Haoxin YAN

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Passionate AI engineer working on efficient AI algorithms for mobile camera systems

EDUCATION

M.Eng. Instrument and Meter Engineering — ***Tsinghua University*** AUGUST 2019 - AUGUST 2022
Tsinghua-RWTH double degree program
Thesis: Deep Transfer Learning Research on Industrial Defect Detection

M.Sc. Production Systems Engineering — ***RWTH Aachen University*** OCTOBER 2019 - AUGUST 2020
Tsinghua-RWTH double degree program
Thesis: Deep-Learning-Driven Reconstruction of Optical Diagnostic Data of Turbulent Combustion

B.Sc. Instrumentation Engineering — ***Beihang University*** SEPTEMBER 2015 - JULY 2019
Courses: Digital Imaging Processing, Geometric and Physical Optics, Deep Learning etc.

WORK EXPERIENCE

Xiaomi - New Business Department — ***Algorithm Engineer*** AUG 2022 - NOW
Working towards enabling camera AI algorithms on power-constraint mobile devices for better user experience.

- **AI Video Raw Denoising**:
  - A comprehensive solution for AI video denoising given any specific sensor. We established a complete process including noise model calibration, RGB-to-Raw unprocessing, baseline model training and finetuning using real-world samples.
  - Participated in **model deployment** on a high-end mobile platform. Worked on floating-point model training and mixed-precision model quantization (including PTQ and QAT). The resulting NPU inference performance is **80fps@4K**.
  - Independently responsible for a research project for **night-mode capture preview**. The algorithm is expected to combine bayer downsampling and denoising which would decrease power consumption (lower resolution) and reduce noise for higher possible brightness. The quantized model achieved **better detail and noise performance** than existing platforms (PQ certified).
- **AI-PP2PD (Autofocus)**
  - Being core of the overall autofocus algorithm (PDAF), ai-pp2pd (phase pixel to phase difference) aims at calculating the distance between two phase pixel raw images, hence determining the ideal in-focus motor position.
  - Responsible for developing the complete training and evaluating scheme of ai-pp2pd. We train the network in two subsequent phases, using artificial samples generated from public datasets and collected raw images labeled with CDAF algorithms. The results on test set show a significantly higher accuray than traditional algorithm (**0.98 vs 0.83**).
  - We carefully designed the model structure to meet the stringent power budget. The total computaional power of the model is reduced to **0.5 GFLOPs** after quantization.
- **ISP/DPU Auto Calibration**
  - Worked on an offline platform for efficient ISP/DPU parameter auto-calibration. The system utilized optimization algorithms (tpe, nsga...) to find the optimal parameter combination that achieves best image quality (measured in IQA).
  - Adapted ISP brightness modules and DPU pipeline to existing auto-calibration platform. Developed **parameter generation methods** and **IQA algorithms** according to different systems. The auto-calibrated parameters achieved better performance than parameters calibrated by hand in several PQs.
  - Explored and developed new auto-calibration framework based on **deep reinforcement learning algorithms**. The new framework can access various reinforcement methods (HPO, TRPO, etc.) which achieves twice as fast convergence speed on DPU autotuning tasks (800 rounds vs 2000 rounds).

SKILLS

Python, PyTorch, NumPy, C++, OpenCV...

PUBLICATIONS

[1] Li, C., **Yan, H.**, Qian, X., Zhu, S., Zhu, P., Liao, C., ... Li, X. (2023). A domain adaptation YOLOv5 model for industrial defect inspection. Measurement, 213, 112725. (Co-author)
[2] Li, C., **Yan, H.**, Zhu, S., Hong, Y., Zhu, P., Wen, Y., Tian, H., Liao, C., Li, X., Wang, X. and Qian, X., 2023, January. A feature-based transfer-YOLOv5 model for rapid defect inspection in large mass magnetic tile manufacturing. In Optoelectronic Imaging and Multimedia Technology IX (Vol. 12317, pp. 251-256). SPIE. (Co-author)