Postgraduate Application Form

UNIVERSITY OF CAMBRIDGE
Postgraduate Admissions Office

Liu, Mr Yichen

Course	MASt in Astrophysics (MASAS)	**Date submitted**	30 Nov 2023
Department	Institute of Astronomy	**Mode of study**	Full Time
Course start date	01 Oct 2024 (MT 2024)	**PUF**	No

Academic History

Aug 2022 - May 2024 *(Not yet obtained)*	Bachelor of Science in Astrophysics (Astronomy) - All or mostly full-time	4.00	University of Illinois at Urbana-Champaign (*United States*)
Aug 2019 - May 2022	Non-degree in Applied Physics and Chemistry (Physics and Chemistry) - All or mostly full-time	3.40	University of Macau (*Macao*)

Immigration

Nationality	China (1st)
Country of birth	China
Currently ordinarily resident	China
Country of birth is ordinary residence since birth	Yes
Estimated fee status	Overseas
Visa	Required
Visa type	I do not currently have a UK visa

Language

Type	IELTS (Taken on 05 Aug 2023)
Reference No	23UX000763LIUY824A
Score	**L**: 6.5 **R**: 8.0 **W**: 7.0 **S**: 6.5 **T**: 7
Document	Uploaded

Adverse Effects of COVID

606/2000 chars

During the pandemic in my first 2 years, due to the limited access to the coursework, I put more effort into exploring extracurricular skills that I felt would be helpful for my future studies. I became familiar with Shell/Zsh and Git, and in collaboration with my Physics Tournament, I studied fluid simulation using COMSOL. I spent the most time studying PCB layout and created several interesting projects, like building my own microprocessor business card. The COVID lockdown affected my grades until early 2021, but during that time, my grades were less of a concern than the skillset I taught myself.

Scholarships

Apply for funding	Yes
Apply for Cambridge Trust	Yes
Apply for Gates Cambridge	No

* Document not uploaded at the point of submission
** Other university

Curriculum Vitae

Uploaded

Career Goals

974/1000 chars

My academic and professional trajectory has been fueled by a profound passion for astronomy and the ultimate goal of becoming a research professor. This drive led me to establish a remote observatory at the University of Macau and delve into galaxy spectral analysis and machine learning at the University of Illinois. My research, centered around supermassive black holes (SMBHs), has already resulted in significant contributions, including publications and presentations. These experiences are steps toward my long-term objective of pursuing a PhD in astrophysics, with a focus on SMBHs and galactic phenomena. The MASt program will be a pivotal milestone in this journey, not only bolstering my existing foundation but also providing me with advanced knowledge crucial for excelling in PhD research and beyond. My career aspirations are rooted in research and teaching, aiming to contribute novel insights into the Universe and inspire future generations of astronomers.

Additional Information to Support Application

999/1000 chars

As a first-generation student at the University of Macau (UM), I once lacked guidance navigating the higher education system. While my goal was clear, my path was uncertain. I initially spent much time reading textbooks not tailored to my track and many nights trying serious research with my amateur telescope. Upon finding my way, I wanted to assist others who face similar challenges.
I then initiated an unofficial seminar at UM. Our weekly sessions covered mathematical and programming tools that I taught myself, from complex analysis to LaTeX. To expand our reach, I shared my lecture notes and recordings on GitHub and YouTube. A video even gained over 160,000 views. Upholding my commitment at the University of Illinois, I participated in the tutoring program, providing support to students in need. This teaching process not only strengthened my understanding through the Feynman technique but also illuminated the path for aspiring students seeking a roadmap towards graduate education.

Course Specific Questions

Core - statement of interest	My academic journey in astronomy has been in pursuit of understanding the enigmatic nature of supermassive black holes (SMBHs) and their role in the cosmic landscape. This pursuit has driven me to undertake diverse research projects, laying a solid foundation for advanced study in astrophysics. At the University of Macau, I ventured into computational imaging, where I independently executed a single-pixel imaging encryption project, resulting in a first-author publication in Optics Express. This experience in image processing was pivotal in honing my computational and academic writing skills. Transitioning to the University of Illinois, I focused on a project on deep-field image segmentation using machine learning as part of the LSST pipeline. This work resulted in a publication in MNRAS, where I contributed as the second author. Furthermore, I embarked on a project analyzing low-luminosity active galactic nuclei (AGNs), exploring the spectral data, and gaining experience in spectral energy distribution fitting. This research, which I will present at the AAS 243rd meeting, marks a significant milestone in my academic journey, enhancing my analytical skills and deepening my understanding of AGNs. My interest in Cambridge's MASt in Astrophysics stems from a desire to further deepen my knowledge. The program's advanced courses align perfectly with my academic pursuits, providing me with the essential tools and experiences necessary to excel in my future PhD studies.
Core - reasons for applying	The MASt program presents an ideal opportunity for me to further my astrophysical studies in preparation for a PhD. My academic background and research experiences have laid a solid foundation in both the theoretical and practical aspects of astronomy. The course structure of the MASt program,

	with its combination of advanced courses and a substantial research project, aligns perfectly with my academic objectives and research interests in supermassive black holes and galaxies. The opportunity to engage in a rigorous research project as part of the MASt curriculum is particularly appealing. It will allow me to expand my knowledge in astrophysics, honing skills that are essential for a successful research career. Additionally, the advanced courses offered by the program will deepen my understanding of astrophysical principles, which is fundamental for my intended PhD studies. Cambridge's prospect of learning from leading astrophysicists is a key motivator for this prestigious program.
Astronomy - Extra Materials WP	Uploaded

Application Information

Academic Awards

No awards entered

Employment History

Jan 2023 - May 2023	Undergraduate tutor	Univerisity of Illinois at Urbana-Champaign (*Urbana, United States*)
Jun 2023 -	SPIN Internship	National Center for Supercomputing Applications (*Urbana, United States*)
Jul 2020 - Oct 2020	Student Helper	University of Macau (*Taipa, Macao*)

Other Applications Made

No other applications entered

Personal Information

Identifying Information

Full name	Liu, Mr Yichen	**Date of birth**	12 Dec 2000
Previous name		**Legal gender**	Male

Contact

Email	yl127@illinois.edu	**Phone**	+1 4479022638 (1st)
Skype address			+86 13718131631 (2nd)
Contact address	110 S Gregory St, Apt 3, Urbana, Illinois, 61801, United States	**Home address**	331 Yuquan Rd 16th Courtyard, Unit 4-9, Haidian district, Beijing, 100039, China
Valid until		**Valid until**	

Dependants

Partner	**WILL NOT** bring partner	**Child**	**WILL NOT** bring children

Disability

Disability	No
Further information	

Adjustment for Interview

Adjustment required	No
Details	

College Preferences

College	Trinity College (1st)

Current Membership

College	Not College member

Visa Requirement

Visa type	I do not currently have a UK visa

Study Visas

Applicant previously **HAS NOT STUDIED** in the UK

Visa not entered

Funding Application

Cambridge Trust

Here is a list of CT awards that you would like to be considered

Cambridge International Scholarship
My extensive background in programming and astrophysics, demonstrated through impactful research and publications, showcases my dedication and capability and aligns with the scholarship's focus on academic excellence and research potential.

Gates Cambridge Scholarships (Overseas)

Apply for Gates Cambridge No

Personal Statement 0/3000 chars

Harding Scholarship

Mastercard Foundation

UKRI

Department Funding

College Funding

Based on the information you have provided, you are eligible to apply for these awards.

