

# Anirban Bairagi

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in anirban-bairagi    🐙 anirbanbairagi

## Education

**Institut d'Astrophysique de Paris, CNRS & Sorbonne Université**

*Jan 2023 – June 2026*

*PhD in Astrophysics, Statistics and Machine Learning*

**Simons Foundation**

- **Advisor:** Dr. Benjamin Wandelt

**Indian Institute of Technology Kharagpur**

*July 2017 – April 2022*

*B.S.-M.S in Physics*

**CGPA: 8.55/10**

- **Coursework:** General Relativity, Astrophysics, Mathematics, Statistics, Deep Learning

## Experience

**Technical Consultant**

*Calcutta, India*

*TCG Digital*

*June 2022 – Dec 2022*

- Automated end-to-end monthly analytics pipeline in Python, from SQL data extraction to final analysis, reducing manual workload and turnaround time for client reporting.
- Performed data-driven workforce analytics on leave patterns in a major U.S. supermarket chain, enabling optimized staffing strategies that reduced revenue loss due to understaffing and overtime costs by 85%.
- Reduced the loss incurred by the pharmaceutical companies by 72% due to insufficient and excessive supply of diagnostic kits in different countries of Europe using LDA and XGBoost.

**Caltech SURF - LIGO**

*Pasadena, CA*

*California Institute of Technology*

*May 2021 – July 2021*

- Simulated laser beam spot images incorporating mirror micro-roughness and CCD sensor noise to mimic real-world optical imperfections in the LIGO detector.
- Developed a Convolutional Neural Network (CNN) to infer beam position from noisy CCD images with sub-pixel accuracy ( $\leq 40 \mu m$ ) to mitigate noise from the detector signal due to misalignment of mirrors.

**MITACS Globalink Research Fellow**

*London, Ontario*

*Western University*

*July 2021 – Oct 2021*

- Modeled Continuous Gravitational Wave (CGW) signals from non-precessing triaxial neutron stars.
- Built a real-time CGW detection algorithm using Convolutional Neural Network (CNN), enabling prompt identification of potential electromagnetic counterparts.
- Performed Bayesian inference on the signals using Markov Chain Monte Carlo (MCMC) to obtain robust posterior distributions for astrophysical parameters.

## Publications

**Gravitational Waves Detection and Glitch Classification using CNN** [🔗](#)

*2020*

Anirban Bairagi

*Royal Astronomical Society*

**LIGO Laser Beam Tracking** [🔗](#)

*2021*

Anirban Bairagi, Yehonathan Drori, Tega Edo, Rana Adhikari

**How many simulations do we need for simulation-based inference?** [🔗](#)

*2025*

Anirban Bairagi, Benjamin Wandelt, Francisco Villaescusa-Navarro

*Submitted to A&A*

**PatchNet: GPU is not limitation anymore for Cosmological inference**

Anirban Bairagi, Benjamin Wandelt

*draft in prep.*

## Technical Skills

**Languages:** Python, Cython, Mathematica, MATLAB, C, SQL, HTML, CSS, Arduino

**Machine Learning:** XGBoost, Deep Learning, CNN, YOLO, Diffusion models, Normalizing flows, Transformers

**Frameworks/Libraries:** Numpy, Pandas, Scipy, Scikit-learn, Matplotlib, Pytorch, TensorFlow, Keras, OpenCV

**Tools:** Weights & Biases, Git, Linux, CMake