

CONTACT INFORMATION	Institute for Theory & Computation Harvard-Smithsonian Center for Astrophysics 60 Garden Street, Cambridge, MA 02138, USA	+1 (617) 858-6595 www.kiziltan.org bkiziltan@cfa.harvard.edu
EDUCATION	<p><b>University of California, Santa Cruz (M.Sc., Ph.D.);</b> Astronomy &amp; Astrophysics, 2004 – 2010</p> <ul style="list-style-type: none"> <li>• Ph.D. Thesis Topic: Reassessing the Fundamentals: On the Evolution, Ages, and Masses of Neutron Stars</li> <li>• Ph.D. Focus: Astrophysical Computation, Mathematical Modeling and Simulation</li> <li>• M.Sc. Focus: Multi-wavelength Observations</li> <li>• Advisor: Stephen E. Thorsett</li> </ul> <p><b>Pennsylvania State University (M.Sc.);</b> Astronomy &amp; Astrophysics, 1999 – 2001</p> <ul style="list-style-type: none"> <li>• Focus: Observation, Analysis and Instrumentation (in Radio and High Energy)</li> <li>• Advisors: Alex Wolszczan, George Pavlov, Gordon P. Garmire</li> </ul> <p><b>Middle East Technical University (B.Sc.);</b> Ankara, Turkey; Physics, 1994 – 1997</p> <ul style="list-style-type: none"> <li>• Focus: Astronomy &amp; Astrophysics</li> <li>• <i>Summa Cum Laude</i>, Advanced Physics Program, Valedictorian</li> </ul>	
RESEARCH INTERESTS	<p><b>Machine Learning &amp; Informatics</b> - Applications of Artificial Intelligence (Deep Learning), Applied Statistics (Bayesian), Information Theory (Divergence, Entropy), and scalable Computer Aided Learning (Deep Neural Networks) to engineering and astrophysical problems; <b>Astrophysics</b> - Neutron Stars, Pulsars, Mathematical Modeling of Globular Cluster Dynamics, Black Holes.</p>	
OTHER QUALIFICATIONS	<p><b>Project manager</b> certified by Kepner-Tregoe; <b>Teaching Certificate</b> by Derek Bok Center for Teaching and Learning, Harvard University.</p>	
APPOINTMENTS	<p><b>Head of Deep Learning   Data Science &amp; Analytics</b> Aetna</p> <p><b>Astrophysicist   Associate Scientist</b> Institute for Theory &amp; Computation Harvard-Smithsonian Center for Astrophysics</p> <p><b>Data Science Lead   Principal Investigator   Astrophysicist</b> Multi-Institutional R&amp;D</p> <p><b>Head/Teaching Fellow   Lecturer</b> Harvard University</p> <p><b>Visiting Scientist</b> Massachusetts Institute of Technology (MIT)</p> <p><b>Postdoctoral Research Fellow</b> Harvard-Smithsonian Center for Astrophysics</p> <p><b>Researcher   Teaching Assistant</b> University of California, Santa Cruz</p> <p><b>McLean Fellow   Researcher</b> University of California, Santa Cruz</p> <p><b>Data Analyst   Consultant</b> Space Telescope Science Institute/AURA/NASA</p> <p><b>Graduate Researcher</b> Pennsylvania State University</p> <p><b>Fulbright Exchange Fellow in Astrophysics</b></p>	<p>2018 –</p> <p>2013 – 2017</p> <p>2010 –</p> <p>2012 – 2017</p> <p>2012 – 2013</p> <p>2011 – 2013</p> <p>2005 – 2010</p> <p>2004 – 2005</p> <p>2001 – 2004</p> <p>2000 – 2001</p> <p>1998 – 2000</p>

Pennsylvania State University	
<b>Research/Teaching Assistant</b>	1997 – 1998
Middle East Technical University	
<b>Sonmak Fellow</b>	1994 – 1997
Middle East Technical University	

