

Ting-Yun CHENG (Sunny)

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Education

School of Physics and Astronomy, University of Nottingham
PhD in Physics

*Nottingham,
United Kingdom
Oct 2017 – Oct 2020*

- **Supervisor:** Prof. Christopher J. Conselice and Prof. Alfonso Aragón-Salamanca
- **Thesis:** The Narrative of Galaxy Morphological Classification Told Through Machine Learning

Institute of Astronomy, National Tsing Hua University
MSc in ASTRONOMY

*Hsinchu, Taiwan
Sep 2014 – Aug 2016*

- **Supervisor:** Prof. Ing-Guey Jiang
- **Thesis:** Investigating Dark Matter Distribution in Early-Type Galaxies

Department of Physics, National Taiwan Normal University
BSc in PHYSICS

*Taipei, Taiwan
Sep 2010 – Jun 2014*

Research Experience

* Collaborators' affiliations listed here are the ones when the collaboration was carried out. It may be different now.

Centre for Extragalactic Astronomy, Durham University
Postdoctoral Research Associate

*Durham,
United Kingdom
Nov 2020 – now*

• **Leading Projects:**

- I. Collaborating with Dr Ryan Cooke (Durham University, UK) in several studies of the machine learning applications to automated detection and characterisation of hydrogen absorbers in the Lyman alpha (Ly α) forest as well as relevant studies of intergalactic medium (IGM) and circumgalactic medium (CGM).
 - i. Identification and characterisation of the Ly α forest using convolutional neural networks (CNNs). **The paper is published on MNRAS in 2022.**
 - ii. Fast detection of Deuterium systems with low column density using CNNs. The paper is in Prep.
 - iii. The connection between Ly α absorbers and the global properties of host galaxies. The work is in progress.
- II. Collaborating with Helena Domínguez Sánchez (Institute of Space Sciences, Spain) and the Dark Energy Survey (DES) organisation on a massive comparison of two largest galaxy morphological classification catalogues, including over 20 million galaxies each. This comparison provides a further cross-validation for catalogue users and a better understanding in deep learning applications for future users of convolution neural networks. **The paper is published on MNRAS in 2023.**

• **Collaborating Projects:**

- I. Collaborating in a project led by Dr Dani Chao (Institute Ruđer Bošković, Croatia) to predict Ionisation parameter from galaxy colour images using deep learning. The work is in progress.
- II. Collaborating in a project led by Dr Lupin Lin (National Chen Kung University, Taiwan) to use CNNs for gravitation wave detection and parametrisation. The work is in progress.

School of Physics and Astronomy, University of Nottingham
PhD in Physics

*Nottingham,
United Kingdom
Oct 2017 — Oct 2020*

• **Leading Projects:**

- I. Collaborated with Prof. Chris Conselice and Prof. Alfonso Aragón-Salamanca (University of Nottingham, UK) and the DES organisation on a series of projects to create a galaxy morphological classification catalogue for DES using machine learning techniques.
 - i. Examining several supervised machine learning methods such as k-nearest neighbour, support vector machine, random forest, neural networks, and convolutional neural networks on the galaxy morphological classification using DES imaging data. **The paper is published on MNRAS in 2020.**
 - ii. Using the chosen method to build one of the largest galaxy morphological classification catalogues, which includes 20 million galaxies, using CNNs for DES Y3 data. **The paper is published on MNRAS in 2021, and the catalogue is published with the DES Y3 release in 2021.**
- II. Collaborated with Dr Nan Li (University of Nottingham, UK) on the project of classifying galaxy-galaxy strong lensing system using an unsupervised convolutional autoencoder. **The paper is published on MNRAS in 2020.**
- III. Collaborated with Prof. Marc Huertas-Company (the Instituto de Astrofísica de Canarias, Spain) on the study of galaxy morphology using an unsupervised machine learning technique. **The paper is published on MNRAS in 2021.**

