## Michael J. Zevin

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### **Education**

**Northwestern University** 

Evanston, IL

PhD Candidate

2014 - present

- Department of Physics and Astronomy; Research Advisor: Dr. Vicky Kalogera
- Master of Science: Awarded Fall, 2016

# **University of Illinois Urbana-Champaign**

Champaign, IL

Bachelor of Science

2008 - 2012

- Double Major in Astronomy and Physics, Minor in Music Performance

#### **Research Interests**

Gravitational wave astrophysics, parameter estimation, and detector characterization; binary stellar evolution, formation of compact binaries, X-ray binaries, stellar dynamics, cluster dynamics, and population synthesis; machine learning applications to astrophysical data science and citizen science.

#### **Featured Publications**

**Zevin, M.**; Kremer, K.; Siegel, D. M.; Coughlin, S.; Tsang, B. T.-H.; Berry, C. P. L.; Kalogera, V. "Can Neutron-Star Mergers Explain the r-process Enrichment in Globular Clusters?", *The Astrophysical Journal*, submitted (2019).

Rodriguez, C. L.; **Zevin, M.**; Amaro-Seoane, P.; Chatterjee, S.; Kremer, K.; Rasio, F. A.; Ye, C. S., "Black Holes: The Next Generation", *Physics Review D* submitted (2019).

**Zevin, M.**; Samsing, J.; Rodriguez, C. L.; Haster, C. J.; Ramirez-Ruiz, E. "Eccentric Black Hole Mergers in Dense Star Clusters: The Role of Binary-Binary Encounters", *The Astrophysical Journal* 871, 1 (2019).

LIGO Scientific Collaboration and Virgo Collaboration.<sup>1</sup> "On the Progenitor of Binary Neutron Star Merger GW170817", *The Astrophysical Journal Letters* 850, L40 (2017).

**Zevin, M.**; Pankow, C.; Rodriguez, C. R.; Sampson, L.; Chase, E. A.; Kalogera, V.; Rasio, F. A. "Constraining Formation Models of Binary Black Holes with Gravitational-wave Observations", *The Astrophysical Journal* 846, 82 (2017).

**Zevin, M.**; Coughlin, S.; Bahaadini, S.; Besler, E.; Rohani, N.; Allen, S.; Cabero, M.; Crowston, K.; Katsaggelos, A. K.; Larson, S. L.; Lee, T. K.; Lintott, C.; Littenberg, T. B.; Lundgren, A.; sterlund, C.; Smith, J. R.; Trouille, L.; Kalogera, V. "Gravity Spy - Integrating Advanced LIGO Detector Characterization, Machine Learning, and Citizen Science", *Classical and Quantum Gravity* 34, 6 (2017).

Rodriguez, C. L.; **Zevin, M.**; Pankow, C.; Kalogera, V.; Rasio, F. A. "Illuminating Black Hole Binary Formation Channels with Spins in Advanced LIGO", *The Astrophysical Journal Letters*, 832, L2 (2016).

<sup>&</sup>lt;sup>1</sup>MZ: Chair of paper-writing team and analysis lead

# **Contributed Publications**

Kremer, K; Rodriguez, C. L.; Amaro-Seoane, P.; Breivik, K.; Chatterjee, S.; Katz, M. L.; Larson, S. L.; Rasio, F. A.; Samsing, J.; Ye, C. S.; **Zevin, M.** "Post-Newtonian Dynamics in Dense Star Clusters: Binary Black Holes in the LISA Band", *arXiv*:1811.11812 (2019).

Rodriguez, C. L.; Amaro-Seoane, P.; Chatterjee, S.; Kremer, K.; Rasio, F. A.; Samsing, J.; Ye, C. S.; **Zevin, M.** "Post-Newtonian dynamics in dense star clusters: Formation, masses, and merger rates of highly-eccentric black hole binaries", *Physics Review D* 98, 12 (2018).

Bahaadini, S.; Noroozi, V.; Rohani, N.; Coughlin, S.; **Zevin, M.**; Katsaggelos, A. K. "DIRECT: Deep Discriminative Embedding for Clustering of LIGO Data", *IEEE International Conference on Image Processing* (2018).

Bahaadini, S.; Noroozi, V.; Rohani, N.; Coughlin, S.; **Zevin, M.**; Smith, J. R.; Kalogera, V.; Katsaggelos, A. K. "Machine learning for Gravity Spy: Glitch classification and dataset", *Information Sciences Journal* 444, 172-186 (2018).

Pankow, C.; Chase, E. A.; Coughlin, S.; **Zevin, M.**; Kalogera, V. "Improvements in Gravitational-wave Sky Localization with Expanded Networks of Interferometers", *The Astrophysical Journal Letters* 854, L25 (2018).

