张启航

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Education

香港中文大学（深圳） 2023/08 - 2026/06

学术型硕士

- 专业：计算机科学
- 导师：孙启霖教授
- 研究方向：计算成像与低层视觉

东京工业大学 2025/04 - 2025/09

科研助理

- 指导老师：田中正行教授和纹野雄介教授
- 研究方向：偏振成像

香港中文大学（深圳） 2019/08 - 2023/06

工学学士

- 专业：计算机科学与工程

Work Experience

Vivo 移动通信 2022/06 - 2022/11

测试引擎开发实习生 深圳

- 参与 Android 测试引擎的开发与维护，编写并优化核心代码，开发多个基于 Python 的 ADB 自动化测试组件以提升测试效率与覆盖率，同时提高代码的可读性和可维护性。
- 扩展测试引擎功能，支持多国定制化测试需求，确保测试流程适配不同地区的语言和文化要求。
- 实现 Google Android 测试基准的全流程自动化，编写脚本并集成工具链，确保测试流程符合 Google 测试工程规范。
- 编写并更新测试引擎的使用文档，帮助测试开发团队快速上手，减少沟通成本并提高团队协作效率。

Research Experience

彩色偏振图像联合去噪与去马赛克 2025/04 - 2025/09

Collaborators：田中正行教授，纹野雄介教授

- 提出了首个面向彩色偏振成像的联合去噪与去马赛克重建框架，在共享特征空间内协同建模并恢复退化图像。
- 设计了基于编码器特征融合机制的图像重建模型，显著提升了重建质量。
- 构建了首个真实世界彩色偏振图像数据集，支持模型训练与评估。
- 在多个指标上显著优于现有偏振图像去噪与去马赛克方法。

超高动态范围传感器快速 Tonemapping 和 ISP 2024/05 - 2024/11

Collaborators：孙启霖教授，点昀技术

- 设计并实现基于硬件加速的高速色调映射算法，支持 24Bit-HDR 图像的实时处理与 LDR 显示，实现动态范围接近人眼感知极限（130-140dB）视频的 LDR 输出。
- 开发端到端可学习的 ISP 算法，通过小型神经网络实时估算 Global Tonemapping 参数，显著提升 24 位视频流的处理效率与图像质量。
- 在 ISP 算法中引入端到端可微设计，支持任务扩展与联合优化；例如，将 ISP 与目标检测任务结合，优化 ISP 输出以适配检测网络，以提升目标检测精度。
- 通过实验验证算法在多种场景下的性能，确保其在复杂光照条件下的稳定性。

RGB-IR 传感器 ISP 和快速反射去除 2023/08 - 2023/12

Collaborators：孙启霖教授, 田中正行教授，纹野雄介教授

- 设计并实现基于 GPU 加速的 RGB-IR 传感器图像信号处理管线（ISP），显著提升图像处理效率，满足实时性要求。
- 提出一种基于红外光特性的反射去除算法，利用 NIR 波段对玻璃反射的低敏感性，结合可见光波段信息，有效分离并去除反射干扰，提升图像质量。
- 采用引导滤波技术优化 RGB-IR 图像的特征提取与融合过程，在保证算法精度的同时，大幅降低模型复杂度与参数量，提升计算效率。

Project Experience

相机仿真图像生成管线 2024/08 - 至今

Collaborators：孙启霖教授，实验室成员（负责光学部分），华为（横向委托方）

- 设计并实现了从光学到传感器的完整图像仿真处理流程。
- 使用空间可变的点扩散函数（PSF）卷积核模拟镜头退化。
- 基于传感器噪声特性构建噪声模型并生成噪声 Map。
- 完成了可扩展、可移植的仿真管线，可适配不同应用场景，为算法开发与验证提供高保真数据支撑。

CPU/GPU 部分算子并行计算实现（MPI, OpenMP, CUDA, Triton） 2024/09 - 2024/12

Collaborators：徐源

- 构建模块化 CPU/GPU 并行算子库，实现部分传统图像处理算子（灰度化、模糊、Sobel、双边滤波）、矩阵乘法及部分深度神经网络卷积/全连接层，并支持反向传播。
- 使用 MPI、Pthreads、OpenMP 实现 CPU 上的并行优化，使用 CUDA 和 Triton 实现 GPU 上的并行优化。
- GPU/Triton 实现的图像算子和矩阵乘法在相同条件下性能优于基线-PyTorch 实现。

基于 HDR-Plus 的 HDR 视频处理应用开发 2022/12 - 2023/03

- 基于谷歌 HDR+ 论文，实现多帧短曝光 Raw 合成的高动态范围（HDR）视频处理管线。
- 使用多帧对齐与融合、滤波降噪和局部色调映射等 HDR+ 提出的 ISP 模块。
- 使用 Python 和 PyQt5 框架开发了图形用户界面（GUI）应用，方便用户操作，支持选择 RAW 图像序列进行处理，并通过调用 FFmpeg 将处理后的图像帧合成为最终的 HDR 视频。

Research Interest

- **应用方向：** 图像处理、HDR 成像、新型图像传感器
- **技术方向：** 计算成像、低层视觉

Language and Skills

- **语言能力**：IELTS 7.0（阅读 8.5 / 听力 7.5 / 口语 6.0 / 写作 6.0）能够熟练阅读英文技术文档并交流。
- **编程技能**：掌握 Python、C++ 等编程语言，具备扎实的编程基础和良好的代码实践能力。
- **技术专长**：熟悉传统图像处理算法和基于深度学习的图像处理技术，深入了解图像信号处理管线（ISP）的各个模块及其实现原理。
- **项目信息**：部分可公开项目代码与详细内容请查看此 Link。

