Xianyuan Liu

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Personal Profile

A Senior AI Research Engineer at the Department of Computer Science, and Assistant Head of AI Research Engineering at the Centre for Machine Intelligence, University of Sheffield. Specializes in machine learning, multi-modal learning, video domain adaptation and AI engineering.

Education

University of Chinese Academy of Sciences   *Beijing & Chengdu, China*

PhD in Signal and Information Processing   *Sept 2016 - July 2023*

- In Institute of Optics and Electronics (IOE)
- Supervisor: Prof. Tao Lei and Prof. Ping Jiang
- Research direction: Deep learning, action recognition, and domain adaptation
- Dissertation: Video Action Recognition with Unsupervised Domain Adaptation

Southeast University   *Nanjing, China*

BEng in Measuring Control Technology and Instruments   *Sept 2012 - Jun 2016*

- In School of Instrument Science and Engineering (INS)
- Supervisor: Prof. Xiaoguo Zhang
- Research direction: Image processing and signal processing
- Thesis: Research on Key Technologies of Remote Video Monitoring for Ocean Vessel

Work Experience

University of Sheffield   *Sheffield, UK*

Senior AI Research Engineer at Department of Computer Science   *Sept 2023 - Current*

- Research direction: Domain adaptation, multi-modal learning, and machine learning for healthcare

University of Sheffield   *Sheffield, UK*

Visiting Researcher at Department of Computer Science   *Sept 2019 - Sept 2021*

- Supervisor: Prof. Haiping Lu
- Contributed to the development of the machine learning library PyKale
- Collaborated with the Machine Learning Research Group on domain adaptation and medical image processing
- Participated in the supervision of two undergraduates and two MSc graduate students

Research Projects

DOMAIN ADAPTATION

Multi-modal First-person Video Domain Adaptation   *China*

University of Chinese Academy of Sciences   *Feb 2022 - Current*

- Developed new Transformer encoders for learning spatio-temporal information from RGB frames, optical flow, and audio signal individually
- Developed an attention-based cascade fusion for modeling the relationship between three modalities
- Developed a multi-stage conditional adversarial domain alignment and Incorporated all developed algorithms for recognizing human actions
- **Results:** Proposed a multi-stage video domain adaptation algorithm for multi-modal action video input
- **Achievements:** Published two international conference paper (ITNEC2023 & ISPP2023)

Uni-modal First-person Video Domain Adaptation   *UK & China*

University of Sheffield & University of Chinese Academy of Sciences   *Mar 2020 - Jan 2022*

- Studied state-of-the-art attention mechanisms and developed a mechanism for modeling channel and temporal interdependencies in CNN
- Developed an attention-based I3D algorithm for learning spatio-temporal information from RGB frames
- Incorporated the developed I3D with adversarial domain alignment for recognizing human actions
- **Results:** Created new multi-scene cross-site benchmark datasets and proposed a new attention-based video domain adaptation algorithm
- **Achievements:** Published an IEEE Transaction journal paper (CSVT)

Development of the Open-source Machine Learning Library: PyKale
UK

University of Sheffield
Aug 2020 - Current

- Participated in the design of the main structure, i.e. modular and pipeline-based architecture
- Implemented some image processing and all video processing algorithms and their functional testing
- Participated in creating the explanation document, operating manual, and instructive example
- Participated in daily maintenance and updates
- **Results & Achievements:** Joined the PyTorch ecosystem and published an international conference paper (CIKM2022)

ACTION RECOGNITION

Abnormal Human Action Detection using Internet of Vehicles
China

University of Chinese Academy of Sciences
Mar 2018 - Dec 2018

- Studied urban monitoring techniques for detecting abnormal human action and established the technical roadmap
- Utilized super-resolution algorithms for improving video quality from Mobile Digital Video Recorder
- Developed the abnormal action detection algorithm using 3D CNN
- **Results:** Developed an effective smart vehicle system for detecting and reporting abnormal human activities
- **Achievements:** Participated in the Innovation and Entrepreneurship Competition hosted by the Youth Promotion Association of the Chinese Academy of Sciences and won a 5,000 RMB prize

Temporal Action Detection in Untrimmed Videos from Fine to Coarse Granularity
China

University of Chinese Academy of Sciences
Mar 2018 - May 2019

- Developed new 3D CNNs for learning spatio-temporal information under the "proposal then classification" framework
- Developed a window-level classifier for coarse-grained classification to locate the time range of actions, and a segment-level classifier for fine-grained classification to classify the located actions
- **Results:** Proposed a new algorithm to overcome the challenge of recognition on untrimmed long-term action videos
- **Achievements:** Published a journal paper (Applied Sciences)

Temporal Modeling on Multi-Temporal-Scale Spatio-temporal Atoms
China

University of Chinese Academy of Sciences
Dec 2017 - May 2019

- Created multi-modal action video input for improving temporal information embedding by transferring knowledge from RGB to optical flow
- Developed different Res3D algorithms for different modalities to generate the atomic features at different time scales
- Developed multiple PCA algorithms for generating spatio-temporal atomic features
- Utilized LSTM for improving the embedding of long-term time information
- **Results:** Proposed a Res3D-based algorithm that can capture spatio-temporal information at different scales
- **Achievements:** Published a journal paper (Applied Sciences)

Action Recognition using 3D CNN and GRU algorithms
China

University of Chinese Academy of Sciences
Dec 2017 - Aug 2018

- Studied and evaluated state-of-the-art action recognition algorithms and GRU algorithms on publicly available third-person action video dataset
- Utilized 3D CNN for learning spatio-temporal information from videos
- Incorporated GRU for improving the insufficient embedding of long-term time information in 3D CNN
- **Results:** Proposed a new algorithm to address the limitation of 3D CNN in handling long-term time information
- **Achievements:** Published an international conference paper (ICRCA)

