

# Ayan Bhattacharjee

✉ ayan@unist.ac.kr • 🌐 astro-ayan.github.io • 📺 Astro-Ayan

## RESEARCH INTERESTS

- 📖 **Accretion-Ejection around Compact Objects:** X-Ray Spectra/Timing Studies, Smoothed Particle Hydrodynamics, Monte Carlo Simulations, Radiative Transfer
- 📖 **Dynamics of Jets:** Relativistic Hydrodynamics, Radio Emission Modelling, Hydrodynamic Instabilities

## EMPLOYMENT

🏢 <b>Postdoctoral Researcher</b> Department of Physics, UNIST NRF CREATIVE AND CHALLENGING (창의·도전) RESEARCH FELLOW	<b>South Korea</b> Jun 2022 – Present
🏢 <b>Researcher</b> Center for High-Energy Astrophysics, UNIST	<b>South Korea</b> Jul 2021 – Jun 2022
🏢 <b>Visiting Researcher</b> Department of Astrophysics and Cosmology, SBNBCBS	<b>India</b> Aug 2019 – Jul 2020
🏢 <b>Senior Research Fellow</b> Department of Astrophysics and Cosmology, SBNBCBS	<b>India</b> Aug 2016 – Jul 2019
🏢 <b>Junior Research Fellow</b> Department of Astrophysics and Cosmology, SBNBCBS	<b>India</b> Aug 2014 – Jul 2016

## EDUCATION

🎓 <b>Ph.D. in Astrophysics</b> 🏛️: S. N. BOSE NATIONAL CENTRE FOR BASIC SCIENCES THESIS: Spectral And Timing Properties Of Black Holes And Neutron Stars In X-Ray Binaries Using Two-Component Advective Flow Solution Advisor: Prof. Sandip K. Chakrabarti	<b>India</b> Aug 2014 – Feb 2021
🎓 <b>M.Sc. in Physical Sciences (Graduated 1st in Class of '14)</b> 🏛️: S. N. BOSE NATIONAL CENTRE FOR BASIC SCIENCES PROJECT: Parrondo's Paradox and the Brownian Ratchet Project Supervisor: Prof. Punyabrata Pradhan	<b>India</b> Aug 2012 – Jul 2014
🎓 <b>B.Sc. in Physics (Graduated 2nd in Class of '12)</b> 🏛️: WEST BENGAL STATE UNIVERSITY	<b>India</b> 2009 – 2012

## REFEREED PUBLICATIONS

- 📖 **First Authored:** 5 [2 MNRAS<sup>†</sup>, 2 ApJ<sup>†</sup>, 1 ASSP<sup>†</sup>]
- 📖 **Corresponding Author:** 5  
Second authored: 3 [1 ApJ<sup>†</sup>, 1 RAA, 1 AdSpR]  
Contributory author: 2 [1 ApSS, 1 AdSpR]
- ☰ **Complete List of Publications:** ORCID, Google Scholar, NASA ADS

## PROFESSIONAL SERVICES

- ✍️ **Editor:** Two-Component Advective Flow (TCAF) XSPEC User Manual, 2024
- 👥 **Member:** Korea Numerical Astrophysics Group (KNAG), 2023-Present
- 👥 **Member:** Korean Astronomical Society (KAS), 2021-Present
- 👥 **Member:** Center for High-Energy Astrophysics (CHEA), UNIST, 2021-2022
- 👤 **Peer-Reviewer:** Research in Astronomy and Astrophysics (RAA), 2020-Present
- 👤 **Resource Personnel:** Two-Component Advective Flow (TCAF) XSPEC User Group, 2014-Present

