

Dr. Raj Prince

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🌐 https://www.bhu.ac.in/Site/FacultyProfile/1_158?FA001388

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Employment History

- Feb 2024 – present 📌 **Assistant Professor** at the Department of Physics, BHU, Varanasi
- March 2023 – Feb 2024 📌 **Postdoctoral Fellow** at the Center for Theoretical Physics, Warsaw, Poland.
- April 2022 – Sept 2022 📌 **SUPA Fellow** at St. Andrews University, Scotland, UK.
- March 2020 – March 2023 📌 **Postdoctoral Fellow** at the Center for Theoretical Physics, Warsaw, Poland.

Education

- 2014 – 2020 📌 **Ph.D.** in Astronomy and Astrophysics at the Raman Research Institute, Bangalore, India. Thesis title: *Multi-wavelength Data Analysis and Theoretical Modeling of Blazar Flares.*
- 2012 – 2014 📌 **M.Sc. (Physics)** specialized in space physics at the Banaras Hindu University, Varanasi, India.
- 2009 – 2012 📌 **B.Sc. (Hons.)** in physics at the Banaras Hindu University, Varanasi, India.

International Collaboration

- 2020–present 📌 Polish-LSST Consortium: Participating as an in-kind contributor to LSST and developing software to measure the emission line time delays from AGN and Quasars.
- 2020–2022 📌 Polish-Czech NAWA Exchange Program

Research Interests

- 📌 Changing Look AGN
- 📌 Timing and spectral study of AGN (soft X-ray excess, Ultra fast outflows)
- 📌 Modeling soft X-ray excess with warm Comptonization and Blurred ionized reflection models
- 📌 Modeling size and structure of X-ray corona in AGN
- 📌 AGN and Quasars as a Cosmological tool
- 📌 BLR and disk reverberation in AGN
- 📌 Disk-Jet coupling in Blazar
- 📌 Multi-wavelength theoretical modeling of blazar jet and extended kilo parsec jet
- 📌 AGN-Neutrino connection and lepto-hadronic modeling
- 📌 Quasi-periodic Oscillations (QPOs) in blazar light curves

Skills

Coding and Software Experience	■ Advanced Python, Xspec, Topcat, Heasoft, emcee, LSP, WWZ
	■ Leptonic & Hadronic modeling (GAMERA, JetSet, AGNpy)
	■ Javelin, ICCF, PyROA (software to measure the reverberation time lags)
	■ MEMECHO, PrepSpec (software to model the BLR response and emission lines)
	■ Photoionization code CLOUDY
Data Analysis	■ Fermi-LAT, Swift-XRT/UVOT, XMM-Newton, NuSTAR, AstroSat
Plotting Skill	■ Matplotlib, Gnuplot

Awards and Achievements

2024	■ Organizer of the High-Energy Astrophysics Workshop at BHU
	■ Fondecyt Postdoctoral Fellowship in Chile, but declined to join BHU
2023	■ LSST travel support , to attend the LSST summer meeting in Charlottesville, Virginia, USA
2022	■ SUPA fellowship , earned the highly competitive SUPA Saltire emerging research fellowship of 8300£ to pursue the research at St. Andrews University, Scotland, UK for six months.
2020-2021	■ Organizer of weekly Astro-Cosmos journal club at the Center for Theoretical Physics, Warsaw, Poland
2018	■ DST travel grant , awarded by SERB, DST to attend the 8th international Fermi Symposium at Baltimore, USA.
2013	■ CSIR-JRF & NET , also eligible for lectureship in India.
	■ ISRO-SSPS Fellowship , awarded by ISRO in master's to pursue a master's specialization in Space Physics.

Community Service

Active reviewer at International refereed journals

- Nature (Main)
- The Astrophysical Journal (ApJ): Main, Letter, and Supplementary
- Astronomy and Astrophysics (A&A)
- Monthly Notices of the Royal Astronomical Society (MNRAS)
- Publications of the Astronomical Society of Japan (PASJ)
- Astrophysics and Space Science (A&SS)
- Publications of the Astronomical Society of Australia (PASA)

Reviewer at NASA for Scientific Proposals

- NICER & Swift

Media coverage of my research work

- [Recent work recognized by the Department of Science and Technology, India](#)

Media coverage of my research work (continued)

 [Coverage by prominent newspaper in India](#)

Conferences

Invited talks

- 2023  XIV Serbian Conference on Spectral Line Shapes in Astrophysics, Serbia
Title: *Dissecting Mg II and Fe II emission regions in Intermediate-redshift quasars with SALT*