Sheepshanks Studentship in Astronomy

You have applied for Sheepshanks Studentship in Astronomy

Wolfson College & Rowan Williams Cambridge Studentship

Separate application form
To be considered for this studentship, applicants should complete and return a separate application form to the Trust, which has been designed to assist the Trust in the identification of eligible candidates. The Rowan Williams Cambridge Studentship application form is available at https://www.cambridgetrust.org/our-scholarships/highlighted-scholarships/rowan-williams-cambridge-studentship.
Notes for applicants:
The Rowan Williams Cambridge Studentships are not available for courses offered by the Institute of Continuing Education, premium rate courses offered by the Judge Business School (including MBA, MFin, EMBA etc.) or for courses where the fees are charged at the higher Clinical rate.
Selection panels will assess applications taking regard of the severity of barriers faced to pursuing higher education at the University of Cambridge.

Your Funding

Funding Sources

No funding sources entered

Declaration

The information you have provided forms the legal basis of your application to the University of Cambridge. We reserve the right to refuse admission in the event of any misrepresentation by you. Submission of an application does not imply an offer of admission.

- The University of Cambridge, the Cambridge Colleges, the Gates Cambridge Trust and the Cambridge Commonwealth, European and International Trust (and their collaborators) will use your personal information for the purpose of processing your applications for admission and funding and deciding whether to offer you a place for the course you have applied for. For further information on the use of your personal information during the application process, please see How we use your personal information (for applicants).
- I certify that all the information given in this application is complete and accurate. I also understand that if I have given false or misleading information, the University of Cambridge will not admit me as a Postgraduate student and may take legal action against me.
- I certify that I am the original and sole author of all work submitted as part of this application, except where clearly indicated otherwise.
- I understand that if my application is unsuccessful, the papers relating to it will be destroyed and cannot be returned.

I confirm that I have read, understand and agree to the above declarations.

澳門大學
UNIVERSIDADE DE MACAU
UNIVERSITY OF MACAU

STUDENT NO. : D-B9-2773-9
NAME : LIU YICHEN
CURRENT STATUS : **WITHDRAWN**
ADMISSION DATE : 14 AUGUST 2019
ACADEMIC UNIT : FACULTY OF SCIENCE AND TECHNOLOGY
PROGRAMME : BACHELOR OF SCIENCE IN APPLIED PHYSICS AND CHEMISTRY

COURSE CODE	COURSE TITLE	CREDIT UNITS	GRADES
FIRST SEMESTER, ACADEMIC YEAR 2019 / 2020			
APAC1001	COLLEGE PHYSICS	3.00	A-
*CISC1000	INFORMATION TECHNOLOGY FUNDAMENTALS AND PRACTICES	3.00	P
*CPED1000	RESIDENTIAL COLLEGE EXPERIENTIAL LEARNING	1.00	P
*CPED1001	PHYSICAL EDUCATION I - KOREBALL	0.50	P
*EELC1001	INTERACTIVE ENGLISH I	3.00	CW
*EELC1002	INTERACTIVE ENGLISH II	3.00	CW
EELC1003	ACADEMIC ENGLISH	3.00	C+
GEGA1000	MACAO AND CHINESE CIVILIZATION	3.00	A
GEST1004	QUANTITATIVE REASONING FOR SCIENCE AND TECHNOLOGY	3.00	A-
SECOND SEMESTER, ACADEMIC YEAR 2019 / 2020			
*APAC1000	ADVANCED MATHEMATICS I	3.00	P
APAC1002	ELECTROMAGNETISM AND PHYSICAL OPTICS	3.00	B+
APAC1003	INTRODUCTION TO COLLEGE CHEMISTRY	3.00	B
*CPED1002	PHYSICAL EDUCATION II - TENNIS	0.50	P
ECEN1005	CIRCUIT ANALYSIS	4.00	B
GELH1000	CHINESE LANGUAGE AND CULTURE	3.00	B+
GEST1015	PHYSICS AND MODERN SOCIETY	3.00	B-
FIRST SEMESTER, ACADEMIC YEAR 2020 / 2021			
APAC2000	ADVANCED MATHEMATICS II	3.00	B
APAC2001	ANALYTICAL AND ENVIRONMENTAL CHEMISTRY	3.00	B-
APAC2002	MODERN PHYSICS	3.00	B+
*GEGA1006	GREEN ENERGY FOR GLOBAL SOCIETY	3.00	W
GESB1001	APPLIED ETHICS	1.00	C+
GESB1002	FOUNDATIONS OF MORAL VALUES	1.00	B
GESB1003	LAW AND SOCIETY	1.00	B-
HONR1001	SELF-AWARENESS AND SOCIAL RESPONSIBILITY	3.00	A-
PORT1000	PORTUGUESE LANGUAGE I - INTRODUCTORY PORTUGUESE	3.00	C+
SECOND SEMESTER, ACADEMIC YEAR 2020 / 2021			
APAC2003	INORGANIC CHEMISTRY	3.00	B
APAC2004	QUANTUM PHYSICS	3.00	B
APAC4010	TOPICS IN EMERGING MATERIALS	3.00	B+
CISC1001	PROGRAMMING SCIENCE	3.00	A-
CISC1006	PROBABILITY AND STATISTICS	3.00	B-
*GEGA1006	GREEN ENERGY FOR GLOBAL SOCIETY	3.00	W

PAGE 2 FOLLOWS

DATE ISSUED: 8 JUNE 2022

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澳門大學
UNIVERSIDADE DE MACAU
UNIVERSITY OF MACAU

STUDENT NO. : D-B9-2773-9
NAME : LIU YICHEN
CURRENT STATUS : **WITHDRAWN**
ADMISSION DATE : 14 AUGUST 2019
ACADEMIC UNIT : FACULTY OF SCIENCE AND TECHNOLOGY
PROGRAMME : BACHELOR OF SCIENCE IN APPLIED PHYSICS AND CHEMISTRY

COURSE CODE	COURSE TITLE	CREDIT UNITS	GRADES
FIRST SEMESTER, ACADEMIC YEAR 2021 / 2022			
APAC3000	MATERIALS PHYSICS AND CHEMISTRY	3.00	A
APAC3001	SOLID STATE PHYSICS	3.00	A-
APAC3002	THERMODYNAMICS AND STATISTICAL PHYSICS	3.00	A
APAC4004	MATHEMATICAL METHODS IN PHYSICS	3.00	A
CISC1002	DISCRETE STRUCTURES	3.00	A-
*MATH1003	INTERMEDIATE CALCULUS	3.00	X
MATH2002	MULTIVARIABLE CALCULUS	3.00	A
MATH2003	MATHEMATICAL ANALYSIS I	3.00	B
*MATH3001	COMPLEX ANALYSIS	3.00	X
SECOND SEMESTER, ACADEMIC YEAR 2021 / 2022			
APAC2005	EARTH AND UNIVERSE	3.00	B+
APAC3003	MATERIALS CHARACTERIZATION	3.00	A-
APAC3004	OPTOELECTRONICS	3.00	A
APAC3005	PHYSICAL CHEMISTRY	3.00	A
APAC4002	ELECTRODYNAMICS	3.00	A-
GEST1014	MYSTERIES OF THE UNIVERSE	3.00	A
HONR1000	HONOURS PROJECT	3.00	A
*HONR1003	COMMUNICATING IN A GLOBAL CONTEXT	3.00	W
MATH3003	ABSTRACT ALGEBRA	3.00	A