• **Collaborating Projects:**

- I. Collaborated in a project led by Leonardo Ferreira (University of Nottingham, UK) on creating a major-merger classifier using CNNs. **The paper is published on ApJ in 2020.**

University of California Santa Cruz
KAVLI STUDENT FELLOW, 1.5 MONTHS SUMMER PROGRAM

*Santa Cruz, CA, United States
Jul 2019 — Aug 2019*

- I carried out two projects: (1) unsupervised galaxy morphology classification, and (2) high fidelity synthetic galaxy images emulation, during this program. In a month, I created novel unsupervised machine learning pipelines for the two projects using a machine learning technique called 'Vector Quantised Variational Autoencoder' from Google DeepMind in 2019. Scientific report can be viewed in the archive of *Kavli Summer Program in Astrophysics*.

Institute of Astronomy, National Tsing Hua University
MSc in ASTRONOMY

*Hsingchu, Taiwan
Sep 2014 — Aug 2016*

- MSc Thesis - "**Investigating Dark Matter Distribution in Early-Type Galaxies**"
- Analysed imaging data from the Hubble Space Telescope to measure the surface brightness profile of early-type galaxies (ETGs) using IRAF.
- Carried out a numerical analysis to convert 2D Sérsic index into 3D numerical model for luminosity density model, and introduce a novel functional total mass-to-light ratio as a function of radius to construct the total mass distribution of ETGs. With this numerical model, we further investigated the dark matter distribution of ETG and showed that a majority of ETGs in our samples does not have a significant fraction of dark matter.

National Cheng Kung University
RESEARCH ASSISTANT, UCAT SUMMER PROGRAM

*Tainan, Taiwan
Jul 2011 — Sep 2011*

- Used software IDL to re-analyse a famous solar flare event called 'Bastille Day event' happened on 14 July 2000. By comparing the output energy measured in observation with the theoretical model, this study supports the theory of the magnetic reconnection for the origin of solar flares.

Teaching Experience

Department of Physics, Durham University

Durham, United Kingdom
Nov 2020 — Now

- **Year 1 Laboratory Demonstrator**
 - Weekly laboratory demonstration
 - Formative and summative report marking and feedback
 - Oral presentation examination and feedback
- **Supervision: L4/Master projects.**
 - V. Desai, 2022/2023, Master of Physics
 - T. M. Hehir, 2022/2023, Master of Physics
 - S. M. William, 2021/2022, Master of Physics, Class I (Honours)
 - A. Lowe, 2021/2022, Master of Physics, Class II Division 1 (Honours)
- **Supervision: UG summer projects**
 - 2023

School of Physics and Astronomy, University of Nottingham

Nottingham, United Kingdom
Oct 2017 — 2020

- **Coursework Marker, 2017–2020**
 - PHYS1001 (F31CO1): From Newton to Einstein
 - PHYS1004 (F31QP1): Quantitative Physics

Institute of Astronomy, National Tsing Hua University

Hsingchu, Taiwan
Sep 2015 — Aug 2016

- **Teaching Assistant for Summer Program in Astrophysics**
 - The program included one-week lectures of General Astronomy and the tutorial of astronomical softwares, two-days observation trip at the Lulin Observatory (Taiwan), data analysis, and seminars.
- **Teaching Assistant**
 - Compulsory course — ASTR610000: Observational Astronomy

Department of Physics, National Tsing Hua University

Hsingchu, Taiwan
Sep 2014 — Aug 2016

- **Teaching Assistant**
 - Optional course — PHYS317000: Numerical Analysis
 - Optional course — PHYS241000: General Astronomy (I)
 - Optional course — PHYS242000: General Astronomy (II)

Awards and Grants

Physics Department Award for Excellence

Durham University
United Kingdom
Sep 2022

- For contributing extensively to the health and well-being of the astronomy group.

The Alan Turing Institute Post- Doctoral Enrichment Awards

The Alan Turing Institute
United Kingdom
2022

- The award offer flexible funds to top researchers in data science to build on their current research and develop and grow activities.

