# KAILAI ZHOU

Birth: 1997/05/31 · Phone: +86 15857132947
GitHub · GoogleScholar · kailai.zhou@ntu.edu.sg

## EDUCATION

**Nanyang Technological University** 2023.11 - 2024.11

*Joint PhD Program, supported by China Scholarship Council Scholarship, Advisor: Bihan Wen*

**Nanjing University** 2019.9 - 2025.6

*Combined Master's and PhD Program, Advisor: Xun Cao*

**Dalian University of Technology** 2015.9 - 2019.6

*B.E. degree, Electronic Information Engineering, Rank top 3%*

## RESEARCH INTERESTS

My research focuses on the intersection of computational spectral imaging and computer vision. By studying imaging mechanisms and the expansion of information dimensionality, i am particularly interested in exploring the role of spectral vision in emerging directions such as AI for Science, embodied intelligence, and world models, with the long-term goal of developing high-dimensional intelligent visual systems that surpass human perceptual limits and exhibit stronger environmental understanding and generalization.

- **Computational Imaging**: Computational Spectral Imaging · Spectral Video Computational Imaging System · Infrared Imaging · Mid-Infrared Spectral Imaging · Miniaturized Spectrometer
- **Multi-/High-dimensional Feature Representation**: Multimodal Learning · Hyperspectral Video Processing · Spectral–Spatial Joint Representation · Physics-informed Representation Learning
- **Spectral Vision Applications**: Spectral Foundation Model · Gaseous Flow Analysis ·Spectral+Mobile Photography · Spectral Skin Analysis · Infrared+Automatic Driving

## RESEARCH PUBLICATIONS

- **Kailai Zhou**, Yibo Wang, Tao Lv, Qiu Shen, Xun Cao, Gaseous Object Detection. IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), 2024. [PDF] [CODE]
- **Kailai Zhou**, Yibo Wang, Tao Lv, Yunqian Li, Linshen Chen, Qiu Shen, Xun Cao, Explore Spatio-temporal Aggregation for Insubstantial Object Detection: Benchmark Dataset and Baseline. IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2022. [PDF] [CODE]
- **Kailai Zhou**, Linshen Chen, Xun Cao, Improving Multispectral Pedestrian Detection by Addressing Modality Imbalance Problems. European Conference on Computer Vision (ECCV), 2020. [PDF][CODE]
- **Kailai Zhou**, Lijing Cai, Yibo Wang, Mengya Zhang, Bihan Wen, Qiu Shen, Xun Cao, Joint RGB-Spectral Decomposition Model Guided Image Enhancement in Mobile Photography. European Conference on Computer Vision (ECCV), 2024. [PDF] [CODE]
- **Kailai Zhou**, Fuqiang Yang, Shixian Wang, Bihan Wen, Linsen Chen, Qiu Shen, Xun Cao, M-SpecGene: Generalized Foundation Model for RGB-IR Multispectral Vision, International Conference on Computer Vision (ICCV), 2025. [PDF] [CODE]
- Lijing Cai, Xiangyu Dong, **Kailai Zhou**, Xun Cao, Exploring Video Denoising in Thermal Infrared Imaging: Physics-Inspired Noise Generator, Dataset, and Model. IEEE Transactions on Image Processing (TIP), 2024. [PDF] [CODE]
- Lijing Cai, **Kailai Zhou**, Guizhu Shen, Yiyang Yao, Lanxin Qiu, Chongde Zi, Xun Cao, High-precision Temperature Measurement and Calibration Technology of Infrared Thermal Imager. Infrared and Laser Engineering, 2021. [PDF]
- Xun Cao, **Kailai Zhou**,Qionghai Dai, Recent Progress in Computational Spectral Imaging. Communications of the China Computer Federation (CCCF), 2020. [PDF]

## HONORS AND AWARDS

Graduate Stage:

