Kaiyang Zhou

Research Fellow
School of Computer Science and Engineering
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Research Interests

Representation learning, foundation models, domain adaptation, domain generalization, semi-supervised learning, unsupervised learning, out-of-distribution detection, generative modeling, reinforcement learning, low-power design, and explainable AI

Areas: Machine Learning & Computer Vision

Research Highlights

My research revolves around the development of *generalizable* (across changing data distributions) and *efficient* (small / fast / low-power) machine learning models—particularly those based on neural networks—for large-scale data analytics in an open world, with applications to computer vision and others. I have published more than 20 papers at major journals and conferences in relevant fields, such as TPAMI (flagship journal in AI with IF=24.31), IJCV (flagship journal in computer vision with IF=13.37), and the three prominent computer vision conferences (i.e., CVPR, ICCV and ECCV).

Google Scholar Citations: 2,900 citations with h-index 15 (as of Mar 2023).

Appointments

Nanyang Technological University, Singapore
Research Fellow with Prof. Ziwei Liu and Prof. Chen Change Loy 2021.01 – present

Samsung AI Center Cambridge, UK
Research Intern with Prof. Tao Xiang 2018.11 – 2019.05

SIAT-MMLAB, Chinese Academy of Sciences, China
Research Assistant with Prof. Yu Qiao 2016.10 – 2017.08

Education

PhD in Computer Science 2020
University of Surrey, UK
Supervised by Prof. Tao Xiang

MSc in Advanced Computing (Distinction) 2016
University of Bristol, UK
Supervised by Prof. Majid Mirmehdi and Dr. Adeline Paiement

BSc in Computer Science (First Class Honor) 2015
University of Ulster, UK

Publications

Journal impact factors:
IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI): 24.31
International Journal of Computer Vision (IJCV): 13.37
IEEE Transactions on Image Processing (TIP): 11.04

Refereed journal articles:

1. Yuhang Zang, Kaiyang Zhou, Chen Huang, and Chen Change Loy. Semi-supervised and long-tailed object detection with cascadematch. *International Journal of Computer Vision (IJCV)*, 2023.
2. Kaiyang Zhou, Ziwei Liu, Yu Qiao, Tao Xiang, and Chen Change Loy. Domain generalization: A survey. *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2022.
3. Kaiyang Zhou, Jingkang Yang, Chen Change Loy, and Ziwei Liu. Learning to prompt for vision-language models. *International Journal of Computer Vision (IJCV)*, 130:2337–2348, 2022.
4. Zhongying Deng, Kaiyang Zhou, Da Li, Junjun He, Yi-Zhe Song, and Tao Xiang. Dynamic instance domain adaptation. *IEEE Transactions on Image Processing (TIP)*, 31:4585–4597, 2022.
5. Kaiyang Zhou, Yongxin Yang, Yu Qiao, and Tao Xiang. Domain adaptive ensemble learning. *IEEE Transactions on Image Processing (TIP)*, 30:8008–8018, 2021.
6. Kaiyang Zhou, Yongxin Yang, Andrea Cavallaro, and Tao Xiang. Learning generalisable omni-scale representations for person re-identification. *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2021.

Refereed conference papers:

