Harsh Bihany

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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*

PUBLICATIONS

LoRMA: Low-Rank Multiplicative Adaptation for LLMs ↗   Exploration Labs, IIT Kanpur
Harsh Bihany, Shubham Patel, Ashutosh Modi
○ *Findings of the Association for Computational Linguistics: ACL 2025*

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, Banglore.   *2020, 2021*
- Secured the **NTSE Scholarship** of 2019 awarded by Central Board of Secondary Education, New Delhi.   *2019 - 2025*

ONGOING RESEARCH PROJECTS

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 ↗   Linux Kernel Programming

Prof. Debadatta Mishra   *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