YICHEN LIU

tel +1-(447) 902-2638
e-mail yl127@illinois.edu
web https://yliu.fit

0000-0003-4247-0169
Chisen-Lupus
Yichen Liu

EDUCATION

University of Illinois at Urbana-Champaign | College of Liberal Arts & Sciences **Aug 2022 - Present**

- Bachelor of Science (**Honor**) in **Astrophysics** and **Mathematics**, expected May 2024 **4.00/4.00**
- 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)**

PUBLICATIONS AND TALKS

1. **Yichen Liu**, Colin J. Burke, Charlotte A. Ward, Xin Liu, Jenny Greene, 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
2. 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," Monthly Notices of the Royal Astronomical Society 526, 1122 (2023)
3. **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)
4. Peixia Zheng, **Yichen Liu**, and Hong-Chao Liu, "Single-pixel imaging and metasurface imaging," Infrared and Laser Engineering 50, 20211058-1 (2022)

RSEARCH 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)
  - Examined the source extraction pipelines of `DeepDISC` and `Astro R-CNN` using `Sep` and `Scarlet`
  - Conducted simulation runs of different models and configurations based on PhoSim data on Hardware - Accelerated Learning (HAL) cluster using `Detectron2`
  - Modified code and applied Transformer models, MViT and VitDet, into the pipeline
- Project 2 - DES SED fitting
  - Performed SED fitting of the sources in the DES and WISE catalogs using `CIGALE`
  - Generated criteria and selected AGN candidates in the source catalogs
- Project 3 - host galaxy properties of variable AGNs
  - Matched the dwarf AGN candidates in HSC DR2 catalog to DR3, SIMBAD, and COSMOS2020 databases
  - Prepared batch-download code of optical spectra for SDSS, zCOSMOS, Magellan, DEIMOS, etc.
  - Compared and resolved the inconsistensies of redshifts between HSC and other databases
  - Performed SED fitting on the candidates and concluded the relation between black hole masses and redshifts
- Project 4 - redshift estimation in astronomical surveys using machine learning (NCSA SPIN internship)

Summer Research Internship at *National Observatory of China* **Jun 2022 - Aug 2022**

- Advisor - Professor Chaojian Wu
- Project - meteor slitless spectrum
  - Generated the spectrum of 2021 Gemini meteors captured by DSLR
  - Analyzed the intensitities of Sodium and Magnesium lines using Python
  - Wrote machine learning code to filter and locate meteors from mass recording and perform photometry automatically

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
  - Reviewed latest studies on ghost imaging & single-pixel imaging and presented research summaries at staff meetings
  - Measure ghost imaging quality based on different equipment and reconstruction algorithms in MATLAB, analyzed the data, and authored reports for project supervisors
  - Investigate light patterns reflected by distorting mirrors and compare the patterns to reflections from regular mirrors
- Project 2 - anti-loss image encryption based on ghost imaging
  - Conducted experiments on ghost imaging, metamaterials and metasurfaces, and topological materials
  - Designed Python algorithms based on compressive sensing and gradient descent

  - Managed computational imaging simulations using PyTorch using high-performance graphic card
  - Published a research paper as the first author as the first undergraduate student in the department and reported by local newspaper
- Project 3 - ghost imaging using recurrent neural network
  - Operated laser devices in collaboration with postgraduate students
  - Summarized and verified existing ghost imaging methods that involve nerural networks
  - Designed Python pipelines based on recurrent and convolutional neural network for ghost imaging

OBSERVATION EXPERIENCE

- Cerro Tololo Inter-American Observatory, Blanco 4m / DECam: 3 nights observation — Jan 2023 - Apr 2023

AWARDS AND GRANTS

- AAS 243rd Meeting Travel Grants, Department of Astronomy — Oct 2023
- NCSA SPIN Internship (Summer 2023 & Academic Year 23-24) — Aug 2023
- 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
- Second Prize, Deng Feng National Contest on Science and Innovation — Aug 2018
- Second Prize, China National Astronomy Olympiad — May 2018

