

# Rui Zhao

Phone: +86 15522968695 Email: ruizhao@stu.pku.edu.cn Homepage: <https://ruizhao26.github.io>  
2728 Science Building #2, Peking University, No.5 Yiheyuan Road, Haidian District, Beijing

## Education Experience

### Peking University

2020.09 – Present

*Ph.D. Candidate, Computer Science, School of Computer Science*

- Institute for Video Technology, Supervisor: Ruiqin Xiong
- Research Topics: Optical flow estimation and image reconstruction for neuromorphic cameras

### Tianjin University

2016.09 – 2020.07

*Bachelor of Engineering, Communication Engineering, Qiushi Honor College*

- GPA: 94.5/100, 3.94/4.00; Rank: 1/125

### Nankai University

2017.09 – 2020.07

*Bachelor of Economics, Finance, School of Finance*

## Publications

### First-Authored (Including Jointly First-Authored) Papers:

- [1] Boosting Spike Camera Image Reconstruction from a Perspective of Dealing with Spike Fluctuations  
**Rui Zhao**, Ruiqin Xiong, Jing Zhao, Jian Zhang, Xiaopeng Fan, Zhaofei Yu, Tiejun Huang  
IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**) 2024 (**CCF-A**)  
Intro: Analyzing statistics of spikes' quantitative effects from a perspective of spike fluctuations, proposing robust spike representation and alignment strategy in spike-based image reconstruction.
- [2] Optical Flow for Spike Camera with Hierarchical Spatial-Temporal Spike Fusion  
**Rui Zhao**, Ruiqin Xiong, Jian Zhang, Xinfeng Zhang, Zhaofei Yu, Tiejun Huang  
AAAI Conference on Artificial Intelligence (**AAAI**) 2024 (**CCF-A**)  
Intro: Proposing a hierarchical spatial-temporal fusion representation for spikes, improving the accuracy of the description for correlation volume in spike-based optical flow estimation.
- [3] Learning Optical Flow From Continuous Spike Streams  
**Rui Zhao**, Ruiqin Xiong, Jing Zhao, Zhaofei Yu, Xiaopeng Fan, Tiejun Huang  
Annual Conference on Neural Information Processing Systems (**NeurIPS**) 2022 (**CCF-A**)  
Intro: Constructing relationships between the continuousness of the recording for scenes of spike cameras and the continuousness of motion, improving the accuracy of motion estimation based on temporal context.
- [4] Optical Flow Estimation for Spiking Camera  
Liwen Hu#, **Rui Zhao**#, Ziluo Ding, Lei Ma, Boxin Shi, Ruiqin Xiong, Tiejun Huang (# Jointly First Author)  
IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**) 2022 (**CCF-A**)  
Intro: Proposing the first simulator and dataset for spike-based optical flow, and proposing a optical flow neural network for spike camera based on motion-guided prior.
- [5] Spike Camera Image Reconstruction Using Deep Spiking Neural Networks  
**Rui Zhao**, Ruiqin Xiong, Jian Zhang, Zhaofei Yu, Shuyuan Zhu, Lei Ma, Tiejun Huang  
IEEE Transactions on Circuits and Systems for Video Technology (**TCSVT**) 2024 (**CCF-B, SCI Q1, IF=8.4**)  
Intro: Processing continuous spikes output from spike cameras using temporally continuous spiking neural networks, realizing continuous scene reconstruction.
- [6] MRDFlow: Unsupervised Optical Flow Estimation Network With Multi-Scale Recurrent Decoder  
**Rui Zhao**, Ruiqin Xiong, Ziluo Ding, Xiaopeng Fan, Jian Zhang, Tiejun Huang  
IEEE Transactions on Circuits and Systems for Video Technology (**TCSVT**) 2022 (**CCF-B, SCI Q1, IF=8.4**)  
Intro: Introducing dual motion injection, multi-scale processing, and loss function that preserves high-resolution information in the upsampling of flow into the recurrent decoding of unsupervised optical flow estimation.
- [7] Optical Flow Estimation Between Images of Different Resolutions via Variational Method  
**Rui Zhao**, Ruiqin Xiong, Shuyuan Zhu, Bing Zeng, Tiejun Huang, and Wen Gao  
IEEE International Conference on Visual Communications and Image Processing (**VCIP**) 2020  
Intro: Proposing an energy function for optical flow estimation between images of different resolutions and iteratively solving the flow based on the Euler-Lagrange Equation.

