XIAOCHUN LIU

Research Scientist

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Accomplished and results-driven Postgraduate Research Fellow with 5+ years' experience in researching and developing image processing algorithms, computational photography, and computer vision. Aptitude for implementing, modeling, analyzing, and evaluating machine learning solutions. Comprehensive understanding of image quality metrics, with expertise in optical imaging and depth sensing. Articulate communicator confident in participating in cross-functional and multi-disciplinary projects to advance research deliverables. Proven track record of achieving results as demonstrated by first-authored publications and project contributions; in addition to reviewing state of the art method publications such in Nature Publishing Group: *Light Science & Applications*; IEEE: *IEEE Transactions on Computational Imaging*; OSA: *Optics Express, Optics Letters*; SPIE: *Advanced Photonics*; Cambridge University Press: *APSIPA Transactions on Signal and Information Processing*.

Education

PhD in Electrical & Computer Engineering – Signal Processing & Machine Learning
University of Wisconsin
Projected Graduation Date: 05/2022

MSc in Electrical & Computer Engineering – Signal Processing & Machine Learning
University of Wisconsin
2020

Technical Proficiencies

Software:	OpenCV; OpenGL; Pytorch; Blender
Programming Languages:	C++; Python; MATLAB; LabVIEW

Career Experience

University of Wisconsin, Madison, WI — 2017 – Present
Research Assistant

Collaborate with multi-disciplinary teams, in computer graphics, computer vision, hardware circuit design, and optics, to advance research deliverables. Contribute to **11** research outcomes (**four** first author publications), published in multiple peer-reviewed journals including **CVPR**, **ICCP**, **ICCV**, **Nature**, **Nature Communications**, and **PAMI**. Utilize computational imaging and photography methods to enhance quality of 3D imaging and inverse problem reconstructions using deep learning, machine learning, and optimization. **15+ journal paper reviews** related to Computational Imaging/Photography, Optics, Signal processing and Machine learning in Nature, OSA, SPIE and IEEE.

- Improved imaging algorithm complexity run time by a factor of approximately **500** with **20x** less memory usage than other cutting-edge algorithms by designing groundbreaking imaging reconstruction solver for 3D imaging sensing and implementing proposed method using **OpenCV** in **C++** and **Python**.
- Developed novel Fourier domain histogram acquisition pipeline, in **C++** on **GPU** and **FPGA** platform, for **single photon avalanche diode array** with less memory usage, thereby successfully enabling real time application on limited resource platforms.
- Contributed towards development of single photon avalanche diode array 3D imaging pipeline, within imaging reconstructions in **C++**, **GPU**, and **OpenCV** with FIFO data structure.
- Designed **automatic vision assisted PID control calibration system** for 3D imaging utilizing RGB camera, laser galvo, and Time-correlated Single Photon Counting with PID controller in **C++**, **LabVIEW**, and **MATLAB**.
- Assisted with NASA's Perlapsis Subsurface Cave Optical Explorer project, programming non-line-of-sight imaging simulation pipeline, including forward/inverse algorithms, using **OpenGL** and graphic render in **C++**.

Adaps Photonics, San Jose, CA — 06/2020 – 09/2020
Algorithm Engineering Intern

Collaborated on research project and facilitated algorithm development for direct-time-of-flight (dToF) depth sensing prototype camera.

- Utilized **Pytorch** to formulate **deep learning-based sensor fusion** approach for RGB and dToF camera.
- Applied simulating pipeline and hardware prototype measurements to model and assess dToF sensing system.

- Improved depth estimations including denoising and up-sampling for dToF array.

Additional Experience

Additional Project Experience

Machine Learning Project: Sequential prediction of Stock price.

- Developed and compared methods utilizing Hidden Markov Model (HMM), Long-short term Memory (LSTM), and Support Vector Machine (SVM) regression for US stock predications.

National Competition: Non-contact photoelectric method for volumetric measurement.

