Tarraneh Eftekhari

NASA Einstein Fellow, CIERA, Northwestern University

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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

I served as the Head Teaching Fellow for an undergraduate science course at Harvard for three consecutive years, leading a team of teaching assistants and developing weekly interactive lectures with an emphasis on student participation. I received a Certificate of Distinction in Teaching from the Harvard University Bok Center for my role as a teaching assistant. I currently serve as a co-advisor for a second year graduate student at Northwestern and a tutor for two undergraduate students through the Northwestern Prison Education Program.

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

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)

Very Large Array (VLA)	141 hr
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

Professional Service

Panel Member, NASA Review*CIERA, Northwestern University*	2022
Seminar Coordinator, Astronomy Seminar, *CIERA, Northwestern University*	2022–Present
Coordinator, Journal Club, *CIERA, Northwestern University*	2022–Present
Liaison to CHIME/FRB, *Fast and Fortunate for FRB Follow-up Collaboration*	2021–Present
Referee for *ApJ, ApJL, & MNRAS*	2019–Present
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

Co-chair, Academic Support Committee at Stateville Correctional Center, 2021–Present
Northwestern Prison Education Program

I work directly with three cohorts of students at Stateville to manage their academic needs, including organizing weekly tutoring sessions.

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

Science Communication Online Programme (SCOPE) 2023
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. Uncovering the Elusive Origin of Fast Radio Bursts 2023
   UC Santa Cruz Colloquium
2. Multi-wavelength Follow-up of FRBs with F^4 2023
   Multi-wavelength follow-up of fast radio bursts in the era of routine (sub)arcsecond localizations, University of Toronto
3. Elucidating the Origin of Fast Radio Bursts 2023
   University of British Columbia Colloquium
4. The Host Galaxies and Environmenst of Fast Radio Bursts 2023
   Herzberg Astronomy and Astrophysics Research Centre Colloquium
5. Elucidating the Origin of Fast Radio Bursts 2023
   Kavli Institute for Cosmological Physics, University of Chicago Seminar
6. Extragalactic Millimeter Transients in the Era of Next Generation CMB Surveys 2022
   Florida State University Astrophysics Seminar
7. The Host Galaxies and Environments of Fast Radio Bursts 2022
   IAU Symposium 369: The Dawn Of Cosmology & Multi-Messenger Studies With Fast Radio Bursts
8. Extragalactic Transient Detection Rates with CMB-S4 2022
   Astrophysics with the CMB-S4 Survey – Part II: Source and Transient Science
9. Millimeter Transients in the Era of Next Generation CMB Surveys 2022
   Caltech Tea Talk
10. Late-time Radio and Millimeter Observations of Superluminous Supernovae 2021
    Pennsylvania State University Transients Group
11. Millimeter Transients in the Era of CMB-S4 2021
    CMB-S4 Spring 2021 Collaboration Meeting
12. An Overview of FRB Environments 2020
    The Astrophysics of Fast Radio Bursts, Flatiron Institute
13. Localizing Fast Radio Bursts and Their Host Galaxies 2019
    Toronto FRB Day, CITA/Dunlap Institute

14. Identifying the Host Galaxies of Fast Radio Bursts 2019
FRBs and their Possible Neutron Star Origins, Amsterdam

15. A Radio Source Coincident with the Superluminous Supernova PTF10hgi 2019
Columbia University, Department of Astronomy Pizza Lunch

16. A Radio Source Coincident with a Superluminous Supernovae 2019
Institute for Theory and Computation Luncheon, Harvard University

Public Talks

1. Uncovering the Mystery of Fast Radio Bursts 2022
Amateur Astronomers, Inc

2. Uncovering the Mystery of Fast Radio Bursts 2022
Astronomical Society of the Palm Beaches

3. Uncovering the Mystery of Fast Radio Bursts 2021
Gloucester Area Astronomy Club

4. Uncovering the Mystery of Fast Radio Bursts 2018
New Hampshire Astronomical Society

Conference Contributions

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

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

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

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

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

6. 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

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

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

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

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

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

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

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

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

15. 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 43 publications with > 8000 citations, including **8 first-author publications**, and 1 second-author publication. A full listing of my publications can be found on the ADS.

First Author Publications

1. *Extragalactic Millimeter Transients in the Era of Next Generation CMB Surveys*
T. Eftekhari, E. Berger, B. D. Metzger, et al.
2021, Submitted to ApJ, pp. 23 (arXiv: 2110.05494)

2. *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)

3. *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)

4. *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)

5. *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)

6. *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)

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

8. *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. *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