Bahaadini, S.; Rohani, N.; Coughlin, S.; **Zevin, M.**; Kalogera, V.; Katsaggelos, A. K. "Deep Multi-view Models for Glitch Classification", *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, New Orleans, LA. (2017).

Sanders, N. E.; Kohler, S.; Faesi, C.; Villar, A.; **Zevin, M.** "Incorporating current research into formal higher education settings using Astrobites", *American Journal of Physics* 85, 741 (2017).

Pankow, C.; Sampson, L.; Perri, L.; Chase, E. A.; Coughlin, S.; **Zevin, M.**; Kalogera, V. "Astrophysical Prior Information and Gravitational-wave Parameter Estimation", *The Astrophysical Journal* 834, 154 (2017). March

### Collaboration Publications (As part of the LIGO-Virgo Collaboration)

LIGO Scientific Collaboration and Virgo Collaboration.<sup>2</sup> "GW170817: Observation of Gravitational Waves from a Binary Neutron Star Inspiral", *Physical Review Letters* 119, 16 (2017).

LIGO Scientific Collaboration and Virgo Collaboration. "Observation of Gravitational Waves from a Binary Black Hole Merger", *Physics Review Letters*, 116, 6 (2016).

### **Invited Talks**

"Unveiling the Lives and Deaths of Stars through Compact Object Mergers", *University of Wisconsin-Milwaukee*, *CGCA Seminar*, Milwaukee, WI (March 2019)

"From the Detected to the Detectors: Using Gravitational Waves to Enable Insights from the Stellar Graveyard & the Next Generation of Citizen Science", *University of Portsmouth Astronomy seminar*, Portsmouth, UK (March 2018)

"From the Detected to the Detectors: Using Gravitational Waves to Enable Insights from the Stellar Graveyard & the Next Generation of Citizen Science", *Oxford University SPI-MAX seminar*, Oxford, UK (February 2018)

<sup>&</sup>lt;sup>2</sup>MZ: Education and Public Outreach Liaison

"Revealing the Lives of Stars through the Cataclysmic Collisions of Black Holes", *Seven Minutes of Science: An Interdisciplinary Symposium*, Evanston, IL (April 2017)

### **Contributed Talks**

- "Eccentric Black Hole Mergers in Dense Star Clusters: Post-Newtonian Effects & Higher Multiplicity Encounters", *Aspen Winter Conference 2019: Astrophysics with Gravitational-Wave Populations*, Aspen, CO (February 2019)
- "Eccentric Black Hole Mergers in Dense Star Clusters: The Role of Binary-Binary Encounters", *American Astronomical Society 233rd Conference*, Seattle, WA (January 2019)
- "Gravity Spy: Integrating Gravitational-Wave Astrophysics, Machine Learning, and Citizen Science", *National Science Foundation Research Traineeship Annual Meeting*, Washington, DC (September 2018)
- "The Role of Binary-Binary Interactions in Inducing Eccentric Black Hole Mergers", *MODEST-18: Dense Stellar Systems in the Era of GAIA, LIGO & LISA*, Santorini, Greece (June 2018)
- "On the Progenitor of Binary Neutron Star Merger GW170817", APS April Meeting, Columbus, OH (April 2018)
- "The Future of Citizen Science: Coupling Crowdsourcing and Machine Learning", *Detecting the Unexpected: Discovery in the Era of Astronomically Big Data*, Baltimore, MD (March 2017)
- "Discriminating Formation Channels of Binary Black Hole Systems with Advanced LIGO", *APS April Meeting*, Washington, DC (January 2017)
- "Discriminating Formation Channels of Binary Black Hole Systems with Advanced LIGO", *American Astronomical Society 229th Conference*, Grapevine, TX (January 2017)
- "Astrobites: Engaging Undergraduate Science Majors with Current Astrophysical Research" (workshop & poster), *American Astronomical Society 229th Conference*, Grapevine, TX (January 2017)
- "Gravity Spy Integrating aLIGO detector characterization, machine learning, and citizen science", *American Astronomical Society 228th Conference*, San Diego, CA (June 2016)
- "Integrating aLIGO detector characterization, machine learning, and citizen science" (poster), *Computational Research Day*, Northwestern University (April 2016)
- "LIGO glitch classification through the combination of machine learning and citizen science", *Midwest Relativity Meeting*, Northwestern University (September 2015)

### Awards, Grants & Honors

Avery Coonley School, Graduation Keynote Speaker	June 2018
Oxford Centre for Cosmological Studies Balzan Visiting Fellow <sup>3</sup> Jar	n 2018 - Feb 2018
Illinois Space Grant Consortium Graduate Student Fellowship	2017
Kavli Summer Program in Astrophysics Graduate Student Fellow <sup>4</sup> July 20	017 - August 2017
NSF GK-12 Graduate Fellow Ju	ine 2017 - present
IDEAS Data Science Fellow	ine 2016 - present
Breakthrough Prize in Fundamental Physics, as part of the LIGO Scientific Collaboration .	May 2016
American Astronomical Society Media Intern	June 2016
Poster competition winner - Computational Research Day at Northwestern University	Apr 2016
High distinction in Physics - University of Illinois Urbana-Champaign	May 2012

