


YICHEN LIU

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 Chisen-Lupus
 Yichen Liu

EDUCATION

University of Illinois at Urbana-Champaign | College of Liberal Arts & Sciences **Aug 2022 - Present**
4.00/4.00
• Bachelor of Science (**Honor**) in **Astrophysics** and **Mathematics**, expected May 2024
• Minor in **Physics**, **Computer Science**, and **Chemistry**
University of Macau | Faculty of Science and Technology **Aug 2019 - May 2022**
• Completed Junior Year of **Applied Physics and Chemistry (Honour)**

TECHNICAL SKILLS

Programming: Python, \LaTeX , MATLAB, Git, Arduino, Shell Bash/Zsh, C/C++, Mathematica, Julia, docker, SQL, and Java
Softwares: MaxIm DL, COMSOL, Altium Designer, KiCAD, Solidworks, Cinema 4D, and SPSS
Python Packages: [AstroPy](#), [Scarlet](#), [PyTorch](#), [Detectron2](#), [CIGALE](#), and [PyQSOFit](#)
Machine Learning: Neural (RNN, Mask R-CNN, ResNet, and Transformer)

PUBLICATIONS AND ABSTRACTS

- Yichen Liu**, Colin J. Burke, Charlotte A. Ward, Xin Liu, Priya Natarajan, "Host galaxy properties of HSC-SSP variable AGNs in the COSMOS field and expectations for Rubin Observatory", American Astronomical Society Meeting #243, id. 3936
- Grant Merz, **Yichen Liu**, Colin J. Burke, Patrick D. Aleo, Xin Liu, Matias Carrasco Kind, Volodymyr Kindratenko, Yufeng Liu, "[Detection, Instance Segmentation, and Classification for Astronomical Surveys with Deep Learning \(DeepDISC\): Detectron2 Implementation and Demonstration with Hyper Suprime-Cam Data](#)," MNRAS 526, 1122 (2023)
- Yichen Liu**, Peixia Zheng, and Hong-Chao Liu, "[Anti-loss-compression image encryption based on computational ghost imaging using discrete cosine transform and orthogonal patterns](#)," Optics Express 30, 14073 (2022)
- Peixia Zheng, **Yichen Liu**, and Hong-Chao Liu, "[Single-pixel imaging and metasurface imaging](#)," Infrared and Laser Engineering 50, 20211058-1 (2022)

RESEARCH EXPERIENCES

Research Assistant at *Department of Astronomy, University of Illinois* **Sep 2022 - Present**
• Advisor - [Professor Xin Liu](#)
• Project 1 - instance segmentation in astronomical surveys using machine learning (NCSA SPIN internship)
– Evaluated and optimized source extraction pipelines for [DeepDISC](#) and [Astro R-CNN](#) using [Sep](#) and [Scarlet](#) frameworks
– Orchestrated simulations employing diverse models and configurations on PhoSim data via the Hardware-Accelerated Learning (HAL) cluster with [Detectron2](#) integration.
– Enhanced the pipeline by incorporating Transformer models, specifically MViT and VitDet, to improve instance segmentation
• Project 2 - DES SED fitting
– Performed SED fitting on sources cataloged in DES and WISE using the [CIGALE](#) toolkit
– Developed selection criteria and identified AGN candidates from extensive source catalogs
• Project 3 - host galaxy properties of variable AGNs
– Cross-referenced dwarf AGN candidates between HSC DR2 and subsequent catalogs (DR3, SIMBAD, DESI, and COSMOS2020)
– Created scripts for batch downloading of optical spectra from various sources such as SDSS, zCOSMOS, Magellan, DEIMOS, among others, and reconciled discrepancies in redshift data across different databases
– Determined black hole mass - host galaxy mass relation through SED fitting
– Investigated star formation main sequence using [PyQSOFit](#) toolkit
Summer Research Internship at *National Observatory of China* **Jun 2022 - Aug 2022**
• Advisor - [Professor Chaojian Wu](#)
• Project - meteor slitless spectrum
– Analyzed the spectral data of 2021 Gemini meteors captured with DSLR cameras equipped with diffraction gratings
– Employed Python to dissect the intensities of Sodium and Magnesium lines
– Developed machine learning algorithms for the automated detection and photometric assessment of meteor recordings
Research Assistant at *Institute of Applied Physics & Materials Engineering, University of Macau* **Aug 2019 - May 2022**
• Advisor - [Professor Hongchao Liu](#)
• Project 1 - ghost imaging in complex environment
– Conducted a comprehensive review of contemporary ghost imaging and single-pixel imaging research
– Assessed the quality of ghost imaging across various setups using MATLAB, producing reports and comparative analyses
– Investigated the reflection patterns from distorting mirrors, contrasting them with standard mirror reflections to inform imaging technique improvements
• Project 2 - anti-loss image encryption based on ghost imaging
– Executed experimental research into ghost imaging, investigating the potential of metamaterials and metasurfaces
– Created Python algorithms leveraging compressive sensing and gradient descent methodologies.
– Managed and fine-tuned computational imaging simulations on [PyTorch](#) with high-performance GPUs
– Published a first-authored research paper as the first undergraduate student in the department, and [exposed by local media](#)
• Project 3 - ghost imaging using recurrent neural network
– Collaborated with a team of postgraduate students in managing laser equipment for experimental setups

