

# ARITRA MUKHOPADHYAY

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Machine learning scientist with a background in physics and computer science from NISER. I build efficient AI systems across deep learning, algorithms, and robotics. Passionate about solving complex problems—with a strong focus on automation, optimization, and promoting the noble art of personal laziness through smarter systems.

## PROJECTS

### Microsoft Research Collaboration - *MAPG 2023*

Earned Microsoft Academic Partnership Grant (MAPG) for published work on optimising neural networks. Collaborated with MSR India scientists to develop quaternion transformers using the lottery ticket hypothesis, maintaining performance with 2–4 times fewer weights.

### MoirePy – Python Library - *PyPI, GitHub*

Authored MoirePy, a FOSS Python library for simulating bilayer moiré lattices; now published on PyPI. Designed and implemented all code, CI/CD, packaging and documentation end to end on GitHub.

### Applied ML Research (MSc Thesis & Internships)

- Reduced time complexity from  $O(n^3)$  to  $O(n)$  in *MSc thesis* by training ML models to estimate lattice energies with  $< 3\%$  error, replacing expensive many-body computations.
- Explored meta-learning algorithms at IISER Bhopal (Summer 2024)
- Improved AILA dataset MAP score from 14% to 21% by engineering an ML-based information retrieval pipeline (data cleaning, tokenization, ranking) during NLP internship at IISER Kolkata (Winter 2021) (*GitHub*).

### Software & Web Development Highlights

- Built and maintained multiple personal tools including a Flask-based *QR food coupon system* and a *secure voting platform*. Other projects include a static *trip expense manager*, my *blog site* (using Astro) etc.
- Contributed to NISER's internal tech stack as part of the *Software Development Group*, working on tools such as the *Canteen Menu* (static site using Google Sheets as backend), a Django-based *Lost & Found*, *NISER Listings*, a *student-run archive for PYQs*, and a *course-based timetable generator* that outputs PDF and .ics files.

### Leadership & Community Contributions

- Headed NISER's Coding Club and Software Development Group (2023–2024), driving community initiatives and promoting tech culture.
- Organized weekly tech talks (with *blogs*) and coding competitions.
- Oversaw multiple dev projects, coordinated teams and ensured timely feature rollouts through planned managerial endeavours.

### Homelabbing & Robotics

- Set up self-hosted Raspberry Pi server for home automation, running Nextcloud, PiHole, Glance etc via Docker; deployed LLMs via Ollama to power custom scripts for various small tasks including media tagging and RSS feed summarization and filtering.
- Led reinforcement-learning-based rover project using NVIDIA Isaac Sim; built autonomous drone from scratch with Pixhawk 4, GPS control, and custom 3D-printed frame.

## OBJECTIVE

Solve real-world problems using ML and smart algorithms in organisation that values innovation and creativity.

## PUBLICATIONS

- [1] A. Mukhopadhyay, A. A, and S. Mishra, *Large Neural Networks at a Fraction*, in *Northern Lights Deep Learning Conference* (2023).
- [2] A. Mukhopadhyay, R. B. Joshi, N. Tiwari, and S. Mishra, *Transformers at a Fraction*, in *Northern Lights Deep Learning Conference* (2024).

## ACHIEVEMENTS

### 1st Place in ML4SCI Hackathon

Built ensemble (5 neural nets + XGBoost) hitting ROC AUC 0.88 on classifying 11M+ samples. Showcased advanced ML, feature engineering, and large-scale data wrangling in a Brown/CERN-backed international competition.

## EDUCATION

### National Institute of Science Education and Research (NISER)

Integrated MSc. 7.6 CGPA  
| 2020 - 2025 | Physics major |  
Computer Science minor |

## SKILLS

Machine Learning, Deep Learning, Git, Large Language Models (LLMs), Python, Natural Language Processing (NLP), PyTorch, Computer Vision, Transformers, Hugging Face,

## TOOLS

• Git/GitHub • VS Code • Linux