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: Prof. Craig Heinke — Sep 2024 – Aug 2028
  GPA: 4.0/4.0 — University of Alberta, Canada

- **BS-MS Dual-degree Programme**
  Major: Physics | Minor: Data Science & Engineering — Jul 2019 – Jul 2024
  CPI: 9.41/10.0 — IISER Bhopal, India

PUBLICATIONS (First Author)

- 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, Page 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, Page 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.

PUBLICATIONS (Co-Author)

- 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, Mattia Libralato, Phyllis Lugger, Haldan Cohn, Stefan Dreizler*;
  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

- **Phys.org News Article (May 2025)**: Spectroscopic study inspects blue straggler stars in NGC 3201. (Article Link)

CONFERENCE PRESENTATIONS

- Are Double Blue Straggler Sequences Real?; oral presentation by **Gourav Kumawat** at *Back To The Future 2026*, Sexten, Italy (International).
  Also presented at the *Physics Graduate Student Symposium* and *ISSET Student Seminar*, University of Alberta (Institutional).

- 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

- **Physics Graduate Student Travel Award (2026/27)**; awarded in recognition of an outstanding presentation at the Graduate Student Symposium. *Award: 2,000 CAD.*

- **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: 8,645.29 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.*

- **Gold Honor (2021)**, International Astronomy and Astrophysics Competition.

RESEARCH EXPERIENCE

- **Intracluster or Intercluster?** Apr 2026 – Present
  Supervisor: Prof. Craig Heinke, University of Alberta, Edmonton, Canada
  - Re-analyzing differential reddening maps that Pancino+24 interpreted as evidence of intracluster medium.
  - Testing whether the signature instead arises from spatial gradient-induced scatter, crowding, and field contamination.

- **Census of Sub-subgiants across Globular Clusters** Jan 2026 – Present
  Supervisor: Prof. Craig Heinke, University of Alberta, Edmonton, Canada
  - Compiling the first uniform catalog of the enigmatic sub-subgiant population across globular clusters.
  - Characterizing their origins, evolutionary pathways, and physical properties.

- **Are Double Blue Straggler Sequences Real?** Jun 2025 – Apr 2026
  Supervisor: Prof. Craig Heinke, University of Alberta, Edmonton, Canada
  - Analyzed blue straggler sequences in HST color–magnitude diagrams across 56 Galactic globular clusters.
  - Applied Gaussian Mixture Models and Hartigan's Dip Test to evaluate unimodality versus bimodal/multimodal distributions.
  - Simulated false-positive rates under realistic photometric errors to assess visual double sequences.
- **Multi-wavelength Analysis of Terzan 5 X-ray Sources** Aug 2024 – Aug 2025
  Supervisor: Prof. Craig Heinke, University of Alberta, Edmonton, Canada
  - Analyzed over a decade of Chandra observations to identify and classify X-ray sources in Terzan 5.
  - Performed photometric, spectral, and variability analyses to classify thermal, non-thermal, and faint X-ray emitters.
  - Constructed X-ray color–magnitude diagrams and luminosity functions to study source demographics.
- **Spectroscopic Study of Blue Stragglers in NGC 3201** Aug 2023 – Apr 2024
  Supervisor: Dr. Ramakant S. Yadav (ARIES) | Co-Supervisor: Prof. Sukanta Panda (IISER Bhopal)
  - Conducted high-resolution spectroscopic analysis of 39 blue straggler stars using VLT/MUSE data.
  - Derived radial velocities, atmospheric parameters, metallicities, and [Mg/Fe] abundance ratios using iSpec.
  - Identified velocity dispersion profiles and stellar rotation properties to constrain formation pathways.
- **X-ray Binaries and Optical Counterparts in NGC 362** May 2023 – Jul 2023
  Supervisor: Prof. Craig Heinke, University of Alberta, Edmonton, Canada
  - Analyzed archival Chandra ACIS-S data and HUGS Hubble Space Telescope photometry for NGC 362.
  - Identified optical counterparts for low-luminosity X-ray sources, classifying qLMXBs, CVs, and active binaries.
  - Derived spectral parameters and X-ray variability to constrain the binary population in the cluster core.

TEACHING EXPERIENCE

- **Graduate Teaching Assistant** Sep 2024 – Present
  Department of Physics, University of Alberta
  - **PHYS 130: Wave Motion, Optics, and Sound** Sep 2026 – Present
    Conducting laboratory sessions for over 50 first-year engineering students.
  - **PHYS 381: Electromagnetic Theory I** Sep 2025 – Dec 2025
    Graded assignments and examinations for an advanced undergraduate course.
  - **PHYS 124: Particles and Waves** Jan 2025 – Apr 2025
    Provided concept clarification and problem-solving guidance via Piazza.
  - **ASTRO 122: Astronomy of Stars and Galaxies** Jan 2025 – Apr 2025
    Assisted in designing and error-proofing quiz and examination questions.
  - **PHYS 130: Wave Motion, Optics, and Sound** Sep 2024 – Dec 2024
    Conducted laboratory sessions for over 50 first-year engineering students.
- **Astronomy Tutor & Mentor** Apr 2022 – Mar 2024
  HipHab Startup
  Delivered introductory astronomy lectures and guided hands-on research projects for K-12 students.

SERVICE & OUTREACH

- **Astrophysics Representative** Nov 2025 – Present
  Graduate Physics Students' Association (GPSA), University of Alberta
- **Mitacs Globalink Mentor** Apr 2025 – Present
  University of Alberta – Mentored international research interns and facilitated onboarding and integration.

- **Juror** Jan 2026
  Canadian Young Physicists' Tournament (CaYPT)
- **Computational Team Member & Club Coordinator** May 2021 – Jul 2024
  IISER Bhopal Astronomy Research Group & Astronomy Club
- **Event Coordinator** Sep 2021 – Oct 2021
  Singularity 2021 (Annual Science Fest of IISER Bhopal)

SCHOOLS, WORKSHOPS & CONFERENCES

- **Back To The Future** Jun 2026
  Hosted by Sexten Center for Astrophysics, Sexten, Italy.
- **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.
- **Tools and Software:** SAOImageDS9, Aperture Photometry Tool, TOPCAT, Aladin, VOSA, CIAO, Sherpa, iSpec, Microsoft 365.
- **Operating Systems:** Linux, macOS, Windows.

LANGUAGES

- English, Hindi *Native or Bilingual proficiency*

REFERENCES

- **Prof. Craig Heinke** (PhD Supervisor)
  Professor, Department of Physics, University of Alberta
  Email: heinke@ualberta.ca
- **Dr. Ramakant S. Yadav** (Master's Supervisor)
  Scientist, Aryabhatta Research Institute of Observational Sciences (ARIES)
  Email: rkant@aries.res.in
- **Prof. Sukanta Panda** (Master's Co-Supervisor)
  Professor, Department of Physics, Indian Institute of Science Education and Research (IISER) Bhopal
  Email: sukanta@iiserb.ac.in