

*Multimessenger Astronomy, Transients, Bayesian Inference, Time-Series Analysis,
Design of Experiments, Reinforcement Learning*

Professional Experience

- Mar 2023 to present **Assistant Professor** *Drexel University*, Philadelphia, PA.
- 2021 – 2023 **Postdoctoral Research Associate** *California Institute of Technology*, Pasadena, CA.
Supervisor Prof. Matthew Graham
- 2018 – 2021 **Postdoctoral Research Associate** *Purdue University*, West Lafayette, IN.
Supervisor Prof. Dan Milisavljevic

Education

- 2013 – 2018 **Ph.D. in Physics and Astronomy** *Northwestern University*, Evanston, IL.
Adviser Prof. Vicky Kalogera
- 2011 – 2013 **M.S. in Physics and Astronomy** *Northwestern University*, Evanston, IL.
- 2006 – 2011 **Bachelor of Architecture (Honors) / Minor in Physics** *IIT*, Kharagpur, India.

Approved Programs: PI

- May 2025 to Apr 2027 Charles E. Kaufman Foundation – Urania E. Stott grant \$150,000
Title: *Optimizing constraints on the equation of state of neutron stars.*
- Sep 2023 to Aug 2026 NSF Advanced Technologies and Instrumentation (2307374) \$341,248
Title: *Optimal Follow-up for Multimessenger Astronomy.*
- Feb 2021 to Jul 2021 Las Cumbres Observatory - 1m/Sinistro (DDT2021A-003) 30 hours
Title: *Autonomous Real-time Value-driven Follow-up with LCO for Next-generation Surveys.*
- Nov 2020 to Nov 2022 HST Cycle 28 Theory Research (HST-AR-16154) \$104,000
Title: *Optimal Use of HST for Obtaining Statistical Constraints for SN IIB Progenitors and their Companions.*

Publications

Total citations: 832, h-index: 13

First Author (9).

- 2024 Machine-directed gravitational-wave counterpart discovery
the Astrophysical Journal, 974, 214
- 2023 Pythia: A prototype artificial agent for designing optimal gravitational-wave follow-up campaigns
accepted at Machine Learning and the Physical Sciences Workshop, NeurIPS
- 2021 Real-time science-driven follow-up of survey transients

- 2020 Progenitors of Type IIb Supernovae: II. Observable Properties
The Astrophysical Journal, 903, 70
- 2020 Real-time, Value-driven Data Augmentation in the Era of LSST
The Astrophysical Journal, 893, 127
- 2019 Progenitors of Type IIb Supernovae: I. Evolutionary Pathways and Rates
The Astrophysical Journal, 885, 130
- 2018 Constraints on the Progenitor System of SN 2016gkg from a Comprehensive Statistical Analysis
The Astrophysical Journal Letters, 852, L17
- 2016 Strongly time-variable ultraviolet metal-line emission from the circum-galactic medium of high-redshift galaxies
Monthly Notices of the Royal Astronomical Society, 463, 120
- 2014 Importance of Tides for Periastron Precession in Eccentric Neutron Star-White Dwarf Binaries
The Astrophysical Journal, 792, 138

Papers with significant Contribution (3) * indicates student projects.

- 2023 *HST Proper Motion Measurements of Supernova Remnant N132D: Center of Expansion and Age
The Astrophysical Journal, 848, 33
Banovetz et al., 3rd author
- 2021 The Center of Expansion and Age of the Oxygen-rich Supernova Remnant 1E0102.2-7219*
The Astrophysical Journal, 912, 33
Banovetz et al., 3rd author
- 2011 The Mass Distribution of Stellar-mass Black Holes
The Astrophysical Journal, 741, 103
Farr et al., 2nd author

Supported Papers (15) * indicates student projects.