- Nanjing University Dongliang Excellence Scholarship (< 50 students), PhD National Scholarship
- National First Prize (< 0.69%), 17th "Challenge Cup" National College Student Extracurricular Academic and Technological Works Competition, 2022 (First Contributor)
- National First Prize (< 1.33%), Best Paper Award, 16th China Graduate Electronic Design Competition, 2021 (First Contributor)
- National First Prize, 3rd China Graduate Artificial Intelligence Innovation Competition, 2021

Undergraduate Stage:

- Liaoning Province Outstanding Graduate (< 3%), National Scholarship for Undergraduates
- National First Prize (< 1.8%), National Undergraduate Electronic Design Competition, 2017
- Provincial First Prize, 8th Chinese Mathematics Competition, 2016
- Northeast Regional Second Prize, National College Student "NXP Cup" Intelligent Car Competition, 2017

## PROJECT EXPERIENCES

**National Distinguished Young Scientist Fund Project "Computational Imaging"** 2021-2025

- Computational spectral imaging theory and system · High-dimensional data processing · Multimodal fusion

**National Major Scientific Instrument Development Project** 2017-2021

- Contributed to *Computer Vision: A Reference Guide* · Multispectral pedestrian detection · Video understanding

**National Key R&D Program** 2023-2026

- Imaging optimization · Mid-infrared spectral video gas cloud imaging system · Gaseous fluid analysis

**Spectral Vision on Mobile Phones (Project Leader)** 2022-2023

- Spectral + Mobile photography · Miniaturized spectrometer · Skin analysis · Spectral vision applications

## INTERNSHIP EXPERIENCES

**ZHIPUTECH (Series B)** , Algorithm Engineer 2019.11-2023.7

- Spectral video gas cloud imaging system · Gas detection · Imaging optimization · Spectral vision applications

## PATENTS

- **Kailai Zhou**, Yibu Wang, Tao Lü, Linshen Chen, Chongde Zi, Training Methods and Devices for Video-Level Object Detection Models, Equipment, and Storage Medium (Authorized in 2022.7)
- **Kailai Zhou**, Linshen Chen, Yunqian Li, Lijing Cai, Chongde Zi, Tao Lü, A Multi-Spectral Object Detection Method and System for Infrared and RGB Image Fusion
- **Kailai Zhou**, Linshen Chen, Yunqian Li, Yongxiang Zu, Yuanzhuo Wang, Wenlong Chen, Han Li, Aocheng Huang, Mengya Zhang, A Method and Device for Video Image Processing (Authorized in 2021.12)
- Xun Cao, **Kailai Zhou**, Lijing Cai, Yibu Wang, Mengya Zhang, Qiu Shen, Linshen Chen, Near-Infrared Prior-Driven Mobile Image Enhancement
- Xun Cao, **Kailai Zhou**, Yibu Wang, Tao Lü, Qiu Shen, A Voxel Shift Field-Based Deep Structural Representation Method for High-Dimensional Spectral Video Data
- Xun Cao, **Kailai Zhou**, Lijing Cai, Yibu Wang, Mengya Zhang, Qiu Shen, Linshen Chen, Multi-Spectral Prior-Guided Mobile Image Tone Enhancement
- Xun Cao, Tao Lv, **Kailai Zhou**, Linshen Chen, Yunqian Li, A Method and System for Chemical Gas Leak Detection Based on Spectral Video (Authorized in 2022.2)
- Xun Cao, Zhouyu Jin, Yongxiang Zu, Chongde Zi, Linshen Chen, Lijing Cai, **Kailai Zhou**, A System and Method for Synchronous Acquisition of Spectral and Depth Information
- Xun Cao, Zhiwei Deng, Guizhu Shen, Lijing Cai, Bo Dai, Yiyang Yao, **Kailai Zhou**, A Layered Quantization Method for Image Codec Neural Networks (Authorized in 2022.4)

## OTHER INFORMATION

- Programming Skills: Python, C++, Matlab, Tensorflow, Pytorch, TensorRT
- Academic Service: Reviewer for T-PAMI, TIP, J-STSP, CVPR, ECCV, ICIP, EuroGraphics, etc.