# YUNHAO ZOU

Ph.D. Candidate & Beijing Institute of Technology & Beijing, 100081

Homepage & jackzouyh@gmail.com & Google Scholar

## **EDUCATION**

Beijing Institute of Technology, Beijing, China	2019.9 - 2025.6 (expected)
Ph.D. Candidate in Computer Science, Supervisor: Prof. Ying Fu	
University of Würzburg, Würzburg, Germany	2024.3 - 2025.3 (expected)
Joint Ph.D. Student in Computer Science, Supervisor: Prof. Radu Timofte	
Beijing Institute of Technology, Beijing, China	2015.9 - 2019.6
B.S. in Computer Science and Technology	GPA: 3.7/4.0

#### **RESEARCH INTERESTS**

Computer vision, computational photography, low-level vision, image denosing, HDR imaging, computational imaging

# PUBLICATION

**[TPAMI'24]** <u>Yunhao Zou</u>, Ying Fu, Tsuyoshi Takatani, Yinqiang Zheng, EventHDR: from Event to High-Speed HDR Videos and Beyond (IF=20.8)

[CVPR'24] Xinzhe Wang, Kang Ma, Qiankun Liu, Yunhao Zou, Ying Fu, Multi-Object Tracking in the Dark

**[ICCV'23]** <u>Yunhao Zou</u>, Chenggang Yan, Ying Fu, RawHDR: High Dynamic Range Image Reconstruction from a Single Raw Image

[ICCV'23] <u>Yunhao Zou</u>, Chenggang Yan, Ying Fu, Iterative Denoiser and Noise Estimator for Self-supervised Image Denoising

**[TCSVT'23]** Ying Fu, Yang Hong, <u>Yunhao Zou</u>, Qiankun Liu, Yiming Zhang, Ning Liu, Chenggang Yan, Raw Image Based Over-Exposure Correction Using Channel-Guidance Strategy (IF=8.3)

**[TGRS'23]** Ying Fu, Hongrong Liu, <u>Yunhao Zou</u>, Zhongxiang Li, Dezhi Zheng, Category-Level Band Learning Based Feature Extraction for Hyperspectral Image Classification (IF=7.5)

[CVPR'22] <u>Yunhao Zou</u>, Ying Fu, Estimating Fine-Grained Noise Model via Contrastive Learning, IEEE Conference on Computer Vision and Pattern Recognition

**[CVPR'21]** <u>Yunhao Zou</u>, Yinqiang Zheng, Tsuyoshi Takatani, Ying Fu, Learning to Reconstruct High Speed and High Dynamic Range Videos from Events

**[PRCV'21]** Yuhang Zeng, <u>Yunhao Zou</u>, Ying Fu, 3D<sup>2</sup>UNet: 3D Deformable Unet for Low-Light Video Enhancement **[RS'20]** <u>Yunhao Zou</u>, Ying Fu, Yinqiang Zheng, Wei Li, CSR-Net: Camera Spectral Response Network for Dimensionality Reduction and Classification in Hyperspectral Imagery

**[OL'20]** Ying Fu, <u>Yunhao Zou</u>, Liheng Bian, Yuxiang Guo, Hua Huang, Illumination Modulation for Reflective and Fluorescent Separation

**[OE'19]** Ying Fu, <u>Yunhao Zou</u>, Yinqiang Zheng, Hua Huang, Spectral Reflectance Recovery Using Optimal Illuminations

## **PROJECTS**

## **Image Denoising**

At BIT and University of Würzburg

Jun. 2021 - present CVPR'22 ICCV'23

- We model fine-grained noise model from the physics perspective, and present a noise estimation method based on contrastive learning. Then, an innovative noise model estimation and noise synthesis pipeline is presented for realistic noisy image generation. Our pipeline accurately estimates the parameters for complex noise models and improve the denoising performances on real image denoising, with only test noisy images.
- We design an iterative training strategy for self-supervised image denoising, which iteratively optimizes the denoiser and noise estimator, and gradually approaches high denoising performances using only single noisy images.

