Gourav Kumawat

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RESEARCH INTERESTS

Understanding the formation and evolution of exotic stellar populations, such as blue stragglers, blue lurkers, quiescent low-mass X-ray binaries, millisecond pulsars, extremely low-mass white dwarfs, sub-subgiants, and cataclysmic variables, in dense globular clusters through multi-wavelength observations spanning X-ray to radio.

EDUCATION

- **Doctor of Philosophy (PhD)**
  Physics (Astronomy & Astrophysics) | Supervisor: Craig Heinke — Sep 2024 - Aug 2028
  GPA : 4/4 — University of Alberta, Canada
- **BS-MS Dual-degree Programme**
  Major: Physics | Minor: Data Science & Engineering — Jul 2019 - Jul 2024
  CPI: 9.41/10 — IISER Bhopal, India
- **Higher Secondary Education**
  AISSCE(2019), Board: CBSE — Apr 2018 - Jun 2019
  Percentage: 95/100 — Dashpur Vidyalaya, Mandsaur, India

PUBLICATIONS

- Revisiting the Evidence for Double Sequences of Blue Straggler Stars in Globular Clusters;
  ***Gourav Kumawat**, Craig Heinke, Alison Sills, Haldan Cohn, Phyllis Lugger, Christian Knigge, Andrea Dieball*;
  The Astronomical Journal (AJ), Volume 171, Number 5, Pages 306.

- Spectroscopic Study of Blue Straggler Stars in the Globular Cluster NGC 3201;
  ***Gourav Kumawat**, Arvind K. Dattatrey, R.K.S Yadav*;
  Revista Mexicana de Astronomia y Astrofisica (RMxAA), Volume 61, Pages 76-83.

- A Comprehensive Analysis of X-ray Sources in Terzan 5 Using Chandra Observations;
  ***Gourav Kumawat**, Craig Heinke, Jiaqi Zhao, Arash Bahramian, Haldan Cohn, Phyllis Lugger*;
  The Astrophysical Journal (ApJ), Volume 990, Number 2, Pages 218.

- Chandra and HST studies of the X-ray sources in the Globular Cluster NGC 362;
  ***Gourav Kumawat**, Craig Heinke, Haldan Cohn, Phyllis Lugger*;
  Monthly Notices of the Royal Astronomical Society, Volume 530, Issue 1, May 2024, Pages 82-94.

- Searching for exotic object companions in the dense core of NGC 362: A multi-wavelength and multi-epoch photometric analysis;
  *Greta Ettorre, Emanuele Dalessandro, Cristina Pallanca, Mario Cadelano, **Gourav Kumawat**, Craig Heinke, Sebastian Kamann, Mattai Libralato, Phyllis Lugger, Haldan Cohn, Stefan Driezler*;
  Astronomy & Astrophysics (A&A), Volume 697, Article No. A215, May 2025.

- GlobULeS V. UVIT/AstroSat studies of stellar populations in NGC 362: detection of blue lurkers in a globular cluster;
  *Arvind K. Dattatrey, R. K. S. Yadav, **Gourav Kumawat**, Sharmila Rani, Gaurav Singh, Annapurni Subramaniam, Ravi S Singh*;
  Monthly Notices of the Royal Astronomical Society: Letters, Volume 523, Issue 1, July 2023, Pages L58-L63.

MEDIA COVERAGE

- "Spectroscopic study inspects blue straggler stars in NGC 3201" featured on Phys.org in May 2025. (Article Link)

CONFERENCE PRESENTATIONS

- Stellar Exotica in Globular Clusters; oral presentation by **Gourav Kumawat** at the *Graduate Physics Students Association (GPSA) Symposium*, Department of Physics, University of Alberta, October 2025 (Institutional).
- Analysis of X-ray Sources in Terzan 5; poster presentation by **Gourav Kumawat** at the *IAU Symposium 398 / MODEST-2025*, Seoul, South Korea (International). Also presented at the *Graduate Physics Students Association (GPSA) Symposium*, Department of Physics, University of Alberta, October 2025 (Institutional).
- Chandra and HST studies of the X-ray sources in the globular cluster NGC 362; poster presentation by **Gourav Kumawat** at the *Astronomical Society of India (ASI) Meeting 2024*, Bengaluru, India (National). Also presented at the *Graduate Physics Students Association (GPSA) Symposium*, Department of Physics, University of Alberta, 2024 (Institutional).
- UVIT/AstroSat studies of stellar populations in NGC 362: detection of blue lurkers in a globular cluster; poster presentation by **Gourav Kumawat** at the *Canadian Astronomical Society (CASCA) Annual General Meeting 2023*, Penticton, BC, Canada (National).