Graduate School Travel Prize

University of Nottingham
United Kingdom
Sep 2019

- The prize supports postgraduate students at the University of Nottingham to attend national/international conference/meeting.

Conference/Meeting Travel Grants

- The prize supports researchers to attend national/international conference/meeting.

*Royal Astronomical Society
United Kingdom
Aug 2019*

Kavli Student Fellow

- Stipend offers to the selected fellow of the Kavli Summer Program in Astrophysics.

*UC Santa Cruz
United States
Jul 2019 – Aug 2019*

Vice-Chancellor's Scholarship for Research Excellence (International)

- PhD living stipend and full tuition awarded to top international applicants.
(£20,700+£12,000 annually)

*University of Nottingham
United Kingdom
2017 – 2020*

ASROC Special Award for Oral Presentation

- Awarded to an excellent postgraduate student at the Annual Meeting of the Astronomical Society in Taiwan (ASROC).

*Astronomical Society ROC
Taiwan
2016*

Hardship Funds (UG)

- Financial support for top students studying in higher educational institutes.

*NTNU
Taiwan
Sep 2012 – Jun 2014*

Physics department Scholarship (UG)

- Awarded to an excellent undergraduate each year at Physics department.

*NTNU
Taiwan
2010–2012*

Academic Service & Volunteering

• Referee for peer-review Journals

<i>Journal Name</i>	<i>Number</i>
Monthly Notices of the Royal Astronomical Society (MNRAS)	3 paper(s)
Astronomy and Computing (ASCOM)	2 paper(s)
The Astrophysical Journal (ApJ)	2 paper(s)
Astronomy and Astrophysics (A&A)	1 paper(s)
Physics Review Journals (Phys. Rev)	1 paper(s)
Publications of the Astronomical Society of the Pacific (PASP)	1 paper(s)

• Academic Enrichment

Dark Energy Survey (DES) Organisation

- Co-convenor** of the *Galaxy evolution & QSO* working group (Dec 2022–)
- Member of the *Galaxy evolution & QSO* working group (2018–)
- Early Career Mentor-Mentee program (2023/2024): Mentor for undergraduate/graduate students in DES

Dark Energy Spectroscopic Instrument (DESI) Organisation

- Members (2023–)

Astronomy and Computing (ASCOM)

- ASCOM is a peer-reviewed journal, published by Elsevier, that focuses on the broad area between astronomy, computer science, software development and information technology.

- Early Career Researcher editorial board (November 2022–)
- Co-editor** of a special edition: “*Machine Learning Techniques in Modern Astronomy*” (in preparation)

Taiwanese Young Researcher Association (TYRA)

- Project Tyra provides a platform for Taiwanese young researchers in diverse research fields to share their academic experience and develop collaborations with each other.
 - i) IT supports (April 2022–)
 - ii) Chair of weekly seminar (Oct 2022–)

Centre for Astronomy and Particle Theory, University of Nottingham

- i) **Organiser** of weekly lunch talk at CAPT (2019–2020)

Student Union, Physics department, National Taiwan Normal University

- i) Academic activity leader (2012-2013)
 - ii) Orientation event organiser (2012)
 - iii) Outreach activity leader of the Physics camp for 15-18y students (2011-2012)
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• EDI Activities & volunteering

CEA/ICC/CfAI/Physics, Durham University, 2022 —

- Durham IDEA is a discussion group happening every four weeks to talk about, raise awareness, interact and share ideas about Integration, Diversity, Equity and Accessibility.
 - i) **Co-organiser** of IDEA discussion sessions:
 - Imposter Symptoms (28 February 2022)
 - ii) IDEA group members
- PhD/ECR Career Day
 - i) **Leading organiser** of annually PhD/ECR career activities (Jan 2022–)
- Designer of the mental health awareness poster at Physics department (2021)

EDI panel/talks:

- Invited Panelist: "How to thrive your PhD", Alan Turing Institute, Oct 2022

Volunteering activities:

