Jidong Xu

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EDUCATION

University of Wisconsin-Madison (Madison, US) Sep 2023 -Present
Ph.D. student Major: Electrical and Computer Engineering **GPA: 4.0/4.0**

Johns Hopkins University (Baltimore, US) Aug 2021-May 2023
Master of Science in Engineering Major: Electrical Engineering GPA: 3.9/4.0

Chongqing University (Chongqing, China) Sep 2016-Jun 2021
Bachelor of Engineering Major: Electrical Engineering and Automation GPA: 3.76/4.0

University of Cincinnati (Cincinnati, US) Sep 2016-Apr 2021
Bachelor of Science Major: Electrical Engineering GPA: 3.74/4.0

RESEARCH INTERESTS

Computational Imaging, Computer Vision, Video/Image/Signal Processing, Machine Learning

RESEARCH EXPERIENCES

The Computational Optics Group, Department of ECE, University of Wisconsin-Madison
Advisor: Associate Professor, Andreas Velten

1. Quanta Video Burst Photography for SPAD Video Reconstruction *Sep 2023 - Present*

- Architected a **GPU-accelerated video burst pipeline** using **SPAD (Single-Photon Avalanche Diode)** cameras, incorporating causal/noncausal modes, pyramid alignment, frame aggregation, patch grouping, and robust merging to **reduce reconstruction latency** and **improves memory efficiency** for long sequences.
- Designed a **fast SPAD burst reconstruction algorithm** that significantly **accelarates** conventional Quanta Burst Photography while retaining **stable quality** under **low-photon counts and fast motion**.
- Implemented **stream-friendly compression and integration** of SPAD frames, enabling **compact storage and high-rate playback** while preserving visual fidelity.
- **Demonstrated cross-sensor generalization:** the burst-video pipeline applies to both **SPAD photon streams** and **conventional RGB videos** (e.g., fluorescence-guided navigation, drone footage), delivering **high-quality results** with **lower compute**.
- Explored extensions to computational imaging tasks and potential deployment on mobile-class devices for **efficient, real-time denoising** on resource-constrained hardware.

The Photonics and Optoelectronics Laboratory, Department of ECE, Johns Hopkins University
Mentor: Jacob Suter Jammer Professor, Jin U. Kang

1. LiDAR Guided Object Detection-Based Robot Assisted Injection Surgery *Jun 2022-May 2023*

- Built LiDAR-guided 7-DOF robot-assisted surgery model based on YOLO object detection framework and robotic motion planning to achieve a delicate and accurate injection surgery.
- Modified the convolutional layers and anchor boxes of the YOLO-based neural network in Pytorch to improve the detection ability for small objects.
- Achieved an accurate detection with the confidence of more than 0.9 and fast inference speed with time of less than 25 ms per frame.
- Proposed a visual serving method based on the Jacobian matrix estimation algorithm to achieve calibration between the camera and robot coordinate system.

2. Neural Networks-Based Needle Detection for Medical Retinal Surgery *Jan 2022-Jun 2022*

- Built a YOLO-based object detection deep learning framework to achieve a fast and accurate detection of needle positions and angles for medical retinal surgery.
- Proposed a classification method assist in determining the specific positions and angles of needle tips on detected bounding box.

- Achieved a fast and accurate position detection, where the inference time was less than 25 ms per image, the needle position error was less than 4.8 pixels and the angle error was less than 0.85 degrees.

State Key Laboratory of Power Transmission Equipment & System Security and New Technology, Chongqing University
Mentor: Associate Professor, Qiwei Xu

1. Design and Research of Mobile Robot Control System *Jun 2020-Dec 2020*
- Analyzed the motion conditions for a wheeled-mobile robot, and designed a differential steering motion model to implement robot in-situ rotation, obstacle recognition, and signal transfer.
- Developed a visual obstacle avoidance system based on depth detecting camera and grayscale sensor for obstacle detection and robot motion planning.
- Applied Pulse Width Modulation on voltage control to drive the DC servo motor.

2. Control System Model Design of Permanent Magnet Synchronous Motor *Sep 2019-Jan 2020*
- Designed triple closed-loop vector control system of Permanent Magnet Synchronous Motor (PMSM) based on the Simulink simulation platform.
- Applied MATLAB and C++ language to generate an embedded motor control program to implement stable and accurate motor angle control.
- Analyzed and established the mathematical model and discrete simulation model of PMSM.

PROJECTS

Course Project, Wavelets and Filter Banks, Johns Hopkins University
Mentor: Professor, Trac-Duy Tran

Wavelets-based Digital Watermarking Scheme for Medical Image Data *Sep 2021-Dec 2021*
- Designed wavelet-based digital watermarking schemes to embed and extract the watermark from medical image data, which achieved high-level visual integrity and a low degree of degradation.
- Applied Discrete Wavelet Transform (DWT), Singular Value Decomposition (SVD), and Arnold transformation to implement a digital watermarking scheme.
- Evaluated performance of watermarking scheme under different processing and geometric image attacks, which achieved robust copyright protection for medical image data against different attacks.

Senior Design, **Undergraduate Thesis**, **University of Cincinnati**
Mentor: Associate Professor, Boyang Wang

Identifying Authorship of Source Code with Neural Networks *Sep 2020-May 2021*
- Built a Long Short-Term Memory (LSTM)-based Recurrent Neural Network (RNN) using TensorFlow to implement the authorship identification.
- Leveraged word embedding using Term Frequency-Inverse Document Frequency (TF-IDF) to encode source code as sequences.
- Trained and tested the LSTM-based neural networks, which achieved a high accuracy of 84%.

PATENT

1. Xu, J.; Seets, T.; Velten, A. “Camera with Video Burst Photography.” U.S. Patent Application, Docket P250325US01 (filed 2025) — Pending.

PUBLICATIONS

1. Xu, Jidong, Jinglun Yu, and Hao Tang. "Wavelets-Based Digital Watermarking Scheme for Medical Image Data." 2022 2nd International Conference on Computer Graphics, Image and Virtualization (ICCGIV). IEEE, 2022.
2. Xu, Jidong, et al. "The neural networks-based needle detection for medical retinal surgery." International Conference on Computer Graphics, Artificial Intelligence, and Data Processing (ICCAID 2022). Vol. 12604. SPIE, 2023.

SKILLS

- **Programming Language:** Python, MATLAB, C++, CUDA;
- **Framework:** Pytorch and TensorFlow.