Yichi Zhang

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EDUCATION

- **Purdue University**   West Lafayette, U.S.A.
  Master of Electrical and Computer Engineering   *Aug. 2023 - Present*
  Research Assistant   Supervisor: Fengqing Maggie Zhu

- **Hangzhou Normal University**   Hangzhou, China
  Bachelor of Computer Science (Finance Service Engineering)   *Sep. 2019 - Jun. 2023*

RESEARCH INTEREST

- Image & Video & Point Cloud Coding

RESEARCH EXPERIENCE

- **RAW Domain Images Analysis**
  National Student Innovation and Entrepreneurship Training Program   *Jul. 2021 - Mar. 2022*
  - Suggested an approach aimed at **conducting image recognition and semantic segmentation tasks directly on RAW data**. The accuracy on RAW domain data is comparable with full ISP processing RGB, but the time required is about 10% of the full ISP.
  - Proposed to enhance low-light images from the RAW domain via **a cross-scale framework** leveraging **Spatial-Frequency information** for multi-level representations. The proposed method outperforms SOTA low-light enhancement methods in both full reference assessment metrics, including PSNR (0.68 dB higher), MPSNR, SSIM, and no-reference metric NIMA.

- **Low-complexity Codec Toolkit**
  Google Chrome University Research Program   *Apr. 2022 - Jul. 2023*
  - Developed an **extremely low-complexity neural network (1000 FLOPs/pixel)** for AV2 in-loop filtering, achieving 2.01% and 1.07% BD-rate reduction in intra and inter coding with 9k parameters (AOM open source code: Available at https://gitlab.com/AOMediaCodec/avm/-/tree/research-in-loop-filters).
  - Designed a low-complexity BackboneFormer using separable self-attention. Based on this BackboneFormer, a **Content-Aware Meta-Learning post-processing** framework together with a **compression artifact estimation** method is devised achieving 4.32% BD-rate reduction over VVC.
  - Proposed a **Reconfigurable in-loop filtering framework** and a **Wave-based Multiscale PoolFormer network**, which are jointly applied in VVC in-loop filtering and demonstrate **outstanding performance, 7.13% BD-rate reduction** against the VVC anchor in All Intra mode.
  - Proposed a **low-complexity arbitrary-scale super-resolution** method embedded in the AV2 super-resolution framework.

- **End-to-End Learned Image Compression**
  Video and Image Processing Laboratory (VIPER)   *Jul. 2023 - Present*
  - Designed a **Contextual Clustering**-based Learned Image Compression (LIC) method, leveraging clustering operations and employed **Guided Post-Quantization Filtering** to minimize quantization errors in the initial decoding phase.
  - Introduced the use of **estimated theoretical bounds** of LIC as a "**teacher**" model to **direct and enhance** the performance of practical LIC implementations.
  - **Empirically** evaluated **various transforms**, including convolutional neural networks and transformers, alongside **different context models** such as hierarchical, channel-wise, and space-channel. Developed a series of efficient models, culminating in a final model that delivers performance **on par with leading methods** but with **significantly reduced complexity**.

PUBLICATIONS

- Long Chen, **Yichi Zhang**, Zhangkai Lyu, and Dandan Ding*: Low-Light Image Enhancement Based on RAW Domain Image. Journal of Computer-Aided Design & Computer Graphics, 2023, 35(2): 303-311.

- **Yichi Zhang**, Hengyu Liu, Dandan Ding*, and Zhan Ma: Low-light RAW Image Enhancement Using Paired Fast Fourier Convolution and Transformer. 2022 IEEE International Conference on Visual Communications and Image Processing (VCIP). IEEE, 2022: 1-5.

- **Yichi Zhang**, Hengyu Liu, and Dandan Ding*: A Cross-scale Framework for Low-light Image Enhancement Using Spatial-spectral Information. Computers and Electrical Engineering, 2023, 106: 108608.

- **Yichi Zhang**, Gongchun Ding, Dandan Ding*, Zhan Ma and Zhu Li: On Content-aware Post-processing: Adapting Statistically Learned Models to Dynamic Content. ACM Transactions on Multimedia Computing, Communications and Applications, 2023, 20(1): 1-23.

- **Yichi Zhang**, Dandan Ding*, Zhan Ma and Zhu Li: A Reconfigurable Framework for Neural Network-based Video In-loop Filtering. ACM Transactions on Multimedia Computing, Communications and Applications, 2024, 20(6): 1-20.

- **Yichi Zhang**, Zhihao Duan, Ming Lu, Dandan Ding*, Fengqing Zhu, and Zhan Ma: Another Way to the Top: Exploit Contextual Clustering in Learned Image Coding. The 38th Annual AAAI Conference on Artificial Intelligence, 2024, 38, 9377-9386.

- **Yichi Zhang**, Zhihao Duan, Yuning Huang, and Fengqing Zhu: Theoretical Bound-Guided Hierarchical VAE for Neural Image Codecs. 2024 IEEE International Conference on Multimedia and Expo, 2024

- **Yichi Zhang**, Zhihao Duan, and Fengqing Zhu: On Efficient Neural Network Architectures for Image Compression. 2024 IEEE International Conference on Image Processing, 2024

- Dandan Ding, Hengyu Liu, **Yichi Zhang**: RAW Domain Low-light Image Enhancement, Software copyright.

Work Experience

- **Artificial Intelligence Trainer Assistant Intern**
  Aidigger Technology, Hangzhou, China   *Jun. 2020 - Sep. 2020 & Jan. 2021 - Apr. 2021*
  - Created labeling standard documents in collaboration with product requirements, encompassing the precise delineation of data labeling and calibration procedures. Iteratively refined labeling standard documents by assimilating insights from product testing outcomes, thereby ensuring optimal alignment with evolving project needs.

Awards

- Silver Award, the 13th "Challenge Cup" Student Entrepreneurial Plan Competition of Zhejiang Province. 2023.
- Gold Award, the 12th "Hope Cup" Entrepreneurship Competition of Hangzhou Normal University. 2022.