Samanpreet Singh Lang

samanpreetsinghlang@gmail.com | **ORCID: 0009-0009-4801-5619**

GitHub | **Phone: +91–9803150000** | **Chandigarh, India**

Education

- **M.Sc. Physics** **2023 – 2025**
  Panjab University, Chandigarh
  - **Coursework: Astrophysics and Planetary Sciences**, Classical and Quantum Mechanics, **Relativity (Special and General)**, Mathematical Physics, Quantum Field Theory (QFT and RQFT), **High Energy Physics**, **Computational Physics**, Microprocessors and Microcontrollers.
  - Completed a research project in astrophysics, details in *Research & Projects* section.

- **B.Sc. Physics (Hons.)** **2020 – 2023**
  Panjab University, Chandigarh
  - **Coursework:** Mechanics, Quantum Mechanics, **Nuclear Physics**, Solid State Physics, **Radiation Detection**, **Mathematical Physics**, Numerical Analysis, **C Programming**, and introductory Laboratory Training.
  - Built a foundation in both experimental and computational methods.

Research & Projects

- **M.Sc. Research Project – Cloud–Cloud Collision Simulations** **2024 – 2025**
  Computational Astrophysics Lab, Panjab University (Supervisor: **Prof. Sandeep Sahijpal**)
  - Modeled molecular cloud collisions using 2D **Smoothed Particle Hydrodynamics (SPH)** in C++, showing how shock compression may trigger star formation.
  - Methods/Tools: C, C++, SPH, numerical methods, simulation design.
  - Project report on **Zenodo.**
  - Project repository on **GitHub.**

- **Galaxy Morphology Classification using CNNs** **2024 – 2025**
  - Designed and implemented a **Convolutional Neural Network (CNN)** using PyTorch for galaxy classification from survey images.
  - **Executed project independently**, including dataset preprocessing and model evaluation.
  - Methods/Tools: Python, PyTorch, CNNs, image processing.

- Project report on **Zenodo.**
- Project repository on **GitHub.**

- **C++ Learning UI Project (IAPT NCICP Competition)** **2023 – 2024**
  Guided by **Prof. Vipin Bhatnagar**, Panjab University
  - Created a **computational physics** project with an interactive user interface (UI) for learning C++ through physics problems.
  - Focused on making learning accessible via practical problem-solving.
  - Methods/Tools: C++, UI design, numerical problem solving.
  - Project repository on **GitHub.**

Workshops & Presentations

- **NASA's Exoplanet Program Analysis Group (ExoPAG–32) Virtual Meeting** **2025**
  - Attended talks and discussions on exoplanet detection, characterization, and mission planning, gaining insights into current priorities in exoplanetary science.
- **Theme Meeting on Facility for Antiproton and Ion Research (FAIR) Science, Panjab University** **2025**
  - Participated in sessions focused on particle physics and FAIR's role in advancing nuclear and high-energy physics research.
- **Chandigarh Science Congress (CHASCON), Panjab University** **2024**
  - Presented my C++ Learning UI Project at a departmental stall, engaging with faculty, peers, and visitors about computational physics education.
- **Departmental Presentations on Computational Physics and High-Performance Computing, Panjab University** **2024**
  - Delivered presentations on applying numerical methods and high-performance computing techniques to physics simulations.

Selected Coursework & Certifications

- **Machine Learning with Python** **2025**
  freeCodeCamp
  - Practical introduction to supervised and unsupervised learning methods, implemented through Python libraries.
- **Scientific Computing with Python** **2025**
  freeCodeCamp
  - Hands-on training in numerical computation, algorithms, and problem-solving using Python.
- **Astro 101: Black Holes** **2024**
  University of Alberta (Coursera)

- Introduced the physics of black holes, their observational signatures, and their role in high-energy astrophysics.

- **AstroTech: The Science and Technology behind Astronomical Discovery** **2024**
  University of Edinburgh (Coursera)
  - Learned about the instruments, telescopes, and detectors used to explore the universe, and their role in modern discoveries.

- **From the Big Bang to Dark Energy** **2024**
  University of Tokyo (Coursera)
  - Studied the evolution of the universe, cosmic expansion, dark matter, and dark energy through the lens of observational cosmology.

- **Data-Driven Astronomy** **2024**
  University of Sydney (Coursera)
  - Learned to use SQL to access exoplanetary databases.
  - Implemented image median stacking algorithms on FITS files.
  - Gained hands-on experience with computational astronomy techniques.

- **Astrophysics: The Violent Universe** **2023**
  Australian National University (Coursera)
  - Explored compact stellar remnants, supernovae, and high-energy astrophysics with applications to observational astronomy.

Skills

- **Programming**
  - Proficient in **C**, **C++**, and **Python**; experienced with scientific libraries (NumPy, Pandas, Matplotlib) and **machine learning frameworks** (PyTorch, TensorFlow, Keras, scikit-learn).

- **Scientific Computing**
  - Strong background in numerical methods and computational modeling, hands-on experience developing **Smoothed Particle Hydrodynamics (SPH)** simulations in C++ and applying **Convolutional Neural Networks (CNNs)** for classification tasks in astrophysical datasets.

- **Data Analysis**
  - Skilled in handling and processing astronomical datasets, experience with **Flexible Image Transport System (FITS)** files, image median stacking, and visualization techniques for astrophysical data.

- **Other Tools**
  - Proficient with **Git** for version control, **LaTeX** for scientific writing, and general problem-solving in computational physics and astronomy.

Professional Memberships, Outreach & Science Communication

- Member, **Physics Association**, Panjab University – **Science Outreach Committee**, contributed to organizing seminars, science exhibitions, and outreach events to engage students and the public with physics.
- Member, **Astronomy Club**, Panjab University, participated in stargazing sessions, academic talks, and peer discussions focused on astronomy and astrophysics.
- Active science writer on **Substack**, where I maintain a **newsletter**, I write accessible articles on astrophysics, computational physics, and broader science topics.

Languages

- **English** (Professional Proficiency), **Hindi** (Native), **Punjabi** (Native)