SYNERGISTIC ACTIVITIES

- Talks:
  - AAS 243rd Meeting, Scheduled Jan 2024, LA, US
  - NCSA, Jul 2023, IL, US
- Conferences:
  - AAS 243rd Meeting, **Oral presenter**, Scheduled Jan 2024, LA, US
  - STEM Career Exploration and Symposium at UIUC, **Poster Presenter**, Jul 2023, IL, US
  - The Transient and Variable Universe Conference at NCSA, Jun 2023, IL, US
  - AAS 241st Meeting, Jan 2023, WA, US
  - EU Contest for Young Scientists, **Poster Presenter**, Sep 2019, Sofia, Bulgaria
- Was student in:
  - University of California Berkeley (4.000/4.000), Summer 2022
  - Shanghai Jiao Tong University (4.00/4.00), Summer 2021
- Is member of:
  - LSST Dark Energy Science Collaboration

TEACHING

Undergraduate Tutor — **Jan 2023 - May 2023**

- Planned and facilitated collaborative tutoring sessions for Astronomy-program major students enrolled in introductory-level thermal physics, quantum physics, and astrophysics

Youtuber in physics and mathematics — **Sep 2021 - Present**

- Live stream or publish videos in "Bilibili" platform, offering public education resources in Chinese
- Topics include undergraduate-level or self-leared mathematics and physics, such as complex variables
- The most popular video obtained more than 160,000 watchings

Seminar of Physics at the University of Macau — **Feb 2022 - May 2022**

- This was a series of unofficial lectures organized by me and my classmate, Jiheng Duan, offering math and physics contents that the University of Macau's curriculum did not provide, such as classical mechanics and partial differential equations, supplementing the theoretical basis of future research and studies in physics for DPC students
- Conducted the class meetings twice a week over the semester
- Prepared and taught the lecture *SPUM 102 The tools of physical tools*, including complex variables, Γ functions, integral transforms, δ functions, and Green functions |Syllabus
- The recordings of the lectures are publically available on Youtube

PROFESSIONAL EXPERIENCES

Astrophotographer at *Personal 25-centimeter Remote Observatory (Hebei, China)* **Jan 2018 - Jul 2022**

- Identified a suitable site in Hebei, China and built a 2×2-meter storage facility with internet access and a retractable roof
- Selected, assembled, and tested the equipment, and successfully developed a remotely-operated facility
- Regularly captured emission nebulae and selected photos are listed in my website

Director of *Physics Society, University of Macau (Macau SAR, China)* **Aug 2020 - Feb 2021**

- Founded the University's physics society and promoted its activities on social media platforms
- Significantly expanded the Society's membership through effective outreach activities and university club fairs
- Organized and led a team of undergraduate students at the 2020 China Undergraduate Physics Tournament

Student Helper at *Department of Physics and Chemistry, University of Macau (Macau SAR, China)* **Jul 2020 - Oct 2020**

- Requested equipmrnt quotes and negotiated contracts with suppliers for physics-related research
- Tracked the department's procurement budget and developed budgeting recommendations
- Purchased supplies for the 2020 China Undergraduate Physics Tournament

Organizer of *Beijing Astronomy and Astrophysics Olympiad (Beijing & Guangdong, China)* **Jan 2018 - Apr 2018**

- Coordinated the preparations for the 2018 Olympiad with participating high schools across China
- Invited distinguished professors and organized guest lectures/workshops on astronomy and astrophysics
- Developed the competition paper , prepared and purchased competition materials, and supported panel judges with evaluations
- Led the Awards Ceremony at the National Astronomical Observatory

President of *Beijing Youth Astronomy Union (Beijing, China)* **Aug 2017 - Aug 2018**

- Held a series of lectures on astrophysics and prepared supplementary to train candidates for the National Astronomy Olympiad
- Held roadside observation events near the Olympic Park, Beijing
- Attended the Ninth National Astronomical Society Development Forum in Weihai, Shandong
- Operated the WeChat public account "北京市中学生天文联盟" , and the most popular post obtained more than 100,000 readings

TECHNICAL SKILLS

Skilled in:	Python, LaTeX, MATLAB, Git, and Shell Bash/Zsh
Basic Knowledge:	C/C++, Mathematica, Julia, docker, SQL, and Java
Softwares:	MaxIm DL, COMSOL, Altium Designer, KiCAD, Solidworks, Cinema 4D, and SPSS
Often-used Packages:	`AstroPy`, `Scarlet`, `PyTorch`, `Detectron2`, and `CIGALE`
Contributions:	`DeepDISC`: Using deep learning for classification on astornomical survey images
	`Metspec`: Auto-detection and photometry of meteor slitless spectrum
	`DES-SED-Fitting`: SED fitting and classification of DES sources
	`DECat-pointings`: working repository of DECam
	`Dwarf-AGN-COSMOS`: Spectral analysis for dwarf AGN candidates in COSMOS field