* COURSE NOT COUNTED TOWARDS THE GPA

CUMULATIVE GPA : 3.40
TOTAL CREDITS EXEMPTED : 6.00
TOTAL CREDITS WAIVED : 6.00
TOTAL CREDITS GAINED : 120.00

ACADEMIC HONOURS
DEAN'S HONOUR LIST : ACADEMIC YEAR 2019/2020 FIRST SEMESTER
ACADEMIC YEAR 2021/2022 FIRST SEMESTER

END OF TRANSCRIPT

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Grading System for Bachelor's Degree Programmes

A. Grading System

Letter Grades	Grade Points	Percentage
A	4.0	93 – 100
A-	3.7	88 – 92
B+	3.3	83 – 87
B	3.0	78 – 82
B-	2.7	73 – 77
C+	2.3	68 – 72
C	2.0	63 – 67
C-	1.7	58 – 62
D+	1.3	53 – 57
D	1.0	50 – 52
F	0	Below 50

Other Grades

Grades	Definition
CW	Course Waiver
DX	Deferred Result
I	Incomplete
NP	Fail
P	Pass
T	Audit
W	Withdrawal
X	Course Exempted

B. Letter grades are official grades. Grade points are used for the purpose of calculating the GPA. Letter grades other than F are passing grades.

C. For the Faculty of Law, 20-point scales are official grades. Scales at 10 or above are passing grades.

D. Cumulative Grade Point Average (Cumulative GPA) / Scale Average (SA)
Cumulative GPA and SA are used to indicate the overall performance of a student in all the semesters of the specified years of studies.

E. Academic Honours
The Rector's Honour List is compiled on the Dean's recommendation and it is awarded to the best registered student in each academic unit. The students must complete at least 15 credits or the number of credits required by the designated study plan of the semester at the University and achieve a semester GPA of 3.5/semester SA of 16 or better in both semesters of that academic year.
The Dean's Honour List is awarded to registered students who complete at least 15 credits or the number of credits required by the designated study plan of the semester at the University and achieve a semester GPA of 3.3/semester SA of 14 or better in that semester.

學士學位課程評分制度

一. 評分制度

字母評級	績點	百分制
A	4.0	93 – 100
A-	3.7	88 – 92
B+	3.3	83 – 87
B	3.0	78 – 82
B-	2.7	73 – 77
C+	2.3	68 – 72
C	2.0	63 – 67
C-	1.7	58 – 62
D+	1.3	53 – 57
D	1.0	50 – 52
F	0	50 以下

其他評級

評級	定義
CW	科目轉修
DX	延期評分
I	未完成
NP	不合格
P	合格
T	旁聽
W	退修
X	科目免修

二. 大學以字母評級為正式評分制度，績點作計算平均績點之用。F 以外的字母評級表示合格。

三. 法學院以 20 分制為正式評分制度。10 分或以上表示合格。

四. 累積平均績點 (Cumulative GPA)／20 分制的平均分 (SA)
累積平均績點及 20 分制的平均分是指學生於特定的修讀年期內所有學期總體的成績表現。

五. 學術榮譽
校長榮譽榜經由院長推薦，並頒發予各學院最優秀的學生，學生必須於該學年每學期在澳門大學合格完成至少 15 個學分或學習計劃所要求的學分，並於兩個學期中均取得學期平均績點 3.5／20 分制中學期平均分 16 分或以上。
院長榮譽榜頒發予該學期在澳門大學合格完成至少 15 個學分或學習計劃所要求的學分，並取得學期平均績點 3.3／20 分制中學期平均分 14 分或以上的學生。

Sistema de Classificações dos Cursos de Licenciatura

A. Sistema de Classificações

Classificações em Letras	Classificações Numéricas	Classificações Percentuais
A	4,0	93 – 100
A-	3,7	88 – 92
B+	3,3	83 – 87
B	3,0	78 – 82
B-	2,7	73 – 77
C+	2,3	68 – 72
C	2,0	63 – 67
C-	1,7	58 – 62
D+	1,3	53 – 57
D	1,0	50 – 52
F	0	Inferior a 50

Outras Designações

Designações	Definição
CW	Dispensa de Disciplina
DX	Resultado Adiado
I	Disciplina Não Concluída
NP	Insuficiente
P	Suficiente
T	Ouvinte
W	Desistência
X	Isenção de Disciplina

B. O sistema de classificações oficial é o de classificações em letras, no qual as classificações que não sejam a letra F significam aprovação, sendo as classificações numéricas utilizadas para a calculação do *GPA* (*Grade Point Average*).

C. No caso da Faculdade de Direito, o sistema de classificações oficial é o da escala numérica de 20 valores, no qual a classificação de 10 valores ou superior significa aprovação.

D. *Cumulative Grade Point Average* (*Cumulative GPA*) / *Scale Average* (*SA*)
O *Cumulative GPA* e a *SA* demonstram o desempenho geral de um estudante, em todos os semestres, nos anos lectivos indicados.

E. Honras Académicas
A Lista de Honra do Reitor galardoa o melhor estudante de cada unidade académica, recomendado pelo respectivo director. Para ser candidatos a esta Lista, os estudantes inscritos devem ter completado, em cada semestre do ano lectivo em questão, na UM, um mínimo de 15 unidades de crédito ou o número de unidades de crédito exigido no plano de estudo para cada semestre daquele ano lectivo, com um *GPA* de 3,5 ou superior ou uma escala média de 16 valores ou superior.
A Lista de Honra do Director de Faculdade premeia os estudantes inscritos, que tenham completado, no semestre em questão, na UM, um mínimo de 15 unidades de crédito ou o número de unidades de crédito exigido no plano de estudo para aquele semestre, com um *GPA* de 3,3 ou superior ou uma escala média de 14 valores ou superior.

UNIVERSITY OF ILLINOIS URBANA - CHAMPAIGN

Urbana, Illinois 61801

Student Name: Liu, Yichen

University ID: 678093884 **Issue Date:** 03 - Nov - 23

Level: Undergrad - Urbana-Champaign **Day - Month of Birth:** 12 - Dec

Most Recent Program(s)
College : Liberal Arts & Sciences
Major : Astrophysics
Mathematics

SUBJ	NO.	COURSE TITLE	CRED	GRD	PTS R
TRANSFER CREDIT ACCEPTED					
SU21		Shanghai Jiao Tong Univ			
Ehrs: 8.00 GPA-Hrs: 0.00 QPts: 0.00 GPA: 0.00					
FA19 - SP22		Universidade de Macau			
Ehrs: 103.00 GPA-Hrs: 0.00 QPts: 0.00 GPA: 0.00					
SU22		Univ of Cal Berkeley			
Ehrs: 3.00 GPA-Hrs: 3.00 QPts: 12.00 GPA: 4.00					
INSTITUTION CREDIT:					
Fall 2022 - Urbana-Champaign					
Liberal Arts & Sciences					
Astronomy					
ASTR	210	Introduction to Astrophysics	3.00	A	12.00
ASTR	406	Galaxies and the Universe	3.00	A+	12.00
ASTR	496	Seminar in Astronomy	1.00	S	0.00
ESL	111	Intro to Academic Writing I	3.00	A+	12.00
LAS	102	Transfer Advantage	1.00	A+	4.00
MATH	285	Intro Differential Equations	3.00	PS	0.00
Dept proficiency test					
PHYS	213	Univ Physics: Thermal Physics	2.00	A+	8.00
PHYS	225	Relativity & Math Applications	2.00	A	8.00
PHYS	325	Classical Mechanics I	3.00	A+	12.00
Ehrs: 21.00 GPA-Hrs: 17.00 QPts: 68.00 GPA: 4.00					
Deans List					
Winter 2022-2023 Urbana-Chmpgn					
Liberal Arts & Sciences					
Astronomy					
GGIS	204	Cities of the World	3.00	A+	12.00
Ehrs: 3.00 GPA-Hrs: 3.00 QPts: 12.00 GPA: 4.00					