- Validated existing ghost imaging techniques incorporating neural networks
- Developed Python pipelines integrating recurrent and convolutional neural network architectures for ghost imaging

OBSERVATION EXPERIENCE

- Cerro Tololo Inter-American Observatory, Blanco 4m / DECam: 3 nights observation Jan 2023 - Apr 2023
- Personal remote observatory, BKP250 / QHY9sm: [astrophotography](#) and photometry Jul 2019 - Aug 2022

SYNERGISTIC ACTIVITIES

- Presentations: AAS 243rd Meeting, **Oral presenter**, Scheduled Jan 2024, LA, US
- STEM Career Exploration and Symposium, **Poster Presenter**, Jul 2023, IL, US
- NCSA lightning talk, **Oral presenter**, Jul 2023, IL, US
- EU Contest for Young Scientists, **Poster Presenter**, Sep 2019, Sofia, Bulgaria
- Summer schools: University of California Berkeley (4.000/4.000), 2022
- Shanghai Jiao Tong University (4.00/4.00), 2021
- Membership: LSST Dark Energy Science Collaboration

AWARDS AND GRANTS

- University of Illinois Dean's Honor List (2022-2023) Jul 2023
- Smart Star Sponsorship for studies at University of California, Berkeley Jun 2022
- University of Macau Dean's Honour List (2020 and 2022) Aug 2022
- Residential College Summer Programme Sponsorship for studies at Shanghai Jiao Tong university May 2021
- Third Prize, China Undergraduate Physics Tournament Oct 2020
- National Team Leader at the 2019 European Union Contest for Young Scientists Sep 2019
- University of Macau Full Scholarship (2019-2021) Aug 2019
- Bronze Medal, International Olympiad of Astronomy and Astrophysics Nov 2018
- First Prize, China Adolescents' Science and Technology Innovation Contest Aug 2018

TEACHING EXPERIENCE

- Undergraduate Tutor of Department of Astronomy** Jan 2023 - May 2023
 - Designed and led interactive tutoring sessions for undergraduates majoring in Astronomy, covering foundational concepts in thermal physics, quantum physics, and astrophysics to supplement their introductory courses
- Physics and Mathematics Video Crrator on Bilibili** Sep 2021 - Present
 - Created and shared educational videos on physics and math topics, reaching a broad audience and achieving over 160,000 views on [the most popular video](#)
- Organizer and Lecturer of Seminar of Physics at the University of Macau** Feb 2022 - May 2022
 - Initiated a lecture series with a colleague to bridge the curriculum gap at the University of Macau, providing in-depth instruction in advanced physics and mathematics to supplement formal education
 - Compiled and distributed a guide for incoming physics and chemistry students to navigate academic and research paths
 - Consistently delivered bi-weekly seminars and made the course content ([SPUM 102 The tools of physical tools](#)) publicly available on [Youtube](#), expanding educational outreach

EXTRACURRICULAR EXPERIENCES

- Director of Physics Society, University of Macau (Macau SAR, China)** Aug 2020 - Feb 2021
 - Established and expanded the Physics Society, leading promotional efforts and significantly growing its membership
 - Guided undergraduates through the China Undergraduate Physics Tournament, enhancing the society's academic community
- Student Helper at Department of Physics and Chemistry, University of Macau (Macau SAR, China)** Jul 2020 - Oct 2020
 - Handled equipment procurement processes and managed budget recommendations, streamlining the department's operations
- Organizer of Beijing Astronomy and Astrophysics Olympiad (Beijing & Guangdong, China)** Jan 2018 - Apr 2018
 - Managed the organization and execution of the 2018 Olympiad, securing participation from schools across China and facilitating a knowledge-rich event
- President of Beijing Youth Astronomy Union (Beijing, China)** Aug 2017 - Aug 2018
 - Directed an educational initiative for the National Astronomy Olympiad and engaged the public with astronomy through various outreach activities
 - Managed the WeChat account "北京市中学生天文联盟", achieving widespread readership with posts exceeding 100,000 views