Zeqiang Lai

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RESEARCH INTERESTS	Generative Model, Image Restoration, Multi-Modal, Optimization

EDUCATION

Beijing Institute of Technology   Beijing, China
Master in Computer Science and Technology   Sep 2020 – July 2023
Mentors: Professors Ying, Fu.

Beijing Institute of Technology   Beijing, China
Bachelor in Computer Science and Technology   Sep 2016 – July 2020

PUBLICATIONS

∇-Prox: Differentiable Proximal Algorithm Modeling for Large-Scale Optimization
Zeqiang Lai*, Kaixuan Wei*, Ying Fu, Philipp Härtel, and Felix Heide.
[SIGGRAPH'23] ACM Transactions on Graphics, 2023.

Deep Plug-and-Play Prior for Hyperspectral Image Restoration
Zeqiang Lai, Kaixuan Wei, and Ying Fu.
[NEUCOM'21] Elsevier Neurocomputing, 2021.

Hybrid Spectral Denoising Transformer with Learnable Query
Zeqiang Lai, and Ying Fu.
[ICCV] International Conference on Computer Vision, 2023 (Under Review).

Hyperspectral Image Super-Resolution with Real Unaligned RGB Guidance
Zeqiang Lai, Ying Fu, and Jun Zhang.
[TNNLS] IEEE Transactions on Neural Networks and Learning Systems (Major Revision).

InternGPT: Solving Vision-Centric Tasks by Interacting with ChatGPT Beyond Language
Zhaoyang Liu*, Yinan He*, Wenhai Wang*, Weiyun Wang*, Yi Wang*, Shoufa Chen*, Qinglong Zhang*, Zeqiang Lai*, Yang Yang, Qingyun Li, Jiashuo Yu, Kunchang Li, Zhe Chen, Xue Yang, Xizhou Zhu, Yali Wang, Limin Wang, Ping Luo, Jifeng Dai, and Yu Qiao
[arXiv'23] arXiv preprint, 2023.

Denoising Diffusion Semantic Segmentation with Mask Prior Modeling
Zeqiang Lai, Yuchen duan, Jifeng Dai, Ziheng Li, Ying Fu, Hongsheng Li, Yu Qiao, and Wenhai Wang.
[arXiv'23] arXiv preprint, 2023.

Mixed Attention Network for Hyperspectral Image Denoising
Zeqiang Lai, and Ying Fu.
[arXiv'22] arXiv preprint, 2022.

RESEARCH EXPERIENCE

Proximal Algorithm Modeling [SIGGRAPH'23] [NEUCOM'21]
Mentor: Felix Heide (Princeton University)   Mar 2022 – Present

– We introduce ∇-Prox as a domain-specific language and compiler for differentiable proximal algorithms that solve large-scale optimization problems.
– With only a few lines of code, we demonstrate it generates performant solvers for diverse problems from computational optics to integrated energy system planning – each with state-of-the-art performance by bi-level optimization with algorithm unrolling, equilibrium learning, and reinforcement learning.

Diffusion Models for Semantic Segmentation [arXiv'23]
Mentor: Wenhai Wang (Shanghai AI laboratory)   May 2022 – Present
– We investigate the mask prior modeling for semantic segmentation with generated discrete diffusion models and introduce two novel designs – noise on first prediction and free re-noising, for the training and inference processes.
– We demonstrate that our mask prior modeling can be integrated with state-of-the-art segmentors for boosting performance in terms of quantitative measurements and visual coherence.

Hyperspectral Image Restoration [TNNLS] [ICCV] [arXiv'22]
Mentor: Ying Fu (Beijing Institute of Technology)   Oct 2020 – Present
– We designed a novel hybrid 3D transformer for hyperspectral image denoising. Exploiting domain knowledges, we demonstrate it outperforms existing state-of-the-art by over 1.5 dB on PSNR and with 12% parameters, 42% running time and 20x fast training convergence.
– We built a reference-based image super-resolution system for hyperspectral imaging, together with the first real-world unaligned dataset with paired RGB and hyperspectral images, and a strong flow-based baseline.

INDUSTRY EXPERIENCE

Shanghai AI Laboratory, OpenGVLab   Shanghai, China
Research Intern   May 2022 – Present
– Cutting-edge algorithm exploration of diffusion models on perception tasks.
– InternImage: Regular maintenance; Integrated DeepSpeed for low-cost training of huge model; Optimized DCNv3 CUDA operator, etc.
– InternGPT: Regular maintenance; Integrated tools of Stable Diffusion inpainting, Imagebind generation, and DragGAN editing.
– Multi-Modal data enhancement with large language model.

Kuaishou Technology, Y-Tech   Beijing, China
Algorithm Intern   July 2019 – Mar 2020
– Built a virtual anchor by integrating the systems of prosody prediction, sound synthesis, mouth prediction, etc.
– Developed two learning-based models for mouth animation prediction from the spectrum of audio, and prosody prediction.

OPNESOURCE PROJECTS

Drag Your GAN (3.3k Stars)   Creator
Unofficial implementation of "Drag Your GAN: Interactive Point-based Manipulation on the Generative Image Manifold" at SIGGRAPH 2023

InternGPT (2.2k Stars)   Major Contributor

InternGPT (iGPT) is an open source demo platform where you can easily showcase your AI models.

InternImage (**1.4k** Stars)   Contributor
Official Implmentaiton of "InternImage: Exploring Large-Scale Vision Foundation Models with Deformable Convolutions" (CVPR 2023 Highlight)

Anything to Image (**111** Stars)   Creator
Integration fo ImageBind and Stable Diffusion to achieve anything (audio, text, image) to image generation.

TFPnP (**77** Stars)   Major Contributor
Official implementation of "Tuning-free Plug-and-Play Proximal Algorithm for Inverse Imaging Problems" (ICML 2020 Award Paper & JMLR 2022)

Yan Programming Language   Creator
An educational programming language compiler and interpreter, along with an educational framework and evaluation website.

HONORS AND SCHOLARSHIPS		
National Scholarship (Ministry of Education in China)		2022
Academic Scholarship (Beijing Institute of Technology)		2020,2022
First Prized of Mathematical Contest in Modeling		2018
Scholarship for Outstanding Students		2017, 2018

ACADEMIC SERVICE

Conference and Journal Reviewer
TIP, TGRS, TNNLS
ICCV 2021, PBDL 2021, ACMMM 2021, CVPR 2022, CVPR 2023, ICCV 2023

SKILLS

Programming: Python, C++, Java, HTML, Javascript, Matlab, LLVM
Languages: Chinese (native), English (fluent)