Dayi (David) Li (李大一)

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Research Interests

Astrostatistics & Spatial Statistics: I develop various statistical methods and models to address complex and important astrophysical problems. Specifically, I develop novel **spatial models** to study **Ultra-Diffuse Galaxies** and **star clusters.**

Bayesian Computation: I also work on **approximate Bayesian computation** where I utilize methods from **machine learning** to speed up Bayesian inference.

Education

2020-2025 (exp.) **PhD Candidate in Statistics**, *Department of Statistical Sciences, University of Toronto, Toronto, ON.*
Thesis Title: *"Advanced Spatial Point Process Models for Astrophysics."*
Supervisors: Gwendolyn Eadie, Patrick Brown, Roberto Abraham

2018-2020 **Master of Science in Statistics**, *School of Mathematical and Statistical Sciences, Western University, London, ON.*
Thesis Title: *"Point Process Modeling of Stellar Objects in the M33 Galaxy."*
Supervisors: A. Ian McLeod, Pauline Barmby

2014–2018 **Bachelor of Science, Honor Specializations in Financial Modeling**, ***Gold Medalist***, *School of Mathematical and Statistical Sciences, Western University, London, ON.*

Positions

2023-Present **Data Sciences Institute Doctoral Fellow**, Data Sciences Institute, University of Toronto

2020-Present **CANSSI Multi-disciplinary Doctoral Trainee**, Department of Statistical Sciences, University of Toronto

2020-Present **Graduate Researcher in Astrostatistics**, Department of Statistical Sciences, University of Toronto

2020 **Post-Graduate Researcher in Astrostatistics**, Department of Statistical and Actuarial Sciences, Western University

2018-2020 **Graduate Research Assistant**, Department of Statistical and Actuarial Sciences, Western University

Awards, Fellowships, & Scholarships

At Toronto

2023 Astrostatistics Student Paper Competition Finalist, Joint Statistical Meeting 2023, **100 USD**

2023 Department of Statistical Sciences Doctoral Travel and Conference Award, University of Toronto, **3000 CAD**

2023 Department of Statistical Sciences Doctoral Early Research Excellence Awards, University of Toronto, **1500 CAD**

2023-2026 Data Sciences Institute Travel Award, University of Toronto, **1500 CAD/yr**

2023-2026 Data Sciences Institute Doctoral Student Fellowship, University of Toronto, **25000 CAD/yr**

2020-2025 CANSSI Multidisciplinary Doctoral Trainee

2020 Doctoral Recruitment Award, **10000 CAD**

2020 E.F. Burton and F. W. Burton Graduate Scholarship Award, **4000 CAD**

At Western

2018-2020 Western Graduate Research Scholarship, **7000 CAD/yr**

2018 Western Gold Medalist in Financial Modelling

2016 Robert and Ruth Lumsden Scholarships In Science, **1000 CAD**

2015 William Wyatt Scholarships, **1000 CAD**

2015 Jane Plas International Student Award, **6000 CAD**

2014-2018 Western Continuing Scholarship, **10000 CAD**

Scholarly Work

In Preparation

[1] **D. Li**, P. van Dokkum, R. Abraham, G. Eadie, W. Harris, A. Romanowsky, and S. Danieli, "*Candidate Dark Galaxy-2: Discovery of an Almost Dark Galaxy with Four Globular Clusters in the Perseus Cluster*", In preparation (2024).

[2] A. M. Cook, **D. Li**, G. M. Eadie, D. C. Stenning, P. Scholz, D. Bingham, R. Craiu, B. M. Gaensler, K. Masui, Z. Pleunis, A. Herrera-Martin, R. C. Joseph, A. Pandhi, and A. B. Pearlman, "*k-Contact Distance for Noisy Nonhomogeneous Spatial Point Data, with Application to Repeating Fast Radio Burst Sources*", In preparation (2024).

Submitted

[3] **D. Li**, G. Eadie, P. Brown, W. Harris, R. Abraham, P. van Dokkum, S. Janssens, S. Berek, S. Danieli, A. Romanowsky, and J. Speagle, "*Discovery of Two Ultra-Diffuse Galaxies with Unusually Bright Globular Cluster Luminosity Functions via a Mark-Dependently Thinned Point Process (MATHPOP)*", Submitted to The Astrophysical Journal (2024).

†[4] **D. Li** and Z. Zhang, "*Bayesian Optimization Sequential Surrogate (BOSS) Algorithm: Fast Bayesian Inference for a Broad Class of Bayesian Hierarchical Models*", Submitted to Bayesian Analysis (2024).

Published/Accepted

[5] **D. Li**, A. Stringer, P. E. Brown, G. M. Eadie, and R. G. Abraham, "*Poisson Cluster Process Models for Detecting Ultra-Diffuse Galaxies*", Accepted to The Annals of Applied Statistics (2024).

[6] P. van Dokkum, **D. Li**, R. Abraham, S. Danieli, G. M. Eadie, W. E. Harris, and A. J. Romanowsky, "*Deep HST/UVIS Imaging of the Candidate Dark Galaxy CDG-1*", Research Notes of the AAS **8**, 135 (2024).

