

YIYOU SUN

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Education

University of Wisconsin-Madison

PhD. in Computer Science, Minor in Math

Sept. 2018 - July. 2023

Madison, US

- GPA 3.85/4.0. Advised by Prof. Sharon (Yixuan) Li.

Harbin Institute of Technology

B.S. in Computer Science

Sept. 2014 - Jun. 2018

Harbin, China

- GPA 93.67/100. Rank **1st** among 97 students.

Ph.D. Research Overview

– *We aim to pave the way to a reliable Open-world Machine Learning system.*

Out-of-distribution (OOD) Detection: In an open-world, training and testing distribution for deep neural networks can be different. We want to build robust machine learning system that can identify OOD samples in inference time.

Open-world Representation Learning: As an additional step for detecting OOD, we want the model to learn OOD samples from the novel classes. Under the setting, the model should ideally learn distinguishable representations—not only for the known classes but also the novel categories.

Interpretability: Build an interpretable machine learning system, particularly in visualizing and quantitating the model's inference mechanism or constructing one inherently sparse, simulatable, modular, and thus, interpretable.

Academic Experience

University of Wisconsin-Madison

Research Assistant

Sept 2020 - July 2023

Madison, WI

- Advised by Prof. Sharon (Yixuan) Li.
- Finished thesis “*Detecting and Learning Out-of-Distribution Data in the Open-world: Algorithm and Theory*”, investigating two essential steps for open-world machine learning: Out-of-distribution (OOD) Detection and Open-world Representation Learning (ORL).

University of Wisconsin-Madison

Research Assistant

Sept 2018 - May 2020

Madison, WI

- Advised by Prof. Vikas Singh.

MIT: Computer Science and Artificial Intelligence Laboratory

Undergraduate Research Assistant

Dec 2017 - May 2018

Cambridge, MA

- Supervised by Dr. Bolei Zhou (now at UCLA).

Harvard University: DASlab

Undergraduate Research Assistant

July 2017 - May 2018

Cambridge, MA

- Supervised by Prof. Stratos Idreos.

Industrial Experience

NEC Laboratories America Inc.
Researcher

Aug. 2023 - Current
Plainsboro, NJ

- Report to Dr. Haifeng Chen.

Google Research
Research Intern

May 2022 - Sept 2022
Mountain View, CA

- Supervised by Dr. Yaojie Liu and Dr. Xiaoming Liu.

Facebook Integrity Team
Research Intern

June 2021 - Sept 2021
Remote

- Supervised by Dr. Sethuraman Sankaran and Dr. Ser-Nam Lim.

Facebook AI
Research Intern

June 2020 - Sept 2020
Remote

- Supervised by Dr. Harry Yang and Dr. Ser-Nam Lim.

Publications (Sorted by Years)

- [1] S. Ghosal*, **Y. Sun***, Y. Li. “*How to Overcome Curse-of-Dimensionality for OOD Detection?*”. In the 38th AAAI Conference on Artificial Intelligence (AAAI), 2024.
- [2] (**Spotlight**) **Y. Sun**, S. Zhenmei, Y. Li. “*A Graph-Theoretic Framework for Understanding Open-World Semi-Supervised Learning*”. In Proceedings of the Advances in Neural Information Processing Systems (NeurIPS), 2023.
- [3] X. Du, **Y. Sun**, X. Zhu, Y. Li “*Dream the Impossible: Outlier Imagination with Diffusion Models.*” In Proceedings of the Advances in Neural Information Processing Systems (NeurIPS), 2023.
- [4] Z., Jingyang, J. Yang, P. Wang, H. Wang, Y. Lin, H. Zhang, **Y. Sun**, X. Du, K. Zhou, W. Zhang, Y. Li, Z. Liu, Y. Chen, H. Li. “OpenOOD v1.5: Enhanced Benchmark for Out-of-Distribution Detection”. arXiv preprint arXiv:2306.09301, 2023.
- [5] **Y. Sun**, Y. Liu, X. Zhu, Y. Li, W. Chu. “*Rethinking Domain Generalization for Face Anti-spoofing: Separability and Alignment*”. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2023.
- [6] Y. Ming, **Y. Sun**, O. Dia, and Y. Li. “*How to Exploit Hyperspherical Embeddings for Out-of-Distribution Detection?*” International Conference on Learning Representations (ICLR), 2023.
- [7] **Y. Sun**, S. Zhenmei, L. Yingyu, Y. Li. “*When and How Does Known Class Help Discover Unknown Ones? Provable Understanding Through Spectral Analysis*”. In Proceedings of the International Conference on Machine Learning (ICML), 2023.
- [8] Y. Ming, Z. Cai, J. Gu, **Y. Sun**, W. Li, Y. Li. “*Delving into OOD Detection with Vision-Language Representations.*” In Proceedings of the Advances in Neural Information Processing Systems (NeurIPS), 2022.
- [9] J., Yang, P. Wang, D. Zou, Z. Zhou, K. Ding, W. Peng, H. Wang, G. Chen, B. Li, **Y. Sun**, X. Du, K. Zhou, W. Zhang, D. Hendrycks, Y. Li, Z. Liu. “*OpenOOD: Benchmarking Generalized Out-of-Distribution Detection.*” In Proceedings of the Advances in Neural Information Processing Systems (NeurIPS), 2022.
- [10] **Y. Sun**, Y. Ming, X. Zhu, Y. Li. “*Out-of-distribution Detection with Deep Nearest Neighbors*”. In Proceedings of the International Conference on Machine Learning (ICML), 2022.
- [11] **Y. Sun**, Y. Li. “*Dice: Leveraging sparsification for out-of-distribution detection.*” In Proceedings of the the European Conference on Computer Vision (ECCV), 2022.
- [12] **Y. Sun**, Y. Li. “*OpenCon: Open-world Contrastive Learning with Wild Unlabeled Data*”. Transactions on Machine Learning Research (TMLR), 2022.
- [13] **Y. Sun**, C. Guo, Y. Li. “*ReAct: Out-of-distribution Detection with Rectified Activations.*” In Proceedings of the Advances in Neural Information Processing Systems (NeurIPS), 2021.
- [14] **Y. Sun**, B. Joseph, A. Deatsh, R. Jeraj, Y. Li. “*LOOD: Localization-based Uncertainty Estimation for Medical Imaging.*” ICML Workshop on Distribution-Free Uncertainty Quantification (ICML DFUQ), 2021.