Publications

JOURNAL ARTICLES

First-Person Video Domain Adaptation with Multi-Scene Cross-Site Datasets and Attention-Based Methods
    Xianyuan Liu, Shuo Zhou, Tao Lei, Ping Jiang, Zhixiang Chen, Haiping Lu
    IEEE Transactions on Circuits and Systems for Video Technology (TCSVT) (2023). IEEE, 2023

Single-Frame Infrared Small Target Detection by High Local Variance, Low-Rank and Sparse Decomposition
    Yujia Liu, **Xianyuan Liu**, Xuying Hao, Wei Tang, Sanxing Zhang, Tao Lei
    IEEE Transactions on Geoscience and Remote Sensing (TGRS) 61 (2023) pp. 1–17. IEEE, 2023

Text semantic fusion relation graph reasoning for few-shot object detection on remote sensing images
    Sanxing Zhang, Fei Song, **Xianyuan Liu**, Xuying Hao, Yujia Liu, Tao Lei, Ping Jiang
    Remote Sensing 15.5 (2023) p. 1187. Multidisciplinary Digital Publishing Institute, 2023

Temporal action detection in untrimmed videos from fine to coarse granularity
    Guangle Yao, Tao Lei, **Xianyuan Liu**, Ping Jiang
    Applied Sciences 8.10 (2018) p. 1924. Multidisciplinary Digital Publishing Institute, 2018

Temporal modeling on multi-temporal-scale spatiotemporal atoms for action recognition
    Guangle Yao, Tao Lei, **Xianyuan Liu**, Ping Jiang
    Applied Sciences 8.10 (2018) p. 1835. Multidisciplinary Digital Publishing Institute, 2018

CONFERENCE PROCEEDINGS

Fine-grained egocentric action recognition with multi-modal unsupervised domain adaptation
Xianyuan Liu, Tao Lei, Ping Jiang
IEEE 6th Information Technology, Networking, Electronic and Automation Control Conference (ITNEC), 2023

Cascade attentional fusion for unsupervised domain adaptation on multi-modal egocentric video analysis
Xianyuan Liu, Sanxing Zhang, Tao Lei, Ping Jiang
SPIE 2nd International Conference on Image, Signal Processing and Pattern Recognition (ISPP), 2023

PyKale: Knowledge-aware machine learning from multiple sources in Python
Haiping Lu, **Xianyuan Liu**, Robert Turner, Peizhen Bai, Raivo E Koot, Shuo Zhou, Mustafa Chasmai, Lawrence Schobs
Proceedings of the 31st ACM International Conference on Information and Knowledge Management (CIKM), 2022

Action recognition with 3D ConvNet-GRU architecture
Guangle Yao, **Xianyuan Liu**, Tao Lei
Proceedings of the 3rd International Conference on Robotics, Control and Automation (ICRCA), 2018

Constructing hierarchical spatiotemporal information for action recognition
Guangle Yao, Jiandan Zhong, Tao Lei, **Xianyuan Liu**
IEEE 15th International Conference on Ubiquitous Intelligence and Computing (ICUIC), 2018

Academic Experience

2023	**IEEE Transactions on Cognitive and Developmental Systems (TCDS)**	*Reviewer*
2022	**IEEE Transactions on Neural Networks and Learning Systems (TNNLS)**	*Reviewer*
2021	**British Machine Vision Conference (BMVC)**	*Reviewer*
2019	**Conference on Neural Information Processing Systems (NeurIPS)**	*Assistant Reviewer*
2019	**IEEE Asian Conference on Artificial Intelligence Technology (ACAIT)**	*Reviewer*
2019	**International Conference on Physics and Materials Science (ICPMS)**	*Reviewer*

Achievements

2019	**China Scholarship Council Scholarship**, State Scholarship Fund (Top 1% / all applicants in China)	*China*
2018	**Excellent Student Leader**, UCAS (Top 2% / all UCAS students)	*China*
2018	**Triple-A Student**, UCAS (Top 15% / all UCAS students)	*China*
2017	**Excellent Student Leader**, IOE, UCAS (Top 3% / all IOE students)	*China*

Challenge Experience

EPIC-KITCHENS-100 Unsupervised Domain Adaptation Challenge for Action Recognition   *UK*
CVPR2021   *Mar 2021 - Jun 2021*
- The first and only international competition for first-person video action recognition using domain adaptation
- Objective: Multi-class task, including verb, noun, and action classifications
- **Achievements:** Improved the baseline algorithm and ranked in 5th place

Student Activities

University of Chinese Academy of Sciences   *Chengdu, China*
Vice-chairman of the Student Union in IOE   *Jan 2018 - Jan 2019*
- Set up a new dormitory inspection system
- Organized two traditional activities (Cooking Competition and Tree Planting Day)
- Organized the enrollment procedure for first-year students

Southeast University   *Nanjing, China*
Vice-chairman of the Student Union in INS   *May 2014 - May 2015*
- Set up a new volunteer organization and directed the voluntary service activity
- Organized four traditional activities (New Year Performance, Career Guidance Activity, etc.)
- Participated in the administration of daily affairs

Skills

Programming	Python (PyTorch, PyTorch Lightning, NumPy, Pandas, etc.), Matlab, and C/C++.
Miscellaneous	Linux, Shell (Bash), LaTeX (Overleaf) and Git.
Soft Skills	Teamwork, Project Management, Problem-solving, Documentation, Engaging Presentation.