********** CONTINUED ON NEXT COLUMN **********

SUBJ	NO.	COURSE TITLE	CRED	GRD	PTS R
Spring 2023 - Urbana-Champaign					
Edmund J James Scholar for Academic Year 2022-2023					
Liberal Arts & Sciences					
Astrophysics					
ASTR	310	Computing in Astronomy	3.00	A	12.00
ASTR	414	Astronomical Techniques	4.00	A+	16.00
ESL	112	Intro to Academic Writing II	3.00	A+	12.00
MATH	347	Fundamental Mathematics	3.00	A+	12.00
MATH	415	Applied Linear Algebra	3.00	PS	0.00
Dept proficiency test					
PHYS	436	Electromagnetic Fields II	3.00	A	12.00
PHYS	486	Quantum Physics I	4.00	A+	16.00
Ehrs: 23.00 GPA-Hrs: 20.00 QPts: 80.00 GPA: 4.00					
Deans List					
Summer 2023 - Urbana-Champaign					
Liberal Arts & Sciences					
Astrophysics					
CHEM	232	Elementary Organic Chemistry I	4.00	A+	16.00
CHEM	233	Elementary Organic Chem Lab I	2.00	A+	8.00
STAT	410	Statistics and Probability II	3.00	A	12.00
Ehrs: 9.00 GPA-Hrs: 9.00 QPts: 36.00 GPA: 4.00					
Fall 2023 - Urbana-Champaign					
Liberal Arts & Sciences					
Astrophysics					
CS	124	Intro to Computer Science I	3.00	PS	0.00
Dept proficiency test					
Ehrs: 3.00 GPA-Hrs: 0.00 QPts: 0.00 GPA: 0.00					
IN PROGRESS WORK					
ASTR	390	Individual Study	4.00	IN PROGRESS	
ASTR	404	Stellar Astrophysics	3.00	IN PROGRESS	
ASTR	502	Astrophysical Dynamics	4.00	IN PROGRESS	
CS	128	Intro to Computer Science II	3.00	IN PROGRESS	
MATH	402	Non Euclidean Geometry	3.00	IN PROGRESS	
MATH	427	Honors Abstract Algebra	3.00	IN PROGRESS	

********** CONTINUED ON PAGE 2 **********

Copy of Transcript

Recipient: YL127@ILLINOIS.EDU

Student email: yl127@illinois.edu

Issued to: REFNUM: 20018838943

Meghan Hazen, Registrar

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UNIVERSITY OF ILLINOIS URBANA - CHAMPAIGN

Urbana, Illinois 61801

Student Name: Liu, Yichen

University ID: 678093884 **Issue Date:** 03 - Nov - 23

Level: Undergrad - Urbana-Champaign **Day - Month of Birth:** 12 - Dec

SUBJ NO.	COURSE TITLE	CRED	GRD	PTS	R
IN PROGRESS WORK continued:					
MATH 442	Intro Partial Diff Equations	3.00	IN PROGRESS		
	In Progress Credits 23.00				

********** TRANSCRIPT TOTALS **********

	Earned Hrs	GPA Hrs	Points	GPA
TOTAL INSTITUTION	59.00	49.00	196.00	4.00
TOTAL TRANSFER	114.00	3.00	12.00	4.00
OVERALL	173.00	52.00	208.00	4.00

********** END OF TRANSCRIPT **********

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Meghan Hazen, Registrar

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www.registrar.illinois.edu

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

OFFICE OF THE REGISTRAR, 901 W ILLINOIS, SUITE 140, URBANA, IL 61801-3446

PH (217) 333-9778 /
FAX (217) 333-3100

FULL TRANSCRIPT EXPLANATION IS AVAILABLE ON THE WEB AT: http://go.illinois.edu/transcript
Transcript information for students who attended the University of Illinois Urbana-Champaign prior to 1982 is available at: https://registrar.illinois.edu/wp-content/uploads/2018/06/pre_1982_key.pdf

ACCREDITATION:
Higher Learning Commission of the North Central Association of Colleges and Schools.

ACADEMIC CALENDAR:
The University of Illinois Urbana-Champaign operates on an academic calendar of two sixteen-week semesters and, beginning in 2005, one twelve-week summer term. Prior to 2005, the summer calendar included a four-week summer session (referred to as Intersession prior to 1995) and one eight-week summer session. Beginning December 2014, winter sessions are included between the fall and spring semesters.

PRIVACY NOTICE:
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06/07/2022

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Professional reference for **Mr Yichen Liu**

MASt in Astrophysics

Referee Details

Name	Professor Hongchao Liu	**Job title**	Assistant Professor
Email	hcliu@um.edu.mo	**Department**	Institute of Applied Physics and Materials Eng
Phone	+853 8822 9077	**Institution**	University of Macau
Relationship	Tutor	**City**	Taipa
Known for	Oct 2019 to present	**Country**	Macao

Reference

Academic ranking	Outstanding - Among the best you have ever known in your professional life
Student potential	Outstandingly original/creative/independent of thought
Course suitability	Exceptionally Suitable
Professional position	I am currently an Assistant Professor at University of Macau. I have a broad research background in computational imaging, metamaterials, topological materials, battery-related materials, electrocatalysts, etc. My recent research interests mainly focus on the single-pixel imaging, ghost imaging, and metasurface imaging.

Reference provided as uploaded file. Please see the next page.

澳門大學
UNIVERSIDADE DE MACAU
UNIVERSITY OF MACAU

17-Oct-2023

To whom it may concern,

This is Dr. Hongchao Liu, an Assistant Professor in Institute of Applied Physics and Materials Engineering, University of Macau. I here give my strongest support to Mr. Yichen Liu's application to your program. As the tutor of Yichen at University of Macau, I came to know this resourceful young man in October 2019, when he was selected as a research assistant in our applied optics group. I was also the instructor of his Thermodynamic and Statistical Physics (APAC3002) and Earth and Universe (APAC2005) courses and his mentor in the China Undergraduate Physics Tournament (CUPT). Throughout three years of study, Yichen demonstrated a remarkable ability to understand new theoretical knowledge and experimental skills. I was impressed by his ability to learn quickly and to apply himself fully to challenging tasks, especially in computational imaging and machine learning. He also got the University of Macau full scholarship for undergraduate students.

During three years of his dedicated research in my applied optics group, Mr. Yichen Liu always demonstrated exceptional skills and enthusiasm. Actively engaging in our research program focusing on single-pixel imaging and ghost imaging, he conducted laser experiments and showcased a keen analytical mind in interpreting the results. His dedication and intellectual curiosity were evident in our collaborative efforts, leading to the co-authorship of a paper titled "Single-pixel imaging and metasurface imaging," published in ***Infrared and Laser Engineering*** (in Chinese).

Moreover, Yichen's inquisitive nature and rigorous approach to research were particularly impressive. During our discussions, he consistently displayed the courage to propose novel ideas, underpinned by his profound theoretical understanding and strong mathematical foundation. Notably, from our brainstorming sessions in Fall 2021, he proposed a novel ghost imaging encryption method integrating both robustness and encryption. This initiative led him to a first-authorship of a research paper titled "Anti-loss-compression image encryption based on computational ghost imaging using discrete cosine transform and orthogonal patterns," published in ***Optics Express***. This publication underscored not only his mastery of the subject matter but also his exceptional ability to convey intricate scientific concepts in an accessible manner. Without a doubt, Yichen's work clearly epitomized his tremendous potential as a researcher.