Contributed talks

- 2024  XXVI DAE-BRNS High Energy Physics (HEP) Symposium 2024, at BHU, Varanasi, India
Title: Multi-wavelength Science with AstroSat
-  High-Energy Astrophysics Workshop at BHU, Varanasi, India
Title: Introduction to Active Galactic Nuclei and AGN/Blazar review through gamma-ray
-  Galactic and extragalactic X-ray transients, theory, and observational perspectives, Warsaw, Poland
Title: Understanding the changing look behavior in AGN through CLOUDY simulation
- 2023  LSST@Europe5 Meeting in Porec, Croatia
Title: Expectations for time delay measurements in active galactic nuclei with the Vera Rubin Observatory
-  New Era of AGN Science with the Vera C. Rubin LSST, NRAO Charlottesville, Virginia, USA
Title: Expectations for time delay measurements in active galactic nuclei with the Vera Rubin Observatory
-  41st meeting of The Astronomical Society of India, Indore, India
Title: *Constraining the cosmology with quasars*
- 2022  Polish-German WE-Heraeus-Seminar, Krakow, Poland
Title: *Significant detection of Quasi-Periodic Oscillation in gamma-ray blazar*
-  10th International Fermi Symposium, Johannesburg, South Africa (online)
Title: *Significant detection of Quasi-Periodic Oscillation in gamma-ray blazar*
-  31st Texas Symposium on Relativistic Astrophysics, Prague, Czech Republic
Title: *Wavelength-resolved reverberation mapping of quasar CTS C30.10: Dissecting MgII and FeII emission regions*
-  Cospar, 44th Scientific assembly, Athens, Greece
Title: *Broadband Study of BL Lac during a flare of 2020: Spectral evolution and the emergence of HBL component*
-  CAMK Colloquium 6 April 2022, delivered an online talk
Title: *Constraining the cosmology with quasars*
- 2021  40th Polish Astronomical Society Meeting: 13-17 September, Szczecin, Poland
Title: *Viewing angle observations and redshift evolution in quasar-based cosmology*
- 2018  MARLAM 2018 Meeting at the University of Maryland, Baltimore County, USA
Title: *Fermi-LAT observations of the brightest gamma-ray flare ever detected from CTA-102*
-  Advanced in Astroparticle Physics and Cosmology (AAPCOS), SINP, Kolkata, India
Title: *Long-term study of the light curve of PKS 1510-089 in GeV energies*
- 2017  7th International Fermi Symposium, Garmisch-Partenkirchen, Germany
Title: *Long-term study of the light curve of PKS 1510-089 in GeV energies*
- 2016  Neighbourhood Astronomy Meeting (NAM), ISRO, Bangalore, India
Title: *How Many galactic jets can explain the Positron excess*

Contributed posters

- 2023  The restless nature of AGN: 10 years later, Naples, Italy
Title: Echo mapping of AGN NGC 7469 with ground and space-based observations

Conferences (continued)

- 2022

European Astronomical Society Annual meeting 2023, Krakow, Poland

Title: Echo mapping of AGN NGC 7469 with ground and space-based observations
- 2022

31st Texas Symposium on Relativistic Astrophysics, Prague, Czech Republic

Title: *Multi-wavelength temporal and spectral study of TeV blazar 1ES 1727+502 during 2014-2021*
- Cospar, 44th Scientific assembly, Athens, Greece

Title: *Viewing Angle Observations and Effects of Evolution with Redshift, Black Hole Mass, and Eddington Ratio in Quasar-based Cosmology*
- 7th Heidelberg International Symposium on High-Energy Gamma-Ray Astronomy (γ -2022), Barcelona, Spain

Title: *Broadband Study of BL Lac during a flare of 2020: Spectral evolution and the emergence of HBL component*
- European Astronomical Society Annual Meeting, Valencia, Spain

Title: *Viewing Angle Observations and Effects of Evolution with Redshift, Black Hole Mass, and Eddington Ratio in Quasar-based Cosmology*
- 2021

40th Polish Astronomical Society Meeting: 13 -17 September, Szczecin, Poland

Title: *Broadband study of BL Lac during a flare of 2020: Spectral evolution and the emergence of HBL component*
- 2018

8th International Fermi Symposium, Baltimore, Maryland, USA

Title: *Fermi-LAT observations of the brightest gamma-ray flare ever detected from CTA 102*
- Astronomical Society of India (ASI), Osmania University, Hyderabad, India

