

# Sangeet Paul

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PhD in computational astrophysics. Skilled in Bayesian statistics, GPU acceleration, and machine learning. Research in black-holes and gravitational-wave astronomy.

## EDUCATION

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### University of Oregon

*PhD, Computational Astrophysics*

Eugene, OR

2019 — 2025

### NISER, HBNI

*BSc-MSc, High-Energy Physics*

Bhubaneswar, India

2013 — 2018

## SKILLS

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- **Quant:** Bayesian statistics, MCMC, Cluster analysis, Digital signal processing, Machine learning, Normalizing flows
- **ML:** tensorflow, keras, scikit-learn
- **GPU:** jax, cupy, CUDA
- **Miscellaneous:** emcee, pandas, scipy, numpy, matplotlib, numpyro
- **Programming Languages:** *fluent:* Python || *can read:* C, C++, R, Java
- **Software:** VS Code, Jupyter, PyCharm, Git, LaTeX, Mathematica, MATLAB
- **Astro:** astropy, bilby, pycbc, gwpy
- **Physics:** Gravitational-wave astronomy, General relativity, Quantum mechanics, Quantum field theory
- **Natural Languages:** English, Hindi, Odia, Bengali, Gahaḷā

## WORK EXPERIENCE

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### Research Assistant

Jul 2021 — Jul 2025

Institute of Fundamental Sciences, University of Oregon

*Eugene, OR*

- **Hierarchical mergers of binary black holes in dynamical astrophysical environments:** Built JAX-accelerated Bayesian population inference software to find evidence of hierarchical mergers of binary black holes in gravitational wave catalogs using the coagulation model for black hole mergers in dynamical astrophysical environments, such as globular clusters and active galactic nuclei' accretion disks.
- **Joint inference of astrophysical and noise parameters in gravitational wave data:** Built high-dimensional Bayesian inference software for time-series and frequency-series data from gravitational-wave interferometers to estimate astrophysical signal models and spline-based detector noise models simultaneously. Found localized correlations between signal waveform and noise power spectral density.
- **Clustering algorithms for significantly uncertain data:** Built algorithms to cluster data with high uncertainty, such as data from gravitational-wave interferometers. Found probabilistic clusters and outliers in mass-spin space.

### Teaching Assistant

Sep 2019 — Jul 2025

Department of Physics, University of Oregon

*Eugene, OR*

- **Grad-level:** Scientific computation (machine learning), Design of experiments (Bayesian statistics).
- **Undergrad-level:** Quantum mechanics, Astrophysics, Astronomy, Fourier analysis, Algebra-based physics, Calculus-based physics.

### Research Fellow

2018 — 2019

NISER, HBNI

*Bhubaneswar, India*

- **Blackfolds in higher-dimensional gravity:** Analyzed the stability of higher-dimensional equivalents of black holes. Verified through simulations that a perturbed black string asymptotically settles down to a black hole due to the Gregory-Laflamme instability.

### Research Scholar

2013 — 2018

NISER, HBNI

*Bhubaneswar, India*

- **Membrane – gravity duality in a large number of dimensions:** Demonstrated that black hole event horizons are analogous to hydrodynamic membranes.
- **Analytical predictions of the mass function of halos:** Analyzed the effects of varying dark matter halos' mass functions on astronomical and cosmological observations.

- **Magneto-optic Kerr effect: experiment design:** Constructed theory for an experiment to use the magneto-optic Kerr effect to analyze magnetized surfaces.

## Research Scholar

Institute of Physics, HBNI

May — Jul 2017

*Bhubaneswar, India*

- **Superstring theory: Tree-approximation scattering amplitudes:** Studied the foundations of superstring theory, starting with bosonic strings, moving on to supersymmetry and gauge interactions, finishing with the evaluation of tree-level scattering amplitudes.

## Research Scholar

Centre for Excellence in Basic Sciences, University of Mumbai

May — Jul 2017

*Mumbai, India*

- **Quantum field theory: Decays of the Higgs boson:** Studied relativistic quantum mechanics, quantum electrodynamics, Feynman diagrams, renormalization, and gauge field theories. Analyzed the radiation of gluon jets, the Coleman-Weinberg potential, and the decays of the Higgs boson.

## PERSONAL PROJECTS

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Simulating semi-quantum cellular automata

[github.com/sangeetpaul/sqca](https://github.com/sangeetpaul/sqca)

Generating novel integer sequences from unsolved chess problems

[github.com/sangeetpaul/chess](https://github.com/sangeetpaul/chess)

Efficient integer-based encoding for binary trees

[github.com/sangeetpaul/ancestree](https://github.com/sangeetpaul/ancestree)

Documenting the endangered Gahaḷā language

[sangeetpaul.notion.site/gahala](https://sangeetpaul.notion.site/gahala)

## SERVICE EXPERIENCE

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Graduate Support Group, Dept of Physics, U Oregon

2023 — 2024

PhD Admissions Committee, Dept of Physics, U Oregon

2022 — 2023

Vice-President, Graduate Student Council, Dept of Physics, U Oregon

2021 — 2022

## PUBLICATIONS

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[Google Scholar](#) || [ORCID](#) || [NASA ADS](#)