

Huimin Zeng

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Research Interest

My research is dedicated to the field of general and interpretable computational photography, with a strong interest in generative tasks and foundation models. Specifically, my research experience has concentrated on diffusion models, 3D reconstruction and vision language model.

Selected Publications

- **Huimin Zeng**, Yue Bai and Yun Fu, “Arbitrary-Scale 3D Gaussian Super-Resolution with Diffusion Prior” 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**, 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**.
- **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.
- 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., extreme-low bitrates and degraded inputs).
- Evaluate the feasibility of applying pre-trained generative models (e.g., latent diffusion, VQGAN and StyleGAN) for reconstructing compressed images.
- Develop a generative neural image codec for reconstructing image contents with extremely low bitrates.
- 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

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 necessary modifications and 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)**.

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

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 prior (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.

Generative Prior based Image Compression for Extremely Low Bitrate Scenario

Hefei, China

University of Science and Technology of China

11/2022 - 9/2024

- Due to the traditional Rate-Distortion constraint, existing image compression methods suffer from the balance between perceptual quality and bitrates.
- We introduce a generative prior-based image compression framework that leverages pre-trained generative StyleGAN to embed input images into bitrate-efficient latent vector, and reconstruct high-quality results at the decoder end.
- Extensive experiments demonstrate the effectiveness of our framework in reducing the bitrate, while providing visually satisfying reconstruction results.
- Part of this project is accepted to **WACV 2025**.

Education

Northeastern University

PhD. in Computer Engineering

Boston, U.S.

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, 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