


Tansu Daylan

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Education

- 2018, Ph.D. in Physics, Harvard University, Cambridge, MA
- 2015, M.A. in Physics, Harvard University, Cambridge, MA
- 2013, B.S. in Physics (double major), Middle East Technical University (METU), Ankara, Turkey
- 2012, B.S. in Electrical and Electronics Engineering, METU, Ankara, Turkey
- 2008, High school diploma, Robert College, Istanbul, Turkey

Positions

- 2018-2021, Postdoctoral Kavli Fellow, MIT, Cambridge, MA, US
- 2013-2018, Research/Teaching Fellow, Harvard, Cambridge, MA, US
- 2011-2013, Teaching Assistant, METU, Ankara, Turkey

Research Interests

Fields: astro-particle physics, statistics, exoplanets and cosmology

PhD advisor: Douglas P. Finkbeiner

Record of my research output: my [NASA ADS](#), [Google Scholar](#), and [ORCID](#) profiles

Citation count: 702, h-index: 10 (retrieved from ADS)

- Cosmic-rays, Weakly Interacting Massive Particle (WIMP) self-annihilation, isotropic gamma-ray sky background,
- Transdimensional and Bayesian inference, probabilistic cataloging, machine learning, modeling and analysis of large data sets.
- Dark matter substructure, gravitational strong lensing, Lambda Cold Dark Matter (CDM) at small-scales.
- Exoplanet detection and characterization with TESS, planetary phase curves, exoplanet atmospheres, light curve and radial velocity (RV) data analysis.

Publications

Papers

1. Andres Jordan et al. (including **Tansu Daylan**). TOI-677 b: A Warm Jupiter ($P=11.2d$) on an eccentric orbit transiting a late F-type star. arXiv:1911.05574, Nov 2019.
2. Joshua Pepper et al. (including **Tansu Daylan**). TESS Reveals HD 118203b to be a Transiting Planet. arXiv:1911.05150, Nov 2019.
3. Ian Wong et al. (including **Tansu Daylan**). Exploring the atmospheric dynamics of the extreme ultra-hot Jupiter KELT-9b using TESS photometry. arXiv:1910.01607, Oct 2019.
4. **Tansu Daylan** et al. TESS observations of the WASP-121 b phase curve. arXiv:1909.03000, Sep 2019.
5. Richard M. Feder et al. (including **Tansu Daylan**). Multiband Probabilistic Cataloging: A Joint Fitting Approach to Point Source Detection and Deblending. arXiv preprint arXiv:1907.04929, Jul 2019. arXiv:1907.04929
6. Rebekah I. Dawson et al. (including **Tansu Daylan**). TOI-216b and TOI-216c: Two warm, large exoplanets in or slightly wide of the 2:1 orbital resonance. arXiv:1904.11852, Apr 2019.
7. Liang Yu et al. (including **Tansu Daylan**). Identifying Exoplanets with Deep Learning III: Automated Triage and Vetting of TESS Candidates. arXiv:1904.02726, Apr 2019.
8. M. M. Fausnaugh et al. (including **Tansu Daylan**). Early Time Light Curves of 18 Bright Type Ia Supernovae Observed with TESS. arXiv:1904.02171, Apr 2019.
9. Nestor Espinoza et al. (including **Tansu Daylan**). HD 213885b: A transiting 1-day-period super-Earth with an Earth-like composition around a bright ($V = 7.9$) star unveiled by TESS. arXiv:1903.07694, Mar 2019.
10. Maximilian N. Guenther et al. (including **Tansu Daylan**). A Super-Earth and two sub-Neptunes transiting the bright, nearby, and quiet M-dwarf TOI-270. arXiv:1903.06107, Mar 2019.
11. L. G. Bouma et al. (including **Tansu Daylan**). WASP-4b Arrived Early for the TESS Mission. , 157(6):217, Jun 2019. arXiv:1903.02573, doi:10.3847/1538-3881/ab189f.
12. Joseph E. Rodriguez et al. (including **Tansu Daylan**). An Eccentric Massive Jupiter Orbiting a Subgiant on a 9.5-day Period Discovered in the Transiting Exoplanet Survey Satellite Full Frame Images. , 157(5):191, May 2019. arXiv:1901.09950, doi:10.3847/1538-3881/ab11d9.
13. Samuel N. Quinn et al. (including **Tansu Daylan**). Near-resonance in a system of sub-Neptunes from TESS. arXiv e-prints, page arXiv:1901.09092, Jan 2019. arXiv:1901.09092.
14. Maximilian N. Guenther et al. (including **Tansu Daylan**). Stellar Flares from the First TESS Data Release: Exploring a New Sample of M-dwarfs. arXiv e-prints, page arXiv:1901.00443, Jan 2019. arXiv:1901.00443.
15. Avi Shporer et al. (including **Tansu Daylan**). TESS Full Orbital Phase Curve of the WASP-18b System. , 157(5):178, May 2019. arXiv:1811.06020, doi:10.3847/1538-3881/ab0f96.
16. E. F. Schlafly et al. (including **Tansu Daylan**). The DECam Plane Survey: Optical Photometry of Two Billion Objects in the Southern Galactic Plane. , 234(2):39, Feb 2018. arXiv:1710.01309, doi:10.3847/1538-4365/aaa3e2.

