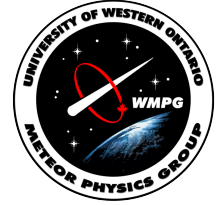


# Ian CHOW

## M.Sc. Candidate | University of Western Ontario

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## 🎓 EDUCATION

PRESENT September 2023	Master of Science – <b>M.Sc. Astronomy</b> <i>University of Western Ontario</i> Cumulative GPA of <b>4.00/4.00</b> <b>Thesis</b> : Orbital and Physical Properties of Decameter Earth Impactors <i>Supervisor</i> : Prof. Peter Brown	<i>London, ON, Canada</i>
April 2023 September 2018	Honours Bachelor of Science – <b>Astronomy &amp; Physics Specialist, Statistics Major, Mathematics Minor</b> <i>University of Toronto</i> Graduated with High Distinction – Cumulative GPA of <b>3.60/4.00</b> <b>Astronomy &amp; Physics Thesis</b> : Analyzing Radial Velocity Data from the Resonant Planetary System HD 45364 <i>Supervisors</i> : Dr. Samuel Hadden, Prof. Hanno Rein <b>Statistics Thesis</b> : Identifying Birth Environments of Isolated Stars With Clustering of Stellar Chemical Abundances <i>Supervisor</i> : Prof. Joshua S. Speagle	<i>Toronto, ON, Canada</i>

## 🔍 RESEARCH INTERESTS

Meteors, Exoplanets, Astrostatistics, Machine Learning, Dynamics, Numerical and Computational Methods

## 🏆 AWARDS, SCHOLARSHIPS, FELLOWSHIPS & HONOURS

2024-2025	<b>Ontario Graduate Scholarship</b> , \$15,000 CAD	<i>University of Western Ontario</i>
2023-2024	<b>Western Graduate Research Scholarship</b> , \$6,372 CAD	<i>University of Western Ontario</i>
2023	<b>SURP Poster Competition Award</b> , \$50 CAD	<i>University of Toronto</i>
2023	<b>Summer Undergraduate Research Program (SURP) Fellowship</b> , \$9,980 CAD	<i>University of Toronto</i>
2022	<b>Summer Undergraduate Research Fellowship (SURF)</b> , \$9,500 CAD	<i>CITA</i>
2021-2022	<b>Smith Solis Research Scholarship in Astronomy and Astrophysics</b> , \$1,250 CAD	<i>University of Toronto</i>
2020-2023	<b>Dean's List Scholar</b> , honour	<i>University of Toronto</i>

## 🧪 RESEARCH EXPERIENCE

August 2023 May 2023	<b>Summer Undergraduate Research Program</b> <i>Dunlap Institute for Astronomy and Astrophysics, University of Toronto</i> <i>Supervisor</i> : Dr. Keir Rogers	<ul style="list-style-type: none"><li>➤ Investigated the distribution of ultra-light axions with funding from the Summer Undergraduate Research Program at the University of Toronto</li><li>➤ Evaluated the performance of Markov chain Monte Carlo and nested sampling on recovering the estimated distribution of ultra-light axions as a function of mass and axion, dark matter and dark energy density by designing and assessing their performance on a qualitatively similar test distribution</li><li>➤ Derived empirical constraints on the ultra-light axion distribution by sampling over high-dimensional parameter space, comparing synthetic CMB power spectra computed by the <b>axionEmu</b> neural network to <i>Planck</i> telescope observations</li><li>➤ Received the SURP Poster Award for a poster competition held at the end of the program</li></ul>
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Astrostatistics Machine Learning Cosmology

April 2023  
September 2022

### Undergraduate Research Project in Statistics

*University of Toronto*

*Supervisor* : Prof. Joshua S. Speagle

- Identified birth clusters of isolated stars in the APOGEE survey by using dimensionality reduction and clustering algorithms like UMAP, t-SNE and hierarchical DBSCAN in Python to group stars in high-dimensional parameter space using their chemical abundances
- Developed a machine learning model based on variational autoencoder architecture to perform dimensionality reduction while robustly propagating high-dimensional measurement error to lower dimension, allowing for probabilistic association of stars with a cluster
- Applied model to APOGEE data for both validation against known star clusters as well as identification of new associations, for several oral presentations, an undergraduate thesis and a poster presentation at the 2023 CASCA AGM conference

Astrostatistics   Machine Learning   Stars & Star Clusters

August 2022  
May 2022

### Summer Undergraduate Research Fellowship

*Canadian Institute for Theoretical Astrophysics (CITA)*

*Supervisors* : Dr. Samuel Hadden, Prof. Hanno Rein

- Continued previous research on the planetary system HD 45364 with funding as part of CITA's Summer Undergraduate Research Fellowship program
- Compared different N-body models of HD 45364 with varying libration amplitudes using penalized regression to determine the effect of libration on the best-fit orbital configuration
- Derived semi-analytic equations of motion for convergent orbital migration of planets under dissipative forces in Hamiltonian mechanics, to determine how eccentricity and semi-major axis damping affect the resonant dynamics of HD 45364, for several oral presentations and a contributed talk delivered at the 2022 Planet Day conference

Exoplanets   Dynamics

April 2022  
September 2021

### Undergraduate Research Project in Astronomy

*University of Toronto*

*Supervisors* : Dr. Samuel Hadden, Prof. Hanno Rein

- Analyzed radial velocity data from the resonant planetary system HD 45364 using N-body simulation and least-squares optimization in Python to find best-fit orbital parameters
- Improved bounds on planet masses and orbital inclinations by analyzing dynamical stability of their orbits
- Developed N-body model for convergent orbital migration of planets under dissipative forces, using Bayesian inference and Markov chain Monte Carlo sampling, to determine how planets are captured into mean-motion resonance
- Awarded the 2021-2022 Smith Solis Research Scholarship in Astronomy and Astrophysics, given to a top student for outstanding achievement on the final oral presentation and undergraduate thesis

