Shoan Anandkumar Raj

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Education

Indian Institute of Technology, Delhi, BTech in Electrical Engineering with Specialization in Power and Automation, Expected Minor in Computer Science. **July 2023 – Aug 2027**
CGPA: 9.25/10 | Department Rank: 3/68

Experiences

Reinforcement Learning Researcher | Advisor: *Dr. Raunak Bhattacharya* **Aug 2024 – Present**
Yardi School of AI, IIT Delhi | onsite

- Researching safe offline reinforcement learning algorithms to avoid constraint violation in learned policies, by improving cost critic learning using novel architectures and exploring the use of diffusion-based, VAEs, and transformer models
- Implemented architectures including Constrained Decision Transformers, CPQ, Constrained Policy Optimization (CPO), FISOR, PPO-Lag, TRPO-Lag, IQL, CQL, ReBRAC etc. from scratch for a deeper understanding of underlying algorithms.
- Benchmarked offline safe RL algorithms against SafetyGymnasium environments in DSRL dataset.

Product Lead | Company: *genoshi.io* **Jan 2024 – Present**
genoshi.io | Hybrid

- Achieved profit of INR 1.5M+ (expected to increase) and ARR exceeding INR 450k with a team of 6 people to build AI-based data discovery solutions tailored for finance companies (eg: FEDAI, 360One, Del Capital)
- Developed *Genoshi Quest*, a software service used by FEDAI and distributed to over 100 major banks in India, including Bank of India, HDFC Bank, Kotak Mahindra Bank Limited, ICICI Bank and Central Bank of India.
- Deployed large scale backend systems sourcing data from 1000+ RBI, DGFT, and FEDAI documents.
- Presented our product before the Deputy Governor of Reserve Bank of India, highlighting its impact and adoption by major Indian banks.

Research Intern | Advisor: *Dr. Hemant Unadkat* **Dec 2022 – Jan 2023**
Duke-NUS Medical School, NUS | Onsite

- Studied applications of ML in materiomics to model effects of surface topographies on cellular growth.
- Learned and implemented statistical tests like Kruskal Wallis H test and ANOVA to analyze cell morphological and topography design features present in lab data.
- Studied algorithms like XGBoost, LightGBM and AdaBoostClassification, and observed ensembled results.

Cybersecurity Intern | Company: *Hackershala* **June 2022 – July 2022**
Hackershala | Online

- Learned techniques like OSINT, networking, reconnaissance, web hacking (XSS, SSRF, SQLi, etc), cryptography, API pentesting, reverse engineering, binary exploitation and completed relevant assignments.
- Worked on 10 real-world assignments and came 1st in end-of-internship Capture The Flag competition.
- Assignments included problems like automating enumeration on list of websites to find ones vulnerable to SQLi and exploiting it, finding sensitive details of target user using OSINT and gaining priviledged access to software using social engineering, etc.

Projects

Genoshi Quest *Associated with genoshi.io*

- Developed and optimized document retrieval strategies and agentic RAG architecture for financial Q/A tasks, deployed at scale and distributed to 100+ companies and banks in the finance sector.
- Built and deployed pipeline using only open source models to maintain integrity of confidential data.
- Used docker containers and docker networking to modularize the pipeline for scalability and flexibility in adding more data ingestion modules, content filters, multi-step prompting and intermediate NLP modules
- Developed and implemented security measures to protect user authentication and mitigate risks such as endpoint exploitation and prompt poisoning attacks. Conducted research on these potential attack vectors.

Loan Data Converter *Associated with genoshi.io*

- Developed an application for *Del Capital* to facilitate the conversion of customers' loan data to a standardized TUDF format, and optimizing the time taken and memory used for over 500,000 records per excel file.
- Reduced data conversion times from ∼12hrs to ∼10min for 500k records, with 12GB of peak memory usage.
- Created a system to identify data format inconsistencies, inform user of required adjustments and suggest possible corrections.

- Productized this by creating an admin panel, and price tiering + secure OTP-based authentication for users.

Remote Surgery Robotic Hand POC *IIT Delhi Open House 2023*

- Built a robotic arm to mimic hand movements using manufacturing methods like sheet metal forming and spot welding as a proof-of-concept for remote surgeries, fitted with 5 servo motors and an Arduino Uno.
- Used Google's *Mediapipe* library and *OpenCV* in python to extract position landmarks for fingers in 3D space.
- Observed that z-coordinates for landmarks were not accurate, so I collected my own data and trained a lightwieght CNN to predict the degree of rotation for each finger using XY landmarks within $\pm$ 5° range.
- Presented project in IIT Delhi Open House 2023-24 and won 1st prize amongst freshmen and 4th overall.

From Scratch Implementations *Personal Learning Project*

I find implementing architectures the best way to learn ML. Here are some models I've made from scratch:

- **Multi-Layer Perceptrons**: Implemented Forward pass and Backpropagation from scratch using only *numpy*.
- **Transformers**: Implemented attention heads and then went on to implement multi-headed attention blocks, then encoder blocks and finally decoders with masked self-attention. Used PyTorch to create the transformer.
- **Generative Adversarial Networks**: Implemented convolution layers and transpose convolution layers from scratch and trained on MNIST dataset. Studied variations like CycleGANs, SGANS and WGANs as well.
- **Reinforcement Learning Algorithms** such as CPO, PPO, PPO-Lag, DDPG, etc. and transformer based models like *constrained decision transformers* and *SaFormer* for ongoing research in safe RL. (PyTorch and JAX/FLAX)
- **Kolmogorov-Arnold Network (naive implementation)**: A barebones (and inefficient) version of KANs. Incorporated learnable parameters as splines in edges in PyTorch and trained it on MNIST dataset.
- **UNets**: Implemented basic UNet for denoising in JAX on MNIST Fashion Dataset.

Awards

Winner, Soonami Venturethon 3.0 ($2k grant + $125k investment offer) June 2024

Best Player + Team Gold Medal, Sportech Chess Tournament 2023-24 March 2024

Team Silver Medal, Inter IIT Chess Tournament 2023-24 Dec 2023

Prize Winner, IIT Delhi Open House 2023-24 Nov 2023

National Rank 3, Bebras India Computational Thinking Challenge 2022-23 Dec 2022

Relevant Courses Taken

IIT Delhi: Data Structures and Algorithms, Signals and Systems, Calculus, Linear Algebra, Digital Electronics
Other: Deep Reinforcement Learning (CS285, UC Berkeley), Deep Learning (CS230, Stanford University), Machine Learning (CS229, Stanford University), Neural Networks: Zero to Hero (Andrej Karpathy, Youtube)

Positions of Responsibilities

Institute Chess Vice Captain: Leading 1000+ members of the chess community of IIT Delhi

DevClub Executive: Organising tech events in IITD, both internal and in collaboration with large companies

Academic Achievements

Department Change: Amongst top 5% of a batch of 1200+ to secure department change for exceptional academics Jul 2024

JEE Advanced All India Rank 1953 Jun 2023

JEE Mains All India Rank 2601 (99.78%ile), with 100%ile in Physics Apr 2023

TOEFL overall score of 115/120. Oct 2022

APs: Score 5/5 in both AP Calculus BC and AP Computer Science A May 2022

SAT: overall score 1500/1600 with 800/800 in Maths and 700/800 in English May 2022

References

Dr. Raunak Bhattacharyya: Assistant Professor, Yardi School of AI, IIT Delhi

Dr. Hemant Unadkat: Assistant Professor, Duke-NUS Medical School, Singapore