RESEARCH &  
EXPERIENCE

<b>Machine Learning, AI &amp; Informatics</b>	2001 to 2017
-Formed, led and managed an international collaboration of 45 engineers and scientists working in 5 different organizations across 4 different countries. Successfully produced a prototype antenna assembly that merges hardware design, astrophysics, signal processing, and innovative implementations of artificial intelligence.	
-Developed a new approach based on information theory that merges heterogenous data sets (i.e., optical, radio, and high-energy observational data, N-body simulations, and probabilistic modeling). This led to the discovery of an intermediate-mass black hole in publicly available data.	
-Developed an analytically tractable approach in non-parametric Bayesian error estimation that can be used for data with non-Gaussian errors. This led to the discovery of the bimodal feature in the neutron star mass distribution.	
-Developed a scalable neural network-based approach that can link subtle dynamical features to otherwise invisible black holes in globular clusters.	
-Developed a scalable neural network based approach to infer the error distribution as an extension of classification.	
-Developed a statistical model for the effects to charge pile-up in CCDs to infer the in underlying true spectral features.	
-Built a database and pipeline for the <b>Hubble Space Telescope</b> (i.e., WFPC2 archival pure parallels), optimized it for mining, rebuilt the calibration database system and managed operations, coordinated pointing/guiding - performance and fine guidance sensors operations, satellite communications at the Space Telescope Science Institute.	
-Developing Deep Neural Network approaches that can go beyond the standard Euclidian parametric geometry and effectively operate in complex Riemann topologies.	
<b>Multi-wavelength Observation &amp; Instrumentation</b>	1999 to 2017
-Multi-wavelength observations and analysis of pulsars in radio, X-rays and gamma-rays; with Arecibo and Parkes radio observatories, <b>Chandra</b> X-ray observatory, and the Fermi lat gamma-ray observatory; probabilistic modeling of the <b>Chandra</b> X-ray satellite ACIS chip quantum efficiencies and electron pile-up on CCDs.	
<b>Astrophysical Theory</b>	2006 to 2017
-Theoretical modeling of millisecond pulsar formation and evolution, pulsar age estimates, neutron star mass measurements, compact binary evolution, accretion processes and geometry, globular cluster dynamics.	

AWARDS &  
RECOGNITIONS

<b>Special Recognition with Proclamation</b> by the MA House of Representatives	2017
<b>The Harvard-Q Award</b> , Harvard University	2015
<b>Teaching Award</b> , Department of Astronomy, Harvard University	2014
<b>BIDEB Visiting Fellow</b> , Turkey	2012, 2013, 2015
<b>Sigma Xi</b> Scientific Research Honor Society, Harvard University Chapter	2011
<b>McLean Fellow</b> , University of California, Santa Cruz	2004
<b>Fulbright Fellow</b> in Physics, Astronomy & Astrophysics	1998 – 2000
<b>Valedictorian</b> , High Honors and Distinction, Middle East Technical University	1997
<b>Presidents Award</b> for Academic Excellence and Achievement	1997
Middle East Technical University	

**President High Honors List**, Middle East Technical University 1994 –1997  
**Sonmak Fellowship**, Middle East Technical University 1994 –1997  
**Ranked 2nd** in Nationwide University Entrance Examination, Turkey 1994

PROGRAMMING  
SKILLS

- Main programming language: **Python** (w/ extensive use of Jupyter, Pandas, Numpy; TensorFlow, Pytorch, Keras Models for implementations of *Supervised* and *Unsupervised* Deep Learning algorithms; Scikit-learn for classification, regression, clustering, dimensionality reduction and model analysis).
- Experience with: CUDA, IDL, R, Hadoop, SQL, Shell, C, C++, and Fortran.