Furthermore, Yichen displayed remarkable initiative by self-learning machine learning techniques and applying them to single-pixel imaging, a complex and challenging task. His relentless efforts culminated in a preliminary result before his departure from our group. His pursuit of knowledge and perseverance in exploring uncharted territories leave no doubt about his promising trajectory as a researcher.

Mr. Yichen Liu proved himself not only in his ability to do research tasks independently but also in the capacity for team cooperation. In 2019, Yichen took the initiative to contact the departmental secretary, proposing that students majoring in Applied Physics and Chemistry participate in the CUPT, an academic tournament involving experiments and debates with teams from various

institutions. As the team leader, I organized the University of Macau's first team in this tournament. Yichen played a significant role in managing experiment materials, participating in experimental work, engaging in discussions regarding data analysis and physical interpretation, and conducting mock debates. His valuable contributions were instrumental in our team's achievement of the third prize in the final national contest.

Although Mr. Yichen Liu has done much better than his peers, his ability is well-tempered by his positive, cheerful, and helpful character. In his third year, he started a physics seminar, sharing his knowledge beyond the course contents with other students majoring in Applied Physics and Chemistry, helping them prepare for graduate study. Never pretentious, I remember on many occasions outside of class seeing him helping other students by explaining complex ideas and theories, simply because this is the disposition of his character. Through his talent and personality, he won the respect of both his peers and faculty members.

Mr. Yichen Liu displayed outstanding proficiency in both APAC3002 and APAC2005 courses study, highlighting his dedication to academic excellence. In APAC3002, he actively participated in tutorials and office hours, delving deep into thermodynamic concepts, and earning an exceptional grade of A. His insightful questions and engaged discussions during class sessions demonstrated not only his grasp of fundamental principles but also his eagerness to explore challenging topics.

Similarly, in APAC2005, his exceptional performance was evident through clear, well-structured class presentations and articulate communication skills. These strengths are rooted in his experience participating in astronomy Olympiads in high school, where he honed his abilities and demonstrated his passion for the field. This passion extends to his eagerness to engage in astronomical research. I believe his consistent enthusiasm and exceptional abilities will make him an outstanding candidate for any physics and astronomy program.

In summary, Mr. Yichen Liu is definitely an outstanding student who stands out as one of the greatest undergraduate students I have had the privilege to teach. He has proven to be an excellent research assistant in our applied optics group, showcasing prowess in learning new theory and experiments. As a dedicated student, he demonstrated innovative research ideas, self-driven learning, and significant contributions in team initiatives, while also serving as an inspiration to his peers. With a deep theoretical understanding and a strong work ethic, he will go far in his studies. I respectfully request that you accept his application. Should I be of any further assistance, please do not hesitate to contact me.

Sincerely,

Hongchao LIU
Assistant Professor,
Institute of Applied Physics and Materials Engineering,
University of Macau
Email: hcliu@um.edu.mo Tel: +853 8822 9077

Professional reference for **Mr Yichen Liu**

MASt in Astrophysics

Referee Details

Name	Professor Xin Liu	**Job title**	Associate Professor
Email	xinliuxl@illinois.edu	**Department**	Department of Astronomy
Phone	+1 217-265-8073	**Institution**	University of Illinois Urbana-Champaign
Relationship	supervisor	**City**	Urbana
Known for	fall 2022 to present	**Country**	United States

Reference

Academic ranking	Outstanding - Among the best you have ever known in your professional life
Student potential	Outstandingly original/creative/independent of thought
Course suitability	Exceptionally Suitable
Professional position	associate professor

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ILLINOIS

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Department of Astronomy
103 Astronomy Building, MC-221
1002 W. Green St.
Urbana, IL 61801-3074

Nov 1, 2023

Graduate Admission Selection Committee

Dear Colleagues,

I am delighted to write this letter to enthusiastically recommend Yichen Liu, an outstanding undergraduate student whose academic prowess, dedication, and remarkable readiness in making impactful contributions to the field of astronomy and astrophysics are truly exceptional. As Yichen's research advisor, I have had the distinct pleasure of witnessing his academic growth, his exceptional intellect, and his profound commitment to scholarly research, which set him apart as an extraordinary candidate.

Yichen's pursuit of a Bachelor of Science in Astrophysics and Mathematics at the University of Illinois at Urbana-Champaign has been marked by consistent academic excellence. His remarkable 4.00/4.00 GPA reflects not just his scholastic brilliance, but also his capacity for innovative research and scientific exploration. His efforts have been commendable, particularly in his involvement in several research projects under my guidance.

Yichen joined my research group at UIUC in Fall 2022 and I have known him for more than a year now. He has been attending my weekly group meetings regularly, even though undergrads are not required to do so. I have gotten to know him well through these meetings. Yichen works both independently and collaborates with multiple members of my research group very well. He shows outstanding communication skills through interactions with more senior members of my group. Yichen demonstrates the kind of grit and self-motivation that will be invaluable in a successful PhD career. He is extremely dedicated and completely self-driving in his research project. His projects span a wide range of astronomical domains, showcasing his adeptness in employing machine learning techniques for instance segmentation within astronomical surveys and spectral energy distribution (SED) fitting. The complexities inherent in these projects were approached by Yichen with a rare combination of astute analysis, methodological precision, and a penchant for innovative problem-solving.

Yichen took the initiative to contact me for a research project in Fall 2022. He stood out as an extremely motivated and outstandingly talented student and was accepted into my group, even though I was not looking for new undergrads. He was also accepted to the Student Pushing Innovation (SPIN) program at the National Center for Supercomputing Applications (NCSA), which is a highly competitive and selective program with hundreds of applicants across the UIUC campus from multiple departments including top ranked programs such as computer science.

The goal of Yichen's research project has been to develop a deep learning framework for detection, instance segmentation, and classification for large astronomical surveys. The next generation of wide-field deep astronomical surveys such as the Rubin/Legacy Survey of Space and Time (LSST) will deliver unprecedented amounts of images through the 2020s and beyond. As both the sensitivity and depth increase, larger numbers of blended (overlapping) sources will occur. If left unaccounted for, blending would result in biased measurements of sources that are assumed isolated, contaminating key inferences such as

photometry, photometric redshift, galaxy morphology, and weak gravitational lensing to probe the nature of dark matter and dark energy. In the LSST era, efficient deblending techniques are a necessity and thus have been recognized a high priority. However, an efficient and robust method to detect, deblend, and classify sources for upcoming massive surveys is still lacking.

Yichen's specific role in the SPIN project is to leverage the rapidly developing field of computer vision and develop a new versatile deep learning framework for the astronomical research community. It makes it easy to efficiently process LSST and other wide-deep survey images and accurately identify blended galaxies with the lowest possible latency to maximize science returns. It can be applied to many other higher-level downstream science applications such as photometric redshift estimation and galaxy morphology inferences.

