021

Journal Reviewer
- Journal of Machine Learning Research (JMLR)
- PNAS Nexus
- Machine Learning
- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
- IEEE Transactions on Knowledge and Data Engineering (TKDE)
- IEEE Internet of Things Journal (IoT-J)
- IEEE Intelligent Systems
- IEEE Journal on Selected Areas in Communications (J-SAC)
- Data Mining and Knowledge Discovery (DMAI)
- ACM Transactions on Management Information Systems (TMIS)
- Knowledge and Information Systems (KAIS)
- INFORMS Journal on Computing (IJOC)
- Big Data
- Artificial Intelligence Review (AIRE)
- Neurocomputing
- IEEE Transactions on Systems, Man, and Cybernetics: Systems
- IEEE/ACM Transactions on Computational Biology and Bioinformatics (TCBB)
- IEEE Network Magazine
- IEEE Computational Intelligence Magazine (CIM)
- BioData Mining
- European Journal of Management and Business Economics (EJMBE)

- The Journal of Open Source Software (JOSS)

Talks and Lectures

USC Retreat on AI and Engineering Safety	*Safety Measures for LLMs*	Apr. 2024
Visa Research	*Towards Reproducible, Automated, and Scalable AD*	Apr. 2024
USC Symposium on Frontiers of Generative AI	*Generative AI for Anomaly Detection*	Mar. 2024
AAAI New Faculty Highlights (invited)	*Towards Reproducible, Automated, and Scalable AD*	Feb. 2024
U of Nevada, Las Vegas	*Automated and Scalable ML Algorithms and Systems*	Oct. 2023
Samsung Seminar	*Automated and Scalable Anomaly Detection Systems*	Aug. 2023
KDD SoCal Day	*Enable Applications by ML with Noisy Inputs*	Aug. 2023
CMU Catalyst	*How (Not) to Fail Your Academic Job Search*	May. 2023
KAUST	*Automated and Scalable ML Algorithms and Systems*	Apr. 2023
Emory University	*Automated and Scalable ML Algorithms and Systems*	Apr. 2023
USC	*Automated and Scalable ML Algorithms and Systems*	Mar. 2023
UC Davis	*Automated and Scalable ML Algorithms and Systems*	Mar. 2023
Stony Brook University	*Automated and Scalable ML Algorithms and Systems*	Feb. 2023
University of Chicago	*Automated and Scalable ML Algorithms and Systems*	Feb. 2023
UC Merced	*Automated and Scalable ML Algorithms and Systems*	Feb. 2023
CMU PDL Meeting	*Automated and Scalable ML Algorithms and Systems*	Jan. 2023
CMU Data Science Seminar	**Guest Lecture** *Automated Anomaly Detection*	Nov. 2022
LoG Seminar	*Large-scale Graph Anomaly Detection*	Oct. 2022
Intuit	*Anomaly Detection for Financial Risk Modeling*	Aug. 2022
Rice University	*Large-scale Anomaly Detection with Automation*	Sep. 2022
Microsoft Research	*Weakly-supervised Anomaly Detection*	Sep. 2022
Wells Fargo	*Anomaly Detection for Financial Risk Modeling*	Aug. 2022
Columbia University	**Guest Lecture** *Anomaly Detection*	Jul. 2022
Morgan Stanley	*Automated Outlier Detection*	Jun. 2022
Microsoft Research	*Automated Outlier Detection*	Jun. 2022
Morgan Stanley	*Large-scale Anomaly Detection Systems*	Mar. 2022
Rutgers Business School	*Outlier Model Selection*	Mar. 2022
Tesla	*Large-scale Anomaly Detection Systems*	Feb. 2022
Catalyst, CMU	*Systems for Data Mining Algorithms*	Dec. 2021
E&Y Canada	*ML applications in Data Analytics*	Oct. 2021
University of Nottingham	*General Machine Learning Applications*	Jan. 2021