- Audio book producer, Foundation for the Blind in Taiwan, 2015 – 2016
 - Amanuensis, Special Education Centre, National Taiwan Normal University, 2013 – 2014
 - Care group for families of natural disaster victims, 2010 – 2011
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• Outreach Activities

Talks/lectures:

- Talk for general audience at the Sunderland Astronomical Society (planned: July 2023)
- Space Night at the Woodham Academy, Durham (Nov 2022)
- Virtual Talk for general audience at CUNY Baruch College Forum (October 2022)
- Virtual Talk for general audience at CUNY Baruch College Forum (June 2022)
- Virtual Talk for general audience at TYRA (November 2021)

Other activities:

- School Science Festival, Durham University (28-30 Mar 2023)
- Durham Astronomy Girl's Day, Physics department, Durham University (Jan-Mar 2023)
- Eyes to the Sky Project, Physics department, Durham University (Dec 2022-Jan 2023)
 - We work with and support students of rural schools to understand science and astronomy.
- Digital Art Project, Ogden@20 schools' day, Physics department, Durham University (Oct-Dec 2022)
 - We work with students of local school to make a film for the Ogden@20 celebration at the Physics department.

NTNU Physics Camp, Student Union of Physics, NTNU (2010—2014)

- The summer and winter multiple-days Physics camps for 15-18y students were we conveyed the concept of Physics through a variety of activities.

Seminars and Conference

Sep 2023	Taiwan Space Union (TSU), Invited Speaker	Virtual
Jul 2023	National Astronomy Meeting (NAM), Royal Astronomical Society, Session Co-organiser	Cardiff, UK
Jun 2023	National Central University, Colloquium, Invited Speaker	Taoyuan, Taiwan
May 2023	Annual meeting of the Astronomical Society in Taiwan, ASROC, Poster	Kaohsiung, Taiwan
Mar 2023	The 52nd Saas-Fee Advanced Course, The Circum-Galactic Medium across cosmic time : an observational and modeling challenge	Les Diablerets, Switzerland
Mar 2023	Royal Astronomical Society (RAS) Specialist Discussion Meeting: Harvesting spectroscopic and time series data with ML/AI, RAS, Leading Organiser	London, UK
Mar 2023	University of Bath, Colloquium, Invited Speaker	
Feb 2023	University of Nottingham, CAPT, Invited Speaker	Nottingham, UK
Jan 2023	Dark Energy Survey Collaboration Meeting, University of Portsmouth, Session Leading Organiser	Portsmouth, UK
Nov 2022	University of Manchester, Seminar Speaker	
Sep 2022	What matter(s) around galaxies 2022, Connecting the dots between the CGM and the larger-scale environment, Contributed	Champoluc, Italy
Jul 2022	National Astronomy Meeting (NAM), Royal Astronomical Society, Session Co-organiser	Warwick, UK
Jun 2022	European Astronomical Society (EAS) Annual Meeting, EAS, Contributed	Valencia, Spain
May 2022	National Chen Kong University, Physics Department, Invited Speaker	Tainan, Taiwan
Mar 2022	AI UK: UK's national showcase of artificial intelligence (AI) and data science research and collaboration, The Alan Turing Institute, Awardee Presentation	Virtual
Dec 2021	Australia National University, Colloquium, Invited Speaker	Virtual
Oct 2021	Debating The Potential of Machine Learning In Astronomical Surveys, Institut Astrophysique de Paris (IAP), Contributed	Virtual
Oct 2021	Artificial Intelligence for Science, Industry and Society (AISIS), National Autonomous University of Mexico (UNAM), Invited Speaker	Virtual
Jun 2021	238th Meeting of the American Astronomical Society (AAS), AAS, Invited Speaker	Virtual
Feb 2021	National Tsing Hua University, Institute of Astronomy, Invited Speaker	Hsinchu, Taiwan
Jan 2021	Academia Sinica Institute of Astronomy and Astrophysics, Seminar Speaker	Taipei, Taiwan
Oct 2020	University of California Santa Cruz, Machine Learning club, Invited Speaker	Virtual
Jul 2020	Kavil Summer Program Astrophysics Alumni Meeting, University of California Santa Cruz, Contributed	Virtual
Nov 2019	Dark Energy Survey Collaboration Meeting, University of Sussex, Contributed	Sussex, UK
Oct 2019	University College London, Astroparticle Seminar, Seminar Speaker	London, UK
Mar 2019	Royal Astronomical Society (RAS) Specialist Discussion Meeting: Machine Learning and AI applied to Astronomy, RAS, Contributed	London, UK
Nov 2018	Royal Astronomical Society (RAS) Specialist Discussion Meeting: Dark Energy Survey: More than dark energy, RAS, Contributed	London, UK

