Hengyu Liu

Computer Vision · GPU Computing · Generative Modeling

Profile **Email:** hengyuliu1021@163.com | **Phone:** +86 13732259899 | **GitHub:** Plumess | **IELTS:** 6.5

Research interests: Efficient GPU computation; image/video restoration and quality assessment; controllable generation through structured supervision. Further interests: 3D reconstruction and visual compression.

Education

Hangzhou Normal University

B.Eng. in **Computer Science and Technology** **Sept 2019 – Jun 2023**

Weighted average score: 88.0/100 | GPA: 3.80/5 | Major Rank: 22/146

University-level Outstanding Undergraduate Thesis Award (2023)

Thesis: Learning-Based Low-Light Image Enhancement.

Peer-reviewed Publications

1. Y. Zhang, **H. Liu**, D. Ding, "A cross-scale framework for low-light image enhancement using spatial–spectral information," *Computers & Electrical Engineering*, vol. 106, 108608, 2023. DOI
2. Y. Zhang, **H. Liu**, D. Ding, Z. Ma, "Low Light RAW Image Enhancement Using Paired Fast Fourier Convolution and Transformer," in *2022 IEEE VCIP*, 2022. DOI

Published Patent Applications

- **Atmospheric Light Estimation for Dehazing Using Integral-Image Optimization.** First-listed inventor · Chinese invention patent application CN117876256A · Published 2024-04-12.
  Algorithmic contribution: Integral/squared-integral image queries replace repeated subregion scans for mean/standard-deviation scoring in quadtree airlight search.
- **Image Dehazing by Refining Atmospheric-Light Masks and Transmission Maps with Depth Information.** First-listed inventor · Chinese invention patent application CN117893443A · Published 2024-04-16.
  Algorithmic contribution: Used estimated depth to refine global airlight into a per-pixel mask and adjust transmission, targeting colour casts and weak distant-scene dehazing.

Research Experience

Hangzhou Normal University · Low-Light Image Enhancement **Jul 2021 – Jun 2022**

Undergraduate Research · Supervisor: Prof. Dandan Ding · Two second-author papers

- **Low-light enhancement experiments:** Suggested FFC, inspired by LaMa, to introduce global context while retaining high-resolution features in RAW-to-RGB enhancement. Contributed architectural modifications and training; compared PSNR, SSIM, and parameter counts.
- **Quality assessment and selective re-enhancement:** Proposed quality-based binary selection for further enhancement and tested no-reference IQA methods; drafted CN114565817A (published in 2022; second-listed inventor).

Industry R&D Experience

Hangzhou Edge Exploration Technology Co., Ltd. **Feb 2026 – Jul 2026**

Algorithm Engineer (sole algorithm engineer)

- **Sparse-attention symbolic-music modeling:** Implemented a symbolic-music model and PyTorch training code from an initial idea of reducing attention computation through musical hierarchy; packing changes reduced recorded peak memory from 67.7 to 38.1 GB (1.24B parameters, 32,768 tokens, 2×H100 80 GB).
- **Structured supervision and training data:** Designed MSD (Music Structured Description) as an intermediate generation target to provide structured supervision for controllable generation and targeted editing. Implemented batch MIDI-to-MSD extraction and synthesis of varied requests from each MSD, forming request–MSD–note training triples.
- **Language-model adaptation for music generation:** Produced Qwen3-1.7B music-generation checkpoints via vocabulary extension, LoRA continued pretraining and supervised fine-tuning.

ePRO Software (on-site at IM Motors) **Apr 2024 – Dec 2024**

Algorithm R&D (on-site contractor)

- **Vision deployment and multi-task evaluation:** Deployed quantized YOLOv5 on Qualcomm SA8295 via ONNX/QNN with C++ post-processing; produced a UniAD reproduction and multi-task evaluation setup on nuScenes mini.

ArcVideo Technology Co., Ltd. **Feb 2023 – Jan 2024**

Image Algorithm Engineer (internship through Jun 2023)

- **CPU-to-CUDA dehazing acceleration:** Reimplemented CPU dehazing in CUDA reusing regional statistics via integral and squared-integral images, with downsampled transmission estimation/guided filtering, buffer reuse and streams. Historical tests with 1080p input recorded approximately 24 ms on i9-9980XE versus 8.5 ms on RTX 3070 Ti.
- **Depth-informed dehazing research:** Compared 10+ methods on real failure cases; designed and implemented depth-informed airlight and transmission adjustments. Improved sky colour casts in selected scenes at approximately 9% additional processing time in the tested version; boundary artifacts remained.
- **Motion-feature fusion and interpolation experiments:** Modified motion-feature fusion and multi-scale flow connections in an existing network; conducted training and failure-case comparisons. Selected cases showed fewer small-object disappearances, with residual flicker.
- **Edge inference integration:** Adapted vision models to Jetson NX/RK3588 using TensorRT plugins, CUDA post-processing, RKNN conversion and image preprocessing.

Selected Open-source Work

- **Guided Filter using CUDA:** Standalone full-resolution GPU guided filtering. Published measurements: approximately **9.8 ms / 1080p image on RTX 4090**, including allocation and memory copies, excluding the first warm-up run.
- **Integral Image using CUDA:** Extended NVIDIA's shuffle-scan sample for 16-bit input and squared-integral images, using warp-level prefix sums and wider accumulators.
- **MAA Skill Ready (2025):** Fine-tuned MobileNetV4 for three skill states, including a cancellable state; reported 99.7% accuracy on 3,000 test images (~16,000 training images). Updated C++ inference integration and training code; maintained and updated ONNX tools, with continued failure-case data expansion and retraining.
- **MAA OCR (2023):** Fine-tuned a game-domain Chinese PP-OCRv3 recognizer (MAA #5895).
- **MAA OCR (2026):** Contributed to MAA's recognition-model upgrade from PP-OCRv3 to v6 through ASCII-specific fine-tuning and dictionary-label fixes (MAA #18812, merged into feat/ppocr); implemented a unified pipeline for data generation, training and export (MaaAI #15, under review).

Technical Skills

- **Programming:** Python, C++, CUDA C/C++, Linux, Git
- **ML / Deployment:** PyTorch, ONNX, TensorRT, QNN, RKNN