

# TIANAO LI

🌐 <https://lukeli0425.github.io> ✉ [tianaoli@u.northwestern.edu](mailto:tianaoli@u.northwestern.edu) 🌐 <https://github.com/Lukeli0425/>

📍 Department of Computer Science, Northwestern University, Evanston, IL

## EDUCATION

### Northwestern University

*Ph.D. student in Computer Science*

Research advisor: Emma Alexander

Evanston, IL

*Sept. 2023 - Present*

### Tsinghua University

*B.Eng. in Electronic Engineering, Magna Cum Laude*

*Curricular Certificate in Astronomy*

GPA: 3.85/4.0 (top 15%)

Research advisor: Cheng Ma

Beijing, P.R. China

*Aug. 2019 - Jun. 2023*

### Beijing No.4 High School

*High School Diploma*

Beijing, P.R. China

*Sept. 2016 - Jun. 2019*

## HONORS & AWARDS

- Outstanding Graduate, Tsinghua University (top 10%) *Jun. 2023*
- Scholarship of Comprehensive Excellence, Tsinghua University (top 10%) *Oct. 2022*
- Scholarship of Comprehensive Excellence, Tsinghua University (top 10%) *Oct. 2021*
- Scholarship of Social Work, Tsinghua University *Oct. 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, physics-informed machine learning, bio-inspired vision, and astronomical 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

### Biophotonics Lab, Tsinghua University

*Undergraduate Researcher*

*Oct. 2022 - Jun. 2023*

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

- 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.

### Bio-Inspired Vision Lab, Northwestern University

*Research Intern (remote)*

*Apr. 2022 - Feb. 2023*

Advisor: **Prof. Emma Alexander**

- 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).

**SIGMA Lab**, Tsinghua University

*Research Assistant*

*Sept. 2021 - Feb. 2022*

Advisor: **Prof. Lu Fang**

- Collaborated with a Ph.D. student on a Deep Diffractive Neural Network ( $D^2NN$ ) implementation of NeRF.
- Implemented a Point Cloud classification network with  $D^2NN$ .

## INVITED TALKS

---

**Galaxy Image Deconvolution for Weak Gravitational Lensing with Unrolled Plug-and-Play ADMM**

Astro Imaging Workshop, Northwestern University

*Jul. 2023*

## 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.
- The 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.

## EXTRACURRICULAR

---

- Vice president of Tsinghua Astronomy Society (2021-22).
- Head of school observatory (2021-22).
- Organized astronomy summer camp for junior high students in Guizhou, China in Aug. 2021.
- Volunteer at Tsinghua Q&A Workshop with a total service hour of 180h.