17. **Tansu Daylan** et al., Probing the Small-scale Structure in Strongly Lensed Systems via Transdimensional Inference. , 854(2):141, Feb 2018. arXiv:1706.06111, doi:10.3847/1538-4357/aaaale.
18. **Stephen K. N. Portillo** et al. (including **Tansu Daylan**). Improved Point-source Detection in Crowded Fields Using Probabilistic Cataloging. , 154(4):132, Oct 2017. arXiv:1703.01303, doi:10.3847/1538-3881/aa8565.
19. **Tansu Daylan** et al. Inference of Unresolved Point Sources at High Galactic Latitudes Using Probabilistic Catalogs. , 839(1):4, Apr 2017. arXiv: 1607.04637, doi:10.3847/1538-4357/aa679e.
20. **Tansu Daylan** et al. The characterization of the gamma-ray signal from the central Milky Way: A case for annihilating dark matter. Physics of the Dark Universe, 12:123, Jun 2016. arXiv: 1402.6703, doi:10.1016/j.dark.2015.12.005.

Proceedings

21. S. Schael and the AMS Collaboration (including **Tansu Daylan**), Precision measurements of the electron spectrum and the positron spectrum with AMS, 33rd International Cosmic Ray Conference, Rio De Janeiro, 2013
22. J. Casaus and the AMS Collaboration (including **Tansu Daylan**), Determination of the positron anisotropy with AMS, 33rd International Cosmic Ray Conference, Rio De Janeiro, 2013
23. V. Choutko and the AMS Collaboration (including **Tansu Daylan**), Precision Measurement of the Cosmic Ray Helium Flux with AMS Experiment, 33rd International Cosmic Ray Conference, Rio De Janeiro, 2013
24. S. Haino and the AMS Collaboration (including **Tansu Daylan**), Precision measurement of the proton flux with AMS, 33rd International Cosmic Ray Conference, Rio De Janeiro, 2013
25. A. Oliva and the AMS Collaboration (including **Tansu Daylan**), Precision Measurement of the Cosmic Ray Boron-to-Carbon Ratio with AMS, 33rd International Cosmic Ray Conference, Rio De Janeiro, 2013
26. B. Bertucci and the AMS Collaboration (including **Tansu Daylan**), Precision measurement of the $e^+ + e^-$ spectrum with AMS, 33rd International Cosmic Ray Conference, Rio De Janeiro, 2013

