Samuel Lai

Email: samuel.lai@anu.edu.au
ORCID: https://orcid.org/0000-0001-9372-4611
Website: https://samlaihei.github.io

Statement

I am an astrophysics researcher specialising in accretion onto compact objects. By combining high performance computing simulations of accretion discs with high quality spectroscopic observations, I develop novel ways of understanding the diversity of observable phenomena. My goal is to study multiwavelength data of ultraluminous black holes in the early universe to understand their cosmic history, how they continue to grow, and how they affect their host galaxies/environment.

Education

March 2021 – Present
Australian National University, *Australia*
Research School of Astronomy & Astrophysics
Website: https://www.anu.edu.au/
- Astrophysics PhD

Sept 2018 – Nov 2019
University College London, *United Kingdom*
Department of Physics & Astronomy
Website: https://www.ucl.ac.uk
- Astrophysics MSc
- Distinction, 87.85/100.00

Sept 2014 – June 2018
University of California – Los Angeles, *United States*
College of Letters and Science
Website: https://www.ucla.edu
- Astrophysics BSc
- Magna Cum Laude, 3.87/4.00 GPA

Research

Sept 2020 – Present
High-Redshift Ultraluminous Quasi-Stellar Objects
Mentor(s): Dr. Christopher Onken, A/Prof. Christian Wolf, and Dr. Fuyan Bian

Nov 2015 – Sept 2020
Contaminated White Dwarfs with Infrared Excess
Mentor(s): Dr. Siyi Xu (许偲艺), assistant astronomer at Gemini Observatory

Oct 2018 – Nov 2019
Emission from Black Hole Event Horizon
Mentor(s): Dr. Ziri Younsi and Prof. Kinwah Wu
Thesis Title: *Black Hole Jet Simulation and Images*

Jul 2017 – June 2018
Harmonic Analysis of Gravitational Wave Power in Binary System Simulation of Stochastically Driven Coupled Oscillator Grid
Mentor(s): Prof. Kenneth Young, Emeritus Professor at CUHK
Thesis Title: *Gravitational waves from a binary system: A detailed analysis of orbital decay*

Apr 2017 – Aug 2018
Galactic Morphology by Surface Brightness and Isophotal Contours
Mentor(s): Dr. Michael Rich, research astronomer at UCLA

Relevant Work Experience

July 2022 – Present
Australian National University, RSAA Publications Officer
ANU 2.3m Time Allocation Committee
Website: https://rsaa.anu.edu.au/research/publications

Aug – Oct 2021
European Southern Observatory, PhD Studentship Programme
Website: https://www.eso.org/

Jan – June 2020
Gemini Observatory, Short-term Research Scholar
Website: https://www.gemini.edu/

June – Aug 2013
Cluster Technology Limited, Software Trainee
Website: https://www.clustertech.com
- Project Management Team

June – Aug 2012
- Software Development Team

Selected Publications

2023
Characterising SMSS J2157–3602, the most luminous known quasar, with accretion disc models
Authors: **Samuel Lai,** Christian Wolf, Christopher A Onken, Fuyan Bian
Monthly Notices of the Royal Astronomical Society

AllBRICQS: The All-sky BRIght, Complete Quasar Survey
Authors: Christopher A Onken, Christian Wolf, Wei Jeat Hon, **Samuel Lai**, Patrick Tisserand, Rachel Webster
Publications of the Astronomical Society of Australia

2022
Chemical Abundance of z ~ 6 quasar broad-line regions in the XQR-30 sample
Authors: **Samuel Lai,** Fuyan Bian, Christopher A Onken, Christian Wolf, Chiara Mazzucchelli, Eduardo Banados, Manuela Bischetti, Sarah E I Bosman, George Becker, Guido Cupani, Valentina D'Odorico, Anna-Christina Eilers, Xiaohui Fan, Emanuele Paolo Farina, Masafusa Onoue, Jan-Torge Schindler, Fabian Walter, Feige Wang, Jinyi Yang, Yongda Zhu
Monthly Notices of the Royal Astronomical Society

