Nathaniel Starkman

Postdoctoral Associate
Brinson Prize Fellow
@ MIT Kavli

77 Massachusetts Avenue
Cambridge, MA 02139, USA
starkman@mit.edu nstarkman.space
Publications arXiv Zenodo 0000-0003-3954-3291

Education

2018 – 2024	**PhD in Astronomy & Astrophysics**, University of Toronto	Toronto, ON, Canada
2014 – 2018	**B.S. in Mathematical Physics and Astronomy**, Case Western Reserve University	Cleveland, OH, USA

Professional Appointments

2024 – 2027	**Postdoctoral Associate**, MIT Kavli Institute for Astrophysics and Space Research	Cambridge, MA, USA
2021 –	**Coordinator (2025 – 2028), Strategic Planner (2025 – 2026) & Core Developer**, Astropy	Remote

Grants & Fellowships

Feb 2024	**Brinson Prize Fellowship**	USD 360,000
Jul 2022	**Astropy Cycle III Funding Grant**	USD 12,000
Jul 2022	**Astropy Cycle III Funding Grants**	USD 8,000
2020 – 2023	**NSERC - CGS D**	CAD 105,000
2019 – 2020	**NSERC - CGS M**	CAD 17,500
2018 – 2024	**University of Toronto Graduate Fellowship**, University of Toronto	CAD 23,000–32,000 p.a.

Awards

Jan 2025	**AAS Lancelot M. Berkeley–New York Community Trust Prize**, American Astronomical Society, *to the Astropy Collaboration*
2014 – 2018	**Case Western Reserve University Merit Scholarship**

Publications

Students I supervised or advised: undergraduate†, graduate‡.

10. **N. Starkman**, J. Nibauer, S. Pearson, S. Wu‡, L. Necib. *When Streams Curve Away: a Test of Dark Matter from Extragalactic Stellar Stream Populations.* SUBMITTED arXiv:2609.40057
9. Euclid Collaboration, **N. Starkman**, J. Nibauer, S. Pearson, S. Wu‡, M. Walmsley, L. Necib, et al. *Euclid Quick Data Release (Q1): The geometry of dark matter halos from extragalactic streams.* Astronomy & Astrophysics SUBMITTED ADS arXiv:2606.21774
8. C. Myers†, **N. Starkman**, L. Necib. *Reconstructing Galactic Gravitational Potentials from Stellar Kinematics with Physics-Informed Neural Networks.* Monthly Notices of the Royal Astronomical Society SUBMITTED ADS arXiv:2606.18386
7. L. Necib, D. Folsom, E. Y. Davies, **N. Starkman**, A. Thoyas. *Galactic Amnesia: The Information Washout of the Milky Way Merger History.* SUBMITTED ADS arXiv:2605.04138
6. **N. Starkman**, J. Nibauer. *phasecurvefit: A High-Performance JAX Framework for Phase-Space Walks with Pluggable Metrics and Strategies.* Journal of Open Source Software SUBMITTED pyOpenSci review
5. S. Wu‡, **N. Starkman**, S. Pearson, J. Nibauer, J. Miro-Carretero, D. Martinez-Delgado. *Potamides: Mapping Dark Matter Halo Shapes from Stellar Stream Tracks in the Local Universe.* The Astrophysical Journal ACCEPTED ADS arXiv:2605.07809
4. S. Wu‡, **N. Starkman**, J. Nibauer, S. Pearson. *Potamides: JAX tools for curvature-based inference from stellar streams.* Journal of Open Source Software 11, 10712 10.21105/joss.10712

3. J. Nibauer, A. Bonaca, D. N. Spergel, A. M. Price-Whelan, J. E. Greene, **N. Starkman**, et al. *StreamSculptor: Hamiltonian Perturbation Theory for Stellar Streams in Flexible Potentials with Differentiable Simulations*. The Astrophysical Journal 983, 68 10.3847/1538-4357/adb8e8 ADS arXiv:2410.21174
2. **N. Starkman**, A. M. Price-Whelan, J. Nibauer. *unxt: A Python package for unit-aware computing with JAX*. Journal of Open Source Software 10, 7771 10.21105/joss.07771
1. **N. Starkman**, J. Nibauer, J. Bovy, J. Webb, K. Tavangar, A. Price-Whelan, et al. *Stream Members Only: Data-Driven Characterization of Stellar Streams with Mixture Density Networks*. The Astrophysical Journal 980, 253 10.3847/1538-4357/ad94f2 ADS arXiv:2311.16960

Software Development

phasecurvefit 2026
Paths through phase space

potamides 2026
Constrain gravitational potentials from stellar stream curvature

galax
Galactic dynamics in JAX

coordinax
Coordinates in JAX

unxt 2025
Units in JAX

quax
Multiple dispatch in JAX

Astropy 2022
Astronomy in Python

Invited Talks

Aug 2026 **Marche III: Big Bang, Big Stars, Big Computers (Jesi)** — Jesi, Italy
Energy Structures of Extragalactic Stellar Streams Reveal Dark Matter Halos

Jun 2026 **EAS 26-S10 (Lausanne)** — Lausanne, Switzerland
The Geometry of Dark Matter Halos from Extragalactic Streams

Feb 2026 **CWRU Seminar (Cleveland)** — Cleveland, OH, USA
Computationally Unscrambling EGGS (Extra-Galactic Gravity from Streams)

Nov 2025 **TevPA (Valencia)** — Valencia, Spain
The Geometry of Dark Matter Halos from Extragalactic Streams

Oct 2025 **DARK seminar (Copenhagen)** — Copenhagen, Denmark
The Geometry of Dark Matter Halos from Extragalactic Streams

Oct 2025 **Texas A&M Seminar (Texas)** — College Station, TX, USA
The Geometry of Dark Matter Halos from Extragalactic Streams

Sep 2025 **CCA Software seminar (NYC)** — New York, NY, USA
unxt, coordinax, and software development in JAX

Sep 2025 **Princeton Thunch Seminar (Princeton)** — Princeton, NJ, USA
Euclid: The Geometry of Dark Matter Halos from Extragalactic Streams

Mentoring

May 2026 **Reem Hamraz Google Summer of Code for Astropy**
Hardening Astropy's core stability

2025 – 2026 **Amir Abdul (Howard)**
Baryon Modeling in External Galaxies with Stellar Streams
Leadership Alliance National Symposium, July 23–25, 2025
2025 NSBP-NSHP Joint Annual Conference, November 19–23, 2025
2026 APS Global Physics Summit, March 14–20, 2026

2024 – 2026 **Charlotte Myers (MIT) with Prof. Lina Necib (MIT)**
Physics-Informed Neural Networks for Modeling Galactic Gravitational Potentials
NeurIPS Paper

Peer Review

Journals — Astronomy & Astrophysics · The Astrophysical Journal · European Physical Journal C · Monthly Notices of the Royal Astronomical Society · Journal of Open Source Software (commensurability: a Python package for classifying astronomical orbits based on their toroid volume), Panels — National Science Foundation project funding panel