Ayan Bhattacharjee

Postdoctoral Researcher · UNIST

Research Interests

My primary area of research has been the accretion-ejection processes around compact objects.

- **Investigating the importance of the advective component of accretion in spectral and timing features of compact objects using multiwavelength observations and numerical simulations.**
- **Monte Carlo simulation of non-local radiation processes around black holes, neutron stars, ULXs, AGNs, for complex flow configurations.**
- **Use of analytical models to study and explain the spectral state transition of Z and Atoll sources.**
- **RHD Simulation of Radio Galaxy Jets, especially focusing on the deceleration of FR-I jets, due to complex interaction between jet and ambient media.**

Refereed Publications

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

Education

S. N. Bose National Centre for Basic Sciences — **India**
PhD. in Astrophysics (Advisor: Prof. Sandip k. Chakrabarti) — *August 2014 – February 2021*†
Spectral And Timing Properties Of Black Holes And Neutron Stars In X-Ray Binaries Using Two-Component Advective Flow Solution
† Delayed due to COVID19 lockdowns

S. N. Bose National Centre for Basic Sciences — **India**
M.Sc. in Physical Sciences — *August 2012 – July 2014*

- **80.9%** (First class, First position in University of Calcutta)

West Bengal State University — **India**
B.Sc. in Physics — *2009 – 2012*

- **74.3%** (First class, Second position in University)

Computational Skills

- Programming Language: **Fortran 77** [Proficient], **C/C++** [Good], **Shell** [Proficient]
- Other Computing Tools: **Mathematica** [Advanced], **ROOT** [Advanced], **Matlab** [Good], **Python** [Good]
- Graphical (plotting) softwares: **GNUplot** [Proficient], **XmGrace** [Proficient], **SuperMongo** [Advanced], **IDL** [Advanced], **ParaView** [Good], **Grapher** [Good], **Origin** [Basic]
- Operating Systems: **Linux** [Advanced], **MacOS** [Advanced], **Windows** [Basic]

Data Reduction & Analysis Skills:

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

github.com/Astro-Ayan

Languages

○ **English** [fluent], ○ **Hindi** [fluent], ○ **Bangla** [Mother Tongue]

Selected Publications

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

Organizational Skills

- **Conference Volunteer**: International Astronomical Union General Assembly Meeting, at BEXCO, South Korea, (**2022**)
- **Conference Volunteer**: EXPUNIV: Black Hole and High Energy Astrophysics, at SNBNCBS, India, (**2018**)
- **Workshop Coordinator**: X-ray Observations and Data Analysis of Compact Objects at 35^{th} Annual Meeting of Astronomical Society of India held at Jaipur, India (**2017**), Link
- **Conference Coordinator**: Indian Science Congress [Children Wing] held at SNBNCBS, India (**2013**)

Grants, Awards and Achievements

- Recipient of Creative and Challenging Research Grant, National Research Foundation of Korea, 2022-2025, **2022R1I1A1A01065435**, with a total budget of 210,000,000 KRW.
- Recipient of ITS from the DST-SERB, Govt. of India, for attending **FOXT**, at API, Amsterdam, 2019
- Recipient of grant of 800 EUR from the Secretariat of the 42nd COSPAR Assembly, Caltech, USA, 2018
- Recipient of Partial grant of from the LOC of the XVth Marcel Grossmann Meeting in Rome, Italy, 2018
- Recipient of travel grant from the LOC of INTEGRAL Symposium, Venice, Italy, 2017
- UGC-NET Fellowship for Junior Research Fellows, 2016
- NET Eligibility for Lecturer-ship in India, 2015
- Conferred the medal of achievement and cash amount of 5000/- for exemplary performance and standing **1st** in the IPhD Programme (2012-2014) by the Dean (AP) and the Director of SNBNCBS, August 2014
- BARC OCES/DGFS 2014 at Bhaba Atomic Research Centre with a 99.6 percentile score (declined), 2014
- All India Rank: **172**, Graduate Aptitude Test in Engineering, 2014

- S. N. Bose Fellow, selected as an Integrated-PhD Scholar, 2012
- Medal of Excellence (**1st** in B. Sc.(H) Physics) from the Principal, BRSN College, June 2012
- INSPIRE (SHE) scholarship from DST, Govt. of India (top 1% in the 10th and 12th standard), July 2009

Invited and Solicited Talks

Two Component Advective Flows (TCAF): **Kolkata, India**
Fitting Procedure and Results for Stellar and supermassive black holes
***T**: X-ray Spectral fitting of BHXRBs by TCAF FITS file* *Sep 25, 2024*
ICSP, Kolkata