REFEREED  
JOURNAL  
PUBLICATIONS

- **Kızıltan, B.**, Baumgardt, H., Loeb, A., 2017, “An Intermediate Mass Black Hole in the Globular Cluster 47 Tucanae”, *Nature*, 542, 203.
- Eksi, Andac, Cikintioglu, Gugercinoglu, Motlagh, **Kızıltan, B.**, 2016, “Inclination Angle and Braking Index Evolution of Pulsars with Plasma-Filled Magnetosphere: Application to High Braking Index of PSR J1640–4631”, *Astrophysical Journal Letters*, 823, 34E.
- **Kızıltan, B.**, Kottas T., De Yoreo M., Thorsett S., E., 2013, “The Neutron Star Mass Distribution”, *Astrophysical Journal*, 778, 66.
- **Kızıltan, B.**, & Thorsett, S., E., 2010, “Millisecond Pulsar Ages: Implications of Binary Evolution and a Maximum Spin Limit”, *Astrophysical Journal*, 715, 335.
- Weltevrede, P.; Johnston, S.; Manchester, R. N.; Bhat, R.; Burgay, M.; Champion, D.; Hobbs, G. B.; **Kızıltan, B.**; Keith, M.; Possenti, A.; Reynolds, J. E.; Watters, K., 2010, “Pulsar Timing with the Parkes Radio Telescope for the Fermi Mission”, *Publications of the Astronomical Society of Australia (PASA)*, 27, 64.
- **Kızıltan, B.**, & Thorsett, S., E., 2009, “Constraints on Pulsar Evolution: The Joint Period–Spin down Distribution of Millisecond Pulsars”, *Astrophysical Journal Letters*, 693, L109.
- Fermi LAT Collaboration w/**Kızıltan, B.**, 2009, “Pulsed Gamma-rays from PSR J2021+3651 with the Fermi Large Area Telescope”, *Astrophysical Journal*, 700, 1059A.
- Fermi LAT Collaboration w/**Kızıltan, B.**, 2009, “Fermi LAT Observations of Vela Pulsar”, *Astrophysical Journal*, 696, 1084A.
- Fermi LAT Collaboration w/**Kızıltan, B.**, 2009, “The Fermi Gamma Ray Space Telescope discovers the Pulsar in the Young Galactic Supernova-Remnant CTA 1”, *Science*, 322, 1218A.
- Zhang, C. M.; Yin, H. X.; Kojima, Y.; Chang, H. K.; Xu, R. X.; Li, X. D.; Zhang, B.; **Kızıltan, B.**, 2006, “Measuring Neutron Star Mass and Radius with Three Mass - Radius Relations”, *Monthly Notices of the Royal Astronomical Society*, Volume 374, Issue 1, pp. 232–236.
- Wadadekar, Yogesh; Casertano, Stefano; Hook, Richard; **Kızıltan, Bülent**; Koekemoer, Anton; Ferguson, Henry; Denchev, Doichin, 2006, “The WFPC2 Archival Pure Parallels Project”, *Publications of the Astronomical Society of Pacific (PASP)*, Volume 118, Issue 841, pp. 450–460.
- Pavlov, George G.; Sanwal, Divas; **Kızıltan, Bülent**; Garmire, Gordon P., 2001, “The Compact Central Object in the RX J0852.0–4622 Supernova Remnant”, *Astrophysical Journal Letters*, 559, L131–134.

CONFERENCE  
PROCEEDINGS,  
ABSTRACTS AND  
OTHER

- Probing Relics of Galaxy Formation with Cosmic Clocks: Pulsars in Globular Clusters, American Astronomical Society, AAS Meeting #224, Boston, 2014
- The Pulsar Quartet: Listening to a Galactic Symphony, American Astronomical Society, AAS Meeting #224, Boston, 2014
- **Kızıltan, B.**, Kottas T., Thorsett S., E., 2011, “The Neutron Star Mass Distribution”, arXiv: 1011.4291 (1st version of the paper later published in

Astrophysical Journal, 778, 66, 2013)