- [15] **Y. Sun**, S. Ravi, V. Singh. “*Adaptive Activation Thresholding: Dynamic Routing Type Behavior for Interpretability in Convolutional Neural Networks*.” In Proceedings of the IEEE Conference on Computer Vision (ICCV), 2019.
- [16] B. Zhou*, **Y. Sun***, D. Bau*, A. Torralba. “*Interpretable Basis Decomposition for Visual Explanation*.” In Proceedings of the European Conference on Computer Vision (ECCV), 2018. (* indicates equal contribution)
- [17] B. Zhou, **Y. Sun**, D. Bau, A. Torralba. “*Revisiting the Importance of Individual Units in CNNs via Ablation*”. arXiv preprint arXiv:1806.02891, 2018.
- [18] S. Idreos, K. Zoumpatianos, M. Athanassoulis, N. Dayan, B. Hentschel, M. S. Kester, D. Guo, L. M. Maas, W. Qin, A. Wasay, and **Y. Sun**. “*The Periodic Table of Data Structures*”. IEEE Data Eng. Bull., 41(3):64-75, 2018.
- [19] S. Idreos, K. Zoumpatianos, S. Chatterjee, W. Qin, A. Wasay, B. Hentschel, M. Kester, N. Dayan, D. Guo, M. Kang, **Y. Sun**. “*Learning Data Structure Alchemy*”. Bull. of the IEEE Computer Society Technical Committee on Data Engineering. 42(2), 2018.
- [20] **Y. Sun**, T. Su, Z. Tu. “*Faster R-CNN Based Autonomous Navigation for Vehicles in Warehouse*”. In 2017 IEEE International Conference on Advanced Intelligent Mechatronics (AIM), pages 1639-1644, July 2017.

Community Services

Journal Reviewer

- Review for Pattern Recognition in 2021, 2022.
- Review for IEEE Transactions on Cybernetics in 2022.
- Review for IEEE Transactions on Multimedia in 2023.
- Review for International Journal of Computer Vision (IJCV) in 2022, 2023.
- Review for IEEE Transactions on Image Processing (TIP) in 2023.

Conference Reviewer

- Review for Conference on Computer Vision and Pattern Recognition (CVPR) in 2022, 2023.
- Review for International Conference on Machine Learning (ICML) in 2022, 2023.
- Review for Conference on Neural Information Processing Systems (NeurIPS) in 2022 (**Top Reviewer Award**), 2023.
- Review for European Conference on Computer Vision (ECCV) in 2022.
- Review for International Conference on Learning Representations (ICLR) in 2022, 2023.
- Review for Association for the Advancement of Artificial Intelligence (AAAI) in 2022, 2023.

Talks

Introduction on Trustworthy Machine Learning <i>Guest lecture @ UC Riverside CS/ECE 228 – Introduction to Deep Learning</i>	Nov 2023 <i>Riverside, CA</i>
The Theoretical Foundation for the Open-world Representation Learning: A Spectral View <i>Invited Talk @ UIUC ML Seminar</i>	Oct 2023 <i>Remote</i>
Out-of-distribution (OOD) Generalization and Detection in AI Risk Management <i>Invited Talk @ Beijing Academy of Artificial Intelligence</i>	Oct 2023 <i>Remote</i>
Detecting and Learning Out-of-Distribution Data in the Open world <i>Ph.D. Oral Defense</i>	July 2023 <i>Madison, WI</i>
Rethinking Domain Generalization for Face Anti-spoofing: Separability and Alignment <i>Intern Presentation @ Google Research</i>	Sept 2022 <i>Mountain View, CA</i>
Introduction on Interpretable Deep Learning <i>Guest lecture @ CS 839 – Special Topics in AI: Deep Learning</i>	Oct 2020 <i>Madison, WI</i>