1. Tingwei Wang, Da Li, Kaiyang Zhou, Tao Xiang, and Yi-Zhe Song. Learning to augment via implicit differentiation for domain generalization. In *British Machine Vision Conference (BMVC)*, 2022. **Oral**.
2. Jingkang Yang, Pengyun Wang, Dejian Zou, Zitang Zhou, Kunyuan Ding, Wenxuan Peng, Haoqi Wang, Guangyao Chen, Bo Li, Yiyou Sun, Xuefeng Du, Kaiyang Zhou, Wayne Zhang, Dan Hendrycks, Yixuan Li, and Ziwei Liu. Openood: Benchmarking generalized out-of-distribution detection. In *Proceedings of the Neural Information Processing Systems (NeurIPS) Track on Datasets and Benchmarks*, 2022.
3. Jingkang Yang, Yi Zhe Ang, Zujin Guo, Kaiyang Zhou, Wayne Zhang, and Ziwei Liu. Panoptic scene graph generation. In *European conference on computer vision (ECCV)*. Springer, 2022.
4. Yuhang Zang, Wei Li, Kaiyang Zhou, Chen Huang, and Chen Change Loy. Open-vocabulary detr with conditional matching. In *European conference on computer vision (ECCV)*. Springer, 2022. **Oral, 158/5,803=2.7%**.
5. Kaiyang Zhou, Jingkang Yang, Chen Change Loy, and Ziwei Liu. Conditional prompt learning for vision-language models. In *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, pages 16816–16825, 2022.
6. Zhongying Deng, Kaiyang Zhou, Yongxin Yang, and Tao Xiang. Domain attention consistency for multi-source domain adaptation. In *British Machine Vision Conference (BMVC)*, 2021.
7. Yezhen Wang, Bo Li, Tong Che, Kaiyang Zhou, Ziwei Liu, and Dongsheng Li. Energy-based open-world uncertainty modeling for confidence calibration. In *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV)*, pages 9302–9311, 2021.
8. Kaiyang Zhou, Yongxin Yang, Yu Qiao, and Tao Xiang. Domain generalization with mixstyle. In *International Conference on Learning Representations (ICLR)*, 2021.
9. Kaiyang Zhou, Yongxin Yang, Timothy Hospedales, and Tao Xiang. Learning to generate novel domains for domain generalization. In *European conference on computer vision (ECCV)*, volume 12361, pages 561–578. Springer, 2020.
10. Kaiyang Zhou, Yongxin Yang, Timothy Hospedales, and Tao Xiang. Deep domain-adversarial image generation for domain generalisation. In *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*, volume 34, pages 13025–13032, 2020.
11. Kaiyang Zhou, Yongxin Yang, Andrea Cavallaro, and Tao Xiang. Omni-scale feature learning for person re-identification. In *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV)*, pages 3702–3712, 2019.
12. Kaiyang Zhou, Tao Xiang, and Andrea Cavallaro. Video summarisation by classification with deep reinforcement learning. In *British Machine Vision Conference (BMVC)*, 2018. **Oral, 37/862=4.3%**.
13. Kaiyang Zhou, Yu Qiao, and Tao Xiang. Deep reinforcement learning for unsupervised video summarization with diversity-representativeness reward. In *Proceedings of the AAAI Conference on Artificial Intelligence (AAAI)*, volume 32, 2018. **Oral, 418/3,800=11%**.

14. Kaiyang Zhou, Adeline Paiement, and Majid Mirmehdi. Detecting humans in rgb-d data with cnns. In *2017 Fifteenth IAPR International Conference on Machine Vision Applications (MVA)*, pages 306–309. IEEE, 2017.

Workshop papers and technical reports:

1. Kaiyang Zhou, Chen Change Loy, and Ziwei Liu. Semi-supervised domain generalization with stochastic stylematch. In *NeurIPS 2021 Workshop on Distribution Shifts: Connecting Methods and Applications*, 2021.
2. Kaiyang Zhou and Tao Xiang. Torchreid: A library for deep learning person re-identification in pytorch. *arXiv preprint arXiv:1910.10093*, 2019.

Theses:

1. Kaiyang Zhou. *Adaptation and Generalization Across Domains in Visual Recognition with Deep Neural Networks*. PhD thesis, University of Surrey, 2020. pdf
2. Kaiyang Zhou. *Human Detection with Convolutional Neural Networks in RGB-D Images*. MSc thesis, University of Bristol, 2016. **(Best Master's Thesis.)**
3. Kaiyang Zhou. *Computer Vision-based Local Navigation for Mobile Robots*. BSc thesis, Ulster University, 2015.

Patents

1. "Dynamic prompt generation technology for vision-language models," filed through NTU & SenseTime, Singapore Patent No. 10202202104P, 2022; China Patent No. 202210431968.4, 2022.
2. "Deep learning-based video summarization method, device and end equipment," filed through SIAT, China Patent No. CN201711374076.0, 2018.

Grants

Co-I, "3D Geometry and Semantic Modeling for Human-Scene Interaction," MOE AcRF Tier 2. (S$ 613,574.00.)

