YUTONG HAO

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RESEARCH INTEREST

- Research interests include enhancing the interpretability of deep learning network and exploring the use of domain knowledge and prior knowledge to improve deep learning methods.
- Focusing on multi-modal data fusion in AI systems.

EDUCATION

● Shenyang Institute of Automation, Chinese Academy of Science　　　　　　　Sept. 2022 - May. 2025
M.S. in Pattern Recognition and Intelligent System　　　　　　　　　　　　　　　3.61/4.0 GPA
Main Courses: Principle and Algorithms of Artificial Intelligence(96), Image Processing(82), Fundamentals of Machine Learning and Mathematics(88), Differential Equations and Image Processing(92)

● Sichuan University　　　　　　　　　　　　　　　　　　　　　　　　　Sept. 2018 - May. 2022
B.S. in Aircraft Control and Information Engineering　　　　　　87.94/100 WAM (Top 15% student)
Main Courses: Linear Algebra(84), Calculus(82), Numerical Computing Method(87), Complex functions and Integral Calculus Conversion(92), Digital Signal Processing(87), Analog Electronic Technology(86), Digital Electronic Technology(92), Signal and System(85)

RESEARCH EXPERIENCE

Separate High-frequency Detail In Remote Sensing Image Super-resolution
Using Diffusion Model　　　　　　　　　　　　　　　　　　　　　　　May. 2024 – Now
Master Project | Supervisor: Prof. Yunpeng Liu

- Generating high-frequency detail features in a low-dimensional latent space can reduce the number of iterations required in a diffusion model.
- Frequency separation encoder network can extract prior knowledge from ground-truth images to guide the generation and aggregation network.
- Transformer based decoder can aggregate generative high-frequency features and inherent semantic features effectively.

Knowledge-based Salient Object Detection Method　　　　　　　July. 2023 – April. 2024
Master Project | Supervisor: Prof. Yunpeng Liu

- Improved the performance and efficiency of salient object detection networks by leveraging insights from the human visual system.
- Proposed a bidirectional attention guided method, which enhances the feature quality of propagation while reducing computational complexity.
- Addressed issues of feature dilution, background interference, and high computational cost.
- Experimental results on 5 mainstream datasets demonstrate the effectiveness of our approach.

Infrared Vision Theory and Method　　　　　　　　　　　　　　　Oct. 2022 – July. 2023
National Major Basic Research Project | Supervisor: Prof. Yunpeng Liu

- Explored the usability and interpretability of deep learning methods in engineering practice.
- Designed an dual-domain prior-driven method based on the sparse and high-frequency prior knowledge of infrared small targets.
- Addressed issues of lacking usable features and low contrast between targets and backgrounds.
- Experimental results shows the outperformance on decreasing False Alarm Rate and analyses on the feature activation maps demonstrates the interpretability.

Research on Video Detection and Recognition method for Airport Small Objects　　Oct. 2021 – May. 2022
Undergraduate Thesis Project | Supervisor: Prof. Wei Li

- Met the requirements of detecting multi-scale objects in the tasks of airport surface guidance and surveillance.
- Learned and improved the memory enhanced global-Local aggregation method.

- Utilized multi-scale feature fusion and semantic feature enhancement modules to improve network performance.
- Tested the network on an airport detection dataset consisting of 26 video segments.

UAV Visual Navigation   Oct. 2020 – Dec. 2021
College Students' Innovation and Entrepreneurship Training Program | Supervisor: Prof. Songchen Han
- Proposed an image enhancement algorithm to improve visual quality under low-light conditions.
- Learned and tested image enhancement algorithms such as SSR, MSRCR, and Retinex-Net.
- Created a paired low-light/normal-light innovative datasets to train and test the network.

HONORS AND AWARDS

- First Class Scholarship for Graduate Students   2023
- MCM Honorable Mention   2021
- Third Prize of National Mathematical Modelling Competition for College Students in Sichuan Province   2020
- Third prize of China Space Foundation - "Romer Scholarship"   2020
- Outstanding student of Sichuan University   2020

PUBLICATIONS

1. **Y. Hao**, Y. Liu, C. Yu, and J. Zhao, "Bidirectional Attention Guided Network for Salient Object Detection," **IEEE Transactions on Multimedia**, (July. 2024, Under Review).

2. **Y. Hao**, Y. Liu, J. Zhao, and C. Yu, "Dual-Domain Prior-Driven Deep Network for Infrared Small-Target Detection," **Remote Sensing**, vol. 15, no. 15, Art. no. 15, Jun. 2023, doi: 10.3390/rs15153827.

3. H. Jiang, **Y. Hao,**, F. Zou, L. Fang, and S. Han, "Advanced RetinexNet: A fully convolutional network for low-light image enhancement," **Signal Processing: Image Communication**, vol. 112, p. 116916, Mar. 2023, doi: 10.1016/j.image.2022.116916.

SKILLS

- Language ability: English (IELTS: 7.0)
- Proficient in programming by **Python, C/C++ and Matlab**.
- Proficiency with **PyTorch and Tensorflow**, and have a good command of knowledge in **deep learning and machine learning**.
- Familiar with writing tools including Word, PowerPoint, Zotero, Latex, et al.
- Basic use of Markdown, Git, PS, and PR.