### Co-Authored Papers:

- Spatio-Temporal Recurrent Networks for Event-Based Optical Flow Estimation  
Ziluo Ding, **Rui Zhao**, Jiyuan Zhang, Tianxiao Gao, Ruiqin Xiong, Zhaoifei Yu, Tiejun Huang  
AAAI Conference on Artificial Intelligence (**AAAI**) 2022 (**CCF-A**)  
Intro: Proposing a dual feature encoding based on recurrent network and correlation volume in event-based optical flow estimation.
- Unsupervised Optical Flow Estimation with Dynamic Timing Representation for Spike Camera  
Lujie Xia, Ziluo Ding, **Rui Zhao**, Jiyuan Zhang, Lei Ma, Zhaoifei Yu, Tiejun Huang, Ruiqin Xiong  
Annual Conference on Neural Information Processing Systems (**NeurIPS**) 2023 (**CCF-A**)  
Intro: Proposing a spike representation based on temporal dilated convolution, and proposing an illumination consistency loss function for spikes.
- Learning to Super-Resolve Dynamic Scenes for Neuromorphic Spike Camera  
Jing Zhao, Ruiqin Xiong, Jian Zhang, **Rui Zhao**, Hangfan Liu, Tiejun Huang  
AAAI Conference on Artificial Intelligence (**AAAI**) 2023 (**CCF-A**)  
Intro: Proposing a spike representation based on adaptive convolutional kernels and a feature fusion strategy based on bi-directional recurrent networks for spike-based super-resolution.
- Optimization-Inspired Deep Network for Image Restoration from Partial Random Samples  
Yanchen Dong, **Rui Zhao**, Ruiqin Xiong, Shuyuan Zhu, Xiaopeng Fan, Tiejun Huang  
IEEE International Symposium on Circuits and Systems (**ISCAS**) 2023 (**CCF-C**)  
Intro: Proposing a deep unfolding neural network based on the unfolding energy-minimization equations for restoring images from partial random sampling.

## Project

---

- **SpikeCV: An Open-Source Framework for Spike Vision** (Number of Downloads on OpenI: 12k+)  
Main Members: Yajing Zheng(Postdoc), Jiyuan Zhang, **Rui Zhao**, Shiyao Chen, Jianhao Ding, Weijian Wu, et. al.  
My Responsibility: Algorithms and tools (such as assessment and visualization) for optical flow and image reconstruction parts.  
OpenI Community Excellent Incubation Project Award. OpenI Community Excellent Developer Award.

## Awards

---

- President Scholarship for Ph.D. Student of Peking University(2%) 2020, 2021, 2022
- Industrial Bank Scholarship 2023
- UbiQuant Scholarship 2022
- Outstanding Student Model Honorable Mention Scholarship of Tianjin University (0.05%) 2019
- National Scholarship for Bachelor Student of Tianjin University(2%) 2018, 2019

## Academic Services

---

- **Serving as Journal Reviewer:**  
IEEE Transactions on Image Processing (**TIP**) (**CCF-A, SCI Q1**)  
IEEE Transactions on Circuits and Systems for Video Technology (**TCSVT**) (**CCF-B, SCI Q1**)  
IEEE Transactions on Multimedia (**TMM**) (**CCF-B, SCI Q1**)  
IEEE Transactions on Intelligent Vehicles (**TIV**) (**SCI Q1**)
- **Serving as Conference Reviewer:**  
IEEE/CVF Conference on Computer Vision and Pattern Recognition (**CVPR**) 2022 – 2024 (**CCF-A**)  
IEEE/CVF International Conference on Computer Vision (**ICCV**) 2023 (**CCF-A**)  
European Conference on Computer Vision (**ECCV**) 2022, 2024 (**CCF-B**)  
AAAI Conference on Artificial Intelligence (**AAAI**) 2023 – 2024 (**CCF-A**)  
IEEE International Conference on Robotics and Automation (**ICRA**) 2024 (**CCF-B**)  
Asian Conference on Computer Vision (**ACCV**) 2024 (**CCF-C**)  
IEEE International Conference on Image Processing (**ICIP**) 2022 – 2024 (**CCF-C**)

## Skills

---

- Language: Chinese(Native), English(CET-6: 569)
- Programming Language and Tools: Python, Matlab, C++, C; Pytorch, Numpy, OpenCV
- Layout and Office:  $\text{\LaTeX}$ , Microsoft Office