

YIHAN HU

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EDUCATIONAL BACKGROUND

Beijing Jiaotong University, School of Computer and Information Technology, Information and Communication Engineering, *Master's Candidate* 2022.9 - 2025.6

Beijing Jiaotong University, School of Computer and Information Technology, Computer Science, *Bachelor of Engineering* 2018.9 - 2022.6

GPA: 3.80/4.00, Rank: 21/213 (Top 10%), Honors: Academic Excellence Scholarship, Student Work Scholarship, Outstanding Member/Outstanding Cadre

RESEARCH DIRECTIONS

- **Natural Image Matting Algorithms**, Trimap-guided natural image matting, and robust mask-guided matting.
- **Video Portrait Matting Algorithms**, Automated portrait matting without guidance, and video matting with single-frame mask guidance.
- **Refined Segmentation and Post-Processing**, Optimization algorithms for segmentation results of complex objects in high-resolution images.

RESEARCH INTERESTS

- **Interactive Image Matting**, Sparse interaction-guided matting models, including clicks and scribbles.
- **Iterative Image Matting**, Enhancing alpha matte quality using prior masks and human interactions.

RESEARCH ACHIEVEMENTS

Iterative Natural Image Matting via Diffusion Process. Under submission to ECCV-2024

- **Challenges.** Existing natural image matting algorithms have unavoidable shortcomings in predicting difficult cases, and their one-step prediction method cannot correct these errors.
- **Core Idea.** We are the first to investigate a multi-step iterative approach for challenging natural image matting tasks, introducing a pixel-level denoising diffusion method (DiffMatte) for alpha matte refinement to achieve outstanding performance.
- **Efficiency Improvement.** To enhance iterative efficiency, we designed a lightweight diffusion decoder as the sole iterative component to directly denoise the alpha matte, saving significant computation from repeatedly encoding mask features.
- **Performance Gain.** We proposed an improved self-adjustment strategy to solidify the performance gains from the iterative diffusion process, allowing the model to adapt to various types of errors by aligning noise samples used in training and inference, mitigating performance drops due to sampling drift.
- **Experimental Results.** Extensive experiments show that DiffMatte not only achieves state-of-the-art performance on the mainstream Composition-1k test set, surpassing previous best methods with 15% and 8% improvements in SAD and MSE metrics, respectively, but also demonstrates stronger generalization in other benchmarks.

Portrait Video Matting Guided by First-Frame Masks. Under submission to IEEE TNNLS

- **Challenges.** Current video portrait matting techniques face challenges such as complex user guidance, difficulty in accurately matting specified targets, and slow processing speed when applied to real-world videos.
- **Core Idea.** We propose a novel instance-aware propagation matting algorithm (IPMatting) that achieves robust and target-centric video portrait matting in real-time using only a coarse mask from the first frame.
- **Efficiency Improvement.** Lightweight network structure design and output refinement modules rapidly enhance prediction resolution, enabling our method to efficiently handle high-resolution videos and achieve real-time processing speeds.
- **Task Evaluation.** We also introduce a novel benchmark, Videomatte-Multi, to evaluate IPMatting's performance in multi-person scenarios and its capability to handle varying quality guidance.
- **Experimental Results.** Our results show that IPMatting significantly outperforms previous methods, demonstrating its robustness and efficiency.

INTERNSHIP EXPERIENCE

Picsart, Visual Algorithm Engineer

2021.8-2023.11

- Participated in the development of **automatic portrait matting algorithms guided by human parsing**, responsible for the deployment of matting algorithms
- Automated labeling of portrait images from the public internet using the developed algorithms and organized team for quality screening
- Engaged in the research and development of **matting algorithms based on salient object detection**, responsible for algorithm investigation

AWARDS

- **College English Test**. CET-4: 534, CET-6: 597
- **National College Students' "Internet+" Innovation and Entrepreneurship Competition**. Beijing Municipal Third Prize
- **"Challenge Cup" National College Students Extracurricular Academic Science and Technology Works Competition**. Beijing Jiaotong University Second Prize
- **Beijing Jiaotong University Algorithm and Programming Contest**. Third Prize