- Reassessing the fundamentals: New Constraints on the Evolution, Masses and Ages of Neutron Stars, Astrophysics of neutron stars conference proceedings, AIP publishing (2011), ArXiv: 1102.5094
- Putting Neutron Stars On A New Scale: The Underlying Mass Distribution of Pulsars from Radio Observation, 215th American Astronomical Meeting, #300.089 (2010)
- Redefining Millisecond Pulsar Ages, 214th AAS Meeting, Vol. 41, p.699 (+Press conference) (2009)
- Constraints on Millisecond Pulsar Evolution, 213th AAS Meeting, 213-L-2291 (2009)
- Do all millisecond pulsars share a common heritage?, NSBP/NSHP Conference, AIP publishing (2009)
- Connecting the Current with the Past: The Spin? Down Evolution of Millisecond Pulsars, 40 Years of Pulsars: Millisecond Pulsars, Magnetars and More. AIP Conference Proceedings, Volume 983, pp. 639-641 (2008)
- Neutron Star Physics in the GLAST Era, 40 Years of Pulsars: Millisecond Pulsars, Magnetars and More., AIP Conference Proceedings, Volume 983, pp. 639-641 (2008)
- The Distribution of Ages, Magnetic Fields and Spin Period Periods of Millisecond Pulsars, 209th AAS Meeting, Vol. 38, p.1065 (2007)
- Pulsar Mass Measurements, Texas in Australia: XXIII Meeting on Relativistic Astrophysics (2006)
- Pulsar Physics with GLAST, Texas in Australia: XXIII Meeting on Relativistic Astrophysics (2006)
- Neutron Star Physics with GLAST, 36th COSPAR Scientific Assembly Meeting: Plenary Meeting, 2114 (2006)
- The Distribution of Magnetic Fields, Ages and Spin Periods of Millisecond Pulsars, 36th COSPAR Scientific Assembly: Plenary Meeting, 2155 (2006)
- Pulsar Astronomy with GLAST, Heraeus Meeting: Neutron Star, Pulsars & Supernova Remnants (2006)
- Pulsar Mass Measurements, Heraeus Meeting: Neutron Star, Pulsars & Supernova Remnants (2006)
- The Distribution of Ages, Magnetic Fields and Spin Period Periods of Millisecond Pulsars, Heraeus Meeting: Neutron Star, Pulsars & Supernova Remnants (2006)
- Pulsar Astronomy with GLAST, A Life with Stars, (New Astronomy Reviews, Elsevier), eds. Kasper, Van der Klis, Wijers (2005)
- Pulsar Mass Measurements, A Life with Stars, (New Astronomy Reviews, Elsevier), eds. Kasper, Van der Klis, Wijers (2005)
- Neutron Star Physics with GLAST, Neutron Stars at Crossroads meeting (2005)
- Pulsar Mass Measurements, Neutron Stars at Crossroads meeting (2005)
- Using Multidrizzle to Combine Dithered WFPC2 Images, Brammer, G.; Koekemoer, A. M., **Kızıltan, B.**, HST Calibration Workshop, p. 235 (2002)
- Exploring the Central Region of SNR RX J0852.0-4622 and a Search for an Optical Counterpart, ASP Conference Series; eds. P. O. Slane, B. M. Gaensler, Vol. 271, 293 (2002)

#### BOOKS

- Reassessing the Fundamentals: New Constraints on the Evolution, Masses and Ages of Neutron Stars, Bülent Kızıltan, Ph.D. Thesis, 2011, Universal Publishers, ISBN: 1612337651

#### SELECTED PRESENTATIONS

- Center for Relativistic Astrophysics (CRA) Seminar, Georgia Tech, Atlanta 4/2017
- Exploring the Astronomical Discovery Space with Deep Learning - Discovery in the Era of Astronomically Big Data Conference, STScI 2/2017
- Black Hole Initiative Colloquium, Cambridge 1/2017
- The Intricate Dynamical Relation of Compact Objects in Globular Clusters, Harvard-

