

# Amruta Jaodand

## Current

2019–present **Postdoctoral Scholar Research Associate in Physics**, *California Institute of Technology*, Pasadena, California, USA.

## Education

2014–2019 **Ph.D. in Astrophysics**, *Netherlands Institute for Radio Astronomy (ASTRON) and University of Amsterdam*, Amsterdam, Netherlands.

2008–2013 **M.Sc. (Hons.) Physics**, *Birla Institute of Technology and Science*, Pilani, India.

2008–2013 **B.E. (Hons.) Electronics and Communication**, *Birla Institute of Technology and Science*, Pilani, India.

## Awards

- 1 RadioNet funding support from the European Union's Horizon 2020 research and innovation programme to attend the IAU Symposium 337: Pulsar Astrophysics - The next 50 years.
- 2 LKBF (Leids Kerkhoven-Bosscha Fonds) funding.
- 3 Support for Young Scientists (YS) in International Space Science Institute teams.
- 4 Principal Investigator (PI) and co-PI for  $\sim 40$  successful proposals with multiple international teams
- 5 Chandra SAO grant for proposal "Chasing the X-ray Afterglows of Gravitational-Wave Events" — \$94,000
- 6 NuSTAR grant for proposal "Probing transformations in transitional millisecond pulsars" — \$88,500

## Selected Colloquia, Seminars, Talks

### Invited

- 04/2022 *Colloquium, University of Iowa, USA*
- 03/2022 *Lunch Talk, Carnegie Observatories, USA*
- 03/2022 *Lunch Talk, MIT Kavli Institute, USA*
- 12/2021 *Stars & Planets Seminars, CfA Harvard, USA*
- 11/2021 *Colloquium, Cal Poly Pomona, USA*
- 05/2021 *Science Hour, CIERA, Northeastern University, USA*
- 02/2021 *Seminar, Michigan State University, USA*
- 11/2020 *Colloquium at Dunlap Institute, University of Toronto, Canada*
- 10/2020 *Colloquium at the University of Wisconsin-Milwaukee, USA*
- 05/2018 Keynote on Python Ecosystem in Astronomy for the Software in astronomy session at European Week of Astronomy and Space Science 2018
- 03/2018 Invited talk for the *PHAROS workshop: The challenge of transitional millisecond pulsars*, Rome, Italy
- 12/2017 *Review talk on millisecond pulsar population* at the 11th Bonn Neutron Stars Workshop, Bonn, Germany
- 11/2017 *Colloquium* at New York University, Abu Dhabi, UAE
- 01/2017 Invited review - Transitional Millisecond Pulsar Workshop at International Space Science Institute, Bern, Switzerland
- 01/2017 *Colloquium at School of Physics and Astronomy, Cardiff, UK*
- 01/2017 *Seminar at International Center for Theoretical Sciences, Bangalore, India*
- 11/2016 *Representative talk for Compact Objects Network (NW3)* at Netherlands Research School of Astronomy (NOVA)'s evaluation board meeting, the Netherlands
- 08/2015 *Lorentz Center Workshop on Zoo of Accreting Compact Objects, Leiden, the Netherlands*

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## Publications

A complete record of my publications can be found at [NASA ADS](#). Key publications are listed below.

- 8 Discovery of UV millisecond pulsations and moding in the low mass X-ray binary state of transitional millisecond pulsar J1023+0038, **A.Jaodand**, *J. Hernandez et al*, *ApJ in press*, 2020; *arxiv:2102.13145*.
- 7 Quasi-simultaneous Radio/X-Ray Observations of the Candidate Transitional Millisecond Pulsar 3FGL J1544.61125 during its Low-luminosity Accretion-disk State, **A.Jaodand**, *A. Deller, Nina Gusinskaia, J.W.T. Hessels et al*, *ApJ*, 923, 3, **2021**.
- 6 Simultaneous NICER and NuSTAR Observations of the Ultracompact X-Ray Binary 4U 1543-624, *Ludlam, R. M., A.Jaodand, et al.*, *ApJ*, 911, 123, **2021**, **Cit: 3**.
- 5 A decade of transitional millisecond pulsars, **A.Jaodand**, *J.W.T. Hessels et al.*, CUP, Proceedings of the International Astronomical Union, 13(S337), 47-51., **2017**, **Cit: 12**.
- 4 Simultaneous *Chandra* and VLA observations of the transitional millisecond pulsar PSR J1023+0038: Anti-correlated X-ray and radio variability, *S. Bogdanov, A. Deller, J. Miller-Jones, A. Archibald, J.W.T. Hessels, A.Jaodand et al.*, *The Astrophysical Journal*, 856, 54, **2017**, **Cit:30**.
- 3 X-ray and radio observations of the magnetar SGR J1935+2154 during its 2014, 2015, and 2016 outbursts, *G. Younes, C. Kouveliotou, A.Jaodand et al.*, *The Astrophysical Journal*, 847, 85, **10/2017**, **Cit:45**.
- 2 Radio pulse search and X-Ray monitoring of SAX J1808.4–3658: What causes its orbital evolution?, *A. Patruno, A.Jaodand, L. Kuiper et al.*, *The Astrophysical Journal*, Vol 841, 98, **06/2017**, **Cit:30**.
- 1 Timing observation of PSR J1023+0038 during a low mass X-ray binary state, **A.Jaodand**, *A. Archibald, J.W.T. Hessels et al.*, *The Astrophysical Journal*, Vol 830, 2, **10/2016**, **Cit:67**.

