Haoming Cai

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Education

- **Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences** — Shenzhen, China
  *Research Assistant supervised by **Prof.Dong Chao** at Multimedia Research Center* — *June 2020 - Present*
- **The Chinese University of Hong Kong (Shenzhen)** — Shenzhen, China
  Bachelor of Computer Science and Engineering — *Sep 2017 - Sep 2022*

Research Interest

- **Image Restoration, Deep Learning, Image Quality Assessment, Network Interpretation**

Publications

- Google Scholar Citation : **42** (Up to Aug.2021)

[1] 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, Talk, Peoject]

[2] 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]

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

[4] 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", **CVPRW 2021, NTIRE**. [PDF, Challenge, Talk]

[5] Jinjin Gu*, **Haoming Cai***, Zhengwen Zhang, Yu Qiao, Chao Dong, "What Representation Makes a Good Perceptual Metric"#, **Draft ready for ICLR, 2022**. # indicates future renaming.

Research Experience

▲ Centering on a looped thesis supervised by **Prof.Dong Chao** and mentored by **Ph.D. student Jinjin Gu**

- **Image Quality Assessment Dataset, Benchmark, and Metrics** [1][2] — *Sep 2019 - July 2020*
  Takes charge of Dataset Construction, Statistical Analysis, and Algorithm Design
  - 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.
  - Build new benchmarks for both Image Quality Assessment (IQA) and super-resolution methods.
  - Propose a novel metric, which compares features on region and avoids aliasing during down-sampling. The robustness on small displacements improves the IQA performance on GAN-based distortion.
- **Interactive Modulation for Image Restoration** [3] — *July 2020 - Nov 2020*
  First time to globally and integrally process a project as first author
  - Propose Controllable Unet Generative Adversarial Network (CUGAN) that introduces continuous modulation for users on restoration strength and texture reconstruction on multi-degraded images with fewer parameters.
- **Organize Image Quality Assessment Challenge at CVPRW 2021** [4] — *Dec 2020 - April 2021*
  Co-organizer : Take charge of all processes beginning from rule making to conclusive report
  - We take charge of the Perceptual Image Quality Assessment (IQA) Challenge based on our PIPAL dataset (ECCV 2020). With 270 registered participants, there are finally 13 teams submitting their perceptual IQA algorithms, which well-improved upon the existing perceptual IQA algorithms on the testing dataset.
- **Interpretability of deep representations in Image Quality Assessment** [5] — *Feb 2021 - Present*
  Delve into the tough topic from explainable perspective as co-first author
  - Statistically compare and study a variety of deep representation models that can be used as perceptual metrics in order to find the core characteristic, which dominates the performance of deep representation models.
  - Propose to employ mutual information maximization training strategy to maximize the amount of distortion-related information in the extracted representation used in perceptual metrics.
- **Interpretability of loss function in Image Super-Resolution** — *May 2021 - Present*
  Delve into the tough topic from explainable perspective as first author
  - Study what characteristics of loss functions that has strong influence on models of image super-resolution (SR). Develop a iterative algorithm to search best combination of losses for a corresponding SR model.

Research Service

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

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. Take charge of interaction effects and whole front-end. More in the exhibition web of ReyeR.

Skills Summary

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