# Tarraneh Eftekhari

NASA Einstein Fellow, CIERA, Northwestern University

teftekhari@northwestern.edu ◇ www.tarraneheftekhari.com

## Research Interests

I leverage radio, millimeter, and X-ray observations of energetic transients, including **fast radio bursts**, **supernovae**, and **tidal disruption events**, to answer key questions about their **progenitors**, **outflows**, and **environments**.

## Education

Harvard University 2021
**Ph.D**, Astronomy and Astrophysics
Thesis: Unveiling the Transient Radio and Millimeter Sky
Advisor: Edo Berger, Ph.D.

Harvard University 2017
**M.A.**, Astronomy and Astrophysics

University of New Mexico 2015
**B.S.**, Astrophysics, Minor in Mathematics, *Magna Cum Laude*

## Related Employment

NASA Einstein Fellow, Northwestern University 2022–Present

CIERA Postdoctoral Fellow, Northwestern University 2021–2022

Content Developer, HarvardX 2017–2020

- University Chemistry: Molecular Foundations and Global Frontiers
- Reclaiming Argument: An Introduction to Logical Reasoning
- The FDA and Prescription Drugs: Current Controversies in Context
- Science of the Physical Universe 30: Super-Earths and Life
- Fundamentals of Neuroscience Part 3: The Brain

Laboratory Assistant, Harvard University 2015–2016
Supervisor: Lincoln Greenhill, Ph.D.

Telescope Operator, Long Wavelength Array, University of New Mexico 2013–2015

Summer Research Assistant, ASTRON 2014
Supervisor: Richard Fallows, Ph.D.

## Teaching & Advising

Co-Advisor, Yuxin Dong, Graduate Student, Northwestern University 2021–Present
Potential Analogs of a Repeating Fast Radio Burst

Tutor, Northwestern Prison Education Program 2022–Present
Robert Boyd, Undergraduate
Brian McClendon, Undergraduate

Head Teaching Fellow, Harvard University Spring 2017, 2018, 2019
Course: Science of the Physical Universe 22: From the Big Bang to the Brontosaurus and Beyond
Prof: Irwin Shapiro, Ph.D.

## Awards

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|---|---|
| NASA Hubble Fellowship Program Einstein Fellowship | 2022 |
| ALMA Ambassador | 2021 |
| CIERA Postdoctoral Fellowship | 2021 |
| ALMA Cycle 7 Student Observing Support | 2019 |
| ALMA Cycle 6 Student Observing Support | 2018 |
| National Science Foundation Graduate Research Fellowship Honorable Mention | 2017 |
| Harvard University Bok Center Certificate of Distinction in Teaching | 2017 |
| La Serena School for Data Science Full Scholarship | 2017 |
| New Mexico Space Grant Consortium Scholarship | 2014 |
| University of New Mexico Undergraduate Research Award | 2013 |

## Telescope Time Allocations (as PI)

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| Very Large Array (VLA) | 427 hr |
| Including 286 hours through a VLA Large Program (24A-331) | |
| Atacama Large Millimeter/submillimeter Array (ALMA) | 39 hr |
| Very Long Baseline Array (VLBA) | 3 hr |
| Arecibo | 15 hr |
| Chandra *(Total Support Funding: $186,746 USD)* | 289 ks |
| Submillimeter Array | 7 tracks |
| Australia Telescope Compact Array | 36 hours |
| XMM Newton | 120 ks |
| Gemini *(Large and Long Program)* | 200 hr |

## Professional Service

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| Deputy Co-Chair, *CMB-S4 Sources & Transients Working Group* | 2023–Present |
| Referee for *ApJ, ApJL, & MNRAS* | 2019–Present |
| Liaison to CHIME/FRB, *Fast and Fortunate for FRB Follow-up Collaboration* | 2021–Present |
| Panel Member, *NASA Review* | 2023 |
| Seminar Coordinator, Astronomy Seminar, *CIERA, Northwestern University* | 2022–2023 |
| Coordinator, Journal Club, *CIERA, Northwestern University* | 2022–2023 |
| Panel Member, NRAO Annual Program Review, *National Science Foundation* | 2022 |
| Peer Review Facilitator, *Chandra Cycle 19 Peer Review* | 2017 |
| Telescope Operator, *University of New Mexico* | 2013–2015 |