Awards, Honors and Achievements

- MIT Kavli Fellowship (2018)
- MIT Translational Fellowship (2018)
- AAS Chambliss Honorable Mention (2015)
- WorldQuant Fellowship (2014)
- Harvard Purcell Fellowship (2013)
- Winner of Bilkent Undergraduate Physics Research Competition (2013)
- Selected as a young researcher to attend the Lindau Nobel Laureates Meeting (2012)
- Featured by the Scientific American in the "30 under 30" list (2012)

- Honorable Mention Award, METU EEE graduation project (2012)
- Prof. Bülent Kerim Altay Award for the highest GPA in the class (twice, 2008 and 2009)
- Turkish Republic Prime Ministry Great Achievement Scholarship (2008-2012)
- Turkish Education Foundation Superior Success Scholarship (2008-2012)
- Technical Sciences Scholarship (2008)
- Ranked 10th (i.e., 99.999th percentile) in the National University Entrance Examination among 1.5 million participants (2008)

Software

- **Probabilistic Cataloger (PCAT)**, Daylan et al. 2017, Daylan et al. 2018, a transdimensional, hierarchical, and Bayesian framework to sample from the posterior probability distribution of a metamodel, i.e., union of models with different dimensionality, given some data.
<https://github.com/daylan/pcat>
<http://pcat.readthedocs.io>
- **Lion**, Portillo et al., 2017, a fast probabilistic cataloger for astronomical images
<https://github.com/stephenportillo/lion>
- **Allesfitter**, Guenther and Daylan, 2019, astronomy software package for modeling photometric and RV data.
<https://github.com/MNGuenther/allesfitter>
<https://allesfitter.readthedocs.io>

Grants

- Andrew Vanderburg et al. (including **Tansu Daylan** as co-I) 2019, Disintegrating Rocky Bodies Transiting White Dwarfs: The Key To Understanding Exoplanet Compositions, TESS Guest Investigator Program, Cycle 2, ID G022077.
- Thomas Mikal-Evans et al. (including **Tansu Daylan** as co-I) 2019, Atmospheric characterization of two temperate mini-Neptunes formed in the same protoplanetary nebula, HST Proposal, Cycle 27, ID 15814.

Service

- TESS Science Office exoplanet vetting lead
- Reviewer for the Hubble Space Telescope (HST) proposals
- Reviewer for the Astrophysical Journal
- Reviewer for NASA FDL2018
- Local organizing committee member for the TESS Science Conference I
- Organizing committee member for the TUBITAK/TBAE research school "Gravitational Waves: New Challenges and Opportunities"
- Organizer of the MIT Exoplanet Journal Club

- NOAO Telescope Allocation Committee member,
- Member of the science council for the East Anatolian Observatory (DAG)
- Research mentor for the Harvard-MIT Science Research Mentoring Program (SRMP)
- Mentor, American Physical Society, National Mentoring Community
- Mentor, MIT Mentor Advocate Partnership (MAP)

Teaching

- Summer 2019, Lecturer, Research summer school "Quantum to Cosmos: Ideas and Applications" , Istanbul, Turkey
- Spring 2019, Guest Lecturer for MIT Course 12S680, Artificial Intelligence for TESS Applications, MIT, Cambridge, MA
- Spring 2019, Guest Lecturer for Harvard Course Astro 130, Cosmology, Harvard, Cambridge, MA
- Fall 2016, Teaching Fellow, Graduate Cosmology, Harvard University, Cambridge, MA
- Spring 2015, Teaching Fellow, The Energetic Universe, Harvard University, Cambridge, MA
- Spring 2013, Fall 2012, Spring 2012, Teaching Assistant, Modern Physics, METU, Ankara, Turkey

Research mentoring

- MIT graduate student: Mariona Badenas-Agusti
- Harvard undergraduate student: Richard Feder-Staehle
- High school research interns: Rohan Subramani, Ashley Davidson, Kartik Pinglé, Jasmine Wright

