

TIANAO LI

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📍 Tsinghua University, Beijing, P.R.China

EDUCATION

Tsinghua University

B.Eng. in Electronic Engineering

Curricular Certificate Program in Astronomy

GPA: 3.84/4.0

Relevant Coursework with GPA 4.0: Digital Image Processing, Introduction to Fourier Optics, Probability and Stochastic Processes, Media and Cognition, Introduction to Auditory-Visual Information System, Advanced Matlab Programming, Data and Algorithm, Signals and Systems, Digital Signal Processing, Linear Algebra

Beijing No.4 High School

High School Diploma

Beijing, P.R.China

Sept. 2019 - Jun. 2023

Beijing, P.R.China

Sept. 2016 - Jun. 2019

HONORS & AWARDS

- Tsinghua University Scholarship of Comprehensive Excellence (top 10%, 2022)
- Tsinghua University Scholarship of Comprehensive Excellence (top 10%, 2021)
- First Prize in National College Students' Physics Competition (top 1%, 2020)
- Tsinghua University Scholarship of Social Work (2020)
- Third Prize in Tsinghua Hardware Design Competition (top 5%, 2020)

RESEARCH INTERESTS

My research interest lies at the intersection of computational imaging, computer vision, signal processing, optimization, and machine learning. I'm especially interested in inverse problems in imaging, physics-informed deep learning, and astronomical imaging. I'm also open to bio-inspired vision, NeRF, and HDR imaging.

PUBLICATIONS

- [1] Tianao Li, Emma Alexander. **Galaxy Image Deconvolution for Weak Gravitational Lensing with Unrolled Plug-and-Play ADMM**, *Monthly Notices of the Royal Astronomical Society: Letters*, 2023.

RESEARCH EXPERIENCE

Tsinghua University, Biophotonics Laboratory

Undergraduate Researcher, Advisor: **Prof. Cheng Ma, Prof. Emma Alexander**

Beijing, P.R.China

Oct. 2022 - Present

- Applied physics-informed machine learning to image reconstruction in photoacoustic computed tomography (PACT), where image qualities are usually degraded by unknown variations in the speed of sound through tissues.
- This is my ongoing senior thesis project.

Northwestern University, Bio-Inspired Vision Lab

Research Intern (Remote), Advisor: **Prof. Emma Alexander**

Evaston, IL, USA

Apr. 2022 - Present

- Applied physics-inspired machine learning to the PSF deconvolution problem in galaxy images in ground-based sky surveys, significantly reducing systematic error in weak gravitational lensing shear measurements. Adopted an end-to-end optimized unrolled network to learn the priors with Plug-and-Play ADMM.
- The proposed method outperforms previous algorithms in shape error of recovered galaxies.
- Paper published on *Monthly Notices of the Royal Astronomical Society* (MNRAS).

Tsinghua University, Tsinghua Visual Intelligence and Computational Imaging Lab

Research Assistant, Advisor: **Prof. Lu Fang**

Beijing, P.R.China

Sept. 2021 - Feb. 2022

- Collaborated with a Ph.D. student on a Deep Diffractive Neural Network (D²NN) implementation of NeRF.
- Implemented a Point Cloud classification network with D²NN.

SKILLS

- **Coding:** Python, PyTorch, TensorFlow, Matlab, C/C++, Git, \LaTeX
- **Language:** English (TOEFL:111, S:26), Mandarin (Native)

SELECTED PROJECTS

Fire Detection [Github] Jun. 2022

- A Python implementation of a non-deep learning fire detection pipeline.
- Pipeline comprises of three parts: color space classifier, color component classifier and texture classifier.
- The model was trained and tested on the BoWFire Dataset and is able to detect fire from static images with an accuracy of 80%.

Video-Audio Signal Processing [Github] Dec. 2021

- Developed joint video-audio processing algorithms in Python.
- The algorithm is capable of recognizing faces from videos clips, recognizing voices from audios and separating speeches from videos with given visual and audio information of the speakers.

Video Editing Based on Rhythm Matching [Github] [Video] Jul. 2021

- Developed a video-editing algorithm in Matlab.
- Our algorithm was designed to create a video from a given set of video clips and a piece of background music to best match the clips' audio rhythm with the background music.

EXTRA-CURRICULARS

- **Vice president of Tsinghua Astronomy Society (2021-22).**
- Head of school observatory (2021-22).
- Organized astronomical popularization summer camp for junior high students in Guizhou and Xizang, China in 2021.
- Volunteer at Tsinghua Q&A Workshop with a total service hour of 160h.