- 2024 ZTF-observed late-time signals of pre-ZTF transients
submitted to Astronomy & Astrophysics
Terwel et al.
- 2024 The Green Monster hiding in front of Cas A: JWST reveals a dense and dusty circumstellar structure pockmarked by ejecta interactions
submitted to The Astrophysical Journal
De Looze et al.
- 2024 *Searching for gravitational wave optical counterparts with the Zwicky Transient Facility: summary of O4a
submitted to PASP
Ahumada et al.
- 2024 ZTF SN Ia DR2: Peculiar velocities impact on the Hubble diagram
submitted to Astronomy and Astrophysics
Carreres et al.
- 2024 A Study of Broad-lined Type Ic Supernovae from the Zwicky Transient Facility
accepted to The Astrophysical Journal
Srinivasaragavan et al.
- 2024 Probing pre-supernova mass loss in double-peaked Type Ibc SNe from the Zwicky Transient

- Facility *accepted to The Astrophysical Journal*
Das et al.
- 2024 Shockingly Bright Warm Carbon Monoxide Molecular Features in the Supernova Remnant Cassiopeia A Revealed by JWST *accepted to The Astrophysical Journal Letters*
Rho et al.
- 2024 A JWST Survey of the Supernova Remnant Cassiopeia A
The Astrophysical Journal Letters, 965, L27
Milisavljevic et al.
- 2023 Updated observing scenarios and multi-messenger implications for the International Gravitational-wave Network's O4 and O5 *submitted to The Astrophysical Journal*
Weizmann Kiendrebeogo et al.
- 2023 Growth-rate measurement with type-Ia supernovae using ZTF survey simulations progenitors *Astronomy & Astrophysics, 674, A197*
Bastien et al.
- 2023 *Inferencing Progenitor and Explosion Properties of Evolving Core-collapse Supernovae from Zwicky Transient Facility Light Curves *The Astrophysical Journal, 945, 46*
Subrayan et al.
- 2022 The prevalence and influence of circumstellar material around hydrogen-rich supernova progenitors *submitted to The Astrophysical Journal*
Bruch et al.
- 2022 NMMA: A nuclear-physics and multi-messenger astrophysics framework to analyze binary neutron star mergers *submitted to Nature Astronomy*
Pang et al.
- 2022 The Progenitor Companion Star of the Type Ib/c SN 2013ge
The Astrophysical Journal Letters, 929, L17
Fox et al.
- 2020 Three-dimensional Kinematic Reconstruction of the Optically Emitting, High-velocity, Oxygen-rich Ejecta of Supernova Remnant N132D *The Astrophysical Journal, 894, 73*
Law et al.

Invited Talks

- Sep 19, 2023 Physics Colloquium *Ohio State University, OH*
Title: *Autonomous Real-time Decision-making in the Era of Multi-messenger Astronomy.*
- Apr 17, 2023 A3D3 seminar *Virtual*
Title: *Autonomous Real-time Decision-making in the Era of Multi-messenger Astronomy.*
- Feb 3, 2023 MIFA colloquium *University of Minnesota, MN*
Title: *Autonomous Real-time Decision-making in the Era of Multi-messenger Astronomy.*
- Nov 2, 2022 Astrophysics seminar *University of Pennsylvania, PA*
Title: *Autonomous Real-time Decision-making in the Era of Multi-messenger Astronomy.*
- Feb 24, 2022 Physics Colloquium *Drexel University, PA*

- Title:** *Autonomous Real-time Decision-making in the Era of Multi-messenger Astronomy.*
- Dec 7, 2021 Big Data Analytics in Science and Engineering Virtual
- Title:** *Autonomous real-time science-driven follow-up in the era of LSST.*
- Jun 29, 2021 Machine Learning and Visualisation in Data Intensive Era: EAS Annual Meeting Virtual
- Title:** *Autonomous real-time science-driven follow-up in the era of LSST.*
- Sep 4, 2020 Rosen Center for Advanced Computing Friday Seminar Purdue University, IN
- Title:** *Autonomous real-time value-driven data augmentation in the era of big-data astronomy.*
- Oct 31, 2019 ITC Luncheon Center for Astrophysics, MA
- Title:** *Real-time Value-Driven Data Augmentation in the era of LSST.*
- Oct 30, 2019 High Energy Phenomena Seminar Center for Astrophysics, MA
- Title:** *Observational parameter space for SN I Ib progenitors from population-scale stellar evolution modeling.*
- May 26, 2017 KICP Friday Seminar University of Chicago, IL
- Title:** *Single and binary progenitors of Type I Ib supernovae.*

Mentoring

Graduate Students.