## Outreach

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| Tutor, *Northwestern Prison Education Program (NPEP)* | 2021–Present |
| Co-chair, Academic Support Committee at Stateville Correctional Center, *NPEP* | 2021–2022 |
| Seminar Coordinator, *Beacon Hill Seminars* | 2018–2020 |
| Speaker Chair and Blog Writer, *Harvard Science in the News* | 2016–2019 |
| Mentor to first-year graduate students, *Harvard Astronomy* | 2019 |
| Graduate student panelist, *Smithsonian Astrophysical Observatory Solar Physics REU* | 2019 |
| Local Organizing Committee, *ComSciCon* | 2018 |
| Poster Judge, *National Collegiate Research Conference* | 2018 |
| Volunteer, *Cambridge Explores the Universe* | 2018 |
| Graduate student panelist, *Wellesley College* | 2017 |
| Mentor, *Science Club for Girls* | 2016–2017 |
| Digital Mentor, *YouthAstroNet* | 2016–2017 |
| Mentor, *Harvard University Women in Stem* | 2016 |

## Professional Development

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|---|---|
| ALMA Ambassador Training | 2022 |
| GROWTH Astronomy School: Follow up of transients in the era of multi-messenger astronomy | 2019 |
| ICRAR/CASS Radio School | 2019 |
| Jerusalem Winter School in Theoretical Physics, The Physics of Astronomical Transients | 2018 |
| La Serena School of Data Science: Applied Tools for Data Driven Sciences | 2017 |
| NRAO Synthesis Imaging Workshop | 2014, 2016, 2022 |

## Invited Talks

1. University of Illinois Urbana-Champaign **Colloquium** 2023
2. The Astrophysics of Fast Radio Bursts II, Flatiron Institute 2023
3. UC Santa Cruz **Colloquium** 2023
4. Multi-wavelength follow-up of FRBs in the era of routine (sub)arcsecond localizations, University of Toronto 2023
5. University of British Columbia **Colloquium** 2023
6. Herzberg Astronomy and Astrophysics Research Centre **Colloquium** 2023
7. Kavli Institute for Cosmological Physics, University of Chicago **Seminar** 2023
8. Florida State University Astrophysics **Seminar** 2022
9. IAU Symposium 369: The Dawn Of Cosmology & Multi-Messenger Studies With Fast Radio Bursts 2022
10. Astrophysics with the CMB-S4 Survey – Part II: Source and Transient Science 2022
11. Caltech Tea Talk 2022
12. Pennsylvania State University Transients Group 2022
13. CMB-S4 Spring 2021 Collaboration Meeting 2021
14. The Astrophysics of Fast Radio Bursts, Flatiron Institute 2020
15. Toronto FRB Day, CITA/Dunlap Institute 2019
16. FRBs and their Possible Neutron Star Origins, Amsterdam 2019
17. Columbia University, Department of Astronomy Pizza Lunch 2019
18. Institute for Theory and Computation Luncheon, Harvard University 2019

## Public Talks

1. Amateur Astronomers, Inc 2022
2. Astronomical Society of the Palm Beaches 2022
3. Gloucester Area Astronomy Club 2021
4. New Hampshire Astronomical Society 2018

## Conference Contributions

1. Catching the Jet Shut Off in the Relativistic Tidal Disruption Event AT2022cmc *(Talk) American Astronomical Society 243rd Meeting* 2023

2. Elucidating the Origin of Fast Radio Bursts with Radio and X-ray Observations *(Talk)* 2022
*NHFP Fellows Symposium*

3. Extragalactic Millimeter Transients in the Era of Next-Generation CMB Surveys *(Talk)* 2022
*3rd URSI Atlantic Radio Science Meeting*

4. Millimeter Transients in the Era of CMB Surveys *(Talk)* 2021
*Spoken-WERRD Symposium*

5. Unveiling the Progenitors of Superluminous Supernovae with Radio and Millimeter Observations *(Talk)* 2020
*Narayan Group Meeting, Center for Astrophysics | Harvard and Smithsonian*

6. Unveiling the Progenitors of Superluminous Supernovae with Radio and Millimeter Observations *(Talk)* 2020
*TUNA Talk, National Radio Astronomy Observatory*

7. Late-time Radio Observations of Superluminous Supernovae: Implications for Central Engines and Fast Radio Bursts *(Talk)* 2020
*Compact Objects Group Meeting, Flatiron Center for Computational Astrophysics*