Yichen took up the challenge and quickly got up to speed on his own with minimal supervision. He followed my advice and attended a deep learning workshop offered at NCSA on campus. In a very limited amount of time, he was able to reproduce some of our earlier work by training a convolutional neural network using the latest Detectron2 framework by Facebook's AI Research. He has been working to improve the performance of the neural nets as well as to test alternative algorithms and complementary methods. Yichen has shown great problem-solving and organization skills, which will be invaluable for any other research projects. Based on this work, we have published a paper in MNRAS with Yichen as the second author and are working on a new paper focusing on photometric redshift estimation and uncertainty quantification. His work has strong implications for a wide range of subjects, ranging from efficiently detecting transients and solar system objects to the nature of dark matter and dark energy.

In addition to his SPIN project research, Yichen has also been working on a completely different research project ("DAVOS: Dwarf AGNs from Variability for the Origins of Seeds") to understand the demographics and origins of intermediate-mass supermassive black holes. Bridging the gap between the approximately ten solar mass "stellar mass" black holes and the "supermassive" black holes of millions to billions of solar masses are the elusive "intermediate-mass" black holes. Their discovery is key to understanding whether supermassive black holes can grow from stellar-mass black holes or whether a more exotic process accelerated their growth soon after the Big Bang. Tentative evidence suggests that the progenitors of supermassive black holes were formed as ~10,000 to 100,000 solar-mass black holes via the direct collapse of primordial gas. Yichen's DAVOS research project helps shed light on this formation mechanism.

Noteworthy among his contributions is his investigation into host galaxy properties in variability-selected AGNs. Yichen's ability to navigate and analyze extensive datasets was evident as he meticulously matched dwarf AGN candidates in the HSC DR2 catalog to various archival photometric and spectroscopic databases. His endeavors included preparing batch-download codes for optical spectra from various sources and concluding, after thorough SED fitting, a discerning correlation among various physical properties providing insights into the formation and evolution of these intriguing systems.

For Project DAVOS, Yichen has been working most closely with my former PhD student, Dr. Colin Burke (now an NSF Postdoctoral Fellow at Yale) for the past ~1 year. I asked Dr. Burke to comment on Yichen's work. Quoted below were Colin's remarks on Yichen:

"Mr. Liu led an archival search for spectra of quasars in the COSMOS field. He has essentially built a database of quasar spectra in the COSMOS field from all public available spectroscopic datasets. As part of this project, he has developed extremely proficient skills in python programming, GitHub workflows, and astronomical data visualization. He has led the effort to identify spectra with incorrect or inconsistent

spectroscopic redshifts and contributed to spectral energy distribution fitting analysis of the quasar host galaxies. We expect to submit a paper with Mr. Liu as second author in early 2024 given his significant contributions. His strengths are his conscientiousness and attention to detail which have been critical to accomplishing this project's goals."

His academic pursuits transcend institutional boundaries. As a summer research intern at the National Observatory of China, his exceptional analysis of meteor slitless spectrums and the application of Python-based machine learning to identify and localize meteors from mass recordings underscored his ability to synthesize diverse datasets and techniques to solve complex astrophysical problems.

Yichen has also been an active participant in the academic community, passionately sharing his knowledge and insights through his educational YouTube channel and actively engaging in initiatives to promote scientific awareness and understanding among his peers and the wider community.

Another attribute that makes Yichen stand out among his peers is always taking the initiatives. He was constantly tracking down the problems and getting them resolved. To further broaden his research horizons, he has sought out several summer research opportunities on his own. He has the mindset, talents, and skills to do scientific research and will most likely thrive in any research program.

In summary, Yichen Liu embodies the spirit of an enthusiastic young scientist, showcasing an exceptional balance of academic rigor, a deep-rooted commitment to research, and an unwavering passion for unraveling the mysteries of the universe. His outstanding achievements, dedication, and the depth of his contributions position him as a remarkable candidate and asset for any PhD program. He has my strongest recommendation. To put Yichen in a broader context, he compares easily with the best undergraduate students that I have known at Illinois who had gone on to top PhD programs in Astronomy and (Astro)physics.

I offer my strongest recommendation for Yichen Liu, confident in his capability to make significant contributions and an indelible impact on any academic or research endeavor he embarks upon. Please do not hesitate to contact me should you have any further questions about his application.

Sincerely,

Xin Liu

Associate Professor

Department of Astronomy, University of Illinois at Urbana-Champaign

Faculty Affiliate, National Center for Supercomputing Applications, Center for AI Innovation

217-265-8073, xinliuxl@illinois.edu

UNIVERSITY OF CAMBRIDGE

We thank you for your time spent taking this survey.
Your response has been recorded.

Below is a summary of your responses Download PDF

Institute of Astronomy

Important: please read before continuing
In this form, you will be asked a series of questions to help us gather information about your **previous** university study. The questions relate to your previous study, not the course that you are currently applying to. Depending on department procedures, relevant contextual data may have a small impact on some funding opportunities, so if your application is eligible for University funding, we encourage you to fill in this form.

You will be given the opportunity to tell us about any events or circumstances that have had an impact on your education, and limited your ability to perform in your studies. **You do not need to provide personal or detailed information about these circumstances**, we only ask you give details of the **impact** that they have had on your studies.

Please only provide the information that you are asked for in the form, and leave the text box blank if you cannot/ do not wish to respond. You should only provide information in the form if you feel comfortable to do so. Your application will not be disadvantaged if you choose not to respond to the questions, and your academic merit will be assessed based on the information you provide in other parts of the application. Once you have completed this form, you will need to download a PDF copy of your answers to upload to the applicant portal. You will be given the option to download the PDF at end of the form, and you will also receive a copy by email. This

the PDF at end of the form, and you will also receive a copy by email. This will be sent to you as soon as the form is submitted.

Your first name:

Yichen

Your surname:

Liu

Your email address:

yl127@illinois.edu

Confirm your email address:

yl127@illinois.edu

The following questions relate to your experience of studying at undergraduate/ bachelor's level.

Your undergraduate/ bachelor's institution:

University of Illinois at Urbana-Champaign

Did you undertake your degree full-time or part-time?

- (●) **Full-time**
- ( ) Part-time (for any part of the degree)

When choosing your university, were there any factors other than grades that you felt limited your choice of institution?

e.g. not being able to live away from home, financial considerations, concerns about fitting in

financial considerations

Characters remaining: 976

Did you have any essential regular commitments that impacted the extent to which you could dedicate yourself to your studies? If so, please explain the impact of this on your studies.
e.g. caring responsibilities, being a single parent or guardian, employment during studies

Characters remaining: 1000

Did you experience any serious disruption to your studies that prevented you from studying for at least 3 months over the course of a year? If so, please explain the impact of this on your studies. It is not necessary to provide details about the nature of the disruption.
e.g. illness, bereavement

Characters remaining: 1000

The following questions relate to your previous experience of university study at all levels (undergraduate and/or postgraduate).

Some students get off to a slower start than others in their studies, and later show an upward progression in their marks.
Were there any circumstances that you feel initially inhibited your academic performance? If so, please provide details of the impact on your studies, and the change in circumstances that allowed you to improve your performance.

Recognizing that solely completing my material science major at the University of Macau would not sufficiently prepare me for astrophysics, I actively engaged with astronomy professors from other institutions, notably Professor Jia Liu at the Kavli Institute for the Physics and Mathematics of the Universe. With their guidance, I pinpointed essential knowledge areas crucial for a solid astrophysical foundation, such as cosmology, differential equations, and mechanics, all of which I independently

foundation, such as cosmology, differential equations, and mechanics, all of which I independently learned. Additionally, I gained insights through Astrobites, enhancing my readiness as an astrophysics student. My transition to the University of Illinois ignited a remarkable academic improvement, reflecting my deep enthusiasm for astrophysics.