# **Affiliations & Leadership Positions**

- Astrobites Administrator and Author
- ComSciCon National Organizing Committee
- LIGO Scientific Collaboration Member
- Physics and Astronomy Graduate Student Council Quality of Life Chair
- CIERA Compact Objects Coffee Chair
- Rapid Fire Research Chair
- American Physical Society Member
- American Astronomy Society Junior Member
- Caltech Gravitational Wave Astrophysics School (2015) Participant
- Chicago Metropolitan Symphony Orchestra Double Bassist
- Draft Week (rock band) Bass Guitarist & Keyboardist

# **Teaching Experience**

- Northwestern University / Evanston Township High School Reach for the Stars Graduate Student Fellow (June 2017 May 2018)
  - Taught in classrooms and developed coding-based curriculum for high-school Astronomy and Astrophysics classes, as part of the NSF GK-12 Grant DGE-1007911
- Northwestern University Astronomy Teaching Assistant, REU Supervisor (Sept 2015 June 2016)
  - Lectured, graded, and ran telescope observing sessions for introductory astronomy classes, supervised undergraduate REU student Yuqi Yun and high school students on summer research projects
- Kids Science Labs Lead Teacher

(Sept 2013 - Aug 2015)

- Taught classes of 2-12 year old students in hands-on, experiential science classes, designed curriculum for science summer camps
- Adler Planetarium Science Leadership Corps Instructor, Mission Specialist (Sept 2012 Aug 2014)
  - Designed educational programs, facilitated exhibits, presented science talks, led students in high-altitude balloon launches

<sup>&</sup>lt;sup>3</sup>Research Advisor: Dr. Chris Lintott (New College, University of Oxford)

<sup>&</sup>lt;sup>4</sup>Research Advisor: Dr. Enrico Ramirez-Ruiz (University of California Santa Cruz)

#### **Outreach**

### • Ongoing Outreach

- ASTROBITES Author and administrator for popular astronomy blog partnered with the AAS, which
  provides daily summaries of recent astronomy research articles (Nov 2014 present)
- SPACE VISUALIZATION LABORATORY Deliver monthly public presentations at the Adler Planetarium for museum guests (Apr 2014 - present)
- COMSCICON Program Organizing Committee for national science communication workshop for graduate students in STEM fields (June 2018 - present)
- ASTRONOMY ON TAP CHICAGO Organize, host, and give talks at astronomy outreach events at bars and breweries in the Chicago-land area, which include astronomy talks and space-based trivia (Sept 2015 - present)
- RAPID FIRE RESEARCH Created, organized, and chaired an annual research presentation event for Northwestern's Department of Physics and Astronomy, in which Northwestern graduate and undergraduate students give 5-minute presentations on their research, with prizes awarded for the top presentations (Sept 2016 - present)
- ASTRONOMER EVENINGS Present on various astronomical topics to the general public during observing hours of the historic Dearborn Observatory (Sept 2016 - present)

#### • Outreach Publications

- THE LEGACY OF SCIENTIFIC DISCOVERY, Northwestern Helix magazine (Jul 2016)
- THE GRAVITY SPY PROJECT MACHINE LEARNING AND CITIZEN SCIENCE, LIGO magazine (Mar 2017)

#### • Prior Outreach

- MACHINE LEARNING MEETUPS Organize and host interdisciplinary colloquium related to data science and machine learning topics, attended by the Northwestern and greater Chicago-land community (Sept 2016 - Sept 2018)
- CHICAGOLAND SCIENCE PENPALS Actively correspond with students in Chicago public schools about scientific research and science as a profession, using handwritten letters (Mar 2017 Jun 2017)
- EINSTEIN EVENINGS Host Northwestern's Dearborn Observatory and give monthly presentations during observing hours on General Relativity and LIGO discoveries in celebration of the 100th anniversary of Einsteins theory (Sept 2015 - Aug 2016)
- TAKE OUR CHILDREN TO WORK DAY Nortwestern University (April 2018, April 2016)
- KEYNOTE SPEAKER Chipping Norton Amateur Astronomy Group (February 2018)
- KEYNOTE SPEAKER Chicago Astronomical Society (May 2017)
- INVITED SPEAKER Haven Midde School (April 2018, April 2017)
- INVITED SPEAKER Avery Coonley School (May 2017)
- INVITED SPEAKER Highcrest Elementary (March 2017)
- INVITED SPEAKER Nettlehorst Elementary, designed and instructed classes on the physics of music to middle school students (February 2016)