Affiliations

- Since 2019, TESS Follow-up Working Group
- Since 2018, TESS Objects of Interest (TOI) Working Group
- Since 2016, American Physical Society
- Since 2014, American Astronomical Society
- Since 2014, Sigma XI Society
- 2011-2013, Associate member, CERN, Geneva, Switzerland
- 2011-2013, AMS-02 Collaboration, Geneva, Switzerland

Selected Science Outreach

- Lecturer, The Project Science Voyagers, (2016-2018, addressed $\sim 30,000$ high school students)
- Lecturer, Turkish Ministry of Education e-conference, (2018, addressed 9,000 high school students)
- Lecturer, Astronomy in Schools (addressed 1500 high school students)
- First Lego League mentor
- Over 10 invited appearances on science outreach podcasts and interviews
- Over 100 science outreach talks to universities and high schools
- Author, Science & Utopia and Tree of Evolution
- Cambridge Explores the Universe, CfA, Cambridge, April 2016
- Ask a Scientist, Cambridge Science Festival, Cambridge, April 2016
- Sky & Space Day, Cambridge Science Festival, Cambridge, April 2015
- Lecturer, Beacon Hill Seminars, Cambridge, MA, (2014-2016)
- Lecturer, Science In The News Public Science Lectures, Cambridge, MA, (2014-2016)
- Author, Science In The News, 2014
- Lecturer, "There is a Scientist In My Classroom" Project, Cambridge, MA, 2013
- Organizer, Mobile CERN exhibition, METU, Ankara, Turkey, 2012

Selected Talks

- *TESS phase curve of WASP-121b*, Yale University, 19 November 2019
- *TESS phase curve of WASP-121b*, University of Arizona, 30 October 2019
- *Probing the small-scale structure in strong lenses with PCAT*, MIT, 28 September 2018
- *Hunting for exoplanets with TESS*, Sabancı University, İstanbul, Turkey, 17 April 2019
- *A transdimensional perspective on dark matter*, METU, Ankara, Turkey, 16 April 2019
- *Hunting for exoplanets with TESS*, Robert College, İstanbul, Turkey, 12 April 2019
- *A transdimensional perspective on dark matter*, Boğaziçi University, İstanbul, Turkey, 10 April 2019
- *TESS phase curve of WASP-121b*, BAESM, Cambridge, MA, 5 April 2019
- *Probing the small-scale structure in strong lenses with PCAT*, JPL, Pasadena, CA, 4 March 2019
- *Recharacterization of previously known exoplanets in multi-sector TESS data*, AAS233, Seattle, WA, 6-10 January 2019
- *Highlights of Early Results - HATS13*, TESS Science Meeting 16, Cambridge, MA, 29 October 2019
- *PSF fitting with the TESS data*, TESS Science Meeting 15, Cambridge, MA, 6 August 2018

