

Huimin Zeng

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Research Interest

My research focuses on general and interpretable computational photography, with a strong interest in 3D reconstruction and generative/interactive tasks. Specifically, my research experience has concentrated on image/video enhancement, HDR inverse tone mapping, and super-resolution.

Selected Publications

- **Huimin Zeng**, Yue Bai and Yun Fu, “Arbitrary-Scale 3D Gaussian Super-Resolution with Diffusion Priors” Under Review.
- **Huimin Zeng**, Jiacheng Li and Zhiwei Xiong, “Plug-and-Play Versatile Compressed Video Enhancement” in Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition **CVPR 2025**.
- **Huimin Zeng**, Jiacheng Li, Ziqiang Zheng and Zhiwei Xiong, “All-in-One Image Compression and Restoration” in Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision **WACV 2025 (oral)**.
- Ziqiang Zheng, Yiwei Chen, **Huimin Zeng**, Tuan-Anh Vu, Binh-Son Hua, Sai-Kit Yeung, “MarineInst: A Foundation Model for Marine Image Analysis with Instance Visual Description,” in The 18th European Conference on Computer Vision **ECCV 2024 (oral)**.
- **Huimin Zeng**, Jie Huang, Jiacheng Li and Zhiwei Xiong, “Region-Aware Portrait Retouching with Sparse Interactive Guidance,” in IEEE Transactions on Multimedia (**TMM**), doi: 10.1109/TMM.2023.3262185.
- **Huimin Zeng**, Xinliang Zhang, Zhibin Yu and Yubo Wang, “SR-ITM-GAN: Learning 4K UHD HDR With a Generative Adversarial Network,” in IEEE Access, vol. 8, pp. 182815-182827, 2020.
- **Huimin Zeng**, Weinong Wang, Xin Tao, Zhiwei Xiong, Yu-Wing Tai and Wenjie Pei, “Feature Decoupling-Recycling Network for Fast Interactive Segmentation,” in Proceedings of the 31st ACM International Conference on Multimedia **ACM MM 2023**.
- Qi Zhao, Ziqiang Zheng, **Huimin Zeng**, Zhibin Yu, Haiyong Zheng and Bing Zheng, “The Synthesis of Unpaired Underwater Images for Monocular Underwater Depth Prediction,” in Front. Mar. Sci. 8:690962, 2021.
- Xinliang Zhang*, **Huimin Zeng***, Xiang Liu, Zhibin Yu, Haiyong Zheng and Bing Zheng, “In Situ Holothurian Non-contact Counting System: A General Framework for Holothurian Counting,” in IEEE Access, vol. 8, pp. 210041-210053, 2020 (*equal contribution).
- Xinliang Zhang, Shu Yang, **Huimin Zeng**, Zhibin Yu, Haiyong Zheng and Bing Zheng, “In-situ Holothurian Non-contact Measurement based on Parallel Laser Beams and Semantic Segmentation,” Global Oceans 2020: Singapore – U.S. Gulf Coast, 2020, pp. 1-7.

Work Experience

Microsoft Research Asia (MSRA)

Full-time Research Intern

2023

- *Mentor*: Dr. Bin Li & Dr. Jiahao Li
- Assess the performance of image codecs under challenging scenarios (e.g., degraded inputs and extreme-low bitrates)
- Reveal long-termly overlooked drawbacks of clean-data-specific codecs in handling degraded inputs.
- Develop general neural image codec with the restoration ability for degradations of different types and degrees.
- Part of this internship is accepted to **WACV 2025**.

Kuaishou Technology

Full-time Research Intern

2021

- *Mentor:* Prof. Yu-Wing Tai & Weinong Wang
- Design the decoupling and recycling algorithm for efficient interactive segmentation.
- Deploy the efficient interactive segmentation algorithm on multiple lightweight backbones.
- Develop the interactive segmentation function of the Kuaiying APP.
- Part of this internship is accepted to **ACM MM 2023**.

Research Project

Arbitrary-Scale 3D Gaussian Super-Resolution with Diffusion Priors

Boston, U.S.

Northeastern University

9/2024 - 1/2025

- Existing 3DGS-based high-resolution novel view synthesis (HRNVS) methods focus on upsampling with fixed scale factors (e.g., $\times 2$ and $\times 4$), ignoring the intrinsic continuous characteristic of 3D world and the need to flexibly adjust rendering accuracy based on available resources.
- We make the first attempt to achieve 3D super-resolution of arbitrary scale factors with a single 3DGS model, providing a unified and efficient solution for flexible HRNVS.
- To enrich the details of the reconstructed 3D model, we explore the powerful generative priors (i.e., StableSR), to refine the high-frequency details in the novel views and inject the generated structures into the 3D model.
- Extensive experiments demonstrate the superiority of our method in rendering high-quality super-resolved results, including non-integer scale factors.
- Under Review.