- Smithsonian Center for Astrophysics 11/2016
- A Case for Computer Aided Learning: Probing Globular Clusters with Gravity, Smithsonian Observatory 8/2016
- Lightbox Gallery Talk: Pulsar Sounds and Symphony, Harvard Art Museum 3/2016
- Zooming into Globular Clusters with Pulsars, Harvard-CfA 12/2014
- The Pulsar Quartet: Listening to a Galactic Symphony, American Astronomical Society Meeting #224, Boston 6/2014
- Probing Relics of Galaxy Formation with Cosmic Clocks: Pulsars in Globular Clusters, American Astronomical Society Meeting #224, Boston 6/2014
- Probing Fundamentals in Physics and Astronomy with Neutron Stars, Physics Department Colloquium, Bosphorus University 11/2013
- The Most Exotic Objects in the Universe (Uzayın En Egzotik Cisimleri), Physics Department Colloquium, Yildiz Technical University 10/2013
- Neutron Stars: Probing Fundamentals with Fundamentals, Physics Department Colloquium, Middle East Technical University 5/2013
- Globular Cluster Dynamics: Probing Globular Clusters with Pulsars Physical Applications of Millisecond Pulsars, Aspen Center for Physics 1/2013
- **TEDx** talk on "Our Connection to the Cosmos", TEDxFulbright, Cambridge 4/2012
- Beyond the tip of the iceberg: Predicting the bulk properties of the neutron star population, Ohio State University, Department of Astronomy 1/2012
- Beyond the tip of the iceberg: Predicting the bulk properties of the neutron star population, Colloquium, Yale University, Department of Astronomy 12/2011
- Pulsars as Tools for Fundamental Physics, Astrophysics Seminar, Brown University, Department of Physics 5/2011
- Millisecond Pulsar Evolution: An incomplete jigsaw puzzle, Institute for Theory and Computation (ITC), Harvard-CfA 3/2011

TEACHING &  
MENTORING  
EXPERIENCE

- Head Teaching Fellow 1/2017 – 6/2017  
Science of the Physical Universe: The Unity of Science (SPU 22), Undergraduate course w/ Prof. Irwin Shapiro, Harvard College
- Teaching Fellow 10/2016 – 12/2016  
Quantum Mechanics for Astrophysics (Astron 251), Graduate course w/ Prof. Lars Hernquist, Department of Astronomy, Harvard University
- Teaching Fellow 1/2015 – 6/2015  
Science of the Physical Universe: The Energetic Universe (SPU 19), Undergraduate course w/ Prof. Robert Kirshner, Harvard College
- Teaching Certificate 5/2014  
Derek Bok Center for Teaching and Learning, Harvard University
- Teaching Fellow 1/2014 – 6/2014  
Science of the Physical Universe: The Unity of Science (SPU 22), Undergraduate course w/ Prof. Irwin Shapiro, Harvard College
- Teaching Certificate Program 2/2013  
The Physical Voice: Vocal Performance Techniques for Scholars, Derek Bok Center for Teaching and Learning, Teaching Certificate Program, Harvard University
- Teaching Certificate Program 5/2012  
Public Speaking Techniques, Derek Bok Center for Teaching and Learning, Teaching Certificate Program, Harvard University
- Teaching Certificate Program 1/2012  
Focus on Advanced Teaching and Communication, Derek Bok Center for Teaching and Learning, Teaching Certificate Program, Harvard University
- Teaching Fellow 1/2012 – 6/2012  
High Energy Astrophysics (Astron 219), Graduate course w/ Prof. Ramesh Narayan, Prof. Edo Berger; Department of Astronomy, Harvard University
- Teaching Fellow 1/2012 – 6/2012

Science of the Physical Universe: Life as a Planetary Phenomenon (SPU 30),  
Undergraduate course w/ Prof. Dimitar Sasselov; Harvard College  
Teaching Assistant 9/2010 – 12/2010  
Mechanics, University of California, Santa Cruz  
Mentor Czar 9/2008 – 9/2010  
Founder of the Peer Mentoring Program, Department of Astronomy and  
Astrophysics, University of California, Santa Cruz  
Lecturer/Seminar Organizer 9/2006 – 11/2006  
Physics of Compact Objects, University of California, Santa Cruz  
Teaching Assistant 9/2004 – 12/2004  
Planets and Planetary Systems, University of California, Santa Cruz