Harshit Dhankhar

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EDUCATION

- **Indian Institute of Technology (IIT), Patna** Patna, India
  *Bachelor of Science in Mathematics and Computing; **CPI: 8.29 on 10.0*** *2021 – 2025 (Expected)*

- **Amity International School, Mayur Vihar** New Delhi, India
  *Class 12th- CBSE Board; **96%*** *2019-2021*

PROJECTS AND EXPERIENCE

- **LAMSADE, Université Paris-Dauphine - PSL**
  Research Intern *May 2024-October 2024*
  - Worked on exploring various extensions of **Monte Carlo Tree Search (MCTS)** for solving the Qubit Routing problem for quantum circuits under **Prof. Tristan Cazenave**.
  - Came up with a novel sample-efficient algorithm employing Nested Monte Carlo Search to route quantum circuits constrained on quantum device topologies.
  - We **beat the state-of-the-art algorithms** (Qiskit by IBM, Cirq by Google) etc, by a factor of upto 52%, offering a runtime upto 50% faster.
  - The manuscript has been submitted to **ICLR 2025** for review, with me as the first author.

- **Computer Systems Group, IIIT Hyderabad**
  Research Intern *December 2022-December 2023*
  - Worked under the guidance of **Dr. Tejas Bodas**, Assistant Professor at Computer Systems Group, IIIT Hyderabad, on **RL-based learning of indexable policies for Multi-Armed Bandits (MABs)** and their applications in **scheduling**.
  - Conducted a literature review of existing indexable policies (Whittle's and Gittins Index) for MABs as well as their application in **scheduling and queuing theory**.
  - **Proposed a novel algorithm** for estimating Gittins indices for MABs using Q-learning and stochastic approximation, **outperforming existing state-of-the-art algorithms.**
  - Work has been submitted for publication at **SIGMETRICS 2024**, with me being the **first author**.
  - **Skills and Frameworks: Reinforcement Learning, Stochastic Approximation, Artificial Intelligence, Scheduling theory, Gittins index, DQNs, PPO.**

- **AI-NLP-ML Lab, CSE Department, IIT Patna**
  Undergraduate Researcher *July 2023-Present*
  - Worked under the guidance of **Prof. Rajiv Misra**, Professor and HOD of CSE department, on CO_2 **forecasting using Deep Learning** techniques.
  - Conducted a literature review of CO_2 emission of SAARC countries, existing DL algorithms like **GRU, LSTM, LSTM with attention, etc**. Also solely implemented these methods for forecasting.
  - Work has been published under **2023 IEEE International Conference on BigData**.
  - Also worked on the implementation of **Deep-RL algorithms** for path routing of EVs. The work has been submitted in **The Journal of Supercomputing.**
  - Currently working on the implementation of novel RLHF based algorithms for Neural Machine Translation under **Dr. Asif Ekbal**.
  - Worked on prediction of charging costs of EVs in a V2G setting via a pipeline architecture employing transformers and Deep-RL agents. The work has been submitted to

- - Skills and Frameworks: Deep Learning, Statistics, LSTMs, Data Science, Path Routing, Deep RL, Transformers.

- **Smart India Hackathon** [Code]
  Project *May 2022-August 2022*
  - Worked on designing **an NLP-based model** to predict career paths for individuals using their resume.
  - This was integrated into the Django framework using PostgreSQL, proposing an end-to-end product.
  - **Runner up in our Problem Statement** among **30,000 competing teams**.
  - **Skills and Frameworks: NLP, Machine Learning, MATLAB, Data Science, Python and its modules, Pytorch.**

- **Inter IIT Tech Meet, IIT Kanpur** [Code]
  Project *Jan 2023-Feb 2023*
  - Worked on devising a pipeline model based on **Computer Vision (CV)** to extract the patients' vitals from monitor images.
  - Used state-of-the-art algorithms like **OpenCV, YOLOV5, InceptionV3, and OCR** in the pipeline.
  - Was able to successfully get around 80% validation accuracy on the model.
  - **Skills and Frameworks: Computer Vision, Image Processing, K-means, Keras.**

TECHNICAL SKILLS

- **Most experienced with**: Python, C, C++, MATLAB, PyTorch, Tensorflow, Git, R, Deep Learning, Statistical analysis, Machine Learning, LaTeX, Linux OS, Open-AI gym, ML-Agents, Game theory, Scheduling theory, Reinforcement Learning and Deep-RL: (DQNs, PPO, SAC, etc), Multi-Agent RL.
- **Some experience with**: HTML, CSS, Javascript, Assembly language, VERILOG and Arduino programming.

COURSEWORK

Mathematics-I and II, Programming and Data Structures, Algorithms, Discrete Mathematics, Data Science, Probability theory, Numerical Linear Algebra, Computational lab, Differential Equations, Computer Architecture, Optimisation techniques, Theory of Computation, Numerical Analysis, Statistics, Deep Learning, Convex Optimisation, Financial Mathematics.

ACHIEVEMENTS

- **Inter IIT Tech Meet, 2023- Silver Medalist**: Our team **represented IIT Patna against all the 23 participating IITs** at the 11th Inter IIT Technical Meet. Worked on building and deploying a **Bayesian network** to predict the **sustainability** score of various corporates through a dedicated modeller.
- **Sudo Override, 2022- 2nd position**: **CTF competition** under Celesta. Used Steganography, deciphering techniques and various Linux modules in Kali Linux and Ubuntu.
- **JEE Advanced**: Secured an **All India Rank of 4497** out of 140,000+ candidates who appeared for JEE Advanced, 2021.
- **JEE Mains**: Secured **99.57 percentile** of the 1 million+ candidates who appeared for JEE Mains, 2021.

INVOLVEMENT

- **TEDxIIT Patna**
  Organiser *April 2023 - October 2023*
  Led a team of 50 individuals to organise the fifth edition of TEDxIIT Patna. Work included bringing in speakers, coordinating with sponsors, managing event logistics, etc.

- **NJACK-ML- Machine learning society, IIT Patna**
  Sub-coordinator *October 2022 - June 2023*
  Organised various group projects and workshops to improve the ML culture at IIT Patna.

- **National Service Scheme, IIT Patna**

  Volunteer   *November 2021 - July 2022*

  Worked in organising primary education drive, blood donation drive, etc., throughout the year.

- **Celesta- Annual Techno-Management Fest, IIT Patna**

  Sub-coordinator: Sponsorship   *September 2022 - January 2023*

  My work included reaching out to MnCs across India, creating networks and pitching for sponsorships.

- **Forthright- Media Body, IIT Patna**

  Senior Content Correspondent   *April 2022 - July 2023*

  Worked in curation, drafting and editing of various articles.