Curriculum Vitae
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Dingding (Esther) Wang

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Education

York University — Toronto, Canada
Master of Science in Physics & Astronomy — *Sept 2023 - June 2025 (expected)*

University of Toronto — Toronto, Canada
Honours Bachelor of Science, Double major: Astronomy & Astrophysics and Statistics — *Sept 2019 - June 2023*

Research Interests

Exoplanets: Observation, Atmospheres, Spectroscopy, Habitability, Astrobiology, Circumbinary, Hot Jupiters
Astrostatistics: Bayesian Inference, Time Series Analysis, Hierarchical Mixture Models, Machine Learning

Projects (Astronomy)

Detecting SiO in the Atmosphere of Ultra Hot Jupiter WASP-178b — May 2024 – Present
co-Supervised by Prof. Sarah Rugheimer(YorkU) and Prof. Jason Dittmann(UFlorida) — *York University*

- Corrected Hubble Space Telescope STIS near-UV data, applied jitter detrending method and Bayesian inference to produce high-resolution transmission spectra of ultra-hot Jupiter WASP-178b.
- Employed in-band/out-of-band statistical techniques, hypothesis testing, and ExoMol molecular absorption line modeling to detect high-resolution features of silicon monoxide (SiO) in the spectra.

Stellar Atmosphere Models: 1D to the Next Frontier — Feb. 2024 – Apr. 2024
Advised by Prof. Adam Muzzin — *York University*

- Conducted literature reviews on the evolution of stellar modeling methodologies and next-generation approaches for precise synthetic spectrum generation.
- Compared the traditional 1D Kurucz ATLAS12 stellar atmosphere models with 3D Stagger-grid simulations to evaluate trade-offs between computational efficiency and accuracy in interpreting synthetic stellar spectra.

A Critical Discourse Analysis of Astronomy Textbooks — May 2023 – Sept. 2023
Supervised by Prof. Carol-Ann Burke — *OISE, University of Toronto*

- Performed comprehensive literature reviews on astronomy education materials, integrating mixed-methods research designs to assess textbook efficacy and pedagogical frameworks.
- Employed Critical Discourse Analysis (via NVivo) and systemic functional linguistics to examine how widely adopted North American Astronomy textbooks textually and graphically portray the interplay between natural and social systems.

Habitability of Circumbinary Planets — Oct. 2022 – Apr. 2023
Supervised by Prof. Lea Hirsch — *University of Toronto*

- Conducted Monte Carlo simulations and N-body orbital analyses to characterize the formation, stability, and habitable zone configurations of Earth-like exoplanets in close-binary systems.
- Quantified dynamic habitability criteria under binary gravitational influences.

Kinematics, Membership, and Origin of SMCNOD — May 2022 – Dec. 2022
Advised by Prof. Ting Li and Prof. Joshua S. Speagle — *University of Toronto*

- Employed hierarchical mixture models, clustering algorithms, and MCMC sampling to estimate stellar membership probabilities in a stellar overdensity in the Small Magellanic Cloud using the Southern Stellar Stream Spectroscopic Survey(S_5) data.
- Integrated kinematic, chemical, and variable star analyses to probe the origin of SMCNOD, gained insights into dwarf galaxy structure and evolutionary processes.

Astrometry from CCD Images | *AST325 Course Project* — Oct. 2021 – Dec. 2021

- Measured positions of stars and asteroids in CCD images to determine celestial coordinates.
- Solved for plate constants using linear least squares fitting, accounting for scale, shear, and orientation.

Projects (Statistics)

Predictive Modeling for Healthcare Expenditure Estimation | *Time Series Analysis* Oct. 2023 – Dec. 2023

- Applied advanced time series forecasting methods (ARIMA, exponential smoothing) to estimate timelines for tuberculosis eradication, leveraging model diagnostics and cross-validation.
- Analyzed large-scale healthcare expenditure datasets to assess economic impacts and guide resource allocation, developing interactive visualizations and data-driven policy recommendations.

Women and Girls Education: The Unequal Balance | *Multivariate Analysis* Mar. 2022 – Apr. 2022

- Conducted multivariate statistical analysis (e.g., principal component and factor analysis) to investigate educational attainment disparities among women in the Philippines.
- Implemented Monte Carlo simulations to evaluate model stability and robustness, providing evidence-based improvements in survey designs and educational policy interventions.

Toronto Homeless Shelter System Flow Analysis | *Cluster Analysis, Chi-square Tests* Feb. 2022 – Mar. 2022

- Employed cluster analysis and chi-square tests to identify demographic-specific usage patterns in Toronto's homeless shelters during the COVID-19 pandemic.
- Integrated data cleaning, transformation, and visualization (R) to reveal shelter flow dynamics, providing targeted service enhancements and allocation strategies.

Key Factors that Cause Breast Cancer | *Multilevel Regression, Predictive Modeling* Sept. 2021 – Dec. 2021

- Applied multilevel regression models and predictive analytics (R) to identify socioeconomic and behavioral factors associated with breast cancer risk.
- Conducted model diagnostics, sensitivity analyses, and validation studies, producing reliable insights for guiding public health initiatives and early intervention programs.

Forecasting the 2021 Canadian Election | *Logistic Regression, Poll Analysis* Aug. 2021 – Oct. 2021

- Developed logistic regression models leveraging historical polling data and demographic features to predict electoral outcomes accurately.
- Validated predictions through hold-out sets and sensitivity analyses.

Publications

(In review) Burke, L., **Wang, D.**, Manini, A., Charoonruk, J., Zaman, Z., 2024. *The storied identity trajectories of four foreign-born Asian women in Canadian undergraduate astronomy*, Journal of Research Science in Teaching, manuscript: JRST-2024-07-0308.