Sep 2018	Machine Learning Applications for Astronomy , University of Nottingham, Contributed	Nottingham, UK
Jun 2018	Planning for Surprises in the era of Data-Driven Astronomy , University of Oxford, Contributed	Oxford, UK
May 2016	Annual meeting of the Astronomical Society in Taiwan , ASROC, Contributed	Tainan, Taiwan
Jan 2016	Annual meeting of the Astronomical Society in Taiwan , ASROC, Poster	Kaohsiung, Taiwan
May 2015	Annual meeting of the Astronomical Society in Taiwan , ASROC, Poster	Ilan, Taiwan

Extracurricular Activities

Durham University Staff Volleyball Club , 2021 —	Durham University United Kingdom
Durham City Table Tennis Club , 2021 — <ul style="list-style-type: none"> 3rd of Team competition in the region league at County Durham (2021–2022) 	Durham City TT Club United Kingdom
UoN Aikido Club , 2018 — 2020 <ul style="list-style-type: none"> The 3rd place in Embu – Randori no Kata at the Student Nationals in March 2019, and the female team was the 2nd place in the Randori. Committee position: Treasurer for the year of 2019/20. 	University of Nottingham United Kingdom
Actor , Oct 2018 — Jan 2019 <ul style="list-style-type: none"> Acted several side roles in a play called “Night of the Souls”. 	The New Theatre, UoN United Kingdom
Working Holiday in Canada , 2016 — 2017	Canada
Actor , Sep 2016 — Oct 2016 <ul style="list-style-type: none"> Part-time worked at the Apple Troupe in children plays in Taiwan. The “Water Elf” play had a round trip at the primary schools in Kaohsiung City, Taiwan. We presented a play called “The Adventures of Spider” at a family-friendly activity held by the Taoyuan City Council, Taiwan. 	Apple Troupe Taiwan
Actor , Mar 2016 — Sep 2016 <ul style="list-style-type: none"> Acted in a Taiwanese musical entitled “Taiwan as a Young Man – Jiji”. Our group was invited as visitor to an acting workshop at the Tsing Hua University in China. Acted in a play entitled “The Late Christopher Bean”. 	The Art Centres, NTHU Taiwan
Female Volleyball Team Starter, Physics Department , 2014 — 2015 <ul style="list-style-type: none"> The 1st place at the Taiwan Universities Physics Cup in 2014 The 2nd place at the Taiwan Universities Physics Cup in 2015 	NTHU Taiwan
Radio DJ , 2014 — 2016 <ul style="list-style-type: none"> Hosted one-hour late-night weekly program Hosted 30-minutes weekly live broadcast Hosted interviews for sport activities 	Tsing Hua Broadcasting NTHU, Taiwan
Female Volleyball Team member, Physics Department , 2010 — 2014 <ul style="list-style-type: none"> Starter in the team since 2011 Committee position: Vice president (2011); president (2012) 	NTNU Taiwan
Cheerleader Team member, Physics Department , 2010 <ul style="list-style-type: none"> Attended the cheerleader competition for fresher at NTNU 	NTNU Taiwan