Title: *Fermi-LAT observations of the brightest gamma-ray flare ever detected from CTA 102*
- 2017

Astronomical Society of India (ASI), BITS, Jaipur, India

Title: *Long-term study of the light curve of PKS 1510-089 in GeV energies*

Visits/Schools/Workshops/Meetings attended

- 2023

Visited Massachusetts Institute of Technology (MIT), Boston, USA, and delivered a talk on "AGN BLR and disk reverberation: application, challenges, and future with LSST"
- Visited Raman Research Institute, Bangalore, India and delivered a talk on "Hubble Tension: Recruiting quasars in cosmology"
- 2022

Visited IUCAA, Pune, India, and delivered a talk on "Constraining the Cosmology with Quasars"
- Visited Raman Research Institute, Bangalore, India, and delivered a talk on "Constraining the Cosmology with Quasars"
- 2021

High Energy Astrophysics in Southern Africa (HEASA) 13-17 September, Virtual
- Black hole accretion disc winds conference 6-9 September, Virtual
- 2019

Visited Tata Institute of Fundamental Research, Mumbai, India, and delivered a talk
- COSPAR Building Workshop in Mohali, India
- 2018

Visited Goddard Space Flight Centre, Greenbelt, MD, USA, and delivered a talk.
- Visited Pennsylvania State University, USA, and delivered a talk.
- 2014-2018

Neighborhood Astronomy Meeting (NAM), Bangalore, India
- 2017

Astrosat data analysis workshop, IUCAA, Pune, India, 2017
- Visited Nicolaus Copernicus Astronomical Center of the Polish Academy of Sciences, Poland, and delivered a talk.
- 2016

Astronomical Society of India (ASI), Kashmir University, India

Telescopes observation time awarded

AstroSat

- 2021  30 ks of time awarded by AstroSat (ToO)
Astrosat follow-up of MAGIC detection of VHE gamma-ray from the blazar BL Lacertae
PI : **Raj Prince**, Co-PIs: Rukaiya Khatoon, Pratik Majumdar
-  30 ks of time awarded by AstroSat (ToO)
Multi-wavelength observations of Blazar BL Lacertae in its high optical state
PI : **Raj Prince**, Co-PIs: Rukaiya Khatoon, Pratik Majumdar
- 2020  60 ks of time awarded by Astrosat (ToO)
Multi-wavelength study of the blazar OJ 287 in outburst state
PI: Aditi Agarwal, Co-PIs: **Raj Prince**, Pratik Majumdar, Nayantara Gupta
- 2019  30 ks of time awarded by Astrosat (ToO)
Multi-wavelength study of a blazar SBS 1150+497 using ASTROSAT
PI : Rukaiya Khatoon, Co-PIs: **Raj Prince**, et al.
-  30 ks of time awarded by Astrosat (ToO)
Multi-wavelength study of a blazar S5 1044+71 using ASTROSAT
PI : Rukaiya Khatoon, Co-PIs: **Raj Prince**, Rupjyoti Gogoi
-  30 ks of time awarded by Astrosat (ToO)
Multi-wavelength study of a blazar OQ 334 (B2 1420+32) using Atsrosat.
PI : Rukaiya Khatoon, Co-PIs: **Raj Prince**, Rupjyoti Gogoi
- 2018  60 ks of time awarded by ASTROSAT (Regular cycle 2018)
Brightest Fermi blazar through Astrosat eye.
PI : **Raj Prince**, Co-PIs : Amit Shukla, Nayantara Gupta
-  30 ks of time awarded by ASTROSAT (ToO)
Multi-wavelength Observations of TeV blazar 1ES 1218+304 in its current flaring state.
PI : **Raj Prince**, Co-PIs : Pratik Majumdar, Nayantara Gupta
-  50 ks of time awarded by ASTROSAT (ToO)
Multi-wavelength study of FSRQ +38.41 in its current flaring state.
PI : **Raj Prince**

