

# Benjamin Ricketts

Updated January 6, 2026

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**Office:** SRON, Leiden

**Citizenship:** United Kingdom

## Research interests

Black holes, accretion physics, machine learning, X-ray timing, Bayesian hierarchical modeling

## Education

### University of Amsterdam

Amsterdam, Netherlands

PhD in Astronomy

September 2022 – Present

Supervisors: Daniela Huppenkothen, Phil Uttley

### University of Southampton

Southampton, United Kingdom

MSci in Astrophysics

September 2018 – July 2022

Mentors: James Steiner, Cecilia Garraffo, Ian McHardy

## Other experience

### Principal Investigator: NEBULA-Xplorer

2024 - present

The NEBULA-Xplorer project is an €50M X-ray timing small satellite concept orientated around long term observations of bright X-ray binary sources within the Milky Way. NEBULA-Xplorer was approved to move to the next stage in the 2025 ESA exploratory mini-F call and deemed "high scientific value for money".

## Publications

**2 refereed, 3 under review, 1 non-refereed, list attached**

## Presentations

**1 invited, 3 contributed, 5 colloquia, 6 posters, list attached**

## Software

### nDspec

Lead developer of open-source python package providing analysis tools for multi-dimensional X-ray data: <https://github.com/matteolucchini1/nDspec>

### XRIimulator

Lead developer of the model simulator for the X-ray Interferometry Simulator XRIimulator: <https://github.com/X-ray-interferometry/XRIimulator>

### reltrans

Developer of the reltrans black hole X-ray reverberation model package as part of my research: <https://github.com/reltrans/reltrans>

## Teaching experience

### Workshop Instructor, Software Carpentry (NWO-I)

2023 - Present

I teach as both a primary instructor and helper for various software workshops where I generally teach principals of version control and integration of programming in python into the workflow of researchers at all points in their career.

### Teaching assistant, API (University of Amsterdam)

### Extreme astrophysics

Autumn 2022, Autumn 2023

Master's course encompassing the physics of black hole accretion discs and jets. Gave 2 3-hour tutorials weekly as well as creating solutions/rubrics for biweekly problem sheets. Graded problem sheets. Marked final project programs.

	<b>Introduction to cosmology</b> Autumn 2023 Bachelor course encompassing an introduction to cosmology for bachelor students. Taught in 2 blocks of 4-hour lectures/problem classes per week. Graded final presentations and the final exam.
Research supervision	<b>Merijn van Otterlo, BSc project (University of Amsterdam)</b> 2025 Project title: "Emulating comptonisation around a black hole" <b>Fatima Abdiche, MSc project (University of Amsterdam)</b> 2024-2025 Project title: "QPOs as Probes of Relativistic Precession: Lorentzian Modeling in GX339-4 and MAXI-J1820" <b>Chuhan Jiang, MSc project (University of Amsterdam)</b> 2024-2025 Project title: "Developing the science case for NEBULA-Xplorer: a new generation X-ray timing telescope" <b>Konstantinos Tsalapatas, MSc project (University of Leiden)</b> 2023-2024 Project title: "X-raying the stellar wind of Cygnus X-1"
Computing resource grants	<b>SURF EINF-13764</b> April 2025 - April 2026 "Emulation of black hole reflection spectra" Awarded 30000 CPU hours and 5000 GPU hours on Research Cloud - HPC Cloud from SURF NL <b>SURF EINF-9197</b> March 2024 - March 2025 "Bayesian inference of black holes with X-ray timing" Awarded 30000 CPU hours and 5000 GPU hours on Research Cloud - HPC Cloud from SURF NL <b>SURF EINF-5505</b> March 2023- March 2024 "Exploring Black Hole Spectral Timing with Bayesian Hierarchical Modeling" Awarded 15000 CPU hours and 10000 GPU hours on Research Cloud - HPC Cloud from SURF NL
Skills	<b>Programming</b> Proficient in: Python, Fortran, Pytorch, git/github. Familiar with: HTML, machine learning, C++, high performance computing. <b>Languages</b> English (native speaker), Dutch (basic), Swedish (basic), French (basic) <b>Organisation</b> Hackathons, Digital Carpentry workshops.
Professional memberships	<b>American Astronomical Society.</b> September 2023 – Present Attended 19th AAS HEAD division meeting and 243rd AAS meeting.
Service to profession	<b>Invited referee for APJ and A&amp;A</b>

# Publications

# Benjamin Ricketts

## Lead author

**RTFAST-Spectra: emulation of X-ray reverberation mapping for active active galactic nuclei**

**Ricketts, B.**, Huppenkothen, D., Lucchini, M., et al *MNRAS*, *V538*, *p1096-1117*, (2025).

**Mapping the X-ray variability of GRS1915+105 with machine learning**

**Ricketts, B.**, Steiner, J., Garraffo, C., et al *MNRAS*, *V523*, *p1946-1966*, (2023).

## Contributing author

**Disk warping and black hole X-ray binaries I. Tentative unification of low-frequency quasi-periodic oscillations**

Marcel, G., Turner, S., **Ricketts, B.**, et al. *A&A*, *arXiv:2511.10474*, (under review).

**Equation-of-state-informed pulse profile modeling**

Hoogkamer, M., et al, incl **Ricketts, B.** *PRD*, *arXiv:2510.27619*, (under review)

**nDspec: a new Python library for modelling multi-dimensional datasets in X-ray astronomy**

Lucchini, M., **Ricketts, B.**, et al, *A&A*, *arXiv:2512.10615*, (under review)

## Non-refereed

**NEBULA-Xplorer (Novel Extended Binary Linked Astrophysics - Xplorer): mini-Fast mission proposal**

**Ricketts, B.**, et al, *available on request*

# Presentations

# Benjamin Ricketts

## Invited talks

### **Machine learning and Black hole modelling**

The True Appearance of Black Holes workshop, Milan, Italy. April 2025

## Colloquia

### **NEBULA-Xplorer: an X-ray timing small satellite concept for long term**

SRON colloquium, Leiden, Netherlands. February 2025

### **Mapping the X-ray variability of GRS1915+105 with machine learning**

Data Science, SISSA, Trieste, Italy. May 2023

ML Journal club, Leiden Observatory, Netherlands. April 2023

SRON, Leiden, Netherlands. March 2023

X-ray Bun Club, Cambridge University, UK. February 2023

## Contributed talks

### **NEBULA-Xplorer: an X-ray timing small satellite concept for long term**

#### **x-ray timing monitoring**

NOVA Network 3 meeting, Nijmegen, Netherlands November 2025

CTAO/KM3NeT synergy meeting, Leiden, Netherlands. November 2025

Accretion meeting, Vasto, Italy. June 2025

## Posters

### **RTFAST-S: emulation of X-ray reflection around black holes**

11th Microquasar Workshop, Cefalù, Italy. September 2025

### **Emulation for x-ray reverberation: faster fitting**

Netherlands' Astronomers Conference 2024, Egmond An Zee, Netherlands.

May 2024

### **Emulation by committee: faster AGN fitting**

EUCAIFcon 2024, Amsterdam, Netherlands. April 2024

243rd AAS, New Orleans, USA. January 2024

### **Mapping the X-ray variability of GRS1915+105 with machine learning**

EAS annual meeting, Krakow, Poland. July 2023

19th AAS HEAD meeting, PA, USA March 2022