8. Late-time Radio and Millimeter Observations of Superluminous Supernovae and Long Gamma-ray Bursts *(Poster)* 2020
*Royal Astronomical Society Early Career Poster Exhibition*

9. Millimeter Transients with CMB-S4 *(Talk)* 2020
*CMB-S4 Spring 2020 Collaboration Meeting, Lawrence Berkeley National Laboratory*

10. Millimeter Transients in the Era of CMB Surveys *(Talk)* 2019
*Astrophysics with the CMB-S4 Survey, University of Chicago*

11. Tidal Disruption Events and Fast Radio Burst *(Talk)* 2018
*Transients Group Meeting, CIERA Northwestern University*

12. Radio Monitoring of the Tidal Disruption Event Swift J1644+57 *(Poster)* 2018
*Jerusalem Winter School in Theoretical Physics, The Physics of Astronomical Transients*

13. On the Association of Fast Radio Bursts and Their Hosts *(Talk)* 2017
*Workshop on Fast Radio Bursts, McGill University*

14. Multi-wavelength Monitoring of the Relativistic TDE Swift J1644+57 *(Poster)* 2017
*American Astronomical Society 229th Meeting*

15. Tidal Disruption Events: A Multi-Wavelength Approach *(Talk)* 2016
*Time-Domain Astrophysics in the American Northeast*

16. A Low Frequency Survey of Giant Pulses from the Crab Pulsar *(Poster)* 2015
*American Astronomical Society 225th Meeting 2015*

## Publications

I have been an author on 58 publications with $>$ 8000 citations, including **9 first-author publications**, and 2 second-author publications. A full listing of my publications can be found on the ADS.

### First Author Publications

1. *An X-ray Census of Fast Radio Burst Host Galaxies: Constraints on AGN and X-ray Counterparts*
**T. Eftekhari**, W. Fong, A. C. Gordon, et al.
2023, ApJ, 958, 66, pp. 19 (arXiv: 2307.03766)

2. *Extragalactic Millimeter Transients in the Era of Next Generation CMB Surveys*
**T. Eftekhari**, E. Berger, B. D. Metzger, et al.
2022, ApJ, 935, 16, pp. 19 (arXiv: 2110.05494)

3. *Late-time Radio and Millimeter Observations of Superluminous Supernovae and Long Gamma-Ray Bursts: Implications for Obscured Star Formation, Central Engines, and Fast Radio Bursts*
**T. Eftekhari**, B. Margalit, C. M. B. Omand, et al.
2021, ApJ, 912, 21, pp. 23 (arXiv:2010.06612)

4. *Wandering Massive Black Holes or Analogs of the First Repeating Fast Radio Burst?*
**T. Eftekhari**, E. Berger, B. Margalit, B. D. Metzger, P. K. G. Williams
2020, Astrophysical Journal, 895, 98, pp. 10 (arXiv:2001.02688)

5. *A Radio Source Coincident with the Superluminous Supernova PTF10hgi: Evidence for a Central Engine and an Analogue of the Repeating FRB121102?*
**T. Eftekhari**, E. Berger, B. Margalit, et al.
2019, Astrophysical Journal Letters, 876, L10, pp. 10 (arXiv:1901.10479)

6. *Associating Fast Radio Bursts with Extragalactic Radio Sources: General Methodology and a Search for a Counterpart to FRB 170107*
**T. Eftekhari**, E. Berger, P. K. G. Williams, P. K. Blanchard
2018, Astrophysical Journal, 860, 73, pp. 9 (arXiv:1802.09525)

7. *Radio Monitoring of the Tidal Disruption Event Swift J164449.3+573451. III. Late-time Jet Energetics and a Deviation from Equipartition*
**T. Eftekhari**, E. Berger, B. A. Zauderer, et al.
2018, Astrophysical Journal, 854, 86, pp. 12 (arXiv:1710.07289)

8. *Associating Fast Radio Bursts with Their Host Galaxies*
**T. Eftekhari** & E. Berger
2017, Astrophysical Journal, 849, 162, pp. 7 (arxiv:1705.02998)

9. *A Low Frequency Survey of Giant Pulses from the Crab Pulsar*
**T. Eftekhari**, K. Stovall, J. Dowell, F. K. Schinzel, G. B. Taylor
2016, Astrophysical Journal, 829, 62, pp. 8 (arxiv:1607.08612)