- Won 3rd Place in competition.
- Utilized OpenCV and C++ to program stereo vision algorithm, as well as depth completion and volumetric estimations.

National Competition: Undergraduate mathematical modeling contest

- Designed mathematical model for Moon landing issue and was subsequently awarded 2nd Place.

National Competition: Lierda cup national Internet of Things

- Awarded 2nd Place in competition for building and developing intelligent warehouse management system with STM32 embedded platform and MFC Windows application software using C++.
- Implemented function to remotely control warehouse components by designing STM32 PCB board and building software using MFC to communicate with STM32.

Publications

P.11 Nam, Ji Hyun, Eric Brandt, Sebastian Bauer, **Xiaochun Liu**, Eftychios Sifakis, Marco Renna, Alberto Tosi, and Andreas Velten. "Low-latency time-of-flight non-line-of-sight imaging at 5 frames per second " Nature communications. 2021. Project Webpage

P.10 Liao, Zhengpeng, Deyang Jiang, **Xiaochun Liu**, Andreas Velten, Yajun Ha, and Xin Lou. "FPGA Accelerator for Real-Time Non-Line-of-Sight Imaging". IEEE Transactions on Circuits and Systems I (TCAS1), 1-14, 2021

P.9 Jiang, Deyang, **Xiaochun Liu**, Jianwen Luo, Zhengpeng Liao, Andreas Velten, and Xin Lou. "Ring and Radius Sampling Based Phasor Field Diffraction Algorithm for Non-Line-of-Sight Reconstruction" IEEE Transactions on Pattern & Machine Intelligence (PAMI), 1-1, 2021

P.8 Marco, Julio, Miguel Angel Cosculluela, Ji Hyun Nam, **Xiaochun Liu**, Adrian Jarabo, Andreas Velten, and Diego Gutierrez. "Virtual light transport matrices for non-line-of-sight imaging." International Conference on Computer Vision (ICCV). 2021. (Oral) Project Webpage

P.7 **Liu, Xiaochun***, Andreas Velten. " The role of Wigner Distribution Function in Non-Line-of-Sight Imaging."IEEE International Conference on Computational Photography (ICCP) 2020. Project Webpage

P.6 **Liu, Xiaochun**, Sebastian Bauer, and Andreas Velten. "Phasor Field Diffraction Based Reconstruction for Fast Non-Line-of-Sight Imaging Systems." Nature Communication 11.1 2020. Project Webpage

P.5 Guillén, Ibón, **Xiaochun Liu**, Andreas Velten, Diego Gutierrez, and Adrian Jarabo. " On the Effect of BRDFS on Phasor Field NLOS Imaging." International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2020.

P.4 **Liu, Xiaochun**, Ibón Guillén, Marco La Manna, Ji Hyun Nam, Syed Azer Reza, Toan Huu Le, Adrian Jarabo, Diego Gutierrez, and Andreas Velten. "Non-line-of-sight imaging using phasor-field virtual wave optics." Nature 572, no. 7771 (2019): 620-623. Project Webpage

P.3 La Manna, Marco, **Xiaochun Liu**, Ji-Hyun Nam, Martin Laurenzis, and Andreas Velten. "A line-of-sight approach for non-line-of-sight imaging (conference presentation)." In Computational Imaging IV, vol. 10990, p. 1099005. International Society for Optics and Photonics, 2019.

P.2 **Liu, Xiaochun**, Sebastian Bauer, and Andreas Velten. "Analysis of feature visibility in non-line-of-sight measurements." Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR). 2019. Project Webpage

P.1 Velten, Andreas, Marco La Manna, Ji-Hyun Nam, and **Xiaochun Liu**. "Non-line-of-sight 3D imaging (Conference Presentation)." In Three-Dimensional Imaging, Visualization, and Display 2018, vol. 10666, p. 106660R. International Society for Optics and Photonics, 2018.