Plug-and-Play Versatile Compressed Video Enhancement

Hefei, China

University of Science and Technology of China

11/2022 - 9/2024

- Compressed videos suffer from unsatisfying perceptual quality and lead to performance degradation in various downstream tasks.
- We introduce a versatile quality enhancement framework that adaptively enhances videos of different compression levels and assists various downstream vision tasks.
- Our approach takes advantage of the overlap between video coding and video quality enhancement. We reuse the off-the-shelf information embedded in the bitstream instead of estimating it from scratch, which contributes to the generalization ability and model performance.
- Extensive experiments demonstrate the effectiveness of our framework in assisting downstream tasks as a plug-and-play enhancement module, and outperforming existing quality enhancement methods in terms of performance and efficiency.
- Accepted to **CVPR 2025**.

All-in-one Image Compression and Restoration

Hefei, China

University of Science and Technology of China

5/2023 - 5/2024

- Image compression methods tailored for clean images tend to faithfully preserve undesired degradations for corrupted inputs, leading to a waste of bits and visually unpleasant results.
- We design a unified pipeline for all-in-one image compression and restoration, which models long-range dependencies and captures discriminative representations with a dual attention mechanism.
- Experimental results demonstrate the effectiveness of our method on various degradations without sacrificing the rate-distortion (RD) performance on clean data.
- This work equips the neural image codec with the restoration capability and improves its generalization ability against various degradations.
- Accepted to **WACV 2025 (oral)**.

MarineInst: A Foundation Model for Marine Image Analysis with Instance Visual Description

Boston, U.S.

Northeastern University

12/2023 - 4/2024

- Existing foundation models (e.g., SAM and CLIP) confront challenges in terms of data distribution shift and intrinsic characteristics of marine visual data, leading to the failure of directly applying existing models to marine images, highlighting domain-specific designs.
- We propose MarineInst, a powerful and flexible marine foundation model, which could perform the instance visual description task in an automatic or interactive manner. Our instance visual description task includes instance segmentation and instance captioning.
- We propose MarineInst20M, the largest documented marine image dataset to date, with remarkable visual diversity and semantic instance mask annotations.
- MarineInst trained on MarineInst20M demonstrates strong performance on various marine analysis tasks (e.g., object segmentation, semantic instance captioning and text-to-image synthesis).
- Accepted to **ECCV 2024 (oral)**.

Education

Northeastern University

Boston, U.S.

PhD. in Computer Engineering

09/2024 - Present

- Advisor:** Prof. Yun Raymond Fu
- Research topic:** 3D Vision, Low-level Vision

University of Science and Technology of China

Hefei, China

M.S. in Information and Communication Engineering

09/2021 - 06/2024

- Advisor:** Prof. Zhiwei Xiong
- Research topic:** Image/Video Enhancement, Interactive Tasks

Ocean University of China

Qingdao, China

B.S. in Electronic Information Engineering

09/2017 - 06/2021

- Advisor:** Prof. Haiyong Zheng & Prof. Zhibin Yu
- Research topic:** Image/Video Generation, Underwater Image Enhancement
- GPA:** 3.86/4.0

Teaching & Service

Teaching Assistant

Undergraduate course "Object-Oriented Programming", "Data Structures".

Journal Reviewer

TPAMI, TKDD, TMM, NPJ Artificial Intelligence

Conference Reviewer

ACM MM 2023/2024, ECCV 2024, WACV 2025, CVPR 2025, ICCV 2025

Achievements & Awards

ChinaMM 2019 Underwater Image Enhancement Challenge (Winner)	2019
2019 National Artificial Intelligence Challenge on 4K UHD HDR (Top 15%)	2020
Outstanding Student Scholarship (Grade 1/ Grade 2)	2023/2022
Outstanding Freshman Scholarship (Grade 1)	2021
The First Prize Scholarship	2018/2020
The Second Prize Scholarship	2019
The Research and Innovation Scholarship	2019

Programming

Languages Python, C, C++, Matlab, \LaTeX , Markdown

Frameworks PyTorch, TensorFlow, Keras, OpenCV, PIL