Discovery of the most luminous quasar of the last 9 Gyr
Authors: Christopher A Onken, **Samuel Lai**, Christian Wolf, Adrian B Lucy, Wei Jeat Hon, Patrick Tisserand, Jennifer L Sokoloski, Gerardo J M Luna, Rajeev Manick, Xiaohui Fan, Fuyan Bian
Publications of the Astronomical Society of Australia

2021 **Infrared Excesses around Bright White Dwarfs from Gaia and unWISE. II.**
Authors: **Samuel Lai**, Erik Dennihy, Siyi Xu, Atsuko Nitta, Scot Kleinman, S.K. Leggett, Amy Bonsor, Simon Hodgkin, Alberto Rebassa-Mansergas, Laura K. Rogers
Astrophysical Journal

2020 **Five New Post-main-sequence Debris Disks with Gaseous Emission**
Authors: Erik Dennihy, Siyi Xu, **Samuel Lai**, Amy Bonsor, J.C. Clemens, Patrick Dufour, Boris T. Gansicke, Nicola Pietro Gentile Fusillo, Francois Hardy, R.J. Hegedus, J.J. Hermes, B.C. Kaiser, Markus Kissler-Patig, Beth Klein, Christopher J. Manser, Joshua S. Reding
Astrophysical Journal

Infrared Excesses around Bright White Dwarfs from Gaia and unWISE. I.
Authors: Siyi Xu, **Samuel Lai**, Erik Dennihy
Astrophysical Journal

Awards and Prizes

2021 **Mt. Stromlo Student Seminars** – Best Science Talk — Australian National University
2019 **Harrie Massey Prize** – Best Overall Astrophysics MSc — University College London
Mathematical and Physical Sciences Dean's Commendation

Teaching and Outreach

2023 ASTR3002/ASTR6002 – Galaxies and Cosmology Course
ESO Studentship
Student: Yanina Bonilla Lopez
ASTR3005 – Astrophysics Research Course
Student: Ashley Hai Tung Tan
ANU 2.3m Telescope Training
Student: Neelesh Amrutha

2022 ANU 2.3m Telescope Training
Students: Jemma Pilossof, Cassidy Grae Mihalenko
ASTR3005 – Astrophysics Research Course
Student: Zachary Steyn
ASTR3002/ASTR6002 – Galaxies and Cosmology Course
J1144-4308 NPR Radio Interview
https://www.nprillinois.org/2022-06-16/scientists-unexpectedly-discover-the-fastest-growing-black-hole
J1144-4308 Discovery
e.g. https://cosmosmagazine.com/space/fastest-growing-black-hole-anu/

2020 Journey through the Universe 2020 – Gemini Observatory
JWST Proposal Workshop
ICS Alumni Newsletter

2019 ICS High School Astronomy Club
ICS High School Chemistry

Actively-Maintained Public Codes

2023 **PyQSpecFit: Python-based Quasar Spectral Fit Code**
Authors: **Samuel Lai**
Purpose: Sensibly model emission features in rest-frame optical and ultraviolet quasar spectra.
GitHub/Zenodo

BADFit: Black hole Accretion Disc Fitting Code
Authors: **Samuel Lai**
Purpose: Model the large-scale multi-wavelength quasar spectral energy distribution with ray-traced thin and slim accretion disc synthetic spectra in order to constrain black hole properties.
GitHub/Zenodo

Talks/Presentations

July 2023	Sydney, Australia	Astronomical Society of Australia (ASA) Annual Science Meeting
March 2023	Canberra, Australia	RSAA Journal Club
September 2022	Online	Gemini Observatory Journal Club
September 2022	Tucson, Arizona	University of Arizona Extragalactic Group
September 2022	Tucson, Arizona	Steward / NOIRLab Galaxy Group
September 2022	Sedona, Arizona	Giant Magellan Telescope Community Science Meeting
March 2022	Online	XQR-30 WP3
July 2022	Canberra, Australia	PhD Thesis Presentation
July 2022	Tasmania, Australia	Astronomical Society of Australia (ASA) Annual Science Meeting[1]
February 2022	Online	European Southern Observatory TMT
November 2021	Online	Mt. Stromlo Student Seminars
September 2019	London, United Kingdom	MSc Thesis Defense

1 Poster