Alexander Laroche

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Research Interests

My research is focused on developing generative learning models for stellar spectra and studying mass transfer via binary stripped helium stars. I have previously worked on dark matter substructure with strong gravitational lensing and 21 cm signal constraints during the Epoch of Reionization.

Education

University of Toronto **Toronto, ON, Canada**
PhD in Astronomy & Astrophysics *2022 –*
Supervisors: Joshua S. Speagle, Maria Drout

McGill University **Montreal, QC, Canada**
BSc in Honours Physics (First Class Honours) *2018 – 2022*
Supervisors: Jo Bovy, Daniel Gilman, Adrian Liu, Jonathan Sievers

Awards & Fellowships

at University of Toronto

NSERC CGS-M **Sep 2023 – Aug 2024**
17,500 CAD, David A. Dunlap Department of Astronomy & Astrophysics

Graduate Entrance Scholarship **Sep 2022 – Aug 2023**
5,000 CAD, David A. Dunlap Department of Astronomy & Astrophysics

NSERC USRA Fellowship **May 2021 – Aug 2021**
9,600 CAD, Natural Sciences & Engineering Research Council

at McGill University

Canada 150 Research Chair Undergraduate Research Grant **May 2020 – Aug 2020**
6,000 CAD, Canada 150 Research Chairs Program

Charles River Laboratories Scholarship **Sep 2020 – Aug 2021**
2,000 CAD, Academic merit

Wing Hing Chan Scholarship in Science **Sep 2020 – Aug 2021**
500 CAD, Academic merit

Dean's Honours List **Sep 2020 – Aug 2021**
Top 10% of Faculty of Science

Publications

Peer-Reviewed Journal Articles

1. **Alexander Laroche**, Daniel Gilman, Xinyu Li, Jo Bovy, Xiaolong Du. Quantum fluctuations masquerade as halos: Bounds on ultra-light dark matter from quadruply-imaged quasars, *Mon. Not. Roy. Astron. Soc.* **517**, 1867 (2022) arXiv:2206.11269 [astro-ph.CO].

Peer-Reviewed Conference Articles

1. **Alexander Laroche**, Joshua S. Speagle. Closing the stellar labels gap: An unsupervised, generative model for *Gaia* BP/RP spectra, *ICML 2023 Workshop on Machine Learning for Astrophysics,* arXiv:2307.06378

[astro-ph.IM].

Theses

1. **A. Laroche**, J. Banghal (2021). "Quantifying Density-Ionization Correlations with the 21cm Power Spectrum While Including X-ray Heating Effects". McGill University. BSc Honours Research Thesis.

Presentations

Conferences

Canadian Astro-Particle Physics Summer Student Talk Competition **Aug 2022**
Quantum fluctuations masquerade as halos *Subdury, ON*

University of Toronto 2022 Stellar Stats Workshop **May 2022**
Constraining ultra-light dark matter by forward modeling flux ratios *Toronto, ON*

Other Talks

McGill University Undergraduate Research Project Presentation **Dec 2021**
Probing the quantum mechanics of ultra-light dark matter with strong lensing *Montreal, QC*

University of Toronto NSERC USRA Poster Seminar **Aug 2021**
Probing the quantum mechanics of ultra-light dark matter with strong lensing *Toronto, ON*

McGill University Undergraduate Research Thesis Presentation **Apr 2021**
Density-ionization correlations with the 21cm power spectrum including X-ray heating *Montreal, QC*

Additional Research Positions

Undergraduate Research Assistant - UofT Galactic Astrophysics Group **2021-2022**
Department of Astronomy & Astrophysics *University of Toronto*
Supervisors: Jo Bovy, Daniel Gilman

- Constraining ultra-light dark matter with strong gravitational lensing

Undergraduate Research Assistant - McGill Cosmic Dawn Group **2020-2021**
Department of Physics *McGill University*
Supervisor: Adrian Liu

- Investigating the effect of x-ray heating on density-ionization correlations during the Epoch of Reionization with the 21cm power spectrum

Undergraduate Research Assistant - McGill Radio Lab **2020-2021**
Department of Physics *McGill University*
Supervisor: Jonathan Sievers

- Data selection and analysis for the Probing Radio Intensity at high-Z from Mario (PRIZM) experiment

Mentorship

Undergraduate Mentor, University of Toronto **2022-**
Advising undergraduate student on research and graduate school applications

Teaching Experience

AST201: Stars & Galaxies **Winter 2023**
Graduate teaching assistant, University of Toronto

AST101: The Sun and Its Neighbours **Fall 2022**
Graduate teaching assistant, University of Toronto

PAPER Tutor **2019-2020**
Undergraduate math and physics tutor, Montreal, QC

Service & Outreach

Graduate Student Union Representative **2022-**
Represent the interests of the astronomy grad student body at GSU meetings

AstroTours - Filmographer **2022-**
Monthly organization of AstroTours, manage video content for oganization