## Second Author Publications

1. *Mapping Obscured Star Formation in the Host Galaxy of FRB 20201124A*
Y. Dong, **T. Eftekhari**, W. Fong, A. Deller et al., 2023, ApJ

2. *Radio Monitoring of the Tidal Disruption Event Swift J164449.3+573451. IV. The Slow Fade*
Y. Cendes, **T. Eftekhari**, E. Berger, E. Polisensky et al., 2021, ApJ, 908, 125

## Publications as Nth Author

1. *A non-repeating fast radio burst in a dwarf host galaxy*
S. Bhandari et al., 2022, arXiv:2211.16790

2. *The Jet Opening Angle and Event Rate Distributions of Short Gamma-ray Bursts from Late-time X-ray Afterglows*
A. Rouco Escorial et al., 2022, arXiv:2210.05695

3. *Chronicling the Host Galaxy Properties of the Remarkable Repeating FRB 20201124A*
W. Fong et al., 2021, arXiv:2106.11993

4. *The emergence of a new source of X-rays from the binary neutron star merger GW170817*
A. Hajela, et al., 2021, arXiv:2104.02070

5. *Probabilistic Association of Transients to their Hosts (PATH)*
K. Aggarwal, et al., 2021, ApJ, 911, 95

6. *A Late-Time Galaxy-Targeted Search for the Radio Counterpart of GW190814*
K. D. Alexander, et al., 2021, Accepted to ApJ

7. *Radio Observations of an Ordinary Outflow from the Tidal Disruption Event AT2019dsg*
Y. Cendes, et al., 2021, Accepted to ApJ

8. *The Broad-band Counterpart of the Short GRB 200522A at z=0.5536 : A Luminous Kilonova or a Collimated Outflow with a Reverse Shock?*
W. Fong et al., 2020, *Accepted to ApJ*

9. *The Tidal Disruption Event AT 2018hyz II: Light-curve modelling of a partially disrupted star*
S. Gomez, M. Nicholl, P. Short, R. Margutti, K. D. Alexander, P. K. Blanchard, E. Berger, **T. Eftekhari**, et al., 2020, MNRAS, 497, 1952

10. *AT 2018cow VLBI: No Long-Lived Relativistic Outflow*
M. F. Bietenholz, R. Margutti, D. Coppejans, K. D. Alexander, M. Argo, N. Bartel, **T. Eftekhari**, D. Milisavljevic, G. Terreran, E. Berger, 2020, MNRAS, 491, 4735

11. *Two years of non-thermal emission from the binary neutron star merger GW170817: rapid fading of the jet afterglow and first constraints on the kilonova fastest ejecta*
A. Hajela et al., 2019, ApJ, 886, L17

12. *A Galaxy-Targeted Search for the Optical Counterpart of the Candidate NS-BH Merger S190814bv with Magellan*
S. Gomez, G. Hosseinzadeh, P. S. Cowperthwaite, V. A. Villar, E. Berger, T. Gardner, K. D. Alexander, P. K. Blanchard, R. Chornock, M. R. Drout, **T. Eftekhari**, et al. 2019, ApJ, 884, L55

13. *The Optical Afterglow of GW170817: An Off-axis Structured Jet and Deep Constraints on a Globular Cluster Origin*
W. Fong, P. K. Blanchard, K. D. Alexander, J. Strader, R. Margutti, A. Hajela, V. A. Villar, Y. Wu, C. S. Ye, E. Berger, R. Chornock, D. Coppejans, P. S. Cowperthwaite, **T. Eftekhari**, et al. 2019, ApJL, 883, L1

14. *Follow-up of the Neutron Star Bearing Gravitational Wave Candidate Events S190425z and S190426c with MMT and SOAR*
G. Hosseinzadeh et al., 2019, ApJL, 880, L4

15. *An embedded X-ray source shines through the aspherical AT2018cow: revealing the inner workings of the most luminous fast-evolving optical transients*
R. Margutti et al., 2019, ApJ, 872, 18

16. *Unveiling the Engines of Fast Radio Bursts, Super-Luminous Supernovae, and Gamma-Ray Bursts*
B. Margalit et al., 2018, MNRAS, 481, 2407

17. *Spitzer Space Telescope Infrared Observations of the Binary Neutron Star Merger GW170817*
V. A. Villar, P. S. Cowperthwaite, E. Berger, P. K. Blanchard, S. Gomez, K. D. Alexander, R. Margutti, R. Chornock, **T. Eftekhari** G. G. Fazio, J. Guillochon, J. L. Hora, M. Nicholl, P. K. G. Williams, 2018, ApJL, 862, L11

