

Bruce Edelman

PHD CANDIDATE · PHYSICS · GRAVITATIONAL-WAVE ASTRONOMER

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Education

University of Oregon

Eugene, OR

MS, PHD PHYSICS

2017 - 2023

- Advisor: Dr. Ben Farr
- Thesis Title: Binary Black Hole Astrophysics with Gravitational Waves

Purdue University

West Lafayette, IN

BS PHYSICS

2013 - 2017

- Advisor: Dr. Chen-Lung Hung
- Minor in Mathematics

Research Interests

Astrophysics of merging compact binaries through the characterization of and their population properties with gravitational-wave observations.

Gravitational waves as a novel probe for cosmology and fundamental physics.

Advanced Bayesian statistics and machine learning techniques applied to complex astrophysical data sets.

Professional Experience

2022 - **Graduate Teaching Assistant**, Department of Physics

University of Oregon

2018 - **Graduate Research Assistant**, Department of Physics

University of Oregon

2017 - 2019 **Graduate Teaching Assistant**, Department of Physics

University of Oregon

2016 - 2017 **Undergraduate Research Assistant**, Department of Physics & Astronomy

Purdue University

2015 - 2017 **Undergraduate Teaching Assistant**, Department of Physics & Astronomy

Purdue University

2015 **Undergraduate Research Assistant**, Department of Nuclear Engineering

Purdue University

Publications

PUBLISHED (* DENOTES FIRST AUTHOR WORK)

* Ain't No Mountain High Enough: Semi-Parametric Modeling of LIGO/Virgo's Binary Black Hole Mass Distribution.

B. Edelman, Z. Doctor, J. Godfrey, B. Farr. *Astrophys. J.*, **924**, 101 (2022).

Transient glitch mitigation in Advanced LIGO data with *glitschen*.

J.D. Merritt, B. Farr, R. Hur, **B. Edelman**, Z. Doctor. *Phys. Rev. D*, **104**, 102004 (2021).

* Poking Holes: Looking for Gaps in LIGO/Virgo's Black Hole Population.

B. Edelman, Z. Doctor, B. Farr. *Astrophys. J. Lett.*, **913**, L23 (2021).

Population Properties of Compact Objects from the Second LIGO-Virgo Gravitational-Wave Transient Catalog.

R. Abbott, et al. incl. **B. Edelman**. *Astrophys. J. Lett.*, **913**, L7 (2021).

Contributions: Event characterization, and comments on the draft.

When are LIGO/Virgo's Big Black Hole Mergers?

M. Fishbach, Z. Doctor, T. Callister, **B. Edelman**, et al. *Astrophys. J.*, **912**, 98 (2021).

GWTC-2: Compact Binary Coalescences Overserved by LIGO and Virgo during the First Half of the Third Observing Run.

R. Abbott, et al. incl. **B. Edelman**. *Phys. Rev. X*, **11**, 021053 (2021).

Contributions: Event characterization.

* Constraining Unmodeled Physics with Compact Binary Mergers from GWTC-1.
B. Edelman, F. Rivera-Paleo, J.D. Merritt, B. Farr, et al. *Phys. Rev. D*, **103**, 042004 (2021).

Bayesian Inference for Compact Binary Coalescences with bilby: Validation and Application to the First LIGO–Virgo Gravitational-Wave Transient Catalogue. I. Romero-Shaw, C. Talbot, S. Biscoveanu, et al. incl. **B. Edelman**.
MNRAS, **499**, 3295–3319 (2020).

IN REVIEW

Things that might go bump in the night: Assessing structure in the binary black hole mass spectrum.
A. Farah, **B. Edelman**, et al. Submitted to *Astrophys. J.* [2301.00834](#)

* Cover Your Basis: Comprehensive Data Driven Characterization of the Binary Black Hole Population.
B. Edelman, B. Farr, Z. Doctor. Accepted by *Astrophys. J.* [2210.12834](#)

The population of merging compact binaries inferred using gravitational waves through GWTC-3.
R. Abbott, et al. incl. **B. Edelman**. Accepted by *Phys. Rev. X*. [2111.03634](#)
Contributions: Served on the Editorial and review teams and led analyses inferring the BBH mass distribution.

COLLABORATION PAPERS

Listed as an author on all publications with the LIGO Scientific Collaboration from December 2019-Present. For a complete list see my [ORCID](#) or [ADS](#) pages.

Awards

2017 **Richard W. King Award**, Department of Physics & Astronomy
2014 - 2017 **Semester Honors**, College of Science

Purdue University
Purdue University

Presentations

TALKS

Exploring the Population of Merging Compact Objects with Data-Driven Models, **B. Edelman**. December 2022. Virtual LIGO Laboratory Seminar

New Insights into the Population Properties of CBCs with GWTC-3, **B. Edelman**. June 2022. Presented at the 2022 Gravitational Wave Astronomy Northwest Meeting, held at LIGO Hanford.