[7] **D. Li**, G. M. Eadie, R. Abraham, P. E. Brown, W. E. Harris, S. R. Janssens, A. J. Romanowsky, P. van Dokkum, and S. Danieli, "*Light from the Darkness: Detecting Ultra-diffuse Galaxies in the Perseus Cluster through Over-densities of Globular Clusters with a Log-Gaussian Cox Process*", The Astrophysical Journal **935**, 3 (2022).

[8] **D. Li** and P. Barmby, "*Gibbs Point Process Model for Young Star Clusters in M33*", Monthly Notices of the Royal Astronomical Society **501**, 3472–3489 (2020).

Telescope Observing Proposals

[9] P. van Dokkum, R. Abraham, S. Danieli, G. Eadie, W. Harris, **D. Li**, and A. Romanowsky, "*A Candidate Nearly-Dark Galaxy with 4 Globular Clusters*", Hubble Space Telescope Proposal, GO 17454 (2023).

† Shared first authorship. Names are listed alphabetically.

[10] **D. Li**, R. Abraham, S. Danieli, G. Eadie, P. Brown, W. Harris, A. Romanowsky, and P. van Dokkum., "*Deep Imaging of a Candidate Dark Galaxy in Perseus*", Gemini Consortium, GN-2022B-Q-109 (2022).

Talks, Presentations & Others

Invited Talks

2023 "*Learning how to Count Again: Inferring Globular Cluster Counts in Ultra-Diffuse Galaxies with Bayesian Marked-Dependently Thinned Poisson Point Process.*" Astrostatistics in Canada and Beyond, Banff, AB

2023 "*Principled Bayesian Inference for estimating Globular Cluster Counts in Ultra-Diffuse Galaxies using Mark-Dependently Thinned Point Process.*" International CHASC Astro-Statistics Centre, Harvard University, Cambridge, MA

2023 "*Poisson Cluster Process for Detecting Ultra-Diffuse Galaxies.*" , Astrostatistics Student Paper Competition, Joint Statistical Meeting 2023, Toronto, ON

2022 "*Detecting Ultra-Diffuse Galaxies in the Perseus Cluster using Log-Gaussian Cox Process.*" Cluster at McMaster, McMaster University, ON

2022 "*Light from the Darkness: Detecting Ultra-Diffuse Galaxies in the Perseus Cluster using Log-Gaussian Cox Process.*" Advances in Astrostatistics in the Great White North —Invited Session, Joint Statistical Meeting 2022, Washington, DC

Contributed Talks

2024 "*Bayesian Optimization Sequential Surrogate (BOSS): Fast Bayesian Inference for Conditional Latent Gaussian Models.*" Statistical Society of Canada Annual Meeting 2024, St John's, NL

2020 "*Gibbs Point Process Model for Objects in the Star Formation Complexes of M33.*" Innovations in Statistics for Astronomy and Space Physics —Topic Contributed Session, Joint Statistical Meeting 2020, Pennsylvania, PA

Poster Presentations

2023 "*Learning how to Count Again: Inferring Globular Cluster Counts in Ultra-Diffuse Galaxies with Bayesian Marked-Dependently Thinned Poisson Point Process.*" Poster Presentation, Data Sciences Institute Research Day, Toronto, ON

2022 "*Poisson Cluster Process Models for Detecting Ultra-Diffuse Galaxies.*" CANSSI Ontario Research Day, Toronto, ON

Software

2024 MATHPOP: R package for fitting mark-dependently thinned point process to infer the counts and luminosity functions of globular clusters in low surface-brightness galaxies.

Teaching

2024 Course Instructor for STA 347: Probability at UTSG

2024 Teaching assistant for STA 237, STA 257, STA 261, STA 347, STA 442, STA 447 at UTSG

2023 Teaching assistant for STA 257, STA 261, STA 347 at UTSG

2022 Teaching assistant for STA 257, STA 261, STA 347 at UTSG

2021 Teaching assistant for STA 220, STA 257, STA 261 at UTSG

2020 Teaching assistant for STA 257, STA 261, STA 465 at UTSG

Service and Leadership

2024 **Organizer**, *STATSTRO 2024 WORKSHOP*, Department of Statistical Sciences & Department of Astrophysics and Astronomy, University of Toronto.

2023 **Organizer**, *Grant Proposal Writing Workshop*, Department of Statistical Sciences, University of Toronto.

2023 **Founder and Organizer**, *STAtistics Research Writing And Reading (STAR WAR) Workshop*, Department of Statistical Sciences, University of Toronto.

2021-2023 **Student Representative**, *Applied Research and Education Seminar (ARES)*, CANSSI Ontario.

Languages

English Fluent

Mandarin Native

Professional References

Gwendolyn M. Eadie
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Department of Astronomy and Astrophysics & David A. Dunlap Institute for Astronomy and Astrophysics
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