- *Probing the small-scale structure in strong lenses with PCAT*, TPS33, Bodrum, Turkey, 09 September 2017
- *Probing faint gamma-ray point sources in the inner Milky Way using PCAT*, TeVPA2017, Columbus, OH, 09 August 2017
- *Inner Milky Way Gamma Ray Excess*, Cape Cod Astronomical Society, 5 January 2017
- *Probing the GeV Excess using PCAT*, IDM2016, Sheffield, UK, 18 July 2016
- *Inference of Dim Gamma-Ray Point Sources Using Probabilistic Catalogues*, Dark Matter and Gamma Rays 2015, Obergurgl, Austria, 09 December 2015
- *Contribution of Dark Matter annihilations to the low-redshift metagalactic ionization rate*, DPF2015, Ann Arbor, MI, 06 August 2015
- *Can MSPs account for the gamma-ray excess in the inner Milky Way?*, EWASS2015, Tenerife, Spain, 25 June 2015
- *The Characterization of the Gamma-Ray Signal from the Central Milky Way*, Turkish Physical Society 31st International Physics Conference, Bodrum, Turkey, 23 July 2014
- *Scrutinizing the Diffuse Gamma-Ray Emission in the Inner Galaxy*, Astroparticle Physics 2014, Astroparticle Physics (TeVPA/IDM) 2014, Amsterdam, Netherlands, 26 June 2014
- *The Characterization of the Gamma-Ray Signal from the Central Milky Way*, Fermi Summer School, University of Delaware, Lewes, DE, 31 May 2014
- *Anomalous Gamma-Ray Emission from the Inner Galaxy*, Particle Seminar, Harvard University, Boston, MA, 07 May 2014
- *Photon Reconstruction In Calorimetric Mode*, AMS Collaboration Meeting, CERN, Geneva, Switzerland, 14 February 2013
- *Spacetime Around a Rotating Massive Object: Kerr Solution*, 27th International Physics Conference of Turkish Physical Society, Istanbul, Turkey, 15 September 2010
- *Hellenic Era Ancient Greek Thoughts and Ideas*, Lions Club Meeting, Istanbul, Turkey, 12 March 2007

Selected Poster Presentations

- *TESS phase curve of WASP-121b*, TESS Science Conference I, Cambridge, MA, 29 July - 2 August 2019
- *Recharacterization of previously known exoplanets in multi-sector TESS data*, Kepler Science Conference V, Glendale, CA, 4-8 March 2019
- *Scrutinizing the unresolved x-ray background in the CDFS field via transdimensional sampling*, the 16th AAS HEAD Meeting, Sun Valley, ID, 20-24 August 2017
- *Inference of Dim Gamma-Ray Point Sources Using Probabilistic Catalogues*, the 227th AAS Meeting, Kissimmee, FL, 07 January 2016
- *Inference of Dim Gamma-Ray Point Sources Using Probabilistic Catalogues*, 6th Fermi Symposium, Arlington, VA, 08 November 2015

- *Contribution of GeV Scale Dark Matter Annihilations to the Cosmic Ultraviolet Background*, the 225th AAS Meeting, Seattle, WA, 06 January 2015
- *GeV excess electrons upscattering the CMB: a possible resolution to the "Photon Underproduction Crisis"*, 5th Fermi Symposium, Nagoya, Japan, 20 October 2014
- *The Characterization of the Gamma-Ray Signal from the Central Milky Way*, Sackler Conference, Cambridge, MA, 19 May 2014

Coding

- Unix-like operating systems, Python, IDL, C++
- TensorFlow, Numpy, Numba, PyCUDA
- Relational databases, SQL
- MATLAB, Mathematica
- Jekyll, HTML5, JavaScript, CSS

Expertise

- Extensive modeling and analysis experience with astrophysical datasets collected by space and ground-based telescopes such as Fermi-LAT, Chandra, HST, SDSS, DECam, TESS, Kepler and AMS-02,
- Observing experience with the DECam on the 4m Blanco Telescope as part of DECam Plane Survey (DECaPS), 2016B-0279, CTIO, Cerro Tololo, Chile.
- Autonomous robot design, real-time image processing for self-localization

Selected Schools and Conferences Attended

- 27 May - 06 June 2014, Fermi Summer School 2014, Lewes, DE
- 28 May - 01 June 2013, Recent Developments in High Energy Physics and LHC, METU NCC, Cyprus
- 01 - 06 July 2012, Lindau Nobel Laureates Meeting, Lindau, Germany
- June - August 2011, Summer school on particle physics, CERN, Geneva, Switzerland
- June 2010, Summer school on nonrelativistic quantum mechanics, Bilkent University, Ankara, Turkey
- June - July 2007, Summer Research Program, Koç University, Istanbul, Turkey

Personal interests

- Lifelong aviator, holding a Private Pilot License since 2012
- Amateur radio operator, holding a ham radio license
- Partner dances: Tango and Bachata