YICHEN LIU

tel	+1-(447) 902-2638		0000-0003-4247-0169
e-mail	yl127@illinois.edu		Chisen-Lupus
web	https://yliu.fit		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)**

Summer sessions
- **University of California, Berkeley**   **Jun 2022 - Aug 2022**
- **Shanghai Jiao Tong University**   **Jun 2021 - Jul 2021**

PUBLICATIONS

1. Liu Y., et al., DES dwarf AGNs, In prep.
2. Colin B., et al., Host galaxy properties of variable AGNs in the COSMOS field I. $M_{BH} - M_*$ relation up to $z \sim 4$, In prep.
3. 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," submitted to MNRAS, available at ArXiv (2023)
4. **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," Opt. Express 30, 14073-14087 (2022)
5. Peixia Zheng, **Yichen Liu**, and Hong-Chao Liu, "Single-pixel imaging and metasurface imaging," Infrared and Laser Engineering 50.12, 20211058-1 (2022)

RSEARCH EXPERIENCES

Research Assistant   **Sep 2022 - Present**
Department of Astronomy, University of Illinois
- Advisor - Professor Xin Liu
- Project 1 - deblending in astronomical surveys using machine learning (Summer 2023 & Academic year 23-24 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
  - Recent work includes building neural networks for photometric redshift estimation
- 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

Summer Research Internship   **Jun 2022 - Aug 2022**
National Observatory of China
- 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   **Aug 2019 - May 2022**
Institute of Applied Physics & Materials Engineering, University of Macau

- 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 high-impact article as the first author as the first undergraduate student in the department
- 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

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 (tuition & accommodation, 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, China National Astronomy Olympiad	May 2018

OUTREACH

Youtuber in physics and mathematics   **Sep 2021 - Present**
- Live stream or publish videos in "Bilibili" platform, offering public education resources in Chinese
- Topics include self-learned or taught undergraduate-level mathematics and physics
- 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

ACTIVITIES

Undergraduate Tutor   **Jan 2023 - Present**
Department of Astronomy, University of Illinois
- Planned and facilitated collaborative tutoring sessions for Astronomy-program major students enrolled in targeted core major courses

Astrophotographer   **Jan 2018 - Jul 2022**
Personal 25-centimeter Remote Observatory
- 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   **Aug 2020 - Feb 2021**

Physics Society, University of Macau

- 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 (Macau SAR, China) -   **Jul 2020 - Oct 2020**

Department of Physics and Chemistry, University of Macau

- 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

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