Ayan Bhattacharjee

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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

Postdoctoral Researcher — **South Korea**
Research Institute of Basic Sciences, SNU — *Jan 2025 – Present*
NRF Creative and Challenging (창의·도전) Research Fellow

Postdoctoral Researcher — **South Korea**
Department of Physics, UNIST — *Jun 2022 – Dec 2024*
NRF Creative and Challenging (창의·도전) Research Fellow

Researcher — **South Korea**
Center for High-Energy Astrophysics, UNIST — *Jul 2021 – Jun 2022*

Visiting Researcher — **India**
Department of Astrophysics and Cosmology, SNBNCBS — *Aug 2019 – Jul 2020*

Senior Research Fellow — **India**
Department of Astrophysics and Cosmology, SNBNCBS — *Aug 2016 – Jul 2019*

Junior Research Fellow — **India**
Department of Astrophysics and Cosmology, SNBNCBS — *Aug 2014 – Jul 2016*

Education

: Ph.D. in Astrophysics — **India**
: S. N. Bose National Centre for Basic Sciences — *Aug 2014 – Feb 2021*
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

: M.Sc. in Physical Sciences (Graduated 1st in Class of '14) — **India**
: S. N. Bose National Centre for Basic Sciences — *Aug 2012 – Jul 2014*
Project: Parrondo's Paradox and the Brownian Ratchet
Project Supervisor: Prof. Punyabrata Pradhan

: B.Sc. in Physics (Graduated 2nd in Class of '12) — **India**
: West Bengal State University — *2009 – 2012*

Refereed Publications

- **First Author**: **5** [2 MNRAS†, 2 ApJ†, 1 ASSP†]
- **Corresponding Author**: **5**
  Second Author: **3** [1 ApJ†, 1 RAA, 1 AdSpR]
  Contributory Author: **2** [1 ApSS, 1 AdSpR]
- **Complete List of Publications**: Google Scholar, NASA ADS, ORCID

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 χ 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 θ 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**, 976, 91 (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
- **Eligibility for Lectureship/Assistant Professorship**: **CSIR-UGC NET**, India, 2015-2016
- **Eligibility for Scientific Officer**: A 99.6 **percentile** in OCES/DGFS 2014, BARC, India, 2014
- **Eligibility for Engineering M.Tech.**: All India Rank **172** in **GATE**, India, 2014
- **Gold Medal: 1st** position in IPhD Programme (2012-2014), Dean (AP) & Director of SNBNCBS, DST, 2014
- **PBIR Fellowship:** Scholarship for Post-B.Sc. Integrated-PhD Scholar, SNBNCBS, DST, India, 2012
- **Gold Medal**: **1st** position in B. Sc.(H) Physics, BRSN College, India, 2012
- **INSPIRE (Scholarship for Higher Education):** Top 1% in the 10th & 12th standard, DST, India, 2009

Computational Skills

- Primary: **Fortran** [Advanced], **Shell** [Advanced], **Mathematica** [Advanced]
- Secondary: **ROOT** [Advanced], **Python** [Proficient], **Matlab** [Intermediate], **C/C++** [Intermediate]
- Data Visualization: **GNUplot** [Advanced], **SuperMongo** [Advanced], **IDL** [Advanced], **Grace** [Advanced], **ParaView** [Intermediate], **Grapher** [Intermediate], **Origin** [Intermediate]
- Version Control and Parallel Computing: **git** [Proficient], **OpenMP** [Intermediate], **MPI** [User Experience]
- Word Processing: **LaTeX** [Advanced], **Pages** [Advanced], **Hancom Office** [Proficient], **Markdown** [Proficient]
- Reference Management: **BibTex** [Advanced], **Obsidian** [Advanced], **Zotero** [Advanced]
- Operating Systems: **Linux** [Advanced], **MacOS** [Advanced], **Windows** [Proficient]

Data Reduction & Analysis Skills:

- Packages: **HEASOFT/FTools** [Advanced], **HEASOFT/Xanadu** [Xspec, Xronos; Advanced].
- Missions: **RXTE/PCA** [Advanced], **RXTE/HEXTE** [Proficient], **AstroSat/LAXPC** [Intermediate].

Selected Invited and Solicited Talks

SNU Astronomy Colloquia — **SNU, Seoul, South Korea**
🔊: *What is the Origin of Jets in Accreting Neutron Stars?*
A Unified Accretion-Ejection Mechanism for Compact Objects — *April 17, 2025*

Two Component Advective Flows (TCAF): — **ICSP, Kolkata, India**
Fitting Procedure and Results for Stellar and supermassive black holes
🔊: *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:*
Structures and Dynamics of FR-I Jets — *Sep 15, 2023*

The 68th GWNR Workshop — **APCTP, POSTECH, Pohang, South Korea**
🔊: *Numerical Simulations of Accretion-Ejection around Compact Objects:*
What to include (and what not to)? — *Mar 15-16, 2023*

Selected Talks from International Conferences

The 45th COSPAR Assembly, Session E1.2 — **BEXCO, Busan, South Korea**
🎤: *What is the Origin of Jets in Accreting Neutron Stars?*
A Unified Accretion-Ejection Mechanism for Compact Objects — *Jul 13 - 21, 2024*

The 45th COSPAR Assembly, Session E1.8 — **BEXCO, Busan, South Korea**
🎤: *A Simulation Study on Relativistic Jets:*
Impact of the Central kpc Region on Jets across Different Scales — *Jul 13 - 21, 2024*

The $XXXI^{st}$ 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*

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 Avective 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*