Huimin Zeng

✉ zenghuimin1998@gmail.com | 🏠 huimin-zeng.github.io | in LinkedIn | 🎓 Google Scholar

Research Interest

3D reconstruction and generative neural rendering (3DGS/NeRF), HDR novel view synthesis, and 3D world generation with MLLM agents.

Selected Publications

- **Huimin Zeng**, Yue Bai, Hailing Wang and Yun Fu, "Physically Inspired Gaussian Splatting for HDR Novel View Synthesis", **Under review**.
- **Huimin Zeng**, Yue Bai and Yun Fu, "Arbitrary-Scale 3D Gaussian Super-Resolution with Diffusion Priors", **AAAI 2026**. arXiv:2508.16467
- 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", **ECCV 2024** (**oral**). Website
- **Huimin Zeng**, Jiacheng Li and Zhiwei Xiong, "Plug-and-Play Versatile Compressed Video Enhancement", **CVPR 2025**. Website
- **Huimin Zeng**, Jiacheng Li, Ziqiang Zheng and Zhiwei Xiong, "All-in-One Image Compression and Restoration", **WACV 2025** (**oral**). arXiv:2502.03649

Research Experience

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.
- **Accepted to AAAI 2026.**

3D World Object-Interaction with MLLM Agent Collaboration
Boston, U.S.
Northeastern University
4/2025 - 12/2025

- Existing 3D large-scale scene ignores the inner relationship between objects, suffering from isolated editing for object updates.
- We formulate the 3D world generation into multi-agent collaborative tasks with prompt-guided layout generation, scene reconstruction, object recomposition/harmonization, thereby enabling object-interaction and recomposition.
- To address inconsistencies in appearance and scale, we introduce a harmonization module that seamlessly blends scene components and supports prompt-based artistic control.
- The integrated 3D world considers rationality between objects and supports high-quality results across zoom/resolution levels.
- Ongoing project.

Physically Inspired Gaussian Splatting for HDR Novel View Synthesis
Boston, U.S.
Northeastern University
6/2025 - 10/2025

- Existing HDRNVS methods primarily rely on camera ISP reconstruction procedures, ignoring the modeling of ambient-illumination-dependent appearance.
- We formulate HDRNVS as a combination of active and passive relighting tasks, and introduce a dual-branch framework that reconstructs the HDR field from both ISP and virtual light perspectives, enabling stable and physics-consistent HDR reconstruction.
- To address the premature deletion of 3DGS in over/under-exposed regions, we propose a gradient scaling strategy based on the exposure difference, thereby preserving critical scene information.
- Experimental results show our superior HDR detail capturing ability, promising quantitative improvements, and enhanced stability over existing methods.
- Under review.

MarineInst: A Foundation Model for Marine Image Analysis
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 VLM 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)**.

Industry 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 contents with extremely low bitrates.
- Part of this internship is accepted to **WACV 2025**.

Sanofi
Full-time Research Intern
2025

- *Mentor*: Dr. Wei Zhao & Dr. Yongjian Yang
- Evaluate the performance of **MLLMs in pharmaceutical document** understanding and reasoning.
- Analyze redundant tokens and complexity-resolution mismatch in long document VQA.
- Develop a hierarchical token fragmentation mechanism for **efficient understanding** and reliable reasoning.

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**.

Education

Northeastern University   *Boston, U.S.*

PhD. in Computer Engineering   *9/2024 - 05/2028*

- **Advisor:** Prof. Raymond Fu
- **Research topic:** 3D vision, generative models, MLLMs

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:** low-level vision, image/video restoration, 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

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, AAAI 2026

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, USTC	*2023/2022*
Outstanding Freshman Scholarship, USTC	*2021*
The First Prize Scholarship, OUC	*2018/2019/2020*
The Research and Innovation Scholarship, OUC	*2019*

Skills

Languages	Python, C, C++, Matlab, LaTeX, Markdown
Frameworks	PyTorch, TensorFlow, Keras, OpenCV, PIL