ZHANG QIHANG

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EDUCATION BACKGROUND

The Chinese University of Hong Kong, Shenzhen 08/2023 - Present
Master of Philosophy

- Major: Computer Science
- Research Focus: Computational Photography and Low-Level Vision
- Advisor: Prof. Qilin Sun

Tokyo Institute of Technology, Japan 04/2025 - 09/2025
Research Assistant

- Supervised by Prof. Masayuki Tanaka and Prof. Yusuke Monno
- Research Focus: Polarized Image Processing

The Chinese University of Hong Kong, Shenzhen 08/2019 - 06/2023
Bachelor of Engineering

- Major: Computer Science and Engineering

WORK EXPERIENCE

School of Data Science, CUHK-Shenzhen 09/2023 - Present
Teaching Assistant *Shenzhen*

- Served as a teaching assistant for Computational Laboratory, Database Systems, and Parallel Programming courses across multiple semesters
- Help professors arrange tutorial course content outlines. Teach tutorial courses each week and answer questions during office hours
- Update the assignment structure and use the latest CS technology in assignments to meet current requirements, such as Triton in Parallel Programming course

Vivo Mobile Communication Co., Ltd 07/2021 - 10/2021
SDE Intern *Shenzhen*

- Developed and maintained the android test engine, completed the development and implementation of multiple automated test components, and achieved excellent results in improving test efficiency and coverage rate
- Extended the engine usage documents according to the development content, improved the work efficiency of the test team, and reduce the communication time
- Ensured that the test engine could support customized testing needs for different countries, and understood the cultural uniqueness of different regions during the development process
- Fulfilled with Google's test engineering requirements to automate the entire process of using Google's Android test benchmarks for mobile phones

RESEARCH EXPERIENCE

Joint Polarized Image Demosaicing AND Denoising 04/2025 - 09/2025
Tokyo Institute of Technology, Japan

- Proposed the first joint denoising and demosaicing framework for color-polarized imaging, addressing both degradations within a shared feature space
- Designed an encoder-based feature fusion mechanism to enhance reconstruction quality
- Built a real-world paired polarized image dataset to support model training and evaluation
- Outperformed existing methods across multiple metrics

Ultra-high Dynamic Range Sensor Fast Tone Mapping and ISP 04/2024 - Present
CUHK-Shenzhen & PointSpread Technology

- Design a hardware-based tone mapping algorithm to achieve LDR display of Ultra-HDR images which have dynamic range close to the human eye (130-140dB)
- Implement an end-to-end learnable simplified ISP algorithm that utilizes a small neural network to estimate the global tone mapping parameters for an image, enabling real-time estimation on a 24-bit video stream

- Incorporate end-to-end differentiability in the design of the ISP algorithm to guarantee future expandability. For example, the ISP's output image can be adapted for target detection tasks, enabling joint optimization between the ISP and the corresponding task, thereby enhancing the output metrics

RGB-IR Sensor ISP and Fast Reflection Removal 08/2023 - 12/2023

- Implement GPU-based RGB-IR sensor image ISP
- Design reflection removal algorithm based on the low reflection property of glass to infrared light, use infrared band information to remove the reflection of the visible light band and provide better multi-spectral images
- Utilize guided filter to accelerate the feature extraction and fusion from RGB-IR image

PROJECT EXPERIENCE

Camera Image Simulation Pipeline (Huawei Collaboration) 08/2024 - Present

Product Design and Programming

- Designed and implemented a full-stack simulation pipeline modeling the camera imaging process from optics to sensor
- Applied spatially varying Point Spread Function (PSF) kernels to simulate lens-induced degradation across the image
- Built a sensor noise modeling framework to generate realistic pixel-level noise maps
- Delivered an extensible and modular pipeline that can be adapted to different sensors/lenses, providing high-fidelity synthetic raw data for algorithm development and validation

Parallel Computing Operator Template 09/2024 - 12/2024

Programming

- Built a modular CPU/GPU parallel operator library including image operators (grayscale, blur, Sobel), matrix multiplication, and DNN layers (convolution, fully connected) with backpropagation support
- Optimized CPU kernels using MPI, Pthreads, OpenMP, and developed high-performance GPU kernels using CUDA and Triton
- Triton/CUDA implementations of image operators and matrix multiplication outperformed baseline PyTorch eager implementations under equivalent settings

HDR Plus Based HDR Video Processing Application 12/2022 - 03/2023

Programming

- Implemented a high dynamic range (HDR) video processing pipeline based on Google's HDR+ paper, utilizing multi-frame short-exposure RAW synthesis
- Integrated HDR+ ISP modules including multi-frame alignment and fusion, filtering for noise reduction, and local tone mapping
- Developed a graphical user interface (GUI) application using Python and PyQt5 framework for user-friendly operation, supporting RAW image sequence selection and processing, with FFmpeg integration for final HDR video synthesis

SERVICE & LEADERSHIP

Teaching Assistant CUHK-Shenzhen

- Parallel Computing (CSC4050) - 2024 Fall
- Computational Laboratory (CSC1002) - 2024 Spring
- Database System (CSC3170) - 2023 Fall

Volunteer 2020

Office of Student Affairs, CUHK-Shenzhen

LANGUAGE & SKILLS

- **Language**: IELTS: overall: 7.0(R: 8.5/ L: 7.5/ S: 6.0/ W: 6.0)
- **Programming Skills**: Proficient in Python, familiar with C/C++, CUDA
- **Research Interests**: Image Processing, HDR Imaging, Novel Sensors, Computational Photography, Low-Level Vision