Introduction to Hierarchical Bayesian Inference with CBCs, **B. Edelman**. June 2022. Presented at the 2022 Gravitational Wave Astronomy Student Workshop Tutorials, held at LIGO Hanford.

Semi-parametric Hierarchical Inference of LIGO-Virgo's Binary Black Hole Mass Distribution, **B. Edelman**. April 2022. Presented the 2022 American Physical Society April Meeting in New York City.

Gravitational-Wave Source Inference with Data-Driven Models, **B. Edelman**. Jan 2022. Presented virtually at Perimeter Institute's Strong Gravity Seminar. [Recording](#)

Resolving Features in LIGO/Virgo's Binary Black Hole Mass Distribution, **B. Edelman**. June 2021. Presented at the 2021 Gravitational Wave Astronomy Northwest Meeting, held virtually.

Gravitational Wave Astrophysics in the Catalog Era, **B. Edelman**. May 2021. Presented in the Institute for Fundamental Science Seminar Series at the University of Oregon.

Searching for Unmodeled Physics with Coherent Splines in LALInference, **B. Edelman**. June 2019. Presented at the 2019 Gravitational Wave Astronomy Northwest Meeting, held at LIGO Hanford.

POSTERS

Comprehensive Data Driven Characterization of the Binary Black Hole Population, **B. Edelman**. January 2023. Poster presented virtually at the 241st meeting of the American Astronomical Society.

Semi-Parametric Hierarchical Inference of the Binary Black Hole Mass Spectrum, **B. Edelman**. November 2021. Poster presented at the IPAM Gravitational-wave Astronomy Workshop III: Source Inference and Parameter Estimation in Gravitational-wave Astronomy held at UCLA.

Non-parametric Modeling in Gravitational-Wave Astrophysics, **B. Edelman**. June 2021. Poster presented at the virtual Statistical Challenges in Modern Astronomy VII conference held by Penn State University.

Teaching Experience

03/22 - 06/22	PHYS 422 , Teaching Assistant	<i>University of Oregon</i>
09/18 - 06/19	ASTR 121-123 , Teaching Assistant	<i>University of Oregon</i>
06/18 -	High School / College Physics and Math , Private Tutor	<i>Lane Tutoring Service</i>
04/18 - 06/18	PHYS 153 , Teaching Assistant	<i>University of Oregon</i>
09/17 - 03/18	PHYS 201-202 , Teaching Assistant	<i>University of Oregon</i>
08/15 - 05/17	PHYS 172 , Undergraduate Teaching Assistant	<i>Purdue University</i>

Research Mentoring

08/21 -	Jaxen Godfrey , NSF Graduate Research Fellow	<i>University of Oregon</i>
07/21 -	Lexi Vives , Undergraduate Researcher	<i>University of Oregon</i>
07/21 -	Jon Hornung , High school Physics Teacher	<i>University of Oregon</i>
05/21 - 06/22	Rachel Hur , Undergraduate Researcher	<i>University of Oregon</i>

Outreach, Press, Professional Development & Technical Skills

SERVICE AND OUTREACH

09/2022-	Skype a Scientist , Volunteer Scientist	<i>K-12 Classrooms</i>
09/2022-	UO Physics Grad Student Mentor Program , Grad Student Mentor	<i>University of Oregon</i>
06/2022	GWANW 2022 LIGO Data Tutorial , Coordinator/Instructor	<i>LIGO Hanford</i>
05/2022	2022 GW Open Data Workshop Oregon Study Hub , Coordinator/Leader	<i>University of Oregon</i>
02/2021	Oregon Junior Science and Humanities Symposium , Volunteer Judge	

PRESS

12/2021	New research Effort Shines More Light on Black Hole Collisions ,	<i>UOregon News</i>
08/2021	Addressing a Gap in Our Knowledge of Black Holes ,	<i>AAS Nova Highlight</i>

TECHNICAL SKILLS

Python, Julia, C/C++, MATLAB, Vim, Linux, L^AT_EX, HTCONDOR, SLURM, Bash, Mathematica, Git, PyMC, Tensorflow, PyTorch, Pyro, Jax, NumPyro, [LALINFERENCE](#), [BILBY](#)

SOFTWARE PROJECTS

[GWINFERNO](#): Gravitational-Wave Hierarchical Inference with NumPyro.

PROFESSIONAL

2021 IPAM Gravitational-Wave Astronomy Workshop III: Source Inference and Parameter Estimation in Gravitational Wave Astronomy. Nov 2021. I attended this IPAM workshop to learn state-of-the-art approaches to parameter estimation and inference in gravitational-wave astrophysics.

2021 Penn State University Astrostatistics Summer School. June 2021. I attended the virtual 2021 PSU Astrostatistics summer school where I learned how to apply robust statistical methods to various types of astronomical data sets.

Peer Reviewer:

- The Astrophysical Journal Letters

Member:

- LIGO Scientific Collaboration
- Cosmic Explorer Consortium