Talks and Presentations

- Statistical Approach to the Detection of Carbon Monoxide's Fundamental Band Structure in WASP-39b's Atmosphere with JWST NIRSpec, York University, Canada, July 2024 (Seminar)
- Detecting SiO in the Atmosphere of Ultra-hot Jupiter WASP-178b, Physics and Astronomy Graduate Executive (PAGE) Conference at York University, Canada, June 2024 (Talk)
- Exploring Habitable Zones in Circumbinary Systems, NASA Astrobiology Graduate Conference (AbGradCon) at Cornell University, June 2024 (Poster)

Conference & Workshop Experience

Astro Lunch | *Presenter, York University* June 2024

PAGE Conference | *Presenter, York University* June 2024

NASA Astrobiology Graduate Conference | *Poster Presenter, Cornell University* June 2024

Canadian Astronomical Society Annual Meetings | *Graduate Student Representative, Toronto* June 2024

VPlanet Workshop | *Participant & Collaborator, University of Washington(virtual)* Aug. 2023

Stellar Stats Workshop | *Participant, University of Toronto* May. 2023

Gaia Hike | *Participant, University of British Columbia* June 2022

DSI-CARTE Machine Learning Bootcamp | *Participant, University of Toronto* June 2022

Public Outreach Experience

Observatory Assistant | *Allan I. Carswell Observatory, York University* Apr. 2024 – Present

- Assisted with a series of 2024 solar eclipse viewing tours, guiding the public through solar observing sessions and providing educational information.
- Participated in monthly public outreach events, operating telescopes of various sizes to engage visitors and facilitate hands-on astronomical experiences.

AstroTours Volunteer | *David Dunlap Observatory, University of Toronto* Jan. 2021 – Apr. 2023

- Guided participants in using Zooniverse to identify distant galaxies and measure dark energy in the early universe.
- Operated and calibrated 6-inch and 8-inch telescopes, explaining imaging principles to the public.

Teaching & Mentoring

Teaching Assistant | *York University* Sept. 2023 – Present

- Assisted in five undergraduate Physics courses: *Engineering Mechanics, Physics Fundamentals Labs, Classical Mechanics, Physics with Life Science Applications, and Experimental Physics with Data Analysis.*
- Graded weekly assignments and exams, designed rubrics, and prepared bi-weekly 3-hour physics lab demos.

Student Mentor Sept. 2020 – Present

- Mentored five high school students aspiring to pursue Physics and Astronomy; devised personalized mentorship plans, and facilitated monthly goal-setting and progress review meetings.

IELTS Instructor May. 2019 – April. 2020

- Conducted one-on-one tutoring sessions for 100+ students of different stages. Created original lesson plans and materials. Monitored and evaluated students' learning outcomes and adjusted teaching methods accordingly.

Extracurricular Experience

Media Assistant & Event Coordinator | *Student Association at the University of Toronto* Sept. 2021 – Apr. 2022

- Produced promotional films for events, enhancing engagement across social media platforms. Led the media team by scheduling, delegating assignments, and managing deadlines.
- Developed technical expertise in Photoshop, photo retouching, and camera/film operation through workshops.

TikTok Content Creator | *Photoshop, Adobe Premiere Pro, Lightroom* Jan. 2021 – Present

- Established and managed a TikTok scenery account for my photography, amassing over 400,000 followers to date, developed solid skills in astrophotography, content creation, and social media data analytics.
- Created vlogs for my academic pathway as an international astronomy student and engaged with audiences.

UofT Recognized Study Group | *Member, University of Toronto* Sept. 2020 – Apr. 2022

- Collaborated with peers in weekly study sessions on physics, statistics, and astronomy. Developed critical thinking and communication skills through group discussions and peer support.

Funding & Awards

York University Graduate Fellowship Sept. 2023 – June 2025
York University Academic Excellence Fund Aug 2024
University of Toronto Conference Scholarship June 2022
University of Toronto Entrance Scholarship Sept. 2019

Relevant Coursework

Astronomy: Stars & Nebulae, Cosmology, Astrobiology, Galaxies, Practical Astronomy
Physics: General Relativity, Geophysics, Quantum Physics, Thermal Physics
Statistics: Astrostatistics, Statistical Inference, Multivariate Analysis, Machine Learning, Data Mining

Skills

Coding Language: Proficiency in Python, R, SAS, SQL, LaTeX, familiar with Fortran
Atmospheric Modeling Tools: Chemclim, PHOENIX, petitRADTRANS
Language: Native fluency in English and Mandarin, Conversational Proficiency in Japanese, Beginner Level in Spanish and French

References

Dr. Sarah Rugheimer | *Associate Professor, York University*

- Email: sarah.rugheimer@yorku.ca
- Website: https://www.sarahrugheimer.com
- Department of Physics and Astronomy, York University, Toronto, Canada
- Relationship: Master's thesis primary supervisor *(2023-present)*

Dr. Jason Dittmann | *Assistant Professor, University of Florida*

- Email: jasondittmann@ufl.edu
- Website: https://astro.ufl.edu/directory/jason-dittmann
- Department of Astronomy, University of Florida, Gainesville, United States
- Relationship: Master's thesis co-supervisor *(2024-present)*

Dr. Carol-Ann Burke | *Associate Professor, University of Toronto*

- Email: carolann.burke@utoronto.ca
- Website: https://wordpress.oise.utoronto.ca/scienceengagement
- Department of Curriculum, Teaching and Learning, University of Toronto, Toronto, Canada
- Relationship: Research supervisor *(2023-present)*