Professional Services

Guest Editor

IJCV Special Issue on The Promises and Dangers of Large Vision Models (*lead guest editor*) 2023

Area Chair / Senior Program Committee

AAAI Conference on Artificial Intelligence (AAAI) 2023
British Machine Vision Conference (BMVC) 2022

Organizer

CVPR 2023 Tutorial: Prompting in Vision† 2023
ICLR 2023 Workshop: What do we need for successful domain generalization? 2023
ECCV 2022 Computer Vision in the Wild Challenges 2022
The AI Talks† 2022

†: *Lead organizer*

Reviewer

IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)
IEEE Transactions on Image Processing (TIP)
IEEE Transactions on Multimedia (TMM)
IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)
International Journal of Computer Vision (IJCV)
ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)
International Conference on Learning Representations (ICLR)
Advances in Neural Information Processing Systems (NeurIPS)

International Conference on Machine Learning (ICML)
AAAI Conference on Artificial Intelligence (AAAI)
IEEE Conference on Computer Vision and Pattern Recognition (CVPR)
International Conference on Computer Vision (ICCV)
European Conference on Computer Vision (ECCV)
British Machine Vision Conference (BMVC)

Teaching

Lecturer / Guest Lecturer, Nanyang Technological University
Open-World Visual Recognition (AI6126: Advanced Computer Vision) Apr 2022
Object Detection (OpenMMLab Workshop) Jun 2021

Teaching Assistant, Queen Mary University of London
ECS797: Machine Learning for Visual Data Analytics Spring 2018
ECS708: Machine Learning Fall 2017, Fall 2018

Mentoring

Xinyu Pan (PhD at CUHK) 2022 – present
Yuanhan Zhang (PhD at NTU) 2022 – present
Yuhang Zang (PhD at NTU) 2021 – present
Jingkang Yang (PhD at NTU) 2021 – present
Zhongying Deng (PhD at Surrey) 2019 – 2020

Talks

CVPR 2023 Tutorial on Prompting in Vision Jun 2023
Prompt learning for visual recognition and generation

Hong Kong Baptist University, CS Department Mar 2023
Open-world visual computing with foundation models: A prompt learning perspective

Nanyang Technological University, School of CSE Feb 2023
Towards generalizable and efficient learning system designs

National University of Singapore, ECE Department Jan 2023
Towards generalizable and efficient learning system designs

Nanyang Technological University, IET CV Workshop Oct 2021
Visual recognition: From closed-set discrete labels to open-set natural language supervision

University of Surrey, Centre for Vision, Speech and Signal Processing (CVSSP) Sep 2020
Adaptation and generalization across domains in visual recognition with deep neural networks

Nanyang Technological University, MMLab Jul 2020
Multi-source domain generalization and adaptation

Queen Mary University of London, Intelligent Sensing Summer School Aug 2018
Summarizing videos with deep reinforcement learning

Honors & Awards

Outstanding Reviewer, *ECCV 2022* 2022
Outstanding Reviewer, *ICCV 2021* 2021
Top 25% of Program Committee Members, *AAAI 2021* 2021
University Strategic Funds Studentship, *University of Surrey* 2019
Queen Mary Principal's Research Studentship, *Queen Mary University of London* 2017
Innovation Scholarship (for contribution to patent), *SIAT Chinese Academy of Sciences* 2017
Best Master's Thesis, *University of Bristol CS Department* 2016

Selected Open-Source Software

I promote open-source AI research and have been an activate contributor to the open-source community on Github. I have developed several open-source projects widely used by both academia and industry (with over 6k stars received in total on Github). Below are the two most representative projects. See my Github page for more.

1. Torchreid
- a well-documented Python library for research on deep learning-based person re-identification
- provides a model zoo containing various pre-trained models
- receives 3.7k+ stars on Github (ranked No. 1 by popularity on Github for person re-id)
- link: github.com/KaiyangZhou/deep-person-reid

2. Dassl.pytorch
- a Python library for research on domain generalization and domain adaptation
- receives 700+ stars on Github
- link: github.com/KaiyangZhou/Dassl.pytorch

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