Haoming Cai

Homepage: www.haomingcai.com

Email: haomingcai@link.cuhk.edu.cn
Github: https://github.com/HaomingCai

Education

- **The Chinese University of Hong Kong (Shenzhen)** — Shenzhen, China
  B.Sc. *in Computer Science and Engineering* — *Sept.2017 - Sept.2022*
  Courses: *Linear Algebra, Artificial Intelligence, Machine Learning, Software Development, Medical Imaging*

Research Interest

- **Computer Vision, Image Processing, Image Quality Assessment, Network Interpretation.**

Publications

- **Google Scholar** Citation : **51** (till October.2021)

[1] **Haoming Cai**, Jingwen He, Yu Qiao, Chao Dong, "Toward Interactive Modulation for Photo-Realistic Image Restoration", accepted by **CVPR 2021, NTIRE workshop**. [PDF]

[2] Jinjin Gu, **Haoming Cai**, Haoyu Chen, Xiaoxing Ye, Jimmy S. Ren, Chao Dong, "PIPAL : a Large-Scale Image Quality Assessment Dataset for Perceptual Image Restoration.", **accepted by ECCV, 2020**. [PDF, Project, Talk]

[3] Jinjin Gu, **Haoming Cai**, Chao Dong, Jimmy S. Ren, Yu Qiao, Shuhang Gu, Radu Timofte, et al., "NTIRE 2021 Challenge on Perceptual Image Quality Assessment", **CVPR 2021, NTIRE workshop**. [PDF, Challenge, Talk]

[4] Jinjin Gu, **Haoming Cai**, Haoyu Chen, Xiaoxing Ye, Jimmy S. Ren, Chao Dong, "Image Quality Assessment for Perceptual Image Restoration: A New Dataset, Benchmark and Metric", **submitted to TPAMI**. [PDF, Code]

[5] Jinjin Gu*, **Haoming Cai***, Zhengwen Zhang, Yu Qiao, Chao Dong, "What Representation Makes a Good Perceptual Metric", **under review**.

Research Service

- **Workshop Co-organizer** - The Perceptual IQA Challenge in the 6th NTIRE workshop at CVPR 2021
- **Reviewer/Assistant Reviewer** - ICCV 2021, TPAMI, CVPR 2021 NTIRE workshop,

Research Experience

Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences — Shenzhen, China
Research Assistant — *May 2020 - Present*

- ♦ **Supervised by Prof.Dong Chao and Prof.Qiao Yu , and work with Ph.D.student Jinjin Gu **
- ♦ **Image Quality Assessment Dataset, Benchmark, Metrics, and Challenge** *(September 2019 - Present)*

  ▶ Contribute a novel perceptual image similarity dataset called PIPAL with Elo rating system to study the new distortion brought by Generative Adversarial Network (GAN) technology. Besides, we build new benchmarks for Image Quality Assessment (IQA) and super-resolution methods. Results indicate that existing IQA methods cannot fairly evaluate GAN-based Image Restoration algorithms. Moreover, we propose a novel metric, which compares features region-wise and avoids aliasing during down-sampling, to improve the IQA performance on GAN-based distortion. Take charge of dataset construction, statistical analysis, and model experiments. **[2][3]**

  ▶ Host the Perceptual Image Quality Assessment Challenge on the 6th New Trends in Image Restoration and Enhancement workshop (NTIRE) in conjunction with CVPR2021 based on our PIPAL dataset. I take charge of all processes beginning from establishing regulation to the conclusive report as a core co-organizer. **[4]**

  ▶ Statistically compare and study a variety of deep representation models that can be used as perceptual metrics to find the core characteristic, which dominates the performance of perceptual metrics. Then, We propose to employ mutual information maximization training strategy to maximize the amount of distortion-related information in the extracted representation used in perceptual metrics. Delve into this topic from the explainable perspective as a co-first author. **[5]**

- ♦ **Interactive Modulation for Image Restoration.** *(July 2020 - November 2020)*

  ▶ Propose Controllable Unet Generative Adversarial Network (CUGAN) which introduces continuous modulation enabling users to adjust the texture reconstruction and restoration strength freely. The CUGAN employs a simple linear mapping for condition vector (strength for texture reconstruction and restoration) to control the latent space in the generator and discriminator. With fewer parameters, CUGAN achieves better performance on selected datasets and real-world images. **[1]**

- ♦ **Interpretability of Loss Function in Image Super-Resolution** *(April 2021 - Present)*

  ▶ Explore what characteristics of loss functions have a strong influence on models of image super-resolution (SR). Develop an iterative algorithm to search for a better combination of losses for a corresponding SR model. Delve into this topic from the explainable perspective as the first author.

Software Development

- **AI-Based Anime Image Toolbox iOS Application (Swift-based)**: We built an AI-based image toolbox named ReyeR, providing reverse anime image search, anime image tag recognition, photo cartoonization, and a human face to anime face. I take charge of interaction effects and the whole front-end. More in the exhibition web of ReyeR .

Skills Summary

- **Languages/Frameworks**: Python(PyTorch, Numpy, OpenCV, Caffe), MATLAB, Swift, LaTex, Markdown