Characters remaining: 253

Please use the space below to let us know about anything else that has had an impact on your studies or educational pathway. You might like to explain any incomplete qualifications or course changes.

In my freshman year at the University of Macau, I found no research faculties in astronomy. After contemplating my future, I delved into a related field to astronomy: optics. While not my initially envisioned path, I endeavored to acquire experience relevant to broader physics research. The diverse skills I acquired, including proficiency in machine learning and literature review, proved invaluable in my subsequent research. Consequently, despite initially not being focused on astronomy, I seamlessly transitioned into astrophysics research at the University of Illinois.

Characters remaining: 424

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YICHEN LIU

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

EDUCATION

University of Illinois at Urbana-Champaign | College of Liberal Arts & Sciences **2022/08 - Expected 2024/05**

- Bachelor of Science (**Honor**) in **Astrophysics** and **Mathematics** **4.00/4.00**
- Minor in **Physics**, **Computer Science**, and **Chemistry**

University of Macau | Faculty of Science and Technology **2019/08 - 2022/05**

- Completed Junior Year of **Applied Physics and Chemistry** (**Honour**)

RSEARCH EXPERIENCES

Research Assistant (advisor: Professor Xin Liu), *Department of Astronomy* **2022/09 - Present**

- **Project 1: instance segmentation in sky surveys with deep 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 HAL cluster with `Detectron2`
  - Enhanced the pipeline by incorporating Transformer models, MViT and VitDet, to improve instance segmentation
- **Project 2: SED fitting and AGN selection of DES sources in Stripe 82 field**
  - Performed SED fitting on the Stripe 82 sample from DES varying assumptions about inclinations and AGN contributions
  - Developed selection criteria using χ^2 values and WISE phtotometries to identify AGN candidates from stars and galaxies
- **Project 3: host galaxy properties of variable AGNs in HSC COSMOS field**
  - Cross-referenced redshifts of variability-selected AGNs from HSC DR2 to subsequent 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 spectral data across databases by plotting and analyzing optical spectra
  - Investigated emission lines and continuum using `PyQSOFit` toolkit, generating a congruent finding as previous studies
  - Planned photometric studies such as host extraction ahead and present preliminary findings at AAS 243rd meeting
- **Project 4: black hole - host galaxy relation of AGNs in DES deep fields (leading)**
  - Updated photometric redshifts of dwarf AGN candidates in the DES C3, X3, and E2 fields to spectroscopic redshifts
  - Assembled publicly accessible spectra and displayed observations from Spitzer, VIMOS, VVDS, GAMA, MMT, and OzDES
  - Determined and visualized black hole mass - host galaxy mass relation through SED fitting using `CIGALE` toolkit
- **Project 5: redshift estimation of distant galaxies with deep learning** (NCSA SPIN internship)
  - Cooperated with graduate colleagues from LINCC institutes to incorporate `Rail` into the framework built upon Project 1

Summer Research Internship (advisor: Professor Chaojian Wu), *National Astronomical Observatory of China* **2022/06 - 2022/08**

- **Project: meteor slitless spectrum analysis captured by DSLR camera (leading)**
  - Analyzed the photos of 2021 Geminid meteor shower captured by commercial camera equipped with gratings
  - Dissected the intensities of Sodium and Magnesium lines using Python, adressing sodium variation in Geminid meteoroids
  - Developed machine learning algorithms for automated detection and photometric assessment of meteor recordings

Research Assistant (advisor: Professor Hongchao Liu), *Institute of Applied Physics & Materials Engineering* **2019/09 - 2022/05**

- **Project 1: stability of ghost imaging in varied environment conditions**
  - Conducted a comprehensive review of current studies in ghost imaging to understand the state-of-the-art in this field
  - Assessed the quality of ghost imaging across various setups using MATLAB, producing reports and comparative analyses
  - Compared the reflection patterns between distorting and standard mirrors to inform imaging technique improvements
- **Project 2: image encryption based on computational ghost imaging (leading)**
  - Executed experimental research into ghost imaging, investigating the potential of metamaterials and metasurfaces
  - Developed Python algorithms employing compressive sensing and gradient descent to optimize encryption efficiency
  - Optimized simulations utilizing high-performance GPUs on the `PyTorch` platform for enhanced processing capabilities
  - Published a first-authored research paper as the first undergraduate student in the department and exposed by local media
- **Project 3: Advancement in ghost imaging through neural network (leading)**
  - Collaborated with graduate students in managing digital micromirror device and laser equipmeent for experimental setups
  - Assessed existing ghost imaging techniques, integrating diverse neural network models for improved technique verification
  - Developed Python pipelines integrating recurrent and convolutional neural network architectures for ghost imaging

PUBLICATIONS AND ABSTRACTS

1. **Yichen Liu**, Xin Liu, et al., "Black hole - host galaxy relations of dwarf AGNs in DES supernova field up to $z \sim 3.4$", In prep.
2. **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
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," MNRAS 526, 1122 (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," Optics Express 30, 14073 (2022)
5. Peixia Zheng, **Yichen Liu**, and Hong-Chao Liu, "Single-pixel imaging and metasurface imaging," Infrared and Laser Engineering 50, 20211058-1 (2022)

SYNERGISTIC ACTIVITIES

Summer schools: University of California Berkeley (4.000/4.000), 2022, Remote
Shanghai Jiao Tong University (4.00/4.00), 2021, Shanghai, China

Presentations: AAS 243rd Meeting, **Oral presenter**, Scheduled Jan 2024, LA, US
STEM Career Exploration and Symposium, **Poster Presenter**, Jul 2023, IL, US
NCSA lighning talk, **Oral presenter**, Jul 2023, IL, US
EU Contest for Young Scientists, **Poster Presenter**, Sep 2019, Sofia, Bulgaria

Membership: LSST Dark Energy Science Collaboration

OBSERVATION EXPERIENCES

- Cerro Tololo Inter-American Observatory, Blanco 4m / DECam: 3 nights observation 2023/01 - 2023/04
- Personal Remote Observatory, BKP250 / QHY9sm: astrophotography and photometry 2019/08 - 2022/08

AWARDS AND GRANTS

- AAS 243rd Meeting Travel Grants from Department of Astronomy 2023/10
- University of Illinois Dean's Honor List (2022-2023) 2023/07
- Smart Star Sponsorship for studies at University of California, Berkeley 2022/06
- University of Macau Dean's Honour List (2020 and 2022) 2022/08
- Residential College Summer Programme Sponsorship for studies at Shanghai Jiao Tong university 2021/05
- Third Prize, China Undergraduate Physics Tournament 2020/10
- National Team Leader at the 2019 European Union Contest for Young Scientists 2019/09
- University of Macau Full Scholarship (2019-2021) 2019/08
- Bronze Medal, International Olympiad of Astronomy and Astrophysics 2018/11
- First Prize, China Adolescents' Science and Technology Innovation Contest 2018/08
- Second Prize, China National Astronomy Olympiad 2018/05

TEACHING EXPERIENCES

Undergraduate Tutor, *Department of Astronomy, University of Illinois at Urbana-Champaign (IL, US)* **2023/01 - 2023/05**

- Crafted and facilitated engaging tutorial workshops for undergraduate astronomy and physics majors, encompassing core principles in thermal physics, quantum physics, mechanics, and astrophysics, to enhance their foundational course understanding

Physics and Mathematics Video Creator on Bilibili *(Remote)* **2021/09 - 2022/08**

