

# Harsh Bihany

✉ harshbihany7@gmail.com | 📞 +91-7357920027 | 🌐 harsh-bihany | 🐙 bihany-harsh

## RESEARCH INTERESTS

Natural Language Processing, Reinforcement Learning, Multi-Agent Systems, Language Model Optimization

## EDUCATION

**Bachelor of Technology, Computer Science and Engineering** 2021 - 2025  
Indian Institute of Technology Kanpur | GPA: 9.5/10 Kanpur, India

## SCHOLASTIC ACHIEVEMENTS

- **Academic Excellence Award** thrice thus far for excellent academic performance in **2021-22, 2022-23, 2023-24**
- **All India Rank 149** in the Join Entrance Examination (JEE Advanced 2021) amongst 150K candidates.
- **All India Rank 326** in the Join Entrance Examination (JEE Mains 2021) amongst over 1.1M candidates.
- Among the **top 1% in, IOQC and IOQP 2021** (Physics and Chemistry Olympiads conducted by IAPT - Indian Association of Physics Teachers).

## SCHOLARSHIPS

- **Aditya Birla Scholar - 2021** one of 17 selected candidates chosen nationwide in the engineering stream for this prestigious scholarship awarded throughout my B.Tech. years. 2021 - 2025
- **KVPY-SA** as well as the **KVPY-SX** scholarships securing an **All India Rank of 257 and 186** in their respective examination conducted by Indian Institute of Science, Bangalore. 2020, 2021
- Secured the **NTSE Scholarship** of 2019 awarded by Central Board of Secondary Education, New Delhi. 2019 - 2025

## ONGOING RESEARCH PROJECTS

**LoRA Augmentation and Experimentations** Exploration Labs, IIT Kanpur  
Prof. Ashutosh Modi Aug '24 - Ongoing

- **Objective:** To analyze the various techniques of Low-Rank Adaptation of LLMs and develop newer representations for the same.
- Developed a prototype which performs better than the standard LoRA techniques and **complete finetuning** a set of NLU and NLG tasks performed over models like **RoBERTa** and **GPT-2**.
- Under review - ACL Rolling Review (ARR).

### Distributive Multi-Agent Planning over Constrained environments

Prof. Sunil Simon and Prof. Subhajit Roy Aug '24 - Ongoing

- **Objective:** To analyze and develop environments in which agents are conditioned to fulfill mathematical specifications.
- Recent studies have shown effective techniques for agent trajectory planning over temporal specification given via LTL or its derivatives.
- To generalize this over a more general distributed setting over a partial/complete knowledge domain.

## SELECTED PROJECTS

### EdiReF

Prof. Ashutosh Modi Jul '23 - Nov '23

- Worked on a **Semeval-2024** problem which was on Emotion Detection and Emotion Flip Reasoning on textual data involving English as well as English-Hindi mix conversations.
- By refining an existing architecture which integrated **masked-memory networks, transformer encoders, and several context-dependent GRUs**, our model surpassed the performance of GPT3.5 and GPT4 models on the given task. Our refinement produced a **weighted F1** score of **0.92** as opposed to GPT 4's 0.50 over zero-shot inference.

### Tinytorch

Self endeavour Jun '23 - Oct '23

- Tinytorch is a simple **lightweight CPU-only** illustrative implementation of Pytorch, a popular deep learning library, written in Python.
- The aim was to demonstrate **backpropagation** over vector computations.

- Constructed a custom Tensor object and an autograd engine from scratch. Provided the API for calculating backprop gradients using a simple `loss.backward()`.
- ### Copy-on-Write for EXT4

Prof. Debadatta Mishra

Linux Kernel Programming

Jan '24 - May '24
- **Objective:** To design, develop and test a prototype for **Copy-on-Write** for the **EXT4 filesystem in Linux**.
  - Our work was aimed at enhancing EXT4's capabilities, laying the groundwork for more advanced features like **file snapshots**.
  - Significantly enhanced the write performance on accord of the **storage efficiency** by modifying the core filesystem's pipeline which involves **reads and writes**, to manage data updates over an **extent level granularity**.
  - Provided the support for the previously unsupported `-reflink` flag over the `cp` system program.

## EXPERIENCE

### Quantitative Trading Intern

Optiver B.V., Amsterdam

May '24 - Jul' 24

- Learnt the basics of **options theory**, and traded on the live European options market, trading **ESX50 Options** on a simulated virtual platform, maintaining positions based on **events, news** and various other market factors.
- Quantified the **impact of large off-market intra-day ETF trades on end-of-day stock price movements**. Conducted in-depth analysis to measure the correlation between market ETF transactions and end-of-day auction changes.

## RELEVANT COURSEWORK

\* IN SPRING 2024-25

Statistical Natural Language Processing

Large Language Models \*

Linux Kernel Programming

Probabilistic Machine Learning \*

Algorithmic Game Theory

Computational Complexity \*

## TEACHING EXPERIENCE AND VOLUNTEERING

### Teaching Assistant, CS656

Computer Science and Engineering, IIT Kanpur

Jan '25 - May' 25

- Assisted the instructor with curating and grading quizzes and examinations for Algorithmic Game Theory.
- Conducted doubt-clearing sessions to address student queries and provided guidance on effective methods for presenting projects.

### Teaching Assistant, EE952

Electrical Engineering, IIT Kanpur

Jan '25 - May' 25

- Designed various assignments and questions for **over 50 industry professionals pursuing E-Masters** at IIT-Kanpur and crediting the course Introduction to Machine Learning.
- Provided consistent online support to students through email and an online forum, ensuring timely assistance.

### Academic Mentor, MTH

Institute Counselling Service, IIT Kanpur

Oct '22 - Jul' 23

- Served as a dedicated guide for first-year students, providing assistance with the academic challenges they faced in foundational math courses.
- Conducted multiple instructional doubt clearing sessions as well as lectures with a **capacity of over 600 students** specifically designed to help the freshers better understand their coursework.

### Volunteer

Prayas, IIT Kanpur

Jan '24 - May '24

- Volunteer at Prayas, which is an endeavor of IIT Kanpur students, aimed at providing primary and secondary education as well as vocational training to the children from under-privileged families that live in and around the IIT Kanpur campus.

## TECHNICAL SKILLS

- **General Tools:** Python, C/C++, Linux Kernel, ReactJS, Django, Git, SQL,  $\LaTeX$ , Bash
- **Machine Learning Utilities:** PyTorch, Tensorflow, OpenAI-Gymnasium, NLTK, Numpy