AWARDS & SCHOLARSHIPS

- **Alberta Graduate Excellence Scholarship (2025/26)**; recognizes outstanding academic achievement of students pursuing graduate studies in Alberta. *Award: 12,000 CAD.*
- **Department of Physics Ph.D. Research Award (2025/26)**; recognizes excellence in research and academic achievement among physics graduate students. *Award: 1,000 CAD.*
- **Myer Horowitz Graduate Students' Association Graduate Scholarship (2025/26)**; awarded on the basis of academic excellence and merit. *Award: 1,400 CAD.*
- **MITACS Globalink Research Internship Fellowship (2023)**; a competitive global program pairing top-ranked students with faculty at Canadian institutions for a three-month summer research project. *Award: 8645.29 CAD.*
- **IASc-INSA-NASI Summer Research Fellowship (2022)**; a prestigious program supporting meritorious students in India to work with researchers at leading Indian institutions for two months. *Award: 30,000 INR.*
- **Smt. Gouri Mukherjee Senior Academic Fellowship (2022)**; awarded to academically outstanding students of IISER Bhopal. *Award: 12,000 INR.*

ACHIEVEMENTS

- **Gold Honor**, International Astronomy and Astrophysics Competition (2021).
- **Zonal Topper**, Mimamsa 2021; a national-level annual science quiz organized by IISER Pune, India.
- **City Topper**, 19th SOF National Science Olympiad (2016–17).

MAJOR RESEARCH PROJECTS

- **Are Double BSS Sequences Real?**
  Guide: Prof. Craig Heinke, University of Alberta, Edmonton, Canada Jun 2025 – Present
  Analyzed blue straggler sequences in *HST* color–magnitude diagrams of 56 Galactic globular clusters to test the statistical significance of reported double blue straggler sequences. First-author paper in AJ.
- **Analysis of X-ray Sources in Terzan 5**
  Guide: Prof. Craig Heinke, University of Alberta, Edmonton, Canada Aug 2024 – Aug 2025
  Analyzed more than a decade of *Chandra* observations of the globular cluster Terzan 5 to identify and classify X-ray sources through photometric, spectral, and variability analyses. First-author paper in ApJ.
- **Atmospheric and Chemical Analysis of Blue Straggler Populations in NGC 3201**
  Guide: Dr. Ramakant S. Yadav, ARIES Nainital, India Aug 2023 – Apr 2024
  Co-Guide: Prof. Sukanta Panda, IISER Bhopal, India
  Conducted a spectroscopic study of 39 blue straggler stars in NGC 3201, deriving radial velocities, atmospheric parameters, metallicities, and the first [Mg/Fe] estimates for the cluster's BSS population. First-author paper in RMxAA.

- **X-ray Binaries in the Globular Cluster NGC 362** May 2023 – Jul 2023
  Guide: Prof. Craig Heinke, University of Alberta, Edmonton, Canada
  Analyzed *Chandra* observations of NGC 362 to identify X-ray sources and their optical/UV counterparts using HUGS photometry, including qLMXBs, AGNs, red stragglers, and active binaries. First-author paper in MNRAS.

- **Analysis of UV-bright Stars in the Cool Stellar Populations of NGC 362** May 2022 – Jul 2022
  Guide: Dr. Ramakant S. Yadav, ARIES, Nainital, India
  Performed multi-wavelength SED analysis using data from the MPG/ESO 2.2-m telescope, AstroSat/UVIT, and Swift/UVOT, leading to the first discovery of blue lurkers in a globular cluster. Third-author paper in MNRAS Letters.