18. *A Decline in the X-ray through Radio Emission from GW170817 Continues to Support an Off-Axis Structured Jet*
K. D. Alexander, R. Margutti, P. K. Blanchard, W. Fong, E. Berger, A. Hajela, **T. Eftekhari**, et al., 2018, ApJL, 863, 18L

19. *A Precise Distance to the Host Galaxy of the Binary Neutron Star Merger GW170817 Using Surface Brightness Fluctuations*

M. Cantiello et al., 2018, ApJ, 854, 31L

20. *The Binary Neutron Star event LIGO/VIRGO GW170817 a hundred and sixty days after merger: synchrotron emission across the electromagnetic spectrum*
R. Margutti et al., 2018, ApJ, 856, 18L

21. *Design and characterization of the Large-Aperture Experiment to Detect the Dark Age (LEDA) radiometer systems* D. Price et al., 2018, MNRAS, 478, 4193

22. *Improved Constraints on H0 from a combined analysis of gravitational-wave and electromagnetic emission from GW170817*
C. Guidorzi et al., 2017, ApJ, 851, 36L

23. *A gravitational-wave standard siren measurement of the Hubble constant*
B. P. Abbott et al., 2017, Nature, 551, 85

24. *The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. II. UV, Optical, and Near-IR Light Curves and Comparison to Kilonova Models*
P. S. Cowperthwaite et al., 2017, ApJ, 848, 17L

25. *The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. III. Optical and UV Spectra of a Blue Kilonova From Fast Polar Ejecta*
M. Nicholl et al., 2017, ApJ, 848, L18

26. *The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. IV. Detection of Near-infrared Signatures of r-process Nucleosynthesis with Gemini-South*
R. Chornock et al., 2017, ApJ, 848, L19

27. *The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. V. Rising X-ray Emission from an Off-Axis Jet*
R. Margutti et al., 2017, ApJ, 848, L20

28. *The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. VI. Radio Constraints on a Relativistic Jet and Predictions for Late-Time Emission from the Kilonova Ejecta*
K. D. Alexander et al., 2017, ApJ, 848, L21

29. *The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. VII. Properties of the Host Galaxy and Constraints on the Merger Timescale*
P. K. Blanchard et al., 2017, ApJ, 848, L22

30. *The Electromagnetic Counterpart of the Binary Neutron Star Merger LIGO/VIRGO GW170817. VIII. A Comparison to Cosmological Short-duration Gamma-ray Bursts*
W. Fong et al., 2017, ApJ, 848, L23

31. *Bifrost: a Python/C++ Framework for High-Throughput Stream Processing in Astronomy*
M. D. Cranmer, B. R. Barsdell, D. C. Price, J. Dowell, H. Garsden, V. Dike, **T. Eftekhari**, et al., 2017, JAI, 6, 1750007

32. *Empirical constraints on the origin of fast radio bursts: volumetric rates and host galaxy demographics as a test of millisecond magnetar connection*
M. Nicholl, P. K. G. Williams, E. Berger, V. A. Villar, K. D. Alexander, **T. Eftekhari**, B. D. Metzger, 2017, ApJ, 843, 84

33. *Bayesian Constraints on the Global 21-cm Signal from the Cosmic Dawn*
G. Bernardi, J. T. L. Zwart, D. Price, L. J. Greenhill, A. Mesinger, J. Dowell, **T. Eftekhari**, S. W. Ellingson, J. Kocz, F. Schinzel, 2016, MNRAS, 461, 3

34. *Digital Signal Processing using Stream High Performance Computing: A 512-input Broadband Correlator for Radio Astronomy*

J. Kocz, L. J. Greenhill, B. R. Barsdell, D. Price, G. Bernardi, S. Bourke, M. A. Clark, J. Craig, M. Dexter, J. Dowell, **T. Eftekhari**, et al., JAI, 2015, 4 50003

35. *Pulsar Observations Using the First Station of the Long Wavelength Array and the LWA Pulsar Data Archive*
K. Stovall, P. S. Ray, J. Blythe, J. Dowell, **T. Eftekhari**, A. Garcia, A.; T. J. W. Lazio, M. McCrackan, F. K. Schinzel, G. B. Taylor, ApJ, 2015, 808, 156