

# Kaiyang Zhou

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Research Fellow  
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## Research Interests

Machine Learning, Deep Learning, Computer Vision

## 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 and more. My papers have been published at major journals and conferences in relevant fields, such as [TPAMI](#) (flagship journal in AI), [IJCV](#) (flagship journal in computer vision), ICLR ([#1 conference in AI](#)), AAAI, 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 CVPR, 2x ICCV, 3x ECCV, 2x BMVC, and 1x MVA—and filed 2 patents. I serve as an area chair/senior program committee member for BMVC 2022 and AAAI 2023.

**Google Scholar Citations:** 1,720 (h-index: 14), as of Aug 2022.

## Appointments

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

## Education

<b>University of Surrey, UK</b> PhD in Computer Science <i>Supervised by Prof. Tao Xiang</i>	2020
<b>University of Bristol, UK</b> MSc with Distinction in Advanced Computing <i>Supervised by Prof. Majid Mirmehdi and Dr. Adeline Paiement</i>	2016
<b>University of Ulster, UK</b> BSc with First Class Honor in Computer Science <i>Supervised by Dr. Inaki Rano</i>	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. 129 citations.**) [pdf](#)  
(TL;DR: A comprehensive survey that summarizes the progress in domain generalization in the last decade.)

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. 90 citations.) [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. (142 citations.) [pdf](#)  
(TL;DR: A simple, plug-and-play module that improves domain generalization for neural networks (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. 500+ citations combined for the conference and journal version.) [pdf](#)  
(TL;DR: An extremely lightweight person re-id neural network that is generalizable across different re-id datasets (also widely used for other human-centered applications such as person tracking).)
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%. 266 citations.) [pdf](#)  
(TL;DR: An unsupervised video summarization approach based on deep reinforcement learning (first of kind in the area of video summarization).)

#### 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. doi: [10.1109/TPAMI.2022.3195549](#). (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. doi: [10.1007/s11263-022-01653-1](#). (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. doi: [10.1109/TIP.2022.3186531](#). (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. doi: [10.1109/TIP.2021.3112012](#). (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. doi: [10.1109/TPAMI.2021.3069237](#). (IF: 24.31.) [pdf](#)

#### Refereed conference papers:

1. 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](#)
2. 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](#)
3. **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](#)
4. 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](#)
5. 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. doi: [10.1109/iccv48922.2021.00917.pdf](https://doi.org/10.1109/iccv48922.2021.00917.pdf)

6. **Kaiyang Zhou**, Yongxin Yang, Yu Qiao, and Tao Xiang. Domain generalization with mixstyle. In *International Conference on Learning Representations (ICLR)*, 2021. [pdf](#)
7. **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. doi: [10.1007/978-3-030-58517-4\\_33](https://doi.org/10.1007/978-3-030-58517-4_33). [pdf](#)
8. **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. doi: [10.1609/aaai.v34i07.7003](https://doi.org/10.1609/aaai.v34i07.7003). [pdf](#)
9. **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. doi: [10.1109/iccv.2019.00380](https://doi.org/10.1109/iccv.2019.00380). [pdf](#)
10. **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](#)
11. **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. doi: [10.1609/aaai.v32i1.12255](https://doi.org/10.1609/aaai.v32i1.12255). **(Oral, 418/3,800=11%.)** [pdf](#)
12. **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. doi: [10.23919/MVA.2017.7986862](https://doi.org/10.23919/MVA.2017.7986862). [pdf](#)

#### Workshop and other papers:

1. Yuanhan Zhang, **Kaiyang Zhou**, and Ziwei Liu. Neural prompt search. *arXiv preprint arXiv:2206.04673*, 2022. [pdf](#)
2. Jingkan Yang, **Kaiyang Zhou**, and Ziwei Liu. Full-spectrum out-of-distribution detection. *arXiv preprint arXiv:2204.05306*, 2022. [pdf](#)
3. Jingkan Yang, **Kaiyang Zhou**, Yixuan Li, and Ziwei Liu. Generalized out-of-distribution detection: A survey. *arXiv preprint arXiv:2110.11334*, 2021. [pdf](#)
4. **Kaiyang Zhou**, Yongxin Yang, Yu Qiao, and Tao Xiang. Mixstyle neural networks for domain generalization and adaptation. *arXiv preprint arXiv:2107.02053*, 2021. [pdf](#)
5. **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. [pdf](#)
6. **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.

## Grants

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

## 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.

## Professional Services

### Organizer:

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

### Area Chair / Senior Program Committee:

- AAAI Conference on Artificial Intelligence (AAAI) 2023
- British Machine Vision Conference (BMVC) [2022](#)

### 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

### Nanyang Technological University

#### Lecturer / Guest Lecturer

- AI6126: Advanced Computer Vision (Topic: Open-World Visual Recognition; Master-level) Apr 2022
- [OpenMMLab Workshop](#): Object Detection June 2021

### Queen Mary University of London

#### Teaching Assistant

- ECS797: Machine Learning for Visual Data Analytics Spring 2018
- ECS708: Machine Learning Fall 2017, Fall 2018

## Mentoring Experience

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|-----------------------------------------------------------------|--------------|
| 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 for <a href="#">ICCV 2021</a>	2021
Top 25% of Program Committee Members of <a href="#">AAAI 2021</a>	2021
University Strategic Funds Studentship, University of Surrey	2019–2020
Queen Mary Principal's Research Studentship, Queen Mary University of London	2017–2019
Innovation Scholarship for Contribution to Patent, SIAT, Chinese Academy of Sciences	2017
Best Master's Thesis, Dept. of Computer Science, University of Bristol	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](https://github.com/KaiyangZhou/deep-person-reid)

### 2. Dssl.pytorch

- a Python library for research on domain generalization and domain adaptation
- received 600+ stars on Github
- link: [github.com/KaiyangZhou/Dssl.pytorch](https://github.com/KaiyangZhou/Dssl.pytorch)

## References

*Available upon request.*

*Last update: August 2022*