The 2023 September KNAG Meeting **Daejeon, South Korea**
***T**: A Simulation Study of Low-Power Relativistic Jets:*
Structures and Dynamics of FR-I Jets *Sep 15, 2023*
KASI, Daejeon

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

CHEA Special Seminar **Ulsan, South Korea**
***T**: Could There Be a Unified Spectral Model for Black Holes and Neutron Stars?* *Jul 22, 2021*
CHEA, UNIST

Selected Talks from International Conferences

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

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

The 109th KAS Meeting, Session HT **Yeosu, South Korea**
***T**:A Simulation Study on the CSO-MSO-FR Track:*
Evolution of Jets across the Galactic Core *Apr 17-19, 2024*
Yeosu

The 108th KAS Meeting, Session HT **Jeju, South Korea**
***P**:A Simulation Study of FR-I jets: Dynamics and Morphology* *Oct 18-20, 2023*
Ramada Plaza, Jeju

The 107th KAS Meeting, Session HT **Jeonju, South Korea**
***T**:A Simulation Study of FR-I Jets: Structures and Dynamics* *Apr 12-14, 2023*
LAHAN Select, Jeonju

The 106th KAS Meeting, Session HT **Gyeongju, South Korea**
***T**:A Study of Morphology of FR-I Jets: Effects of Ambient Media* *Oct 12-14, 2022*
LAHAN Select, Gyeongju

The $XXXI^{st}$ IAU GA Meeting, Focus Meeting 1 **Busan, South Korea**
***T**: A Simulation Study on the Morphological Dichotomy of FR-I and FR-II Jets* *Aug 2-11, 2022*
BEXCO

The 105th KAS Meeting, Session HT **Busan, South Korea**
***T**:A Simulation Study of Morphologies of FR-I and FR-II jets* *Apr 13-15, 2022*
BEXCO

The 43rd COSPAR Assembly, Session E1.5 **Sydney, Australia**
***T**: What is the Origin of QPOs in Accreting Neutron Stars?* *Jan 28 - Feb 4, 2021*

Online

The 43rd COSPAR Assembly, Session E1.8 — **Sydney, Australia**
***T**: Can there be a Unified Spectral Model for Black Holes and Neutron Stars?* — *Jan 28 - Feb 4, 2021*
Online

The Future of X-Ray Timing — **Netherlands**
***T**: Can a Two-Component paradigm explain the spectral and timing properties of neutron stars?* — *October 22 - 25, 2019*
API, Amsterdam

EXPUNIV2018: Black Holes & High Energy astrophysics — **India**
***T**: The Formation of Two Component Advective Flow around Neutron Stars* — *November 14 - 17, 2018*
SNBNCBS, Kolkata

The 42nd COSPAR Assembly, Session E1.13 — **Pasadena, CA, USA**
***T**: Formation of Two-Component Advective Flows around Neutron Stars and the Possibility of Super-Eddington Accretion Rates* — *July 14 - 22, 2018*
Caltech

The 42nd COSPAR Assembly, Session E1.10 — **Pasadena, CA, USA**
***T**: Formation and Stability of Oscillating Shocks in Inviscid Avective Flows around Neutron Stars in Presence of Cooling using Smoothed Particle Hydrodynamics Simulations* — *July 14 - 22, 2018*
Caltech

The 42nd COSPAR Assembly, Session E1.4 — **Pasadena, CA, USA**
***T**:The Formation of Two Component Advective Flow around Neutron Stars* — *July 14 - 22, 2018*
Caltech

The 15th Marcel Grossmann Meetings, Session AC1 — **Rome, Italy**
***T**:The Formation of Two Component Advective Flows around Neutron Stars* — *July 1 - 7, 2018*
University of Rome

INTEGRAL Symposium, Session 4: Accretion and Ejection: Galactic and Extragalactic — **Italy**
***T**:Is neutron star spectrum also an outcome of TCAF?* — *October 15 - 20, 2017*
Venice

INTEGRAL Symposium, Session 2: Outbursting sources: BHC, NS, AGN/Blazars — **Italy**
***T**:Outburst of BHC H1743-322: Analysis of Spectral and Timing Properties Using TCAF Solution* — *October 15 - 20, 2017*
Venice

Wide Band Spectral and Timing Studies of Cosmic X-ray Sources — **India**
***T**: Is Neutron Star Spectrum also an Outcome of TCAF?* — *January 10 - 13, 2017*
TIFR Mumbai