### Pre-print and Non-refereed: GCNs, ATeLs

- 5 LIGO/Virgo S190814bv: Chandra X-ray non-detection of ASKAP J005547-270433/AT2019osy, **A Jaodand**, *S Campana, M Brightman, P D'Avanzo, M Heida, F Harrison...*, GCN 25822, 1, 09/2019.
- 4 NICER detects a type I X-ray burst from 4U 1730-22, *Bult, P. M.; Jaisawal, G. K.; Jaodand, Amruta et al.*, *The Astronomer's Telegram*, 14896, 07/2021.
- 3 ZTF Observations of the Galactic Transient ASASSN-19yt, *Bellm, Eric C.; Jaodand, Amruta et al.*, *The Astronomer's Telegram*, 13176, 10/2019.
- 2 Radio imaging analysis of the newest transitional millisecond pulsar 3FGLJ1544.6–1125, **A.Jaodand**, *et al.*, *Electronic conference proceeding for 28th Texas Symposium on Relativistic Astrophysics*, 12/2016.
- 1 Radio detection of the transient neutron star LMXB 1RXS J180408.9–342058, *J.W.T. Hessels, A. Deller, A.Jaodand et al.*, *The Astronomer's Telegram*, 7255, 03/2015.

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## Awarded Observation Time

I have used multi-wavelength observations (Gamma-ray, X-rays, UV, optical and radio frequencies) to understand various manifestations of neutron stars. I have led ~40 proposals as PI and co-I with significant contributions for observatories such as **HST**, **XMM**, **NuStar**, **NICER**, **Swift**, **GBT**, **Arecibo**, **VLA**, **ATCA**, **WHT**, **Palomar**, **Keck** and **INT**

**Awarded observation time summary in the capacity of PI:**

**Chandra**: 624 ks, **Swift**: 96 ks, **XMM**: 102.4 ks, **HST**: 24 ks, **NuSTAR**: 150 ks, **NICER**: 120 ks

**VLA** : 40 hr, **Arecibo** : 79.5 hr, **GBT** : 7 hr, **Palomar** : 4 CHIMERA+DBSP nights

Currently co-observer and training for LRIS and ESI Keck observations.

### List of selected observation proposals

#### Principal Investigator

**NuSTAR+NICER GO cycle-7 proposal 07302**: "Probing transformations in transitional millisecond pulsars", (90 ks), 11/05/2021

**Chandra, 21510455**: PI for proposal titled "Chasing the X-ray Afterglows of Gravitational-Wave Events, (310 ks), 25/07/2021

**Chandra, 19400812**: PI for accepted *Chandra* proposal titled "Exploring anti-correlated radio/X-ray modes in transitional millisecond pulsars", 14/12/2017, (44 ks).

**VLA, 18A-398:** PI for accepted DDT proposal titled "Exploring anti-correlated radio/X-ray modes in transitional millisecond pulsars", 13/11/2017, (12 hr).

**HST Program, 14934:** Initiator and co-PI for accepted proposal to check simultaneous UV and X-ray variability in the LMXB state of transitional millisecond pulsar J1023+0038. Awarded four orbits to be in conjunction with XMM observation, 25/05/2017, (~24 ks).

**GBT, 17B-172:** co-PI for regular GBT proposal titled "sleuthing the pulsar in a new long-period Gamma-ray loud binary 2FGL J0846.0+2820", 12/05/2017, (6 hr).

**XMM, 80362:** PI for XMM accepted AO16 proposal cycle titled "continued timing of PSR J1023+0038: A unique testbed for accretion physics", 20/01/2017, (96 ks).

**Swift, 33012:** PI for *four* accepted ToO proposals , 2015-2017, (91 ks in total).

**WHT/ISIS, SW2016a16:** co-PI for accepted service proposal to "find the orbit of a transitional millisecond pulsar candidate 3FGL J1544-1125", 29/04/2016, (6 hr).

**Arecibo urgent proposal, Jaodand160630195153:** PI for accepted urgent proposal to "search for pulsed radio emission from transient magnetar SGR 1935+2154 , 02/07/2016, (4.5 hr).

**Arecibo, P2905:** PI for AO16 and AO17 cycle accepted proposals to "catch the re-activation of PSR J1023 as a radio millisecond pulsar" 03/03/2016 ( $2 \times 36$  hr).

**VLA, DDT 15A-484:** PI for accepted DDT proposal titled "3FGL J1544-1128: Catching the newest transitional millisecond pulsar in action", 08/05/2015, (4 hr).

### Co-Investigator

"XMM-Newton Proposal 090270: Probing the Astrophysics of Neutron Star Mergers with X-ray Afterglow", 09/12/2021 , 124 ks trigger for LIGO O4

ATCA : co-I for accepted Australian Compact Telescope Array to "for transitional millisecond pulsars in unassociated *Fermi-LAT* sources", 02/09/2016, ( $6 \times 12$  hrs for 20 sources).

INT extra call 2016 B, co-I for accepted proposal to conduct "a survey for accretion powered transitional millisecond pulsars", 06/08/2016, (8 nights).

*HST*, ID 14724: co-I for accepted imaging proposal in Cycle 24 to "search for a radio millisecond pulsar in a low-mass X-ray binary SAX J1808–3648, 08/04/2016 (4 primary spacecraft orbits).

*Fermi* Guest Investigator: co-PI (contributed significant text) for accepted *Fermi* GI proposal to conduct VLA imaging observations for eight unidentified *Fermi-LAT* sources, 22/01/2016, (~ 80 hr).

INT, I15BN006: co-I for for a *Fermi* selected survey for accretion-powered transitional millisecond pulsars, 02/07/2015, (3 nights and 3 days).

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## Collaborations

2021-2022	Initiator and organiser - biweekly pulsar timing telecon for NuSTAR
2021-present	Member - Ultraviolet Explorer (UVEX) mission's compact binaries working group
2019-present	Member - ZTF collaboration
2019-present	Member - ZTF machine learning collaboration
2020-present	Member - NuSTAR binaries telecon - bi-Weekly Meetings
2017-present	Member - Scientific Working Group- <i>Strobe-X</i>
2017-present	Member - European gravitational Waves, black holes and fundamental physics ( <i>GWverse</i> ) network (European Cooperation in Science and Technology, COST-CA16104)
2016-present	Member - European multi-messenger PHysics and Astrophysics of neutROn Stars( <i>PHAROS</i> ) network (COST-OC-2016-2-21453)
2016-2017	Member - 2nd International Space Science Institute's (ISSI) team on transitional millisecond pulsars

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## Academic Services

2021	Referee - An International Journal of Astronomy, Astrophysics and Space Science, Springer
2021	Reviewer - Giant Metrewave Radio Telescope TAC
2021	Reviewer - NASA Astrophysics Data Analysis Program Panel for allocation of funding to support research based on archival data from the NASA's space astrophysics missions
2019-present	Referee for Astrophysical Journal

- 2019 Reviewer - NASA Astrophysics Data Analysis Program Panel
- 2018-present Referee for Monthly Notices of the Royal Astronomical Society
- 2017 Student representative for ASTRON's five year evaluation
- 2016 Student representative for Netherlands Research School of Astronomy(NOVA)'s five year evaluation board meeting

## Conference Organizer/Chair

- 06/2022 Lead Organizer - An unconference on data intensive astronomy: Where are we and where do we go next?
- 06/2022 Organizer - Machine Learning in Extragalactic Astrophysics: A Way Forward in the New Era of Peta and Exabyte Scale Surveys
- 06/2021 Lead organizer - Machine Learning and Visualisation in Data Intensive Era
- 06/2020 Lead organizer - Bracing for data deluge in astronomy. Tremendous response with engagement on Slack and 175 people in attendance. We are now drafting this session into a two part book series.
- 06/2019 Lead organizer - Understanding data: Visualisation, machine learning, and reproducibility. Very well received sessions with 150 attendants
- 04/2018 Lead organizer - Hack Together day at EWASS 2018, Liverpool, UK
- 04/2018 Lead organizer - Symposium on Software in Astronomy
- 02/2018 Lead organizer - Data-thon as a lead up to ASTRON's involvement with Square Kilometer Array, Dwingeloo, Netherlands
- 06/2017 Lead organizer- Developments and Practices in Astronomy Research Software
- 06/2017 Lead co-organizer - Hack together day at EWASS 2017

## Teaching and Mentoring Experience

- 2020-2021 Caltech SURF program supervisor for Audrey Devault, *Project on Pulsation Searches with Improved NuSTAR Clock Corrections*. This project and the presentation by Audrey Devault selected for Perpal Speaking Competition. I have been mentoring Audrey both through this competition and through the process of drafting a paper on our findings.
- 2019-2020 Caltech Wave program supervisor for Tea Susskind, *Project on X-ray exploration of millisecond pulsars*
- 2017-2019 Supervising Master's student Ivo Maatman, *Project on  $\gamma$ -ray variability in the X-ray state of transitional millisecond pulsars*
- 2018-2019 Python workshop during the Hackathon at European Week of Astronomy
- 2016-2017 Teaching Assistant, University of Amsterdam, *Cosmology and Gravitational Waves*
- 2015-2016 Teaching Assistant, University of Amsterdam, *Cosmology*
- 2015-2016 Teaching Assistant, University of Amsterdam, *Radio Astronomy*

## Leadership and Departmental roles

- 2021-2022 Colloquium organiser at Caltech
- 2019-2021 "Tea Talk Series" organiser for two years at Caltech. Restructured the organisation of this series in terms of organisation, online presence and diversity of talk solicitation.
- 2019-2021 Volunteer organiser - Caltech Astronomy Outreach. Coordinating outreach events such as stargazing, public talks and astronomy on tap.
- 2020-2021 Initiated and organised CPA Postdoc Pod : "Thriving in uncertain conditions, navigating academia" to provide a safe space for postdocs during the Covid pandemic.
- 2016-2017 Secretary - PhD and PD student council at Anton Pannekoek Institute.
- 2014-2018 Founder and Organiser - *weekly* "Pulsar Astronomy" journal club at Anton Pannekoek Institute. Successfully operated for 4+ years.

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## Outreach

I am passionate about promoting science with a focus on inspiring students from diverse, traditionally under-represented groups to consider STEM pathways. I have presented multiple, high profile public lectures, organised star gazing nights and visited schools both virtually and in person to interact with students.

- 14/07/2021 Guest speaker for STEM camp “Boots on the Moon” aimed at first generation college students from low-income families
- 21/05/2021 Caltech Stargazing Lecture: “The surprising world of pulsars: Last 55 years and what have they taught us”, attendance: 150 people
- 19/05/2021 Virtual visit and skype a scientist session at Montalvin Manor school
- 5/12/2020 Greenway talk series at Palomar: “Searching for Lighthouses in the Sky” with the Zwicky Transient Facility
- 1/12/2020 Skype a scientist session at West Valley School District, Spokane WA: “Lighthouses in the Sky”
- 9/7/2020 Skype a scientist session at The Episcopal Academy in Delaware, PA: “Neutron stars as probes of gravity”
- 29/4/2020 Skype a scientist session at Griffin Academy Middle School in Vallejo, CA : “Gravitational waves, black holes and neutron stars”
- 12/2019 Visited and gave public lectures in five high schools in India. Focus on pulsar science and promoting girl students to opt for STEM fields.
- 2019-2020 Panelist for Caltech Astro’s Public Lecture Series - bimonthly appearance, 4-5 instances
- 11/2019 Speaker at Caltech Astro’s Astronomy on Tap
- 2019-2020 Invited Co-I and science partner for Satellites: Operation Lightfoot & LJMU ARI. An international collaboration for musicians and astrophysicist.

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## Past Research Experience

- 2013–2014 Visiting student, *International Center for Theoretical Science, Tata Institute of Fundamental Research, Bangalore*, Supervisor: Dr. Ajith Parmeswaran.  
Worked on **parameter estimation of generic binaries using gravitational wave observations.**
- 01/2013–07/2013 Master's thesis student, *Indian Institute of Astrophysics, Bangalore*, Supervisor: Dr. Pravabati Chinganabam.  
Worked on **statistical properties of cosmic microwave background.**