INTERNSHIP & COURSE PROJECTS

- **Stellar Collisions and Exotic Populations in a Globular Cluster** Oct 2024 - Dec 2024
  Course: Stellar Astrophysics II (PhD)
  Studied stellar populations and collision products in a simulated 10 Gyr globular cluster using MESA. (Project Report)

- **AMUSING ourselves with the secrets of galaxies using Integral Field Spectroscopy** Jul 2023
  Guide: Dr. Ana Paulino-Afonso, Centre for Astrophysics of the University of Porto (CAUP), Porto, Portugal
  Analyzed local and global properties of 21 Type Ia supernova host galaxies using integral field spectroscopy data from VLT/MUSE. (Project Presentation)

- **Automatic solar flare detection algorithm using Ch2-XSM data** Jul 2022 - Aug 2022
  Guide: Krittika (IIT Bombay Astronomy Club), Mumbai, India
  Studied solar flares using Chandrayaan-2 XSM data and reproduced existing flare-detection models to analyze different types of stellar flares. (Project Report)

- **Exoplanet Orbital Semi-Major Axis Prediction using Regression Approach** Feb 2022 - Apr 2022
  Course: Data Science and Machine Learning (BS-MS)
  Extracted and analyzed parameters from the Kepler dataset in the NASA Exoplanet Archive and applied regression models to predict exoplanet orbital semi-major axes. (Project Report)

- **Morphological Classification of Galaxies using Artificial Intelligence** Sep 2021 - Nov 2021
  Course: Artificial Intelligence (BS-MS)
  Developed chronologically constrained evolutionary CNN models for galaxy classification, achieving an accuracy of 82.7% in three-class classification. Project Report

- **The Stellar Trilogy: An Ontology, HR Diagram and ML Harvard Classification** Sep 2021 - Nov 2021
  Course: Advanced Programming in Python (BS-MS)
  Developed an ontology in Owlready2 for stellar classification based on temperature, color, and dominant spectral lines following the Harvard Spectral Classification scheme. (Project Report)

- **Photometry and Supernovae - A case study** Jul 2021 - Aug 2021
  Guide: Krittika (Indian Institute of Technology Bombay Astronomy Club), Mumbai, India
  Performed PSF photometry on GROWTH-India Telescope data using SExtractor and PSFEx, and generated g-, r-, and i-band light curves for the supernova SN2018hna. (Project Report)

POSITIONS OF RESPONSIBILITY

- **Astrophysics Representative**
  Graduate Physics Student Association, University of Alberta Nov 2025 - Present

- **Graduate Teaching Assistant**
  PHYS 381: Grading assignments and exams of a third-year UG electromagnetic theory course. Sep 2025 - Dec 2025
  PHYS 124: Helped students understand the concepts and problems through the Piazza platform. Jan 2025 - Apr 2025
  ASTRO 122: Involved in setting up and error-proofing questions for quizzes and exams. Jan 2025 - Apr 2025
  PHYS 130: Conducted lab sessions for over 50 first-year engineering students. Sep 2024 - Dec 2024

- **Mitacs Globalink Mentor**
  Mentored Globalink research interns, assisted with settling in Canada, organized social events. Apr 2025 - Present

- **Astronomy Tutor & Mentor**
  HipHab, a startup enriching kids' hobbies with lectures and projects. Apr 2022 - Mar 2024

- **Event Coordinator**
  Singularity 2021, Annual Science Fest of IISER Bhopal. Sep 2021 - Oct 2021

- **Computational Team Member**
  IISER Bhopal Astronomy Research Group. Aug 2021 - Present

- **Coordinator**
  IISER Bhopal Astronomy Club. May 2021 - May 2022

SCHOOLS, WORKSHOPS & CONFERENCES

- **IAU Symposium 398 / MODEST-2025** Jun 2025
  Hosted by Seoul National University, Seoul, South Korea.

- **ASI Meeting 2024** Feb 2024
  Hosted jointly by IISc, ISRO, and Jawaharlal Nehru Planetarium, Bengaluru, India.

- **Aditya-L1 Support Cell Workshop** Sep 2023
  Organized at Indian Institute of Technology Kanpur, India.

- **CASCA Annual General Meeting** Jun 2023
  Organized by Canadian Astronomical Society (CASCA), Penticton, BC, Canada.

TECHNICAL SKILLS

- **Programming and Scripting Languages:** Python, MATLAB, Wolfram Mathematica, C, C++, LaTeX.
- **Python Packages:** Scikit-learn, NumPy, SciPy, Matplotlib, AstroPy, Pandas, Seaborn, Pandas.
- **Tools and Software:** Microsoft 365, SAOImageDS9, Aperture Photometry Tool, TOPCAT, Aladin, VOSA, CIAO, Sherpa, ISpec.
- **Operating Systems:** Windows, Linux, macOS.

LANGUAGES

- English, Hindi *Native or Bilingual proficiency*