Swift-XRT/UVOT

PI: Raj Prince

- ToO ID: 19628  Monitoring a possible changing look event in 3C 273 (Dec 2023 - Jan 2024)
- 2022-2023  Multiple ToO observation to monitor blazar flaring events in BL Lac, Ton 599, NGC 1275, 3C 345, neutrino candidate (J004354.36+404634.0), PKS 0805-07, 4C +27.50
- ToO Id: 13191  2.5 ks ToO observation of blazar OQ 334 by Swift-XRT/UVOT on 13 Dec 2019
- ToO Id: 13373  2 ks ToO observation of blazar OQ 334 by Swift-XRT/UVOT on 11 Jan 2020
- ToO Id: 15731  10 ks ToO observation of blazar TXS 1700+685 by Swift-XRT/UVOT between 18 May 2021 to 07 June 2021
- ToO Id: 16051  14ks ToO observation of possible neutrino source 4FGL J0304.5-0054
- ToO Id: 16554  14 ks ToO observation of blazar PKS 0346-27 by Swift-XRT/UVOT during Nov 2021
- ToO Id:16630  22 ks ToO observation of blazar PKS 0903-57 by Swift-XRT/UVOT during Nov-Dec 2021
- ToO Id: 16695  2.5 ks ToO observation of blazar PKS 0735+178 as possible candidate of Ice-Cube event IC211208A

Telescopes observation time awarded (continued)

- ToO Id: 16742 2.5 ks ToO observation of blazar PKS 0735+178 as possible candidate of Ice-Cube event IC211208A
- ToO Id: 36393 10 ks ToO observation of blazar S5 1803+178 by Swift-XRT/UVOT during one of its brightest gamma-ray state

XMM-Newton

- 2022 30 ks of time awarded by international X-ray instrument, XMM-Newton (ToO), to observe the blazar OJ 287 in low X-ray and UV state
PI: **Raj Prince**
- 2021 Constraining the synchrotron peak in Extreme HBL (EHBL) blazars (Regular cycle; id 090405, total allotted time 66 ks)
PI: **Raj Prince**; Co-Is: Nazma Islam, Rukaiya Khatoon, Bozena Czerny
- Investigation of ultra-fast outflows (UFOs) in super-Eddington AGNs (Regular cycle; id 090432, total allotted time 102 ks)
PI: **Raj Prince**; Co-Is: Bozena Czerny, Aneta Siemiginowska, Labani Mallick
- 20 ks of time awarded by international X-ray instrument, XMM-Newton (ToO), to observe the flaring blazar Ton 599
PI: **Raj Prince**
- 20 ks of time awarded by international X-ray instrument, XMM-Newton (ToO), to observe the neutrino candidate blazar 4FGL J0304.5-0054
PI: **Raj Prince**

NuSTAR

PI: **Raj Prince**

- 2022 30 ks of time awarded by international X-ray instrument, NuSTAR (ToO), to observe the blazar OJ 287 in low X-ray and UV state
- 2021 25 ks of time awarded by international X-ray instrument, NuSTAR (ToO), to observe the flaring blazar BL Lacertae

Optical Telescopes

Co-PI: **Raj Prince**

- 2022 Optical follow-up of IceCube Neutrino Events with HCT, India (Proposal id: HCT-2023-C1-P44 during HCT-2023-C1)
- 2021 Temporal and spectral variability studies of high redshift sources at CASLEO, Argentina; 2.0 m Ritchey-Chrétien (RC) telescope
- Multiband Optical-NIR studies of blazars on diverse timescales at CASLEO, Argentina; 2.0 m Ritchey-Chrétien (RC) telescope

Mentoring

- Mentored **Jayant Abhir and Jophin Joseph**, two master's students from IIT Kharagpur, from conceptualization of the project to the final publication [[Link to the paper](#)].
- Mentored **Ms. Shruti Priya** a master's student from IIT Kharagpur from conceptualization of the project to the final publication [[Link to the paper](#)].
- Mentored **Sushanth Reddy Kamaram and Suman Pramanick**, two master's students from IIT Kharagpur, from conceptualization of the project to the final publication [[Link to the paper](#)]. An additional project is also going on where I am mentoring S. R. Kamaram.
- Mentored **Anuvab Banerjee and Prantik Nandi**, two Ph.D. students from SN Bose National Centre for Basic Sciences (SNBNCBS), from conceptualization of the project to the final publication [[Link to the paper](#)].
- Mentoring **Rishank Diwan**, a master's student from IIT Kharagpur but now at The University of Hong Kong. The paper is published in MNRAS [[Link to the paper](#)]. He is working on another project that I gave him it is about modeling the X-ray variability in AGN through stochastic processes.
- Mentoring **Ajay Sharma**, a Ph.D. student from SN Bose National Centre for Basic Sciences (SNBNCBS). I conceptualized the project and it was published in MNRAS [[Link to the paper](#)].