- Developed and disseminated instructional material in physics and mathematics for a broad audience on the Bilibili platform, focusing on undergraduate-level topics and autonomous learning resources, such as the computation of the zeta function
- Achieved widespread outreach with the most popular video surpassing 160,000 views, contributing to the public education

Organizer and Lecturer of Seminar of Physics, *University of Macau (Macau SAR, China)* **2022/02 - 2022/05**

- established and coordinated a comprehensive lecture series at the University of Macau with my peer, Jiheng Duan, delivering in-depth explorations of advanced mathematical and physical concepts that went beyond the standard curriculum
- Bridged the theoretical knowledge gaps crucial for advanced research in physics by covering an array of subjects from classical mechanics to partial differential equations, and essential tools like LaTeX and Git, for the benefit of physics students
- Authored a comprehensive guide for freshmen, providing a roadmap for academic development and graduate study preparation
- Developed and delivered *SPUM 102 The tools of physical tools*, a weekly lecture series encompassing topics such as complex variables, gamma functions, integral transforms, delta functions, and Green's functions, with a detailed syllabus provided
- Made lecture recordings accessible to the public on Youtube, extending the reach of these resources beyond the classroom

EXTRACURRICULAR EXPERIENCES

Astrophotographer, *Personal 10-Inch Remote Observatory (Hebei, China)* **2019/08 - 2022/08**

- Sourced and developed a 2×2-meter unattended observatory with full internet connectivity and a retractable roof
- Curated and calibrated a suite of astronomical equipment and 3D-printed accessories, which can be fully controlled remotely

Director, *Physics Society, University of Macau (Macau SAR, China)* **2020/08 - 2021/02**

- 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, *Department of Physics and Chemistry, University of Macau (Macau SAR, China)* **2020/07 - 2020/10**

- Handled equipment procurement processes and managed budget recommendations, streamlining the department's operations

President, *Beijing Youth Astronomy Union (Beijing, China)* **2017/08 - 2018/08**

- Organized public stargazing events adjacent to Beijing' s Olympic Park to foster community engagement in astronomy
- Managed the WeChat account "北京市中学生天文联盟", achieving widespread readership with posts exceeding 100,000 views

Organizer, *Beijing Astronomy and Astrophysics Olympiad (Beijing & Guangdong, China)* **2018/01 - 2018/04**

- Orchestrated the logistical planning of the 2018 Olympiad, liaising with high schools nationwide for participation
- Composed the Olympiad's examination materials, orchestrated material procurement, and supported the judging panels

SUMMARY OF TECHNICAL SKILLS

Programming: Python/Jupyter, LaTeX, MATLAB, Git, Arduino, 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)

IELTS Academic: August 5, 2023

Yichen Liu
Oxford International Chicago, IL

Reference: A3-UX824-S-9563516
TRF number: 23UX000763LIUY824A

Your results are now available.

Results

Your overall band score 7

View full scores and explanation

This means you're a "Good User"

The test taker has operational command of the language, though with occasional inaccuracies, inappropriate usage and misunderstandings in some situations. They generally handle complex language well and understand detailed reasoning.

Got the score you needed?

Here's what you can do now:

Share results with organizations

Didn’t get the score you needed?

If you didn’t get the score you needed, we can help you improve it.

Improve your score

Your full score and explanation

Listening	6.5
Reading	8.0
Writing	7.0
Speaking	6.5
Your overall band score	**7.0**

Your scores explained:

Listening 6.5

Test takers at Band 6 can typically follow extended speech and understand detailed instructions. They can generally understand directly-stated facts, attitudes, opinions and purposes. They can also generally pick out main ideas, and relevant and irrelevant information; and can also generally infer implied meanings. They can do this without having to process individual words and structures and can remember enough of what they have heard to understand references such as pronouns. They can understand most vocabulary relating to a range of topics, including some terms typical of academic English.

How to improve:

Continue to develop your vocabulary by reading widely. Listen to as much English as you can so that your understanding becomes more automatic. Listen to longer recordings such as interviews and films, with and without English subtitles, pausing and repeating the recording when necessary. Note the words you didn't understand immediately, so you can review them. Try to understand those times when the speakers don't directly say what they mean. What are the clues you use to understand these in your own language? Use the same strategy to understand them in English.

Reading 8.0

Test takers at Band 8 can typically deal effectively with a variety of factual and opinion-based texts that are often complex and dense with information. They are skilled at using their very wide vocabulary knowledge to create meaning, from sentence level to text level, on a range of general, specialised, and technical topics. They are good at following complex arguments and distinguishing between main ideas and supporting details, and at understanding attitude, opinion and implication. They are good at using appropriate reading strategies, such as skimming and scanning, and at synthesizing information and drawing inferences.

How to improve:

Your reading skills are already quite good. Continue to develop your awareness of how to read different types of texts differently. What features does that particular type of text typically have? How is information structured and arranged in such texts? Use your knowledge of these and approach the reading task in an appropriate way. Limit the amount of time you give yourself to read a text. As an exercise, try to find several texts on the same topic so that you can compare opinions, views, definitions and conceptualisations of ideas. Academics often make fine distinctions, so see if you can determine these. You may even try to see if you can capture those differences by writing a one sentence summary.

Writing 7.0

Test takers at this band can typically produce a clear overview of the graph or a clear viewpoint throughout the response. All parts of the task are covered. Test takers can support their main ideas with details and examples, although these might be too general and lack focus. The writing is well-organised and leads logically to its conclusion. They can use a variety of linking words, with some over- or under-used. In Task 2 every paragraph has one main topic. They can flexibly use a range of vocabulary and some less common words with some style, despite occasionally choosing the wrong word or making mistakes in spelling or in the form of a word. They are able to use a variety of complex sentences, and many of their sentences are correct. However they still make a few mistakes with grammar and punctuation.

How to improve:

Practice producing different types of writing. When writing informational and argumentative pieces, take care to develop your points thoroughly, providing as many relevant supporting ideas and details as necessary. Don't develop your points separately. Instead, ask yourself: how might I develop my idea so that it logically leads me to my next idea? Then, also ask yourself: does my use of paragraphing help to highlight the flow of my ideas? Have I also used other means besides paragraphing to do this? Use a good variety of structures, choosing appropriate ones to help the overall effect of your writing. Also try to use a wide range of vocabulary when you write, always using the best possible word. For words and phrases that are newer to you, look them up online to see how other writers use them and what other words they often appear together with. Finally, check your writing, paying special attention to those words and grammar structures you're not as confident about.

Speaking 6.5

Test takers at this band can typically speak at length, although they are sometimes less clear or fluent because of repetition, self-correction, or hesitation to search for words or grammar. Speaking is generally well-organised, and ideas are generally well linked, but with some errors. They have enough vocabulary to discuss topics clearly and at length, although there are often errors, and they can usually paraphrase well. They can use simple and complex grammar structures but with limited range. There may be frequent grammar errors, particularly in more complex structures, but language is usually easy to understand. Pronunciation can be clear and effective, but there may be problems. They are usually easy to understand, although words may be unclear at times.

How to improve:

Talk to other English speakers about more abstract topics or more difficult current topics. Keep the discussion going for as long as possible. At the same time, try to express your ideas as accurately as you can, using the best words you know. Many of your ideas will also require the use of complex grammatical structures. If you’re using several simple sentences, try to join them up in a way that makes your point clearer. Listen (and read) in English more to help you pick up natural and idiomatic phrases. When listening, note the rhythm and also the words that the speaker stresses. Is your rhythm similar? Are you putting the stress on the right words?

Back to top

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