- Aug 2024 to present Gowri Govindaraj Drexel, PA
Project: Statistical inference of SN I Ib progenitor properties
- Jul 2023 to present Natalya Pletsikova Drexel, PA
Project: Forecasting kilonova light curves using low-latency GW alert data
- Oct 2021 to present Shreya Anand Caltech, CA
Project: Joint EM+GW probabilistic kilonova classification and preference for spectroscopy
- Sep 2019 to Apr 2021 Bhagya Subrayan Purdue University, IN
Project: Constraining explosion physics from sparse survey supernova light curves using MCMC, HMC, and Dynamic Nested Sampling
- Oct 2018 to Apr 2021 John Banovetz Purdue University, IN
Project: Estimating center of expansion and age of supernova remnants by tracking ejecta in multi-epoch HST imaging
- Nov 2015 to Dec 2016 Aprajita Hajela Northwestern University, IL
Project: Analytical modeling of binary orbital evolution with supernova kicks

Postbaccalaureate Students.

- Nov 2022 to Aug 2023 Abigail Gray University of Minnesota, MN
Project: Training dataset for gravitational and electromagnetic wave signals from compact binary coalescence

Undergraduate Students.

- Jun 2023 to Sep 2023 Naomi Hagan Drexel, PA

Jun 2022 to Aug 2022	Riti Agarwal	Caltech, CA
Jun 2019 to Sep 2020	Jack Reynolds	Purdue University, IN
Mar 2018 to May 2021	Carleen Markey	Purdue University, IN
Jun 2015 to Jun 2017	Chase Kimball	Northwestern University, IL
Jan 2015 to Jun 2017	Slobodan Mentovic	Northwestern University, IL

Fellowships

Jul 2016 to Jun 2017	IDEAS Data-Science Fellow ideas.ciera.northwestern.edu	Northwestern University, IL
Jun 2015 to Jun 2016	Reach for the Stars GK-12 Fellow gk12.ciera.northwestern.edu	Northwestern University, IL

Teaching

PHYS305 - Computational Physics II, Drexel, PA.

Winter 2024 Numerical differentiation, integration, ODE solvers, N-body solvers

LSSTC Data Science Fellowship Program, Philadelphia, PA.

Sep 2023 Multi-armed bandits - UCB/Thompson Sampling

Zwicky Transient Facility Summer School, Virtual.

2023 Real-time Decision-making in Astronomy

2021, 2022 Introduction to Machine Learning

Guest Lectures, Purdue University.

Spring 2021 Stars And Galaxies (ASTR 36400)

Fall 2020 Data Mine Astronomy (PHYS 39000)

Fall 2019 Cosmology (ASTR 370)

Teaching Assistant, Northwestern University.

Spring 2015 General Physics Laboratory - Introduction to Modern Physics (PHYSICS 136-3)

Winter 2015 Solar System (ASTRON 103-0)

Spring 2014 General Physics - Mechanics (PHYSICS 135-1)

Winter 2013, 2014 General Physics - Electricity and Magnetism (PHYSICS 135-2)

Spring 2013 General Physics - Introduction to Modern Physics (PHYSICS 135-3)

Fall 2012 College Physics Laboratory - Mechanics (PHYSICS 130-1)

MESA Tutorials, Northwestern University.

4 Quarters, Stellar Astrophysics (ASTRON 325-0/425-0)
2014 to 2016

AY **GK-12**, *Evanston Township High School*.
2015 – 2016 Advanced Astrophysics

Leadership

May 2022 Lead, Zwicky Transient Facility Machine Learning Working Group
to present
Jun 2016 Organizer, Northwestern Machine Learning Meetup
to Sep 2018 <http://www.meetup.com/NU-Machine-Learning-Meetup/>
Nov 2015 Chair, Committee on Diversity and Inclusion
to Nov 2016 Physics & Astronomy Graduate Student Council *Northwestern University, IL*
Nov 2015 Peer Inclusion Educator
to Jun 2016 Social Justice Education, Division of Student Affairs *Northwestern University, IL*

Service and Outreach (selected)

2017 to Referee for Nature, ApJ, MNRAS
Present
Jan 4 – 8, Crash Course in Computational Astrophysics (Winter School) *Hill Top School, Jamshedpur, India*
2016
Sep 22, 2015 WiSTEM Guest Speaker *Prospect High School, Mt. Prospect, IL*
Jan – Dec, Presenter for Einstein Evenings *Dearborn Observatory, IL*
2015
Nov 15, 2014 FUSE Workshop at Girls Do Hack *The Adler Planetarium, Chicago, IL*
Jul 17, 2014 Star Art with 3-5 year olds at *Chandler-Newberger Community Center, Evanston, IL*
Camp Kaleidoscope: Planets, Space and Sky