Astrostatistics   Exoplanets   Dynamics

## PROFESSIONAL EXPERIENCE

PRESENT  
September 2023

### Teaching Assistant

*University of Western Ontario*



*London, ON, Canada*

- Led in-person tutorials and help centres, ran midterm viewing sessions, proctored, graded and reviewed exam questions for the introductory university physics courses Physics 1201 (Physics for the Sciences I) and Physics 1402 (Physics for Engineering Students II)
- Supervised lab sessions of 40+ physics students and graded lab reports for first-year physics laboratory courses

Tutorials/Help Centres   Labs   Marking/Reviewing Exams

September 2020 June 2020	<b>Software Developer</b> <i>Innovere Medical</i> Markham, ON, Canada <ul style="list-style-type: none"> <li>Automated detection of dropouts in time-series audio data from an MRI scanner's wireless audio system using power spectrum analysis in MATLAB and Python, eliminating 20+ hours of work weekly</li> <li>Developed and tested TechSmart, an in-house multimedia app for patient use during MRI scans, with company's software development team</li> </ul> MATLAB Python Signal Processing Software Development & Testing
August 2019 June 2019	<b>Software Developer</b> <i>Plantiga Technologies</i> Vancouver, BC, Canada <ul style="list-style-type: none"> <li>Developed methods to compute physical fitness heuristics from time-series acceleration (g-force) data, using signal processing techniques like digital filtering and convolution in Python (SciPy, Pandas) to improve detection of foot impacts</li> <li>Field-tested and validated hardware such as sensor shoe insoles that track movement</li> <li>Acquired data from company partners such as physiotherapy clinics, universities (University of British Columbia, Simon Fraser University), and sports organizations (Houston Rockets, US Tennis Association)</li> <li>Produced documentation of company products and services for clients</li> </ul> Python Signal Processing Biomechanics Data Analytics
August 2017 June 2017	<b>Research Intern</b> <i>Synced Review</i> Toronto, ON, Canada <ul style="list-style-type: none"> <li>Conducted literature review focusing on advancements in reinforcement learning used in adversarial-search board and video game artificial intelligence programs for a company report</li> <li>Worked with company team to research and edit review articles on industry trends in machine learning and robotics technology</li> </ul> Artificial Intelligence Adversarial Search Literature Review

## PROJECTS

<b>FASANO-FRANCESCHINI-TEST</b>  <a href="https://github.com/wmpg/fasano-franceschini-test">github.com/wmpg/fasano-franceschini-test</a> A Python implementation for a multidimensional extension of the Kolmogorov-Smirnov test presented by Fasano & Franceschini (1987). Python	2024
<b>HERE I STAND CALCULATOR</b>  <a href="https://ia-chow.github.io/projects/his/">https://ia-chow.github.io/projects/his/</a> An online calculator tool to compute the odds of various outcomes for the strategy board game Here I Stand, written to familiarize myself with HTML and JavaScript. Hosted on a personal website. HTML CSS JavaScript	2020

## LEADERSHIP, VOLUNTEERING & EXTRACURRICULAR EXPERIENCE

<b>PRESENT</b> <b>September 2023</b>	<b>Consensus Trivia</b> <i>Question Writer/Editor</i> <ul style="list-style-type: none"> <li>Wrote and edited trivia questions for Consensus Trivia, a federally registered not-for-profit organization that runs team-based trivia tournaments for 80+ high school and collegiate teams across Canada</li> <li>Moderated and kept score for tournament games as a staffer</li> </ul>
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May 2023  
January 2019

### University of Toronto Academic Trivia Club

*Vice President, Competitor, Tournament Organizer & Question Writer/Editor*

- Elected Vice President of the University of Toronto's Academic Trivia Club during the 2020-2021 and 2021-2022 academic years organizing twice-weekly practices and social events, managing club Facebook group and Discord server with 300+ members, and moderating practices and tournament games
- Represented the University of Toronto at 30+ trivia (quiz bowl) tournaments across Canada and the U.S. as a competitor with several top finishes at national championships, such as leading the team to fourth place at the 2022 Division II Intercollegiate Championship Tournament in Chicago
- Organized and directed several collegiate and high school tournaments, including the 2021 University of Toronto Collegiate Novice and the 2022 University of Ottawa ACF Fall tournaments, played by 30+ collegiate teams in total across Canada and the U.S.
- Wrote and edited trivia questions across a wide range of academic disciplines (including astronomy and physics) for 2022 WORKSHOP, 2023 Canadian Novice, and 2024 MRNA III, collegiate tournaments played by 80+ teams in total across Canada, the U.S., and the U.K.



## CONFERENCE PRESENTATIONS

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**Chow, I.,** Hadden, S., Rein, H. 2022. Modelling migration scenarios of resonant planets using radial velocity data. Contributed talk. Planet Day, Toronto, ON, Canada : CITA

**Chow, I.,** Speagle, J. S. 2023. Identifying birth environments of isolated stars : a probabilistic dimensionality reduction model for stellar chemical abundances. Poster presentation. CASCA Annual General Meeting, Penticton, BC, Canada : CASCA



## SKILLS

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<b>Programming</b>	Python (Pandas, Matplotlib, Keras/TensorFlow, scikit-learn), MATLAB, R (ggplot, dplyr), HTML, JavaScript (Node.js)
<b>Software</b>	L <sup>A</sup> T <sub>E</sub> X, Git/GitHub, Jupyter Notebook, Anaconda, R Suite, Bash, Linux (ssh), Microsoft Excel
<b>Languages</b>	English (fluent), French (intermediate), Cantonese (spoken)