# HDR Image/Video Reconstruction

At BIT and University of Würzburg, cooperated with Tokyo University

- We set up a prototype optical imaging system to collect a real-world dataset with paired high speed HDR videos and event streams. With such data, we present a convolutional recurrent neural network for the reconstruction of high speed HDR videos from events. Ours model mainly consists of a shared feature extractor, a deformable convolution based alignment module, and a convolutional recurrent fusion and attention-based reconstruction network. We further exploit the potential of event cameras in downstream vision applications under HDR scenes.
- We propose to reconstruct HDR from a single RAW image. To achieve this, we collect a high quality single RAWto-HDR dataset. Then, we introduce two important guidances for HDR reconstruction, including dual intensity guidance, which guides less informative channels with more informative ones, and global spatial guidance which hallucinates scene details from a longer spatial range.

# Low-light Image/Video Enhancement

At BIT and HUAWEI

- We provide physics-based noise modeling and calibration approach for HUAWEI. The noise model and calibration process are tested on P40 Pro+ main sensor (hex-bayer) and wide-angle sensor (quad-bayer), for both images and videos.
- We build the first low-light multi-object tracking dataset using a carefully constructed dual-camera system, and propose the adaptive low-pass downsample module and the degradation suppression learning strategy for low-light MOT.
- $\cdot$  We propose a 3D deformable network based on Unet-like architecture (3D<sup>2</sup>Unet) for low-light video enhancement, which recovers RGB formatted videos from RAW sensor data.

# Hyperspectral Image Reconstruction & Classification

At BIT, cooperated with Tokyo University

- We present a simple and efficient CNN based spectral reflectance recovery method with optimal illuminations. We model the illumination by CNN architecture and optimize it to obtain the task-specific optimal illumination, which greatly facilitate the learning of HSI reconstruction.
- We present a illumination modulation method for the separation of reflectance and fluorescence by using only a single hyperspectral image. The proposed illumination modulation system uses off-the-shelf devices to generate illumination with high frequency components which can effectively help fluorescence separation task.
- We design a convolutional layer to simulate the capturing process of cameras, and learns the optimal CSR function for HSI classification. Then, spectral and spatial features are further extracted by spectral and spatial attention modules.

## HONORS & AWARDS

· Runner-up award of PBDL <i>Highspeed HDR Video Reconstruction from Events</i> challenge at CVPR 2024	2024
· Gold Award of the 49th Geneva International Invention Exhibition (Main contributer and presenter)	2024
· First prize for the 9th China College Students' 'Internet+' Innovation Competition, Beijing Division	2023
· Toyou Technologies Scholarship, Toyou Feiji Electronics Co., Ltd.	2022
· First-Class Scholarship for Outstanding Merits, Beijing Institute of Technology	2022
· China National Scholarship, Ministry of Education (Top 2% in the Ph.D Track)	
· Outstanding Academic Scholarship, Beijing Institute of Technology	
· Excellent Student Award, Beijing Institute of Technology	2020

# **SERVICES & TEACHING**

- · Reviewer for Conferences: CVPR, ICCV, ECCV, AAAI, BMVC, ACCV, ICPR, CICAI
- · Reviewer for Journals: TPAMI, Neurocomputing, Displays, IJRS
- · Co-proposer and presenter for CVPR 2023 tutorial: Optics for Better AI: Capturing and Synthesizing Realistic Data for Low-light Enhancement
- · Teaching assistant for Computer Vision (2021 2024 Fall) at Beijing Institute of Technology

## SKILLS

Computer Skills	Python, Matlab, C, C++, LATEX, Pytorch
Language	Chinese (native), English (fluent)

Jul. 2020 - Jun. 2021 CVPR'24 PRCV'21

Jan. 2019 - Aug. 2020 OE'19 OL'20 RS'20