## SELECTED PUBLICATIONS

1. **A. Bhattacharjee**, I. Banerjee, A. Banerjee, D. Debnath, S. K. Chakrabarti, "The 2004 outburst of BHC H1743-322: analysis of spectral and timing properties using the TCAF solution", **MNRAS**, **466**, 1372-1381 (2016)
2. **A. Bhattacharjee**, S. K. Chakrabarti, "Monte Carlo Simulations of Thermal Comptonization Process in a Two Component Advective Flow around a Neutron Star.", **MNRAS**, **472**, 1361-1371 (2017)
3. **A. Bhattacharjee**, "Generalized Flows Around Neutron Stars", in Mukhopadhyay B., Sasmal S. (eds) *Exploring the Universe: From Near Space to Extra-Galactic*, **ASSP**, vol 53. Springer, Cham, 93-107 (2018)
4. **A. Bhattacharjee**, S. K. Chakrabarti, "Timing Properties of Shocked Accretion Flows around Neutron Stars in presence of cooling", **ApJ**, **873**, 119 (2019)
5. A. Banerjee, **A. Bhattacharjee**, D. Debnath, S. K. Chakrabarti, "Spectral Analysis of  $\chi$  Class Data of GRS 1915+105 Using TCAF Solution", **RAA**, 20(12), 208 (2020)
6. A. Banerjee, **A. Bhattacharjee**, D. Chatterjee, D. Debnath, S. K. Chakrabarti, T. Katoch, & H. M. Antia, "Accretion Flow Properties of GRS 1915+105 During Its  $\theta$  Class Using AstroSat Data", **ApJ**, 916(2), 68 (2021)
7. D. Chatterjee, D. Debnath, A. Jana, J. R. Shang, S. K. Chakrabarti, H. K. Chang, A. Banerjee, **A. Bhattacharjee**, K. Chatterjee, R. Bhowmik, S. K. Nath, "AstroSat observation of non-resonant type-C QPOs in MAXI J1535-571", **ApSS**, 366(8), 82 (2021)
8. S. Chowdhury, S. Sasmal, J. Brundell, S. Chakraborty, **A. Bhattacharjee**, & S. K. Chakrabarti, "Energetic electron precipitation during lightning activities over Indian landmass as observed from WWLLN and NOAA-15 satellite", **AdSR**, 68(10), 4205 (2021)
9. A. Banerjee, **A. Bhattacharjee**, D. Debnath, S. K. Chakrabarti, "Similarities and differences in accretion flow properties between GRS 1915+105 and IGR J17091-3624: A case study", **AdSR**, 69(7), 2930 (2022)
10. **A. Bhattacharjee**, J. Seo, D. Ryu, & H. Kang, "A Simulation Study of Low-Power Relativistic Jets: Flow Dynamics and Radio Morphology of FR-I Jets", **ApJ** (in press), (2024)

## GRANTS, FELLOWSHIPS AND ACHIEVEMENTS

- 🏆 **Creative and Challenging Research Grant**: "Simulation Study on Low-Powered FR-I Jets from Radio Galaxies", total budget of 210,000,000 KRW (\$169,195), National Research Foundation of Korea, 2022-2025
- 📺 **SERB-ITS Grant**: Presenting findings at FOXT, API, Amsterdam, DST, India, 2019
- 📺 **COSPAR Grant**: An €800 support for 42nd COSPAR Assembly, COSPAR Secretariat, Caltech, USA, 2018
- 🌟 **Secured Eligibility for Lectureship/Assistant Professorship**: **CSIR-UGC NET**, The Council of Scientific & Industrial Research and University Grants Commission, Department of Higher Education, India, 2015-2016
- 🌟 **Secured Eligibility for Scientific Officer**: A 99.6 percentile in OCES/DGFS 2014, Bhaba Atomic Research Centre, Department of Atomic Energy, India, 2014
- 🌟 **Secured Eligibility for Engineering M.Tech.**: Ranked 172 in nationwide Graduate Aptitude Test in Engineering (GATE), Department of Higher Education, India, 2014
- 🏆 **Gold Medal**: 1st position in IPHD Programme (2012-2014), Dean (AP) & Director of SBNBCBS, DST, 2014
- 🎓 **PBIR Fellowship**: Scholarship for Post-B.Sc. Integrated-PhD Scholar, SBNBCBS, DST, India, 2012
- 🏆 **Gold Medal**: 1st position in B. Sc.(H) Physics, BRSN College, 2012
- 🏆 **INSPIRE (Scholarship for Higher Education)**: Top 1% in the 10th & 12th standard, DST, India, 2009

## COMPUTATIONAL SKILLS

- PRIMARY: **Fortran 77** [Advanced], **Shell** [Advanced], **C/C++** [Intermediate]
- SECONDARY: **Mathematica** [Advanced], **ROOT** [Advanced], **Python** [Proficient], **Matlab** [Intermediate]
- 🖥️ VISUALIZATION: **GNUplot** [Advanced], **XmGrace** [Advanced], **SuperMongo** [Advanced], **IDL** [Advanced], **ParaView** [Intermediate], **Grapher** [Intermediate], **Origin** [Intermediate]

## DATA REDUCTION & ANALYSIS SKILLS:

- 📺 **HEASOFT/XSPEC** [Advanced]: Spectral analysis, modelling.
- 📺 **HEASOFT/XRONOS** [Proficient]: Timing analysis, modelling.
- 📺 **RXTE/PCA** [Advanced]: Spectral and Timing Data extraction, analysis.
- 📺 **RXTE/HEXTE** [Proficient]: Spectral and Timing Data extraction, analysis.
- 📺 **AstroSat/LAXPC** [Intermediate]: Spectral and Timing Data extraction, analysis.

## INVITED AND SOLICITED TALKS

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- Two Component Advective Flows (TCAF):**  
Fitting Procedure and Results for Stellar and supermassive black holes **ICSP, Kolkata, India**  
🔊: *X-ray Spectral fitting of BHXRBs by TCAF FITS file* **Sep 25, 2024**
- THE 2023 SEPTEMBER KNAG MEETING** **KASI, Daejeon, South Korea**  
🔊: *A Simulation Study of Low-Power Relativistic Jets:* **Sep 15, 2023**  
Structures and Dynamics of FR-I Jets
- THE 68TH GWNR WORKSHOP** **APCTP, POSTECH, Pohang, South Korea**  
🔊: *Numerical Simulations of Accretion-Ejection around Compact Objects:* **Mar 15-16, 2023**  
What to include (and what not to)?
- CHEA SPECIAL SEMINAR** **CHEA, UNIST, Ulsan, South Korea**  
🔊: *Could There Be a Unified Spectral Model for Black Holes and Neutron Stars?* **Jul 22, 2021**

## SELECTED TALKS FROM INTERNATIONAL CONFERENCES

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- THE 45TH COSPAR ASSEMBLY, SESSION E1.2** **BEXCO, Busan, South Korea**  
🔊: *What is the Origin of Jets in Accreting Neutron Stars?* **Jul 13 - 21, 2024**  
A Unified Accretion-Ejection Mechanism for Compact Objects
- THE 45TH COSPAR ASSEMBLY, SESSION E1.8** **BEXCO, Busan, South Korea**  
🔊: *A Simulation Study on Relativistic Jets:* **Jul 13 - 21, 2024**  
Impact of the Central kpc Region on Jets across Different Scales
- THE XXXI<sup>st</sup> IAU GA MEETING, FOCUS MEETING 1** **BEXCO, Busan, South Korea**  
🔊: *A Simulation Study on the Morphological Dichotomy of FR-I and FR-II Jets* **Aug 2-11, 2022**
- THE 43RD COSPAR ASSEMBLY, SESSION E1.5** **Online, Sydney, Australia**  
🔊: *What is the Origin of QPOs in Accreting Neutron Stars?* **Jan 28 - Feb 4, 2021**
- THE 43RD COSPAR ASSEMBLY, SESSION E1.8** **Online, Sydney, Australia**  
🔊: *Can there be a Unified Spectral Model for Black Holes and Neutron Stars?* **Jan 28 - Feb 4, 2021**
- THE FUTURE OF X-RAY TIMING** **API, Amsterdam, Netherlands**  
🔊: *Can a Two-Component paradigm explain the spectral and timing properties of neutron stars?* **Oct 22 - 25, 2019**
- EXPUNIV2018: BLACK HOLES & HIGH ENERGY ASTROPHYSICS** **SNBNCBS, Kolkata, India**  
🔊: *The Formation of Two Component Advective Flow around Neutron Stars* **Nov 14 - 17, 2018**
- THE 42ND COSPAR ASSEMBLY, SESSION E1.13** **Caltech, Pasadena, CA, USA**  
🔊: *Formation of Two-Component Advective Flows around Neutron Stars and the Possibility of Super-Eddington Accretion Rates* **Jul 14 - 22, 2018**
- THE 42ND COSPAR ASSEMBLY, SESSION E1.10** **Caltech, Pasadena, CA, USA**  
🔊: *Formation and Stability of Oscillating Shocks in Inviscid Advective Flows around Neutron Stars in Presence of Cooling using Smoothed Particle Hydrodynamics Simulations* **Jul 14 - 22, 2018**
- THE 42ND COSPAR ASSEMBLY, SESSION E1.4** **Caltech, Pasadena, CA, USA**  
🔊: *The Formation of Two Component Advective Flow around Neutron Stars* **Jul 14 - 22, 2018**
- THE 15TH MARCEL GROSSMANN MEETINGS, S. AC1** **University of Rome, Italy**  
🔊: *The Formation of Two Component Advective Flows around Neutron Stars* **Jul 1 - 7, 2018**
- INTEGRAL SYMP., S. 4: ACCRETION AND EJECTION: GALACTIC AND EXTRAGALACTIC** **INAF, Venice, Italy**  
🔊: *Is neutron star spectrum also an outcome of TCAF?* **Oct 15 - 20, 2017**
- INTEGRAL SYMP., S. 2: OUTBURSTING SOURCES: BHC, NS, AGN/BLAZARS** **INAF, Venice, Italy**  
🔊: *Outburst of BHC H1743-322: Analysis of Spectral and Timing Properties Using TCAF Solution* **Oct 15 - 20, 2017**
- WIDE BAND SPECTRAL AND TIMING STUDIES OF COSMIC X-RAY SOURCES** **TIFR Mumbai, India**  
🔊: *Is Neutron Star Spectrum also an Outcome of TCAF?* **January 10 - 13, 2017**