Matteo Bachetti's Curriculum Vitae

Personal info

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Born 29 Nov 1981, Cagliari, Italy

Married, two daughters

Research activity

Accretion, pulsar timing and ULXs. Much of my research involves the study of accreting X-ray sources, typically neutron stars or black holes, often with pulsar **timing**. I am recognized as one of the key names in the study of **Ultraluminous X-ray sources** (ULXs): I published the **first solid evidence of a spectral break** above 10 keV, and in 2014 I discovered the **first ultraluminous pulsar** in **M82 X-2**, and still coordinate its follow-up (recently measuring its orbital decay).

Spectral timing (/polarimetry). Together with Daniela Huppenkothen and others, I have written and continuously maintain one of the leading spectral timing analysis software for high-energy data, **Stingray**.

Development and calibration of observational instruments. I coordinated the **time calibration of the NuSTAR** satellite, which earned me a **NASA Medal** for Exceptional Scientific Achievement in 2016. I am on the Science Team and/or calibration/operational teams of IXPE, NuSTAR and the Sardinia Radio Telescope, in the **IACHEC** Timing WG, and **co-I of proposals for new missions**, the latest of which is HEX-P. I'm now **PI of an INAF Curiosity Techno** project on the development of new perovskite-based X-ray detectors.

Statistics, new algorithms, citizen science. **New analysis algorithms**, **machine learning and simulation based inference**, and **3D computer games** for pulsar search with **citizen science** (I am scientific PI of the **CICLOPS** project).

List of publications

Most cited

1. **Bachetti, M.**, Harrison, F. A., Walton, D. J. *et al.*, An ultraluminous X-ray source powered by an accreting neutron star, *Nature* **514**, 202 (2014) (754 citations)
2. Huppenkothen, D., **Bachetti, M.**, Stevens, A. L. *et al.*, Stingray: A Modern Python Library for Spectral Timing, *ApJ* **881**, 39 (2019) (295 citations)
3. **Bachetti, M.**, Rana, V., Walton, D. J. *et al.*, The Ultraluminous X-Ray Sources NGC 1313 X-1 and X-2: A Broadband Study with NuSTAR and XMM-Newton, *ApJ* **778**, 163 (2013) (174 citations)
4. **Bachetti, M.**, Harrison, F. A., Cook, R. *et al.*, No Time for Dead Time: Timing Analysis of Bright Black Hole Binaries with NuSTAR, *ApJ* **800**, 109 (2015) (108 citations)
5. Gandhi, P., **Bachetti, M.**, Dhillon, V. S. *et al.*, An elevation of 0.1 light-seconds for the optical jet base in an accreting Galactic black hole system, *Nat. Astron.* **1**, 859 (2017) (90 citations)

Publication record

Source: NASA ADS, UT 2026-10-11. Citations and h-index refer to the refereed papers.

217 papers in refereed journals (12 as first author); Book Chapters: 1; White papers: 6; Refereed Conference proceedings: 12; Proceedings and online presentations: 31; Astronomer's Telegrams: 22; Internal reports: 9; 34636 citations from 22504 papers; 1299 citations to my first-author papers, from 1048 papers; h-index: 60.

Selected from 217 refereed papers and 87 other publications; full list on NASA ADS.

Software

Programming languages: Python, C, Fortran

Techniques: MPI, Optimization, Continuous Integration

Released (or to be released) software

- **Stingray - X-ray spectral timing made easy**: Python library for spectral timing analysis of high-energy data, written and maintained with D. Huppenkothen and others (Python 3.8+)
- **High ENergy Data Reduction Interface from the Command Shell**: Command-line scripts based on Stingray for quick-look (spectral-)timing analysis of X-ray data (Python 3.8+)
- **SRT Single Dish Tools**: Python tools for the quicklook and analysis of single-dish radio data from the Sardinia Radio Telescope (Python 3.6+)

Work Experience

- **Jan. 2024-today**: **Senior researcher**, INAF-Osservatorio Astronomico di Cagliari. *Spectral timing studies of compact objects*
- **Dec. 2016-2023**: **Staff scientist (permanent)**, INAF-Osservatorio Astronomico di Cagliari. *Spectral timing studies of compact objects*
- **Dec. 2015-2016**: **Staff scientist**, INAF-Osservatorio Astronomico di Cagliari. *Multiwavelength studies from radio to X-rays of compact Galactic sources*
- **Sept. 2014-Nov. 2015**: **Post Doc Researcher**, Osservatorio Astronomico di Cagliari. *Multiwavelength studies of double neutron star binaries and X-ray binaries*
- **Feb. 2010-Aug. 2014**: **CNES Post Doctoral Fellowship and short contracts**, IRAP (formerly CESR), Toulouse, France. *Accretion studies with NuSTAR; development of the LOFT and SVOM missions; noise modelling in Planck-HFI; search for QPOs in the RXTE archive*

Education

- **12 Feb 2010**: **PhD**, Università degli Studi di Cagliari
- **23 Nov 2006**: ***Laurea Specialistica*** **(Master's Degree)**, Università degli Studi di Cagliari
- **12 Nov 2003**: ***Laurea Triennale*** **(Bachelor's Degree)**, Università degli Studi di Cagliari

Awards

- **2018**: **Fulbright Scholar Fellowship for a 9-month visit to Caltech**
- **2 Apr 2017**: **Premio città di Selargius**
- **13 Oct 2016**: **NASA Exceptional Scientific Achievement Medal**. For exceptional scientific achievement in the development of NuSTAR timing analyses, which resulted in the discovery of the most luminous pulsar.
- **2013–2014**: **NASA Group Achievement award** ×3, as part of NuSTAR Operations Team (2014), Science Team (2014), Science Commissioning and Operations Team (2013)

Grants and projects as PI

- **2026-2028**: *PI*, INAF Curiosity Techno - A new generation of Halide Perovskite-based Hard X-ray detectors - 29.5 k€
- **2020**: *PI*, H2020-SPACE-2020 proposal GamingA (highly rated but rejected)
- **2020-2023**: *PI*, PRIN INAF-TEC 2019, SpecTemPolar! - 47k€ granted
- **2018-2020**: *Science PI*, POR FESR 2014-2020 - Asse 1, Azione 1.1.3. PROGETTO CiClOPS - 143 k€ granted
- **2018-2020**: *PI*, Microsoft Azure Research Award - proposal Mighty Mice in the cosmos. 5 k€ in computing resources granted

Missions, collaborations and working groups

Affiliated scientist, **SVOM collaboration** (2026-). WP leader, **GECO (ASI-INAF small mission concept)** (2026-). **High Energy Astrophysics Software Futures**: Member of Modeling working group (2025); Vice-chair of Time domain working group (2025). Member, **HEASARC user's group** (2023-). Task leader, **National Centre For HPC, Big Data And Quantum Computing** (2022-). **HEX-P**: Lead, ULX working group (2022-2024); Co-I, NASA Probe mission concept (2022-). Co-I, **DUET (NASA SMEX mission concept)** (2019). Member, **IACHEC** (2019-). **IXPE**: Member, instrument team (2018-), Hardware Team (2017-). Member, **Strobe-X science working group** (2017-). Member, **XIPE Science Team** (2015-). **Sardinia Radio Telescope**: Member, Operations Team (2015-), Science Commissioning and Validation Team (2014-). **NuSTAR**: Lead, Timing WG (2012-); Member, Science Commissioning and Operations Team (2012), Galactic Binaries Working Group (2011-), ULX Working Group (2011-), Science Team (2011-). Member, **LOFT Science Team** (2011-2014).

Selected accepted proposals for observing and computing time

As PI: 2.2 Ms of NuSTAR, 160 ks of XMM-Newton, 60 ks of Chandra, 60 ks of Swift, 36 h of Sardinia Radio Telescope and 2 million CPU hours (FERMI Cluster, CINECA), in 13 proposals (2013–2025); co-I of 4 more.

Conferences with contributions

Latest invited talks

- **1 Dec 2025 – 12 Dec 2025**: **Invited Lecturer**, "Timing analysis", ASTRAL-X: Advanced Spectral-Timing, Polarimetry, and High-Resolution Spectroscopy X-ray School for Latin-America, La Plata, Argentina
- **11 Jun 2024**: **Invited talk**, "The High Energy X-ray Probe (HEX-P)", From the Dolomites to the event horizon: sledging down the black hole potential well, Sesto (BZ), Italy
- **22 Feb 2024**: **Invited Lecturer**, "An introduction to X-ray timing analysis using Stingray", Joint NICER/IXPE Workshop 2024, George Washington University, Washington D.C (remote)

Latest contributed talks

- **10 Sep 2026**: **Talk**, "What we can learn from the variability of M82 ULXs", The many tones of Accretion, Cefalù, Italy
- **24 Jun 2026**: **Talk**, "What we can learn from the variability of M82 ULXs", Breaking The Limits-Super Eddington Accretion onto compact objects, Cagliari, Italy
- **6 May 2026**: **Talk**, "Ultraluminous X-ray sources in the time domain", LXVII Congresso Annuale della Società Astronomica Italiana, L'Aquila, Italy

Other contributions: 16 invited talks, 28 talks, 9 posters (2007–2026)

Conference organization

- **22–26 Jun 2026**: **SOC co-chair, LOC chair**, Breaking the limits 2026, Cagliari, Italy
- **20–22 Jun 2022**: **SOC co-chair, LOC chair**, Ten Years of High-Energy Universe in Focus: NuSTAR 2022, Cagliari, Italy
- **1–5 Oct 2018**: **SOC co-chair, LOC chair**, Breaking the limits 2018, Castiadas (CA), Italy

Also chair or co-chair of 4 more conferences (2011–2018) and member of the organising committees of 7 more (2009–2024).

Expert Services

Member of selection committee: Fulbright Research scholar competition (2026, 2024); Proposal reviewer: Fulbright Research scholar competition (2025, 2022); External reviewer: Fornax science console (2025); Member of time allocation committee: XMM-OTAC (2023, 2022, 2015), TAP - Chinese Telescope Access Program (2015); Reviewer for funding program: Russian Megagrants program (2017), Polish NCN-OPUS program (2017), Netherland NWO Veni program (2016); Reviewer for time allocation committee: Italian SuperComputing Resource Allocation (2012-); 10 selection committees (3 as president), 2017–2021; 2 PhD thesis committees (2018); referee for *RASTI*, *PASP*, *A&A*, *JOSS*, *Exp. Astron.*, *MNRAS*, *Nature*, *ApJ*, *AN* (since 2011).

Teaching and supervision

Supervisor of 3 post-docs (2022–2025); co-supervisor of 2 PhD students (2020–2022); supervisor or co-supervisor of 9 Master's or internship students (2013–2023); mentor of 13 Google Summer of Code projects (2016–2026); 13 courses, lectures and tutorials (2008–2025).

In the Media

29 media appearances (2012–2024): Media INAF (6), Press Release (6), Newspaper interview (5), TV interview (5), Magazine interview (3), Podcast interview (2), Blog interview (1), NASA Media telecon and Press Release (1).

Languages

Italian (mother-tongue), English (fluent, C1–C2), French (fluent, B2–C1), Sardinian (fluent, A2–C1), Spanish (basic, A2–B1)