

Kaiyang Zhou

Research Fellow
School of Computer Science and Engineering
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Research Interests

Machine Learning, Deep Learning, Computer Vision, Artificial Intelligence

Research Highlights

My research centers around the development of *generalizable* and *efficient* machine learning models—particularly those based on deep learning—for large-scale data analytics, with applications to computer vision, reinforcement learning, audio processing, medical imaging and more. My papers have been published at major journals and conferences in relevant fields, such as [IEEE Trans. PAMI](#) (flagship journal in AI with IF=24.31), [IJCV](#) (flagship journal in computer vision with IF=13.37), ICLR ([#1 conference in AI](#)), AAAI, NeurIPS, and the three prominent computer vision conferences (i.e., CVPR, ICCV & ECCV). In total, I have published over 15 papers including 2x TPAMI, 1x IJCV, 2x TIP, 1x ICLR, 2x AAAI, 1x NeurIPS, 1x CVPR, 2x ICCV, 3x ECCV, 2x BMVC, and 1x MVA. I have been actively engaging in academic services: I am a *guest editor* of IJCV, and serve as an *area chair/senior program committee member* for BMVC'22 and AAAI'23.

Google Scholar Citations: 1,834 (h-index: 14), as of Sep 2022.

Appointments

Nanyang Technological University, Singapore <i>Research Fellow with Prof. Ziwei Liu and Prof. Chen Change Loy</i>	Jan 2021–present
Samsung AI Center Cambridge, UK <i>Research Intern with Prof. Tao Xiang</i>	Nov 2018–May 2019
SIAT-MMLAB, Chinese Academy of Sciences, China <i>Research Assistant with Prof. Yu Qiao</i>	Oct 2016–Aug 2017

Education

PhD in Computer Science, University of Surrey, UK <i>Supervised by Prof. Tao Xiang</i>	Sep 2020
MSc in Advanced Computing (Distinction), University of Bristol, UK <i>Supervised by Prof. Majid Mirmehdi and Dr. Adeline Paiement</i>	Sep 2016
BSc in Computer Science (First Class Honor), University of Ulster, UK <i>Supervised by Dr. Inaki Rano</i>	Jun 2015

Publications

Top-5 publications:

1. 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. IF: 24.31. [pdf](#) (TL;DR: A comprehensive survey that summarizes the recent ten-year progress in domain generalization.)

2. 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. IF: 13.37. [pdf](#)
(TL;DR: An efficient and generalizable prompt learning approach for adapting large-scale vision-language models.)
3. Kaiyang Zhou, Yongxin Yang, Yu Qiao, and Tao Xiang. Domain generalization with mixstyle. In *International Conference on Learning Representations (ICLR)*, 2021. [pdf](#)
(TL;DR: A simple, plug-and-play module that improves domain generalization for neural networks and is applicable to natural images, satellite images, medical images, audio data, etc.)
4. 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. IF: 24.31. [pdf](#)
(TL;DR: An extremely lightweight person re-id neural network that, once trained, can generalize from one dataset to another without retraining (also widely used by the community for other human-centered applications such as person tracking and human behavior analysis).)
5. 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 %**. [pdf](#)
(TL;DR: An unsupervised video summarization approach based on deep reinforcement learning.)

Refereed journal articles:

1. 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. IF: 24.31. [pdf](#)
2. 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. IF: 13.37. [pdf](#)
3. 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. IF: 11.04. [pdf](#)
4. Kaiyang Zhou, Yongxin Yang, Yu Qiao, and Tao Xiang. Domain adaptive ensemble learning. *IEEE Transactions on Image Processing (TIP)*, 30:8008–8018, 2021. IF: 11.04. [pdf](#)
5. 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. IF: 24.31. [pdf](#)

Refereed conference papers:

1. Jingkang Yang, Pengyun Wang, Dejian Zou, Zitang Zhou, Kunyuan Ding, Wenxuan Peng, Haoqi Wang, Guangyao Chen, Bo Li, Yiyong 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. [pdf](#)
2. 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. [pdf](#)
3. 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 %**. [pdf](#)
4. 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. [pdf](#)
5. Zhongying Deng, Kaiyang Zhou, Yongxin Yang, and Tao Xiang. Domain attention consistency for multi-source domain adaptation. In *British Machine Vision Conference (BMVC)*, 2021. [pdf](#)
6. 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. [pdf](#)

7. Kaiyang Zhou, Yongxin Yang, Yu Qiao, and Tao Xiang. Domain generalization with mixstyle. In *International Conference on Learning Representations (ICLR)*, 2021. [pdf](#)
8. 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. [pdf](#)
9. 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. [pdf](#)
10. 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. [pdf](#)
11. 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%**. [pdf](#)
12. 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%**. [pdf](#)
13. 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. [pdf](#)

Workshop and other papers:

1. Kaiyang Zhou, Yuanhan Zhang, Yuhang Zang, Jingkang Yang, Chen Change Loy, and Ziwei Liu. On-device domain generalization. *arXiv preprint arXiv:2209.07521*, 2022. (Under review.) [pdf](#)
2. Yuanhan Zhang, Kaiyang Zhou, and Ziwei Liu. Neural prompt search. *arXiv preprint arXiv:2206.04673*, 2022. (Under review.) [pdf](#)
3. Jingkang Yang, Kaiyang Zhou, and Ziwei Liu. Full-spectrum out-of-distribution detection. *arXiv preprint arXiv:2204.05306*, 2022. (Under review.) [pdf](#)
4. Jingkang Yang, Kaiyang Zhou, Yixuan Li, and Ziwei Liu. Generalized out-of-distribution detection: A survey. *arXiv preprint arXiv:2110.11334*, 2021. (Under review.) [pdf](#)
5. Kaiyang Zhou, Yongxin Yang, Yu Qiao, and Tao Xiang. Mixstyle neural networks for domain generalization and adaptation. *arXiv preprint arXiv:2107.02053*, 2021. (Under review.) [pdf](#)
6. 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. (Under review.) [pdf](#)
7. Kaiyang Zhou and Tao Xiang. Torchreid: A library for deep learning person re-identification in pytorch. *arXiv preprint arXiv:1910.10093*, 2019. [pdf](#)

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. Kaiyang Zhou, Jingkang Yang, Chen Change Loy, Ziwei Liu, and Jing Shao. Dynamic prompt generation technology for vision-language models. Singapore Patent No. 10202202104P, 2022. (China Patent No. 202210431968.4. Filing date: 22 April 2022.)

2. Yu Qiao and Kaiyang Zhou. Deep learning-based video summarization method, device and end equipment. 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

International Journal of Computer Vision (IJCV) [2023](#)

Area Chair / Senior Program Committee

AAAI Conference on Artificial Intelligence (AAAI) 2023

British Machine Vision Conference (BMVC) [2022](#)

Organizer / Co-Organizer

[ECCV 2022 Computer Vision in the Wild Challenges](#) 2022

[The AI Talks](#) (an initiative aiming to democratize AI through open talks) 2022–present

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 Experience

Lecturer / Guest Lecturer, *Nanyang Technological University*

AI6126: Advanced Computer Vision (Topic: Open-World Visual Recognition; Master-level) Apr 2022

[OpenMMLab Workshop](#): Object Detection June 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 Experience

Xinyu Pan (PhD@CUHK, co-supervised with Prof. Chen Change Loy) 2022–present

Yuanhan Zhang (PhD@NTU, co-supervised with Prof. Ziwei Liu) 2022–present

Yuhang Zang (PhD@NTU, co-supervised with Prof. Chen Change Loy) 2021–present

Jingkang Yang (PhD@NTU, co-supervised with Prof. Ziwei Liu) 2021–present

Zhongying Deng (PhD@Surrey, co-supervised with Prof. Tao Xiang) 2019–2020

Talks

Visual Recognition: From Closed-set Discrete Labels to Open-set Natural Language Supervision

Invited talk at the IET CV Workshop, NTU, Singapore, Oct 2021

Multi-Source Domain Generalization and Adaptation

Invited talk at MMLab@NTU, Singapore, Jul 2020.

Summarizing Videos with Deep Reinforcement Learning

Invited talk at the Intelligent Sensing Summer School, QMUL, London, Aug 2018

Awards & Honors

Outstanding Reviewer, ICCV 2021	2021
Top 25% of Program Committee Members, AAAI 2021	2021
University Strategic Funds Studentship, <i>University of Surrey</i>	2019
Queen Mary Principal's Research Studentship, <i>Queen Mary University of London</i>	2017
Innovation Scholarship (for contribution to patent), <i>SIAT Chinese Academy of Sciences</i>	2017
Best Master's Thesis, <i>University of Bristol CS Department</i>	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 that have been widely used by the community, of 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 Python library for research on deep learning-based person re-identification
- received 3.5k+ stars on Github ([ranked No. 1 by popularity on Github for person re-id](#))
- link: github.com/KaiyangZhou/deep-person-reid

2. Dassel.pytorch

- a Python library for research on domain generalization and domain adaptation
- received 600+ stars on Github
- link: github.com/KaiyangZhou/Dassel.pytorch

References

Chen Change Loy (postdoc advisor)

Associate Professor, Nanyang Technological University, Singapore
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Tao Xiang (PhD advisor)

Professor, University of Surrey, UK
t.xiang@surrey.ac.uk

Yu Qiao (former mentor)

Professor, Shanghai AI Laboratory; Shenzhen Institute of Advanced Technology, CAS
yu.qiao@siat.ac.cn

Timothy Hospedales (collaborator)

